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Chapter 1 Introduction

1.1 General

This is the Final Report of the 'Study on Water Supply and Sanitation in the Lindi and Mtwara Regions'. The report details the study outputs obtained through study activities, which were carried out by the joint effort of the JICA Study Team and Tanzanian Counterpart Team in accordance with the Scope of Work,[1] agreed upon between the Ministry of Water[2] and the Japan International Cooperation Agency (JICA).

The Study commenced in January 2000, and is complete upon submission of the Final Report in December 2001. This report covers the results of surveys and monitoring, the revisions based on the comments from the Government of Tanzania and the revised development plans, based on monitoring of the pilot scheme. The study period was divided into two stages.

Stage 1 of the Study entailed the information collection and analysis during the period from January to June 2000 to establish the master plan framework and select the 100 candidate villages for water supply project implementation. Stage 2 of the Study entailed a detailed survey (Feasibility Study) on the 100 selected villages from March to December 2001, including 8 sites where pilot studies and monitoring were conducted.

[1] Monitoring work on the Pilot Study sites was added to the Scope of Work agreed in August 1999 as described in 1-2-5

[2] The Ministry of Water became the Ministry of Water and Livestock Development after merging with one department of the Ministry of Agriculture in December 2000

1.2 Outline of the Study

1.2.1 Background of the Study

The United Republic of Tanzania has an area of about 945 thousand km^2, occupying nearly 3.3% of the African continent. It is situated in the eastern part of Africa just south of the equator and borders the Indian Ocean. Being one of the least developed countries, the nation's gross domestic product (GDP) per year has remained at less than US$300 per capita since its independence from the United Kingdom in 1961.

In order to promote national economic reconstruction, the Government of Tanzania initiated the 'Economic Infrastructure Recovery Plan' with short-term rolling plans every 3 or 4 years, involving water resources development for water supply as a part of the services in the social sector.

The Government produced a 20-year Water Supply Plan in 1971, and proceeded to prepare Water Supply Master Plans at the regional level with financial assistance from foreign countries, especially from the Republic of Finland.

The study area, the Lindi and Mtwara Regions, comprises the south-eastern corner of Tanzania. It covers a total area of about 83.7 thousand km^2 (9.0% of the nation) and has a population of about 1.82 million as of 1998 (5.7% of the national population).

The Water Supply Master Plan for the two regions was compiled in 1976 mainly with financial assistance from Finland, and was once updated in 1986, again with Finland's financial support.

During the preparation and revision of the Master Plan, a significant development in the water supply system of the two regions took place. After the suspension of aid from Finland in 1992, however, no foreign financial support was extended to these regions. Accordingly, few water supply projects were carried out and facility maintenance remained inadequate, resulting in a decrease in water supply service coverage and the dilapidation of many of the constructed facilities in the past several years.

Since the Master Plan was last updated 14 years ago, it needed to be revised in accordance with the current demands and plans for the development of the water supply system. Taking this situation into consideration, the Government of Tanzania requested technical assistance from the Government of Japan in August 1996 in order to review the Master Plan and implement a Feasibility Study for the future water supply projects.

In response to the request, the Government of Japan decided to conduct a study, and JICA dispatched a preparatory study team to Tanzania in August 1999 for discussion with the Ministry of Water on Scope of Work for the Study on Water Supply and Sanitation in the Lindi and Mtwara Regions.

1.2.2 Objectives of the Study

The three major objectives of the Study are:

1) To review the existing Water Supply Master Plan for Lindi and Mtwara, establishing the frame work of the updated Master Plan;
2) To carry out a Feasibility Study on the 100 prioritised villages identified in the Master Plan review, in order to establish the groundwater development plan for rural water supply, including such plans as new water resource development, water supply facility construction, the rehabilitation of existing supply facilities, operation and maintenance, and improvement of sanitation.
3) To transfer relevant skills and techniques to the counterpart personnel during the course of the Study

1.2.3 Study Area

The Study covers the entire area of the Lindi and Mtwara regions.

1.2.4 Scope of Work

The Scope of Work for this study program agreed upon between the Ministry of Water and the JICA Preparatory Study Team in August 1999 is attached in the Supporting Report.

1.2.5 Study Components and Sequence

The Scope of Work provided was for a study period of one and a half years. However, as construction of the pilot water supply facilities was included in the scope of work and monitoring the pilot schemes is important, the study period was extended about half a year. The total study period, therefore, became nearly two years – from January 2000 to December 2001, and was divided into 2 stages, as shown in Figure 1-1.

The first stage, extending from January to June 2000, entailed reviewing the Master Plan updated in 1986 and prioritizing the 100 candidate villages for the Feasibility Study.

The second stage of the Study, extending from June 2000 to December 2001, consisted of the Feasibility Study on the selected 100 villages and the monitoring work on the pilot schemes, and was subdivided into four stages, stages 2-1, 2-2, 2-3 and 2-4.

Stage 2-1 covered most of the field surveys of the feasibility study on the selected 100 villages and extended from June to December of 2000.

Stage 2-2 was for the pilot study and it overlapped with stage 2-1, as the pilot study was one part of the feasibility study. In the feasibility study, test drillings were conducted at ten sites to confirm the results of the hydrogeological survey carried out at 100 villages. Six pilot water

supply facilities were constructed using the six productive test wells for the pilot study.

The purpose of the pilot study sites were to practice community participation in the planning and construction of the supply facilities, and moreover, to train and encourage the villagers in operation and maintenance of the facility as well as on the matters of sanitation.

Stage 2-3 comprised not only the analysis work of the various surveys to prepare the draft final report, but also the monitoring work on the pilot study sites.

The monitoring work on the pilot schemes continued to stage 2-4. The Final Report on the Study was prepared and submitted at this stage, including monitoring results, the revised project implementation plan and the facility plan, based on the monitoring study.

1.2.6 Reports

The reports prepared and submitted to the Government of Tanzania during this study period are as follows:

(1) Inception Report	Submitted at the beginning of February 2000
(2) Interim Report	Submitted in the middle of June 2000
(3) Progress Report	Submitted in the middle of December 2000
(4) Draft Final Report	Submitted in the middle of May 2001
(5) Final Report	Submitted to JICA at the end of 2001. JICA sent it to Tanzania through diplomatic channels.

Figure 1.1 Operation Flow Chart

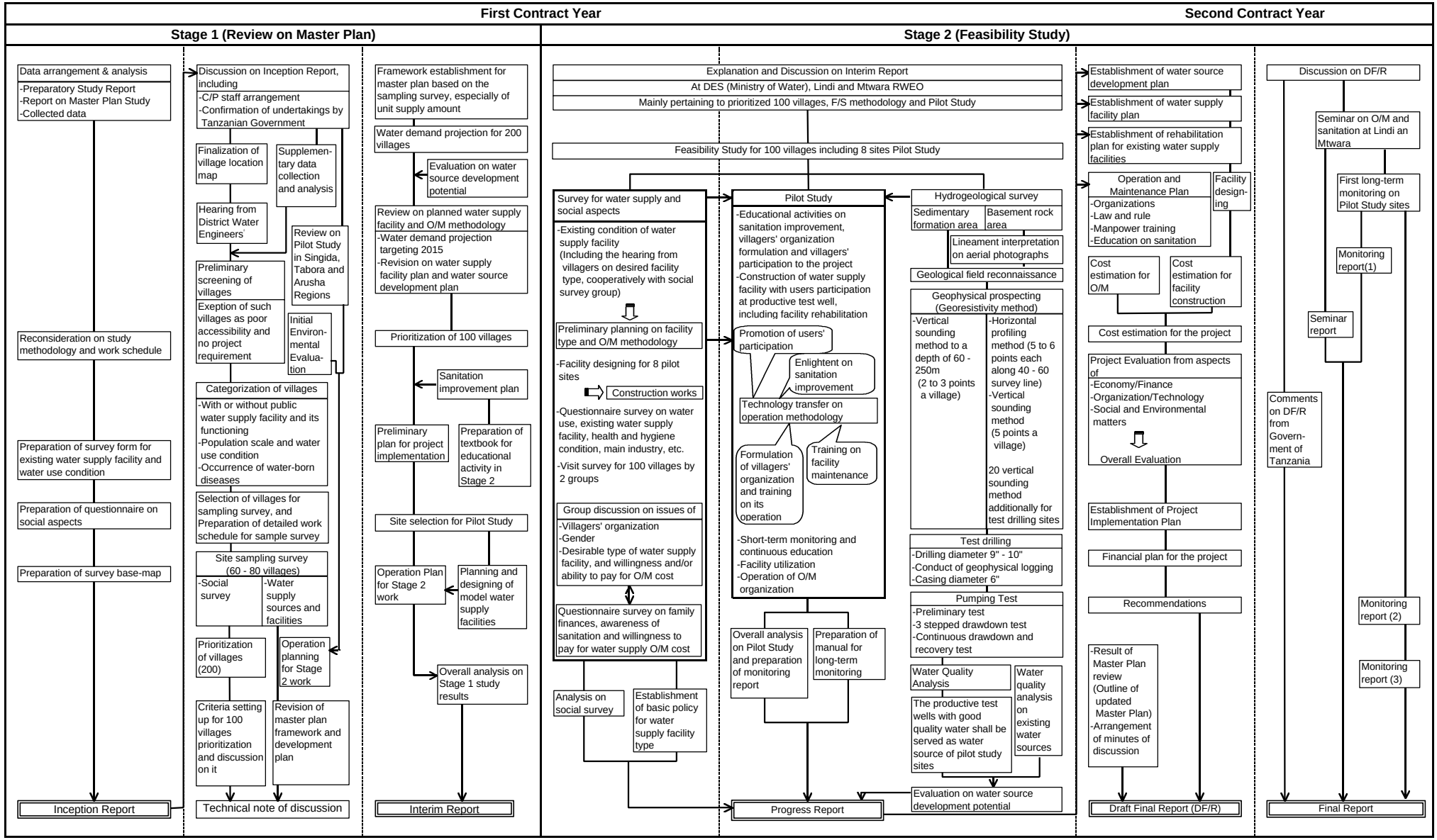


Figure 1.2 (1/2) Work Schedule

Work Schedule (1/2)

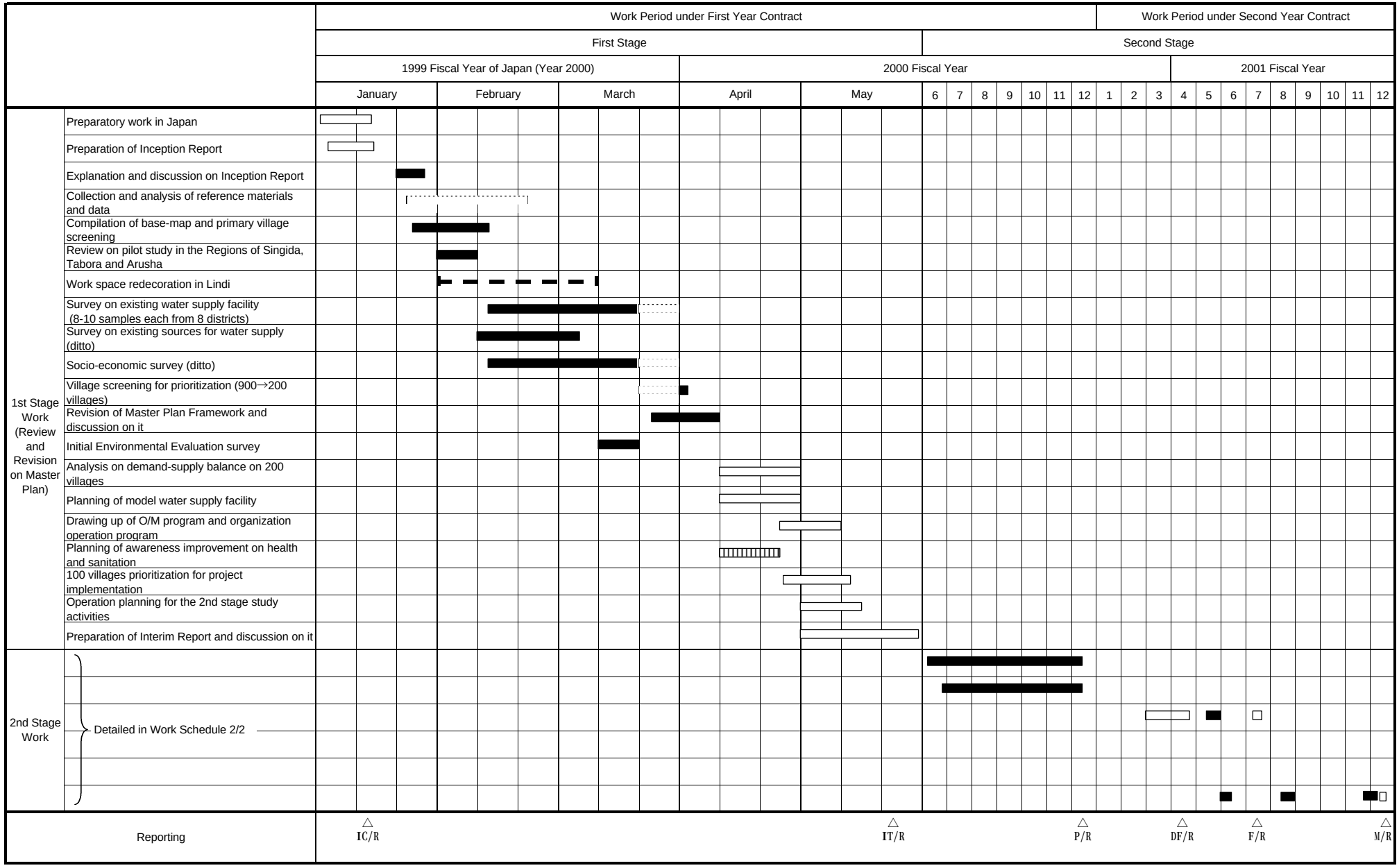
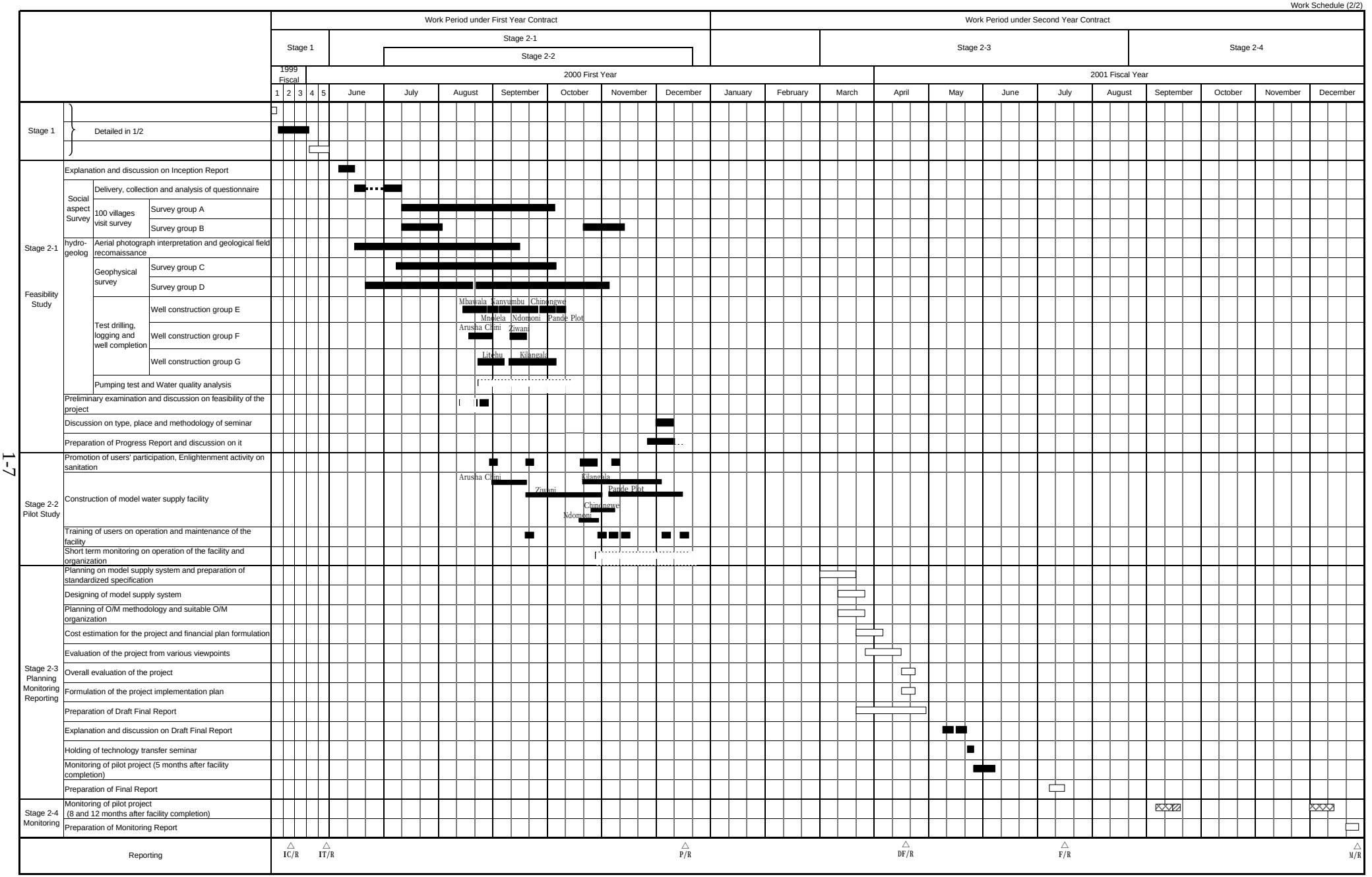


Figure 1.2(2/2) Work Schedule

Work Schedule (2/2)



Chapter 2 Review of Master Plan and Establishment of Master Plan Framework

2.1 Review of Master Plan

2.1.1 Water Master Plan 1977-1991

As a part of the Technical Co-operation between the Governments of Tanzania and Finland, an agreement was reached in 1973 on a Water Resources Inventory and Development Plan for the Mtwara and Lindi Regions. Finnwater Consulting Engineers was appointed to carry out the work, which started in the same year and was completed in March 1977.

In the Water Master Plan of 1977 (WMP-77), the long-term objective was sufficient wholesome water within reasonable distance for everybody by the year 1991. As a planning guide the objective was interpreted as requiring that everybody was to have a public service point yielding 30 liters per person per day within a distance of 500 meters. The service points were either public taps or public wells equipped with hand-pumps.

The medium-term objective in WMP-77 was for every village to have a reliable water source by the year 1981. This medium-term objective was also called a crash program. The emphasis during the crash program was laid on the construction of water sources; the extension and improvement of the distribution system was to come later.

2.1.2 Mtwara-Lindi Rural Water Supply Project of 1977-1984

After completion of the Water Master Plan, the Government of Finland agreed to finance part of the rural water supply development proposed in the plan. The first contract on the Project was signed between the Ministry for Foreign Affairs of Finland, the Ministry of Water and Energy of Tanzania and Finnwater Consulting Engineers in 1977. The United Kingdom and UNICEF had separate agreements with Tanzania through which they supplied materials and equipment to the Project.

The Project was conducted in three phases up to the end of 1984 and was supposed to continue with phase IV from 1985-87.

The main objective of the Project was to improve the water supply situation in the rural areas of the Mtwara and Lindi Regions in order to achieve an improvement in the general health of the population and to create higher potential for economic development.

2.1.3 Comparison between 1975 and 1984

Considerable development in the water supply sector took place between 1975 and 1984. The number of people with improved water supplies (piped W/S or hand pumps) rose from

460,000 (37 %) to 1,170,000 (80 %). The number of piped water supply systems increased from 55 to 143 and their coverage from 458,000 to 852,000 people. After 1975, hand pump wells were introduced in the area and a total of 1800 facilities were constructed by 1984 serving approximately 450,000 people, partly overlapping with the piped schemes.

The actual service provided by the improved water supplies was rather poor. Although the operational status of the piped schemes was not investigated in detail in 1975, there were clear indications that the condition of the piped schemes had deteriorated considerably between 1975 and 1984. The number of people getting reasonable service from improved water supplies did not increase at the same rate as the theoretical coverage.

Table 2-1 Comparison of water supply situation between 1975 and 1984

Type of Water Supply	Situation in 1975		Situation in 1984	
	Users	Percentage	Users	Percentage
1. Piped supply	458,000	37 %	550,000	38 %
2. Hand pump well	27,000*	2 %	380,000	26 %
3. Open well of pit	339,000	28 %	360,000	25 %
4. River and stream	163,000	13 %	80,000	5 %
5. Dam and pond	96,000	8 %	15,000	1 %
6. Others	152,000	12 %	80,000	5 %
Total	1,235,000	100%	1,465,000	100%

Note: * Users of hand pump wells in 1975 are not clearly mentioned in the Master Plan report.

As indicated above, the water supply situation in 1984 did not show significant improvement compared to the situation in 1975. There were several problems in the water supply sector in 1984 due mainly to the continuing poor economic situation of the country, in addition to an increase in the population of the area. It limited the available funds and caused shortages of fuel, spares, equipment and material. It had a large negative effect on personnel management as well.

The staff situation of Water Departments at all levels was unsatisfactory. There was a shortage of personnel at the senior level, especially, and some of the posts were not filled. The worst problem was that the full potential of the staff was suppressed by shortages of transport, insufficient operating funds and lack of supervision. Furthermore, the motivation of the staff was undermined by constraints that prevented them from performing to their maximum capability.

2.1.4 Water Master Plan in 1986

In consideration of the situation mentioned above, the concerned agencies felt a need to update the 1977 Water Master Plan (WMP-77). Due to financial constraints, it was agreed that the revised plan should deal with the water supply sector only. The study to revise the WM-77

for the period of 1986-2001 started in 1984 and was completed in May 1985. The report was finalized in 1986 (WMP-86).

The aim of the plan was to provide everybody with safe water (25 lcd) by the year 2001. An intermediate target was to provide improved water supply to all villages by 1991 guaranteeing a minimum requirement of water (10 liters/capita/day). The plan proposed the following physical water supply development:

- construction of 2340 new hand-pump wells;
- rehabilitation and deepening of 225 existing hand-pump wells;
- rehabilitation and expansion of 91 existing piped water supply schemes; and
- construction of 7 new piped water supply schemes.

The Water Department was assumed to remain responsible for planning, constructing and operating the water supplies. Upgrading staff skills at the Water Department (regional as well as district levels) and improving the facilities and equipment were included in the plan.

The direct development cost was estimated at Tsh. 622 million. This did not include the renewal of structures, machinery and equipment for which Tsh. 415 million were allocated during the planning period. Recurrent costs, including the operation of water supplies and the costs of MAJI organization, were estimated at Tsh. 53.4 million in 1986 and at Tsh. 113.8 million in 2001. The total budget requirement during the planning period including the reservation for the necessary renewal was estimated at Tsh. 2370 million.

2.1.5 Update of Planning Criteria

After reviewing WMP-86, it was concluded that some planning criteria had to be updated for the formulation of the new Master Plan study.

(1) Objective

The objective set out in the WMP-86 was not considered to be very realistic. A more feasible and realistic target should be set, taking into consideration the National Water Policy in 1991 and the Rural Water Policy in 1999.

(2) Water Resources

In many villages in the Study Area, there is a clear shortage of supply sources. Since the projects executed under the WMP-77 and WMP-86 emphasized extension of the pipelines to cover supply services effectively, water resources development was made the second priority. Now, special attention should be paid to further development of water resources.

Groundwater, including spring water, has been targeted as a suitable source as it meets the need for a source that is safe for drinking purposes and stable throughout the year.

Other water sources such as flowing rivers, dams, ponds, shallow dug wells, pits in riverbeds and rainwater are generally used in this area. They are all very important sources in practice. However, none of them are suitable on a long-term basis for the rural water supply. The various sources are compared in the following table.

Characteristics of Water Sources

Source type	Reliability		Safety and Quality	
tube-well	◎	stable through the year	◎	free of bacteria
spring	◎	stable through the year	◎	free of bacteria
river	○		△	high turbidity, exposed to bacteria contamination
stream	○	reduction in dry season	△	high turbidity, exposed to bacteria contamination
dam	◎		×	exposed to bacteria contamination
pond	△	dries up in dry season	×	exposed to bacteria contamination
shallow dug well	△	occasionally dries up	×	exposed to bacteria contamination
pit	△	occasionally dries up	×	exposed to bacteria contamination
rainwater	×	available only in rainy season	○	depends on harvesting method

(3) Population projections

Population growth rates used in WMP-86 are mainly based on the population census data collected in 1967 and 1978. The estimated population in 1988 and thereafter is considerably higher than the 1988 census data in some districts and revisions should be made accordingly. No population census was conducted in 1998 due to financial constraints; therefore population projections had to be based on the population growth rates between the 1978 and 1988 censuses. However, even the projected population does not indicate the actual population of individual communities in many places due to frequent periods of migration or reorganization of the villages over the past decade. The actual population of the individual candidate villages for the project implementation has, therefore, been based on the population records surveyed by the concerned village governments, although reliability is different from place to place. Various development plans, which have been established based on unreliable population data should be reviewed and revised, upon acquisition of the new population census data.

(4) Unit water demand

Unit water demand was set at 30 liters/capita/day (ℓ/c/d) for domestic use in WMP-77, which was reduced to 25 ℓ/c/d in WMP-86. The new National Water Policy states that 25 ℓ/c/d shall be supplied as a basic service level for the rural areas. In the regions of Lindi and Mtwara, however, the unit water demand to be used for the facility design has been set at 20 ℓ/c/d, because the financial capacity of the villagers established through the socio-economic survey is

very small. The reduction from 25 to 20 is based on the concept that a small-sized facility requires less expenditure on O&M.

(5) Institutional arrangement

WMP-86 also specified the need for community participation in the construction and operation of the water schemes; however, this aspect has yet to be realized. The new Rural Water Policy requires the management of water schemes to be community-based and calls for a completely new approach which relies more on people's initiatives and resources. The village water committees, for example, must be reformed in order to cope with their new roles, including financial management.

The new National Water Policy encourages also the private sector to provide support to communities in planning, design, construction and supply of equipment/materials and spares.

Whether management is carried out solely by the villagers or under the private sectors' service, the district and regional water departments should give advice and provide technical services to the managing body in order to make the water scheme sustainable.

(6) Water supply facilities to be designed

Because the facilities should be operated and maintained mostly by the community itself, a simple design with low-cost operation is essential. Preferably, each community should control its water schemes from source to outlet. Where one scheme must serve several communities, smaller schemes are better than large complex ones, and the communities must make rules for the co-operative management of the scheme.

2.2 Establishment of Master Plan Framework

The Master Plan framework for the JICA Study has been established as stated below, in consideration of the items described in the preceding paragraph. It is generally in conformity with the revised draft National Water Policy 2000, except for the sources for the rural water supply (not for urban water supply).

2.2.1 Objectives

The objective of the project is to facilitate sustainable provision of adequate, clean and safe water for the rural population of the two regions to a maximum extent (over 75% of the population) by the year 2015.

2.2.2 Water Resources

Groundwater, including spring water, is the most suitable water source for rural water supply as it is safe and reliable and utilization costs, either by well construction or by spring development, are low. Using surface waters, such as river water, by construction of dam or rainwater are not taken into consideration as the supply source because of such obvious problems as instability and high cost for treatment. Only groundwater is targeted as a source of the rural water supply.

2.2.3 Water Demand

(1) Population growth rates

Population growth rates have been calculated on the basis of census data from 1978 and 1988, the results of which are tabulated below.

Table 2-2 Population Trend by District in Lindi Region

District	1978 Census	Annual Growth Rate	1988 Census	Annual Growth Rate	Population 1998 Estimate
Lindi Urban	27,308	4.3%	41,730	4.3%	63,576
Kilwa	114,032	2.8%	150,392	2.8%	198,224
Lindi Rural	245,089	1.4%	280,543	1.4%	223,499
Ruangwa	0	0.0%	0	1.4%	97,620
Nachingwea	112,067	0.5%	117,478	0.5%	123,118
Liwale	39,406	2.9%	52,211	2.9%	69,233
Total	537,902	1.8%	646,364	1.8%	775,269

Note: Out of the total population of the Lindi Rural District in the 1988 census, 86,507 persons (30.4%) are supposed to belong to the present Ruangwa District.

Table 2-3 Population Trend by District in Mtwara Region

District	1978 Census	Annual Growth Rate	1988 Census	Annual Growth Rate	Population 1998 Estimate
Mtwara Urban	48,510	4.65%	76,407	4.65%	120,372
Mtwara Rural	144,354	1.61%	169,312	1.61%	198,633
Newala	307,385	0.02%	307,715	0.02%	142,971
Tandahimba	0	0.00%	0	0.02%	167,835
Masasi	271,477	2.14%	335,448	2.14%	414,557
Total	771,726	1.42%	888,882	1.62%	1,044,368

Note: Out of the total population of the Newala District in the 1988 census, 166,620 persons (54 %) are supposed to belong to the present Tandahimba District.

(2) Water demand projections

Water demand in Lindi and Mtwara urban areas in 2015 will reach 22,524 m^3/day and 13,578 m^3/day, respectively, assuming 100 l/c/d as the unit demand including factors of water loss and daily maximum (actual consumption rate is set at 50 l/c/d).

The total water demand in the rural areas of the Study Area in 2015 will be 66,487 m^3/day assuming 20 ℓ/c/d as the unit demand, excluding loss or other factors.

2.2.4 Institutional aspects

Since introduction of the Water Policy in 1991, main issues for the formulation of water supply master plans have been i) beneficiary participation; ii) enhancement of sustainability of water schemes; and iii) integrated approach for water and sanitation. Accordingly the following items should be emphasized in institutional aspects.

(1) Decentralization of rural water supplies

In the past, it was the government's responsibility to operate and maintain rural water supply schemes. Given the central government's inability to mobilize sufficient financial and human resources to fulfill this task, the outcome was the deterioration of rural water supplies. Solutions to the problems of operation and maintenance are now being addressed through institutional reforms aimed at decentralizing the functions of technical and financial management to lower levels and empowering communities (through relevant legislation) to manage resources at the lowest appropriate level, and to create an environment conducive for stakeholder participation.

(2) Sectoral co-ordination

The practice for planning has been done separately by various sectors such as villages, districts and regions without adequate co-ordination. Various decision makers have planned and

made decisions about the same resource. This is one of the major institutional issues to be resolved if the anticipated comprehensive management is to be realized.

The demands of the various sectors have to be identified and balanced with the resources. In co-ordination mechanisms within and across the sectors, there exist overlapping and unclear definitions of roles and responsibilities within the sector-related institutions. There is also poor co-ordination of External Support Agencies (ESAs). It is expected that the on-going exercise on organizational reforms in the public sector will bring about positive improvements in the water sector. The need for inter- and intra-sectoral co-ordination has been identified as the key issue underpinning the realization of the sectors objectives.

(3) Integration of water supply and sanitation

Compared with water supply, sanitation has been given low priority at the national level. Funding for sewerage and sanitation has remained very low. Funds allocated annually for sewerage and sanitation since 1979 average only 0.45% of the total government development budget. Looked at from the actual requirement, the annual allocation as compared to the annual requirements according to the five-year development plan has been on the average of 30%. This has limited to a greater extent, any meaningful intervention in trying to solve the current problems.

In relation with the matters of sanitation, however, the use of safe water should be emphasized rather than provision of a sewerage system in the rural area. It is believed that it is time to start a campaign for the use of safe water throughout the year, simultaneously with implementation of water supply schemes. Most people in this area are not using supplied water in the rainy season. They tend to return to the traditional nearby water sources when available, although it may be unsafe. This, in turn, leads to frequent occurrence of water-borne or water-related diseases during the rainy season.

(4) Women's Involvement

Previous water supply and sanitation programs including the formulation of regional water master plans did little to promote women's involvement in sector activities. Women should be encouraged and educated in order to participate in decision-making, planning, implementation, operation and maintenance, monitoring and evaluation of sector programs and projects.

Chapter 3 Water Supply Sector

3.1 Summary of Tanzanian Government's Policy on Rural Water

3.1.1 Water Supply

The Rural Water Policy (Draft) was issued by the Ministry of Water in July 1999. Major points extracted from its seven chapters are as follows:

(1) Policy concept

Coverage of Tanzania by rural water supply schemes remains modest. Yet schemes fall into disuse almost as fast as new ones are made. In response, the new policy stresses sustainability. Water and sanitation projects should be "demanded, planned, implemented and managed by the communities".

(2) Policy objectives

Tanzanian rural water policy objectives are to improve health and to alleviate poverty of the rural population through improved access to adequate and safe water. More specifically, the policy seeks "to provide adequate, safe, affordable and sustainable improved water supply facilities to the rural population"[1].

(3) Policy principles

The policy is in accordance with the following principles

- Socio-economic principles

  Social principles mentioned in the document are that water for human consumption is the top priority and that, geographically, water-scarce areas should get prior access to public investment. By stating that "water is an economic good", the policy recognizes that water supply costs money and that it contributes to the economy as well as to welfare.

- Environmental principles

  Water sources should be protected from degradation. Given the significance of water in environmental health, water supply projects should be integrated with sanitation and hygiene education projects.

- Sustainability principles

  Prerequisites for a sustainable rural water supply are:

  a. water scheme management at the lowest appropriate level

  b. ownership by the beneficiaries

c. full cost recovery for operation and maintenance

d. availability of skills and spare parts for maintenance

e. protection of water sources and catchments

f. choice of appropriate technology, within the means of the user group; and

g. recognition of the role of women.

(4) Strategy

Policy objectives can be achieved through use of appropriate strategies of following;

a. Community participation strategy

- legal ownership of the water supply by the users;
- definition of the roles, responsibilities, rights and limitations of Water User Groups;
- knowledge of the Water Policy; and informed choices being made by stakeholders.

b. Private sector participation strategy

- The private sector is envisaged to have 'an important role in water supply' and will provide (or, at least, should contribute to the provision of...) 'consultancy services, community mobilization, training, construction, manufacturing of equipment, supply of spare parts, operation and maintenance services, and financing of schemes'.

c. Public sector regulation and facilitation strategy

- Roles of central and local government are clearly defined.

d. Environmental protection strategy

- Water projects should be subjected to environmental impact assessment (EIA).

e. Gender awareness strategy

- Women should be represented on water-user institutions. Water programs should raise awareness of gender issues and should train and empower women.

(5) Water Use and Allocation Aspects

Abstraction and use of water are regulated by Water Rights granted by the Ministry under the 1974 Water Act, as amended in 1981. Target consumption levels for domestic use and livestock are specified in this section.

(6) Planning and Co-ordination

Planning should be bottom-up. Priority should be given to low-costing technology and to rehabilitation and completion of on-going projects, rather than new schemes. While the roles of villagers and the Ministry are paramount, other stakeholders in rural water supply are recognized. Co-ordination is necessary. The mentioned stakeholders are external support agencies (ESAs), regional and district authorities, water user entities, the private sector and NGOs.

(7) Conclusion

Success depends on “political will, accountability, concerted effort and collaboration...”. The government will guarantee the realization of policy objectives by close supervision, monitoring and evaluation.

3.2 Investment Policy

It was the central government's responsibility to construct, operate and maintain the rural water schemes until the introduction of the National Water Policy in 1991. Dependence on government and donors as sole providers for water services has led to insufficient delivery of rural water supply and sanitation services, due mainly to the chronic financial constraints of the government and reduced financial support from foreign countries in this sector in the 1980s. Dependence on the government had not cultivated the beneficiaries' participation in maintenance of the schemes, often causing their demise.

The National Water Policy emphasizes community participation in investment of the water supply schemes, not only payment for full cost recovery for operation and maintenance but also payment for part of capital cost, in order to cope with the worsening situation.

The government put the rural communities under an obligation to establish village water committees and to save for construction of water supply facilities. Some of the villages began depositing into water funds and the local government gave financial and technical assistance to the village water schemes. The number of such communities, however, is very limited. Because of rural poverty, people prefer to fetch water themselves for free rather than pay for water. This investment policy, therefore, does not seem to be so effective for drastic improvement of the situation.

3.3 Operation and Maintenance Policy

3.3.1 Operation and Maintenance in Urban Water Supply

Lindi Urban Water and Sewerage Authority (LUWASA) and Mtwara Urban Water and Sewerage Authority (MTUWASA) are responsible for the provision of adequate, clean and safe water for the urban population throughout the year. These authorities are conducting operation and maintenance activities on a commercial basis. In small towns like Masasi, Tandahimba, Newala, Nachingwea, Kilwa, Ruangwa and Liwale, however, operation and maintenance will be conducted by DWE in collaboration with water users in each community.

3.3.2 Operation and Maintenance in Rural Water Supply

Under the new rural water policy, the people who are ultimately in charge of operation and maintenance (O&M) of water supply facilities are the village water users, although DWE is responsible for capacity building on O&M activities and major repair of the facilities. For that purpose, it is mentioned in the Rural Water Policy that every village should have a Village Water Committee (VWC). It is expected that a Village Water Committee (VWC), in close collaboration with the DWE, will conduct O&M activities in rural areas. The DWE is responsible for establishing a VWC in the villages that do not yet have one. Ultimately, each VWC will become a legally registered users' entity. The DWE will train VWC members on operation and maintenance (O&M). In addition, DWE will conduct monitoring on the performance of VWCs and water supply facilities.

3.4 Water Supply Organizations

3.4.1 Ministry of Water (MoW)

The Department of Rural Water Supply and Sanitation of the Ministry of Water (MoW) played a key role in implementing rural water programs. Under the Rural Water Policy in 1999, the role of the MoW was changed from an implementing agency to a regulating, facilitating, promoting and coordinating agency. The Ministry of Water has become the Ministry of Water and Livestock Development by the ministerial reorganization in 2000 without changing the roles of each department. Roles of the central government in the rural water programs are defined as follows:

- To provide a clear policy framework
- To provide an adequate legal framework and review legislation related to water resource management
- To develop performance standards for all sectors in the water sector
- To facilitate research and development of appropriate technology and its dissemination
- To promote institutional capacity building at all levels including the capacity of the private sector
- To create an enabling environment for private sector participation in the provision and management of water supply
- To delineate catchment areas to facilitate protection and conservation of the same and impose enforcement
- To allocate water rights and provide a legal framework for ownership of water schemes by water user entities
- To co-ordinate sector development including donor support
- To provide technical and financial support for the construction of new schemes and the rehabilitation and expansion of existing water supply schemes.

The MoW consisted of two service divisions, namely i) Policy and Planning and ii) Administration and Personnel; and three operational divisions of:

i) Water Resources Assessment and Exploration
ii) Rural Water Supply; and
iii) Urban Water Supply and Sewerage.

Three sections of Maji Central Stores, Drilling and Dam Construction and Water Resources Institute were transformed into semi-autonomous agencies. (Refer to Fig. 3-1)

There were 2629 staff members and employees in the MoW as of year-2000 and the payroll in 1999/2000 amounted to Tsh. 1,802,120,900 including basic salary and allowances.

The average pay per employee amounted to Tsh. 685,478 (US$914) per year. The breakdown of the payroll by section is presented in Table 3-1.

Table 3-1 Budget of MoW

Code	Sections	No. of Employees	Payroll	Payroll per employee
101	Administration and General	56	58,550,100	1,045,538
102	Finance and Accounts	23	15,423,500	670,587
103	Policy and Planning Division	13	28,719,700	2,209,208
201	Water Resources Department	660	472,074,500	715,264
202	Maji Central Stores	50	27,320,800	546,416
203	Water Laboratories Unit	70	51,669,500	738,136
301	Urban Water Supply and Sewerage	859	579,427,200	674,537
302	Central Water Board	25	26,607,200	1,064,288
401	Rural Water Supply and Sanitation	595	356,351,000	598,909
501	Water Resources Institute	90	61,602,200	684,469
601	Drilling and Dam Construction	188	124,375,200	661,570
	Total	2,629	1,802,120,900	685,478

Source: 1999/2000 Budget, MoW

3.4.2 Regional Water Engineer's Office (RWE)

(1) Function and Activities

The Regional Water Engineer's Office (RWE) is responsible for the planning and water development in each region. RWE's function is to be an adviser and technical resource to any local authority and associated organizations in their effort to build capacity and expertise in all aspects of water resources development and management. The main activities of RWE are summarized below.

- To advise Regional Under Secretary (Social Sector Support Services) in capacity building for local authorities and co-ordinate the resulting work concerning: i) water resources development and management; ii) water demand management; iii) water use and allocation;
- To assist Regional Under Secretary (Social Sector Support Services) in supporting each local authority to review its current problems and development opportunities;
- To assist Regional Under Secretary (Social Sector Support Services) in preparing and integrating a development issues report;
- To prepare the water report to be incorporated in the region-wide report submitted to the Regional Consultative Committee (RCC);
- To assist Regional Under Secretary (Social Sector Support Services) in issuing

guidelines on advice for local authorities and other organizations;

- To support local authorities in developing interventions to address the problems and opportunities identified in their development strategies;
- To plan specific capacity building measures for any local authority as requested by them;
- To monitor and evaluate the development and capacity building program monthly, quarterly, half yearly and annually;
- To monitor the implementation of central government policies by local authorities as directed by the Regional Administrative Secretary;
- To interpret water policy issues and other guidelines from the Ministry of Water for local authorities and other organizations in the region;
- To carry out any delegated functions from central ministries as directed by Regional Under Secretary (Social Sector Support Services).

(2) Organization and Personnel

a) Lindi RWE Office

The Regional Water Engineer's office consists of the administrative division and operational divisions (water resources division and executive engineer's division). The former is staffed with a secretary, an accountant, and a registry assistant. The water resources division is staffed with a hydrogeologist, a hydrologist, five technicians and other employees. The executive engineer's division is staffed with an electrical engineer, a civil engineer, a mechanical engineer and six technicians. There are 22 staff members and employees, including a driver, at the Lindi RWE office.

b) Mtwara RWE Office

Under Regional Water Engineer (RWE), there are the water resources management division and the executive engineer's division. The former is staffed with a hydrologist, a hydrogeologist, 11 technicians and other employees. The latter is staffed with an electrical engineer, a civil engineer, and five technicians. There are 28 staff members and employees, including a driver, at the Mtwara RWE office. (Refer to Fig. 3-2). The payroll budget for 1999 amounted to Ths 21,000,000 (i.e. the average pay per employee was Ths 750,000 (US$9137) per year).

3.4.3 District Water Engineer's Office (DWE)

The District Water Engineer's Office (DWE) is responsible for the planning, development and operation and maintenance of water supply systems in the district. Under the District Water

Engineer, there are administrative and operational sections such as construction, operation and maintenance, finance, community participation and sanitation. In general, most of DWEs in the Study Area are not adequately staffed due mainly to budgetary constraints. For instance, there are only 7 staff members and employers at DWE in the Mtwara Rural District. There is only one staff member responsible for operation and maintenance activities in the district and there is no staff for the finance section. (Refer to Fig. 3-3)

3.4.4 Village Water Committee (VWC)

The village water committee (VWC) usually consists of 6 members including a committee chairman, a secretary, two pump mechanics and two caretakers. The roles and duties of VWCs are: i) planning, survey and evaluation of water supply projects; ii) collection and management of water fund; iii) selection of participants for O&M seminars; iv) cleaning of water facility; v) co-ordination on water supply projects between the village government and villagers; and vi) mobilization of villagers for water supply project works. (Refer to Fig. 3-4)

Based on the new policy on rural water supply, communities are required to pay a portion of capital costs, in cash and in kind, for new schemes and for rehabilitation, and also to pay the full cost of operation and maintenance. The collection and management of the village water fund (VWF) is therefore one of the main duties of VWCs. The distribution of VWCs and Village Water Funds in the Study Area is presented below.

Distribution of VWCs and VWFs in Lindi Region (1996)

District	Number of Villages	Number of VWCs	Number of VWFs	Contributed Amount in Tsh.
Kilwa	74	47	24	568,304
Lindi Urban and Rural	121	76	60	1,732,652
Ruangwa	62	27	21	1,228,039
Nachingwea	65	36	21	323,000
Liwale	39	55	31	187,898
Total	365	241	157	4,039,893

Source: Lindi Region Socio-economic Profile

Distribution of VWCs and VWFs in Mtwara Region (1996)

District	Number of Villages	Number of VWCs	Number of VWFs	Contributed Amount in Tsh.
Mtwara Urban	6	n.a.	n.a.	n.a.
Mtwara Rural	101	n.a.	n.a.	10,000,000
Newala	130	n.a.	n.a.	n.a.
Tandahimba	103	n.a.	n.a.	n.a.
Masasi	214	n.a.	n.a.	n.a.
Total	554	n.a.	n.a.	n.a.

Source: (1) Mtwara Region Socio-economic Profile (2) Mtwara District Council

3.4.5 Private Sector

The National Water Policy of 2000 recommends promotion of the private sector to participate in operation and maintenance of the rural water schemes in order to make them sustainable. Operation and maintenance of the schemes will surely go more smoothly if an experienced operator and/or administrative staff member participate, than done only by inexperienced VWCs.

However, introduction of a profit-oriented enterprise to the rural water schemes should not prejudice the fulfillment of the need for water as an entry point to poverty alleviation. Participation by the private sector will be suitable for urban schemes or large multi-village waterworks.

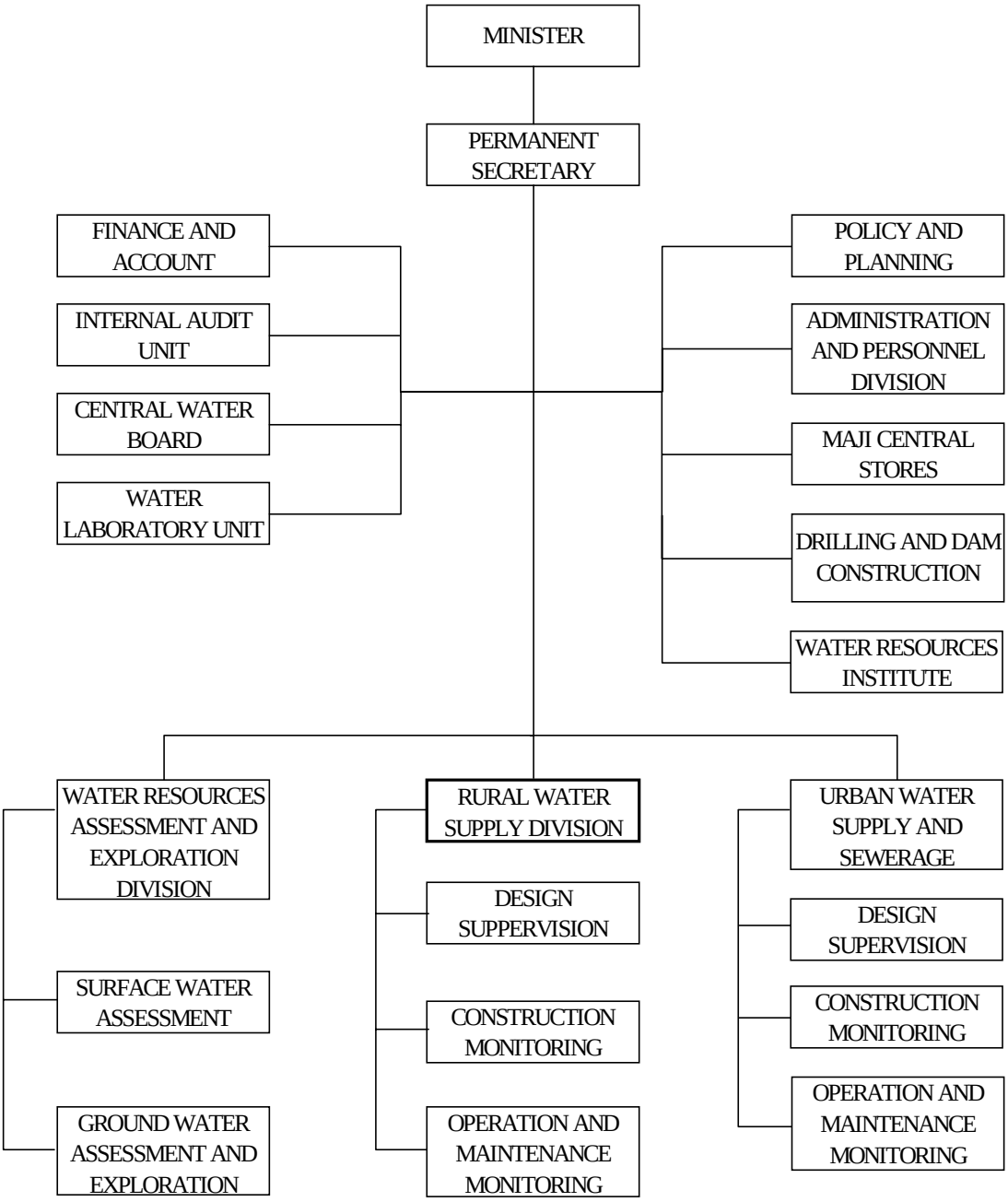
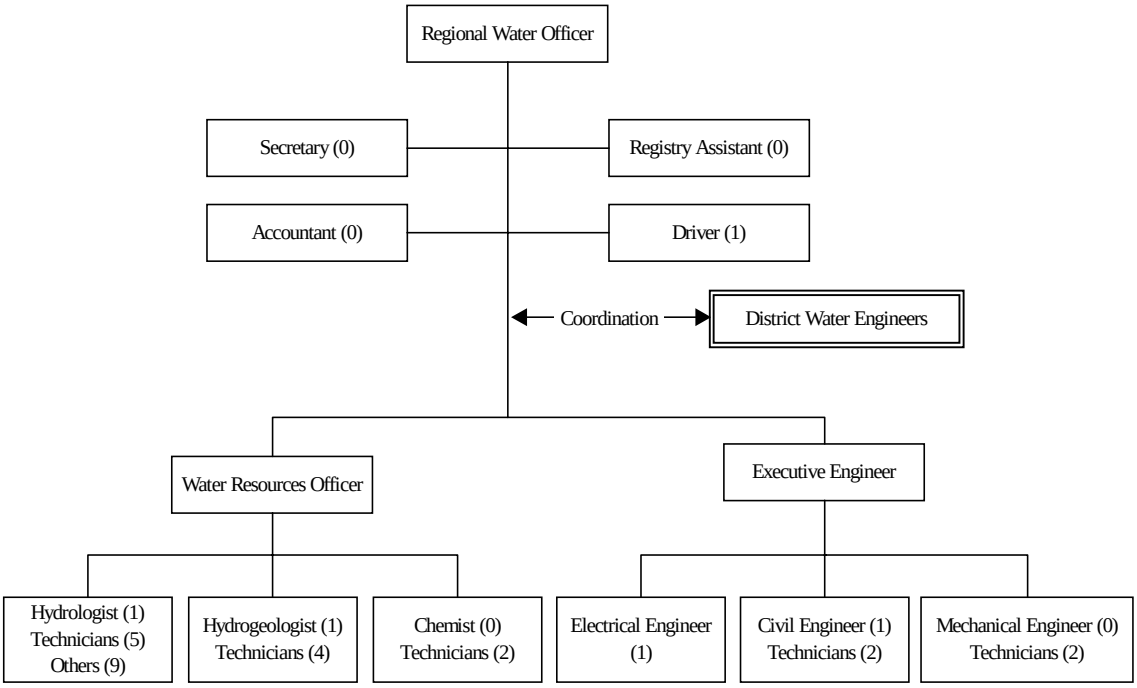
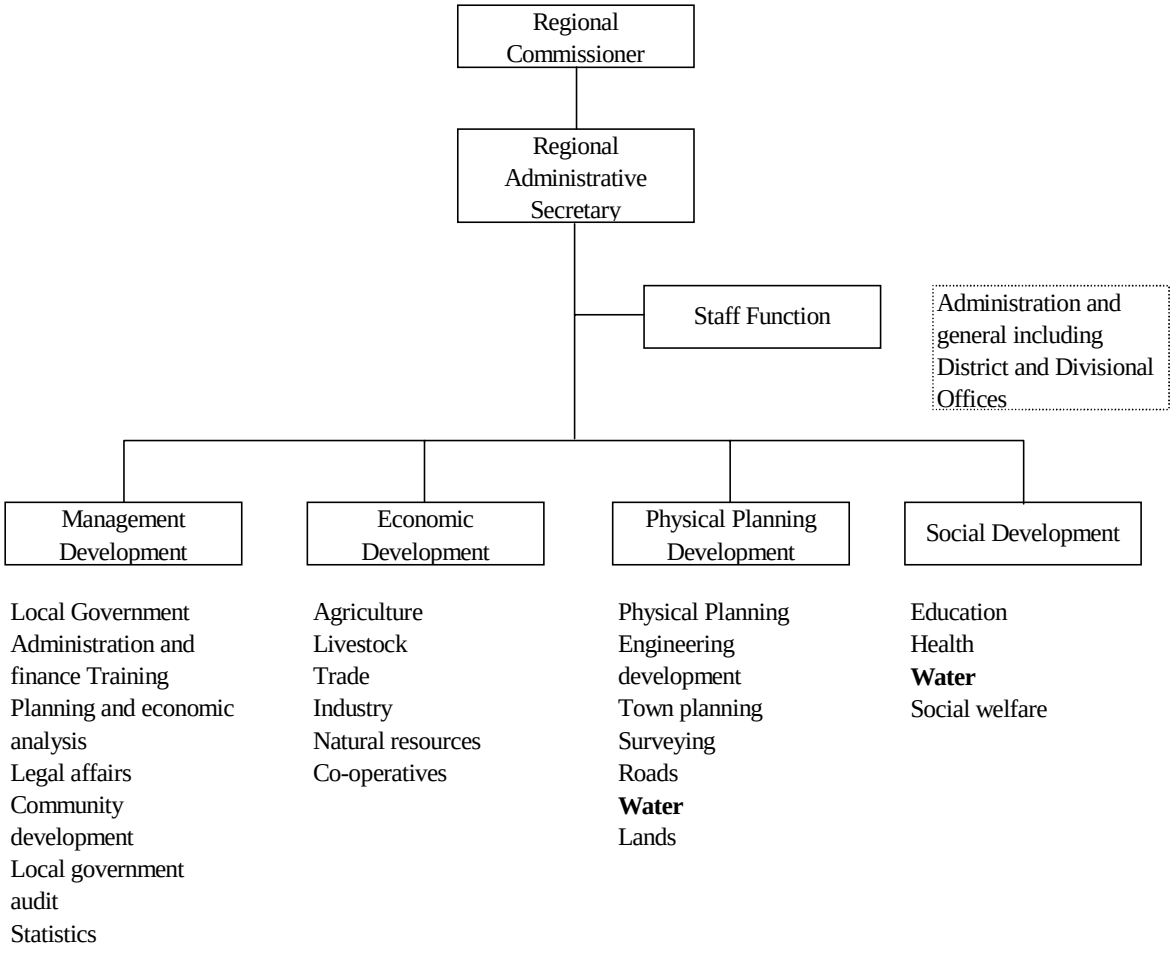


Figure 3-1 Organization Chart of MoW



Note: Figures in parenthesis indicate the number of staff and employees.

Figure 3-2 Regional Water Department Organization Structure (Mtwara Region)



Source: Regional Secretariat's Operations Manual

Figure 3-3 Organizational Structure of Regional Administrative Office

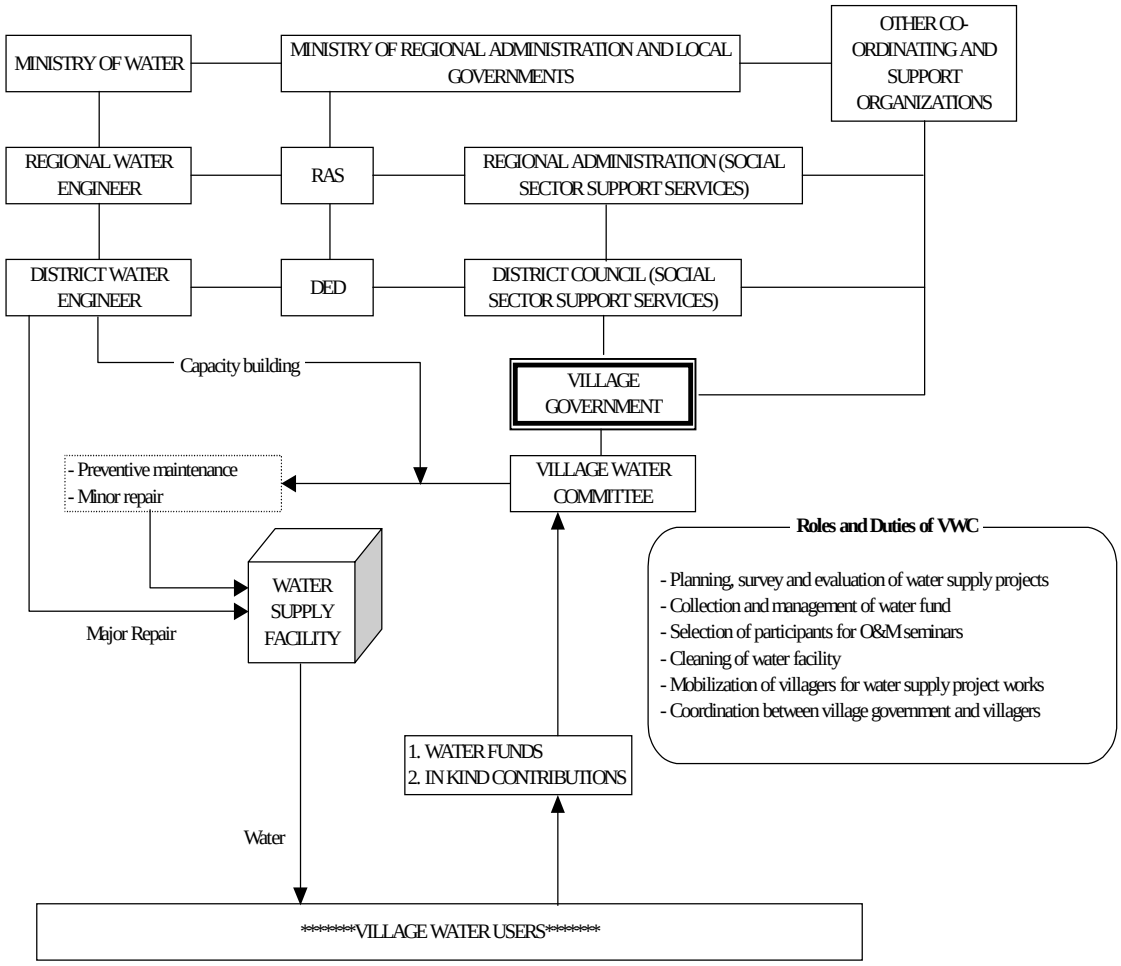


Figure 3-4 Roles and Duties of Village Water Committee

3.5 Financial Status of Regional Administrations and Local Government

3.5.1 Regional Administrations

Under the Local Government Reform Program, responsibility for regional and local authorities has been shifted from the Prime Minister's Office to the Ministry of Regional Administration and Local Government (MRALG). MRALG issued a Regional Secretariat's Operations Manual in 1999 to give operational guidance to all personnel employed in the Regional Secretariat.

According to the Operations Manual, the Regional Commissioner (RC) is responsible for all the development and ministerial support services to local authorities and other organizations within his or her region through the Regional Secretariat. The RC will also provide policy and technical support to local authorities, facilitate coordination among authorities, supervise and monitor performance, exercise proper officer authority and promote a conducive environment of law and order, which enables all actors in the region to function effectively.

The Regional Administrative Secretary (RAS) is the head of the Regional Secretariat and principal advisor to the RC. This advice concerns the performance of all the development and administrative support services to local authorities and other local organizations within his or her region.

The key functions of the regional secretariat are as follows.

(1) Management support services

(2) Economic development support services

(3) Physical planning and engineering support services

(4) Social sector support services including water supply, education and health services.

3.5.2 Local Government

(1) District Commissioner

The main task of the District Commissioner (DC) is to assist the RC in performing his or her administrative duties within that particular district. This includes the maintenance of law and order and creating an political and administrative environment that enables local authorities to perform their services with efficiency and effectiveness. The DC is the justice of peace and overseer of development activities in the district.

(2) District Administrative Secretary

The main task of the District Administrative Secretary (DAS) is to assist the District Commissioner in performing all administrative support services to local authorities and other

organizations within the district.

(3) Divisional Secretary

The main task of the Divisional Secretary is to assist the District Commissioner in performing his or her administrative duties in that particular division. This will include assisting the DC to ensure the maintenance of law and order in the division. He or she is the justice of the peace and overseer of development activities in the division.

(4) Village government

A village government usually consists of 25 members including a village chairman, a secretary, a treasury and other members. These members belong to village committees such as planning and development, social services, health and water.

3.5.3 District Finances

Each district council receives income from two sources: central government allocations and its own taxes and levies. The central government allocation covers the salaries of the majority of officers. The central government also allocates funds from its budget for some development projects but during the last few years' development expenditure has not actually materialized.

Central Government Funding for Mtwara Region (1998/99)

Unit: Tsh.

District	Personnel Emoluments	Other Charges	Total
Mtwara Urban	37,386,988	141,707,474	141,707,474
Mtwara Rural	6,286,700	7,196,500	7,196,500
Masasi	17,791,200	11,538,300	11,538,300
Newala	6,339,400	9,648,000	9,648,000
Tandahimba	3,493,800	3,300,000	3,300,000
Total	71,298,088	173,390,274	173,390,274

Source: Mtwara Regional Secretariat

The district council has its own tax base. In southern Tanzania, the crop levy collected on cashew production has recently generated a sizable income, especially for the Newala and Masasi Districts.

Revenue and Development Budget in Mtwara Rural District Council

Unit: Tsh.

	Budget	Actual
Revenue in 1999	391,598,450	332,928,397
Total Development Budget	122,000,000	48,462,600
Water fund	10,000,000	0

Source: Mtwara Rural District Council

Budget of Mtwara Rural District in 1999 is presented in Table 3-2.

Table 3-2 Budget of Mtwara Rural District

Unit: Tsh.

	Budget	Actual
Revenue in 1999		
1 Taxes	99,210,000	75,825,465
2 Produce licenses	142,800,000	127,215,808
3 Trade licenses	14,060,000	7,976,525
4 Liquor licenses	555,000	42,900
5 Fees and levies	11,437,000	2,183,827
6 Income from council property	9,736,450	657,761
7 Interest and profit	800,000	602,916
8 Other	113,000,000	118,423,195
Total	391,598,450	332,928,397
Development Budget		
1 Agriculture and livestock	4,032,000	4,836,000
2 Education	16,692,000	9,273,000
3 Works	13,000,000	0
4 Trade	29,101,550	15,101,550
5 Culture	6,500,000	2,053,000
6 Water *	10,000,000	0
7 Women and youth	28,000,000	4,810,000
8 Council's contribution to NGOs	14,674,450	12,389,050
Total	122,000,000	48,462,600

Note: * Water fund was collected but not spent in 1999.

Source: Mtwara Rural District Council

3.6 General Water Supply Conditions in the Study Area

3.6.1 Rural Water Supply

(1) General rural water supply condition

Benefited by the humid climate, both surface and groundwater resources are comparatively abundant in the area when compared with other regions of the nation. That does not automatically translate into readily available water for the communities.

Water is a limiting constraint in most villages and poor water quality plus water shortage arethe main causes of disease. People are using water from such sources as dug wells (traditional pit or dug well without protection and without pump, or dug well equipped with hand-pump), boreholes well with pump, springs, rivers or streams (flowing or dammed water) and rainwater (limited to rainy season). Moreover, people are obliged to walk long distances to get water in many of the villages.

According to a socio-economic profile of the regions (1997), 61% of the villages (221 out of 365 villages) had access to safe water in the Lindi region in 1996, and 42% (about 230 out of 548) of the villages in the Mtwara region. Although 87% of the villages were covered by the safe water supply system in the Mtwara region, much of the supply system was out of use resulting in a very low coverage in 1996.

Since maintenance of water supply facilities has been very poor both in the Lindi and Mtwara regions, especially since 1990, the present statistics of the supply service coverage are now much lower than those in 1996.

In order to verify the present situation of the water supply and water use in the two regions, 7 to 17 villages were randomly selected and visited for a sample survey.

Although the number of the visited villages is limited to only 95 out of over 900 villages in the 2 regions, the findings seem to represent the characteristics of the concerned districts to a considerable extent. The most notable matters are the poorly maintained large-scale water schemes, and also the difficulty in operation and maintenance on the existing supply facilities under the government's new O&M policy.

Below is the outline of the findings by region and district from the sample survey. Results from each sampled village are tabulated in Table 3-3 (1)-(5).

Table 3-3 (1) Condition of Water Supply and Water Use of Sample Villages

Kilwa District, Lindi Region

Division	Ward	Village	Population 1988	Estimated Population 2000	Public Water Scheme			Water committee	Water fund	Water source for domestic use as of 2000	Remarks (Strategies for the year 2000)
					name of scheme covered	water source	status				
Pwani	Kivinje	Matandu	4,800	6,686	Singino	hand pump	1/2 operating	exist	none	hand pump	easily
		Nangurukuru	2,500	3,482	Nangurukuru	spring	operating	exist	none	spring	easily
Miteja	Tingi	Njia Nne/Tingi	2,601	3,623	Tingi	hand pump BH	1/3 operating	exist	exist	hand pump	easily
	Kinjumbi	Somanga Ndumbo	2,188	3,048	Somangandumbo	hand pump	not operating	exist	none	dug well	easily
	Mingumbi	Mingumbi	3,728	5,193	Mingumbi	hand pump	3/14 operating	exist	exist	hand pump	easily
Pande	Mandawa	Mandawa	4,141	5,768	Mandawa	hand pump	not operating	exist	none	river	easily
		Kiwawa	2,109	2,938	Kiwawa	spring	not operating	exist	none	spring	easily
		Mavuji	2,599	3,620		hand pump	2/3 operating	exist	exist	hand pump	easily

Ruangwa District, Lindi Region

Division	Ward	Village	Population 1988	Estimated Population 2000	Public Water Scheme			Water committee	Water fund	Water source for domestic use as of 2000	Remarks (Strategies for the year 2000)
					name of scheme covered	water source	status				
Ruangwa	Ruangwa	Ruangwa	6,539	7,726		BH	operating	exist	exist	BH	easily
	Malolo	Mtakuji				hand pump	operating	exist	none	hand pump	easily
	Likunja	Kitandi	2,227	2,631	Kitandi	hand pump	4/10 operating	exist	none	hand pump	easily
		Chilangalile	498	588	Chilangalile	(BH)	not operating	exist	none	river	easily
Mnacho	Luchelegwa	Luchelegwa	1,608	1,900	Luchelegwa	hand pump	operating	exist	exist	hand pump	easily
		Chinongwe	2,984	3,526	Chinongwe	hand pump	not operating	exist	exist	Traditional well	easily
Mandawa	Mandawa	Mchichili (Mandawa)	2,242	2,649	Mandawa	(spring)	operating	exist	exist	spring	easily

Table 3-3 (2) Condition of Water Supply and Water Use of Sample Villages

Lindi District, Lindi Region

Division	Ward	Village	Population 1988	Estimated Population 2000	Public Water Scheme			Water committee	Water fund	Water source for domestic use as of 2000	Remarks (Strategies for the year 2000)
					name of scheme covered	water source	status				
Mtama	Nyengedi	Nyengedi	3,563	4,210	Nyengedi	hand pump (BH)	not operating	exist	none	stream	easily
	Mtua	Kilimahewa (Muta)	3,775	4,460	Muta	hand pump	not operating	exist	none	stream	easily
Sudi	Sudi	Madangwa	2,211	2,612	Madangwa	hand pump	not operating	exist	exist	spring	easily
		Hingawali	2,354	2,781	Hingawali	—	—	exist	none	Traditional pits	easily
	Nachunyu	Nachunyu	3,236	3,824	Nachunyu	spring	3/15 operating	exist	exist	dug well	easily
Nyangamara	Nyangamara	Nyangamara	3,407	4,026	Kitere Nyangamara	BH	operating	exist	exist	BH	Planned to supply to Nahukahuka and Litipu.
Mingoyo	Mingoyo	Mnazimmoja	4,593	5,427	Mnazimmoja	hand pump BH	1/2 operating not operating	exist	exist	BH	easily
		Tulieni				hand pump	operating	exist	exist	hand pump	
	Kiwalala	Kiwalala	1,989	2,350	Kiwalala	spring	not operating	exist	none	dug well	easily
	Mnolela	Mnolela	1,178	1,392	Mnazimmoja	(BH)	not operating	exist	exist		easily
		Zingatia	2,305	2,723	Mnazimmoja	(BH)	not operating	exist	exist	river	easily
Milola	Rutamba	Rutamba ya Sasa	3,666	4,332	Rutamba	hand pump	12/15 operating	none	none	hand pump	easily
Rondo	Mnara	Mkanga II	1,727	2,041	Mkanga	(spring)	not operating	exist	exist	spring	
	Chiponda	Chiodya	1,677	1,981	Rondo	stream river	not operating	exist	exist	rain water	easily
Mchinga	Mchinga	Mchinga II	2,254	2,663	Mchinga II	hand pump	10/14 operating	exist	exist	hand pump	easily
	Kilolombwani	Kilolombwani	1,255	1,483	Kilolombwani /Maloo	hand pump (BH)	not operating	exist	exist	river	
	Mbanja	Likongo	1,098	1,297	Kikwetu	river	not operating	exist	exist	stream	easily
Nangaru	Chikonji	Chikonji	3,068	3,625	Chikonji	hand pump (BH)	not operating	exist	none	dug well	easily

Table 3-3 (3) Condition of Water Supply and Water Use of Sample Villages

Nachingwea District, Lindi Region

Division	Ward	Village	Population 1988	Estimated Population 2000	Public Water Scheme			Water committee	Water fund	Water source for domestic use as of 2000	Remarks (Strategies for the year 2000)
					name of scheme covered	water source	status				
Lionja	Namikango	Namikango	1,841	1,955	Namikango	BH	operating	exist	exit	BH	easily
Mnero	Mnero Miembeni	Mnero Miembeni	1,896	2,013	Mnero Miembeni	hand pump (BH)	2/9 operating	exist	86,250	hand pump	easily
		Mkonjela	1,559	1,655	Ruponda	hand pump	not operating	exist	63,000	hand pump (Mandawa)	easily
Ruponda	Chiola	Chiola	1,594	1,692	Chiola	hand pump (BH)	1/4 operating not operating	exist	123,900	hand pump	easily
	Marambo	Marambo	2,777	2,948	Ruponda	hand pump	2/7 operating	exist	none	Traditional well	easily
	Mkoka	Rweje	1,295	1,375	Rweje	hand pump (BH)	not operating	exist	150,000	Traditional well	fair
Nambambo Kjini	Namatula	Namatula	3,516	3,733	Nachingwea	hand pump	1/11 operating	exist	2,000	hand pump	easily
Nambambo	Naipanga	Naipanga	5,066	5,378	Naipanga	hand pump (BH)	not operating	exist	161,000	Traditional well	easily
	Mkotokuyama	Mkotokwyana	829	880	Mkotokuyama	BH	2/3 operating	exist	70,000	hand pump	easily
	Mtua	Mtua	1,789	1,899	Mtua	hand pump (BH)	1/2 operating	exist	151,000	Traditional well	fair

Liwale District, Lindi Region

Division	Ward	Village	Population 1988	Estimated Population 2000	Public Water Scheme			Water committee	Water fund	Water source for domestic use as of 2000	Remarks (Strategies for the year 2000)
					name of scheme covered	water source	status				
Kibutuka	Kiangara	Kiangara	1,463	2,062	Kiangara	hand pump BH	1/2operating	exist	exist	dug well	easily
Barikiwa	Makata	Makata	1,310	1,846	Makata	hand pump	2/7 operating	exist	none	hand pump, stream/river	easily
	Barikiwa	Ndunyungu	562	792	Ndunyungo	hand pump	1/5 operating	exist	exist	river	easily
	Mkutano	Mkutano	666	939	Mkutano	hand pump	2/5 operating	exist	exist	hand pump	easily
Liwale	Liwale Mjini	Kipule	1,793	2,527		BH	not operating	exist	exist	stream/river	easily
		Mangirikiti	1,025	1,444	Mangirikiti	hand pump	not operating	exist	none	stream/river	easily
	Liwale B	Mikunya	1,926	2,714	Mikunya	hand pump BH	not operating	exist	exist	dug well	easily
	Mihumo	Mihumo	1,853	2,611	Mihumo	hand pump	not operating	exist	none	stream/river	easily
		Likombora	898	1,265	Likombora	hand pump	not operating	exist	none	stream/river	easily
	Ngongowele	Ngunja	833	1,174	Ngunja	hand pump	not operating	exist	none	stream/river	easily

Table 3-3 (4) Condition of Water Supply and Water Use of Sample Villages

Mtwara Rural District, Mtwara Region

Division	Ward	Village	Population 1988	Estimated Population 2000	Public Water Scheme			Water committee	Water fund	Water source for domestic use as of 2000	Remarks (Strategies for the year 2000)
					name of scheme covered	water source	status				
Nanyamba	Nanyamba	Nanyamba	6,898	8,355	Nanyamba	2BH	1/2 operating	exist	exist	Nayamba water supply system	
Ziwani	Ziwani	Ziwani			Ziwani	BH	not operating	exist	none	seasonal open dam	rehabilitation of bore hole
	Nalingu	Msimbati	3,591	4,350	Namindondi	(SW)	not operating	exist	none	4 hand pump 4 SW	
		Msangamkuu	2,951	3,574	Msangamkuu	(seasonal SW)	not operating	exist	none	3 SW	
	Nanguruwe	Nanguruwe	2,167	2,625	Nanguruwe	(SW)	not operating	exist	exist	pit hole near dry dam	
		Mbawala	2,337	2,831	Mbawala Chini	(SW)	not operating	exist	none		
Kitaya	Kitaya	Kitaya	4,412	5,344	Kitaya	Lake	not operating	exist	none	Ruvuma River	
		Arusha Chini	2,364	2,863	Arusha Chini		not operating	exist	none	Lake Chidya	
	Mahurunga	Mahurunga	2,279	2,760	Mahurunga	(dug well)	not operating	—	—	Ruvuma River	
Dihimba	Dihimba	Dihimba	1,244	1,507	Dihimba		not operating	exist	exist		bore holw flushing

Tandahimba Rural District, Mtwara Region

Division	Ward	Village	Population 1988	Estimated Population 2000	Public Water Scheme			Water committee	Water fund	Water source for domestic use as of 2000	Remarks (Strategies for the year 2000)
					name of scheme covered	water source	status				
Namikupa	Mihambwe	Mihambwe	1,792	1,796	Kitangari	(BH)	not operating	exist	none	Ruvuma river (8-10 km),	
		Kisagani	2,512	2,518	Kitangari	(BH)	not operating	exist	none	some rain water harvesting wells	
	Michenjele	Michenjele Juu	1,673	1,677	Kitangari	(BH)	not operating	exist	none	Ruvuma river (3-5 km)	
		Ngongo	977	979	Kitangari	(BH)	not operating	exist	none	Ruvuma river (3-5 km)	
	Mkoreha	Misufini			Kitangari	(BH)	not operating	none	none	Ruvuma river (4-8 km)	
		Mchangani	1,312	1,315						Ruvuma river (4-8 km)	
Mahuta	Mnyawa	Mchichira	2,083	2,088	Kitangari	BH & SW	operating	none	none		
Litehu	Luagala	Mabeti			Kitangari	BH	operating	exist	none	They are getting water from Mmeda, Ngunja and Litehu 2-3km	
		Libobe	620	621	Kitangari	BH	operating	exist	none		
	Mkwiti	Mkwiti	1,768	1,772			—	exist	none	Mkwiti Juu & Mkuwiti Chini are getting water from Mangombya 3-5km.	
	Mkonjowano	Mkula	840	842	Kitangari	BH	operating	exist	none	Uloda Leo and Mkula are getting water from Ngunja & Mangombya 3-5km.	

Table 3-3 (5) Condition of Water Supply and Water Use of Sample Villages

Newala Rural District, Mtwara Region

Division	Ward	Village	Population 1988	Estimated Population 2000	Public Water Scheme			Water committee	Water fund	Water source for domestic use as of 2000	Remarks (Strategies for the year 2000)
					name of scheme covered	water source	status				
Newala	Luchingu	Chitandi	859	861		spring	operating	exist	none	spring	
	Nanguruwe	Nanguruwe	1,110	1,113	Mkunya/Makote	spring	operating	exist	none	spring	
	Nanguruwe	Mnanje	813	815	none	—	—	exist	none	spring	
	Mnekachi	Chiwambo Juu			Chiwambo	(BH)	not operating	exist	none	spring	
	Chitekete	Mitahu	866	868	Chitekete	(BH)	not operating	exist	none	spring	
		Nakahako	1,213	1,216	Chitekete	(BH)	not operating	exist	none		
Chilangala	Mnyambe	Mnima	1,172	1,175	Mbwinji	(spring)	not operating	exist	none	spring	
Kitangari	Kitangari	Mningalie			none	—	—	exist	none	BH	
		Kitangari (Majengo)	1,817	1,821	Kitangari/Mtongwe	BH	operating	exist	exist		
	Mohemo	Chitenda	1,010	1,012	Mkunya/Makote	(spring)	not operating			spring	
	Chiwonga	Nandwahi	1,370	1,373	Kitangari/Mtongwe	BH	operating	exist	none		
		Chipito			none	—	—	exist	none		

Masasi Rural District, Mtwara Region

Division	Ward	Village	Population 1988	Estimated Population 2000	Public Water Scheme			Water committee	Water fund	Water source for domestic use as of 2000	Remarks (Strategies for the year 2000)
					name of scheme covered	water source	status				
Chikundi	Chigugu	Maparagwe	921	1,187		SW	operating	exist	none		
Lisekese	Lisekese	Namkungwi	1,220	1,573		(BH)	not operating	exist	exist	Traditional well	
		Nangose	1,310	1,689		SW BH	operating	exist	exist		
	Lukuledi	Mihima						exist	none	Traditional well	
Nanyumbu	Nanyumbu	Nanyumbu	1,079	1,391		(SW)	not operating	exist	none	Traditional well	
		Namasogo	1,026	1,323		(Dam)	not operating	exist	exist	Traditional well	
Nakopi	Napacho	Chimika	1,640	2,114		—	—	exist	none	Traditional well	
	Likokona	Mkumbaru	2,514	3,241				exist	none	Traditional well	
Mchauru	Mnavira	Makongonda	1,766	2,277		spring	operating	none	none	spring	
Chiungutwa	Chiungutwa	Mpeta	2,399	3,093		(BH)	not operating	exist	exist		
	Nanjota	Nanjota	2,793	3,601		BH	operating	exist	exist		
	Lipumburu	Mtojo	1,162	1,498		BH	operating	exist	exist	Solar system	

(2) Findings of the sample village survey in the Lindi Region

- **Kilwa District**

  Eight villages were visited, two of which are served from spring sources without any serious problem. Six villages had more than 17 dug wells with hand-pumps in total, but only five are operating at present. People are obliged to fetch water from the dug wells without protection and from the river far away from the villages. Cholera broke out at the beginning of February 2000 at villages whose dug wells were more seriously contaminated by colon bacillus than those of other villages.

- **Lindi Rural District**

  Seventeen villages facing certain problems were visited at the strong request of the District Water Engineer. Four of them have never had a public supply system and residents fetch water from the traditional pits, the stream 5 km away and the spring 6 km away from the village. In 8 out of the 17 villages, more than 40 dug wells with hand-pumps were constructed in total, but only 18 wells are in use at 4 of the 8 villages. 2 of the 17 villages were supplied with water under pumping schemes from the river and spring, but neither of them has been operating for many years due to the breakdown of the pumps. 2 of the 17 villages are incorporated in the Mnazimmoja Water Scheme, but water is not transported from the Mnazimmoja borehole well due to a breakdown of the booster pump and superannuated transmission pipes. Residents who receive an insufficient supply of water or no coverage at all have recently been fetching water from the pits of the river bed, buying water from the water vendors at an extraordinarily high cost of 30 to 50 Tsh/bucket, or going to get water from adjacent villages 3 to 5 km away, also paying 20 to 30 Tsh./bucket.

- **Ruangwa District**

  Seven villages, including Ruangwa town, were visited. One of them is supplied with water from the spring source without serious problem, but maintenance of the distribution pipes and standpipes has been somehow poor. Damaged portions of the pipes and the faucets in service 24-hours have been neglected. All of other six villages are insufficiently supplied due to problems concerning the water source (borehole well) or pumping facility, or have no public supply services (two villages) at all.

  In Ruangwa town, which consists of four villages, only one well is operating and production of the well is lower than 100m^3/day, although demand exceeds 200m^3/day. Ruangwa town recently separated from the Lindi District and is now an independent district, but the budgetary measure for operation of the district does not seem sufficient, especially for town development planning of Ruangwa, including infrastructure arrangement. (Two borehole wells were constructed in the town in 2000)

- **Nachingwea District**

  Twelve villages were visited. Eight of them were once equipped with more than 30 hand-pump wells (dug well) in total, but only six wells are in use at present in four villages. Many of the wells are out-of-use because they have dried-up or broken pumps have not been repaired. There have been few attempts to deepen dried-up wells. The concrete cover of the wells makes it difficult to deepen them, but the major reason for the poor maintenance of the wells seems to be the lack of users' awareness of the need for maintenance.

  Nine villages were once covered by the borehole well schemes: three by the large schemes of Ruponda and Nachingwea, and five by small or independent schemes. However, none of these nine villages are receiving water from the borehole wells at present. The reduction of water production from most of the borehole wells has resulted in a suspension of pumping from the wells. Poor maintenance of the wells, such as not re-developing the wells, and not replacing damaged pumps are also causing a suspension of pumping from the wells.

  Since the Nachingwea District is situated in the basement rock areas, production of improperly located wells has never been sufficient.

  The constructed borehole well was abandoned before being used to serve two villages (Mtua and Naipanga) as the water tasted strange. When drilling through weathered basement rock, unpalatable water, which is due to ions of magnesium or potassium especially derived from weathered mica, seems to occasionally be hit.

- **Liwale District**

  Ten villages were visited. Nine of them were once equipped with more than 30 hand-pump wells in total, but only 5 hand-pump wells are under use in three villages. Inhabitants of these villages do not appear to be very eager to rehabilitate the wells or construct new ones, because perennial streams or springs are located within 2 km distance from most of these villages. Piped water schemes once existed in two villages pumping water from shallow wells, but pumping has not been carried out for many years due to a breakdown of the pumps. A borehole well and an elevated reservoir tank were constructed in one village under the piped water scheme plan, but no pump was installed and no pipes were laid because of the very limited production capacity of the well. The residents installed the hand-pump by themselves for the practical use of this well.

(3) Findings of the sample village survey in the Mtwara region

- **Mtwara (Rural) District**

  Ten villages were visited, six of which were involved in large or small-scale water

schemes (One large scheme: the Nanyamba Scheme covering 21 villages, another five schemes covering two to five villages). The Nanyamba scheme is operating, but the supply is not sufficient because one of the two borehole wells is not working. The other five villages under the small to middle-sized water schemes are not supplied water due to problems concerning the water sources such as dried-up shallow wells, a reduction of water production from borehole wells and a breakdown of the pumps. Once trouble occurs at the source in the schemes, none of the villages covered by the scheme can receive a supply. People in these villages are fetching water from traditional dug wells and from the Ruvuma River, or walking 3 to 10 km to adjacent villages,.

The other four villages were once equipped with independent village water schemes with shallow wells, borehole wells or the lake (pipe system) as the source, but none of them is operating at present due to pump breakdown.

- **Tandahimba District**

  More than half of the 190 villages in the Tandahimba District are covered by the Kitangari water scheme, which is the largest scheme in the Mtwara region and extends from the water sources in the well field of Kitangari valley near the Newala district. The number of villages covered by this scheme totals 152 in the two districts counting 47 in Newala and 105 in Tandahimba.

  Eleven villages were visited in the Tandahimba District, nine of which are involved in the Kitangari scheme. Whereas seven villages out of the nine visited are receiving water from the Kitangari sources, two villages located at the eastern end of the district have received no water for several years due to inadequate flow and to leakage.

  Two villages, with no public supply facility since village establishment, derive water from the Ruvuma River 1 km away, or get it from a neighboring village, which is under the Kitangari scheme and 3 km away.

- **Newala District**

  The Newala District has four large water schemes: the Kitangari/Mtongwele borehole scheme covering 47 villages, the Mkunya/Makote spring scheme covering 46 villages, the Mbwinji spring scheme covering 6 villages and the Chiwambo borehole scheme covering 9 villages. Chiwambo boreholes are located in the Masasi District, but supply water to Chitekete ward in the Newala District.

  Twelve villages were visited, two under the Kitangari scheme, another two under the Mkunya/Makote scheme, three under the Chiwambo scheme, and five villages not involved in the large-scale schemes. One of the villages under the Kitangari scheme has not been supplied for the past seven months due to a breakdown of the pump's engine, and also due to superannuated distribution pipes. Neither village under the Mkunya/Makote scheme is supplied with water due to leakage.

None of three villages under the Chiwambo scheme are served with water because of failure of the boreholes. Pipelines between the source and the service area are superannuated, waiting for replacement. The five villages have no public water supply facilities. People are fetching water from springs or rivers far away (3 to 10 km) from the villages. The distance to fetch water in the Newala District seems far when compared with other districts.

- **Masasi District**

  Large water schemes in the Masasi District are in the east, near the springs, and where people are densely settled. The western half of this district has scattered villages and few public water supply services.

  The Masasi District has more villages (424) than any other in the region. The dispersed location of sub-villages is characteristic of this area. Eight villages were visited in the district. Four have various types of independent schemes such as shallow wells with hand-pumps, borehole wells with hand-pumps and dams. They are operating, but the number of the wells and the production rate are inadequate. One village is covered by the Nanyumbu spring scheme, but not served as of now due to superannuated transmission pipes.

  Five villages are not equipped with public supply facilities. Residents are fetching water from the traditional dug wells in and around the village walking several hundreds of meters.

3.6.2 Diagnosis of Urban Water Supply

(1) Definition of urban water supply

The design manual for 'Water Supply and Waste Water Disposal' (July 1997) prepared by the Ministry of Water defines an 'urban area' as follows:

- urban centres: settlements with populations over 5000, more than 10% of whom engage in work other than agriculture
- towns: settlements with populations over 15,000, more than 30% of whom engage in work other than agriculture
- municipalities: settlements with populations over 80,000, more than 60% of whom engage in work other than agriculture
- cities: settlements with populations over 200,000

At least eight communities in the two regions of Lindi and Mtwara correspond to the above-defined urban area. However, the urban water schemes under management of the 'Urban Water Supply and Sewerage Authority' (UWSSA), based on the 1997 Water Works

Ordinance, are limited to only the regional urban centres in 2000. The two towns of Lindi and Mtwara are categorized as (c) of Urban Water Supply Schemes, and are under an obligation to cover the operation and maintenance costs other than personnel expenses and electric power expenses by the water charge income. Some of the towns of the district urban centers of the two regions will be upgraded to Urban Scheme (Category C) by forming UWSSA from the latter half of the year 2000.

The inspection survey on urban water supply was conducted during Stage 1 of the Study pertaining to two urban water schemes in regional urban centers and one district town (Nachingwea). The current condition and problems as well as countermeasures diagnosed in this survey are described below.

(2) Current Status of Urban Water Supply Schemes

- **Mtwara Urban Water Scheme**

  The Mtwara urban water supply consists of two schemes, the Mtwara and the Mikindani, both managed by the Mtwara Urban Water Supply and Sewerage Authority (MTUWASA). The serviced population in these two areas was about 124,000 in the year 2000, and the water demand was nearly 15,000 m^3/day (given that planned consumption in category C schemes is 100 m^3/capita/day). However, the actual daily supplied water amounts to only about 4400m^3, satisfying less than one third of the total demand. Although rehabilitation work took place in the period of 1989-93, no significant improvement has been made since then; therefore, the gap between demand and supply is rapidly growing.

  The supply source of the Mtwara scheme is groundwater from the 7 boreholes in Mtawanya well field about 12 km south-east of the city center (the maximum yielding capacity is 5600m^3 a day). The sources of the Mikindani scheme are groundwater and a spring. The well field with two boreholes and a spring source is about 12 km southwest of the town center, producing nearly 300m^3 a day (the maximum yielding capacity is unknown). The total production capacity of the two sources exceeds 6000m^3 a day; however, the actual total production remains at 4400m^3/day due mainly to an unstable power supply. Individual production of the 9 wells is shown in the following table:

Table 3-4 The amount of the well production

Water Source	No	Name of Well	Amount of production m^3/H	Capacity of pump m^3/H	Amount of average pumping m^3/H
Mtawanya	1	B/H No.18/86	72	60	53.1
	2	B/H No14/86	72	60	52.7
	3	B/H No5/86	240	60	50.5
	4	B/H No20/86	72	60	36.8
	5	B/H No31/86	180	120	23.5
	6	B/H No53/86	72	50	29.8
	7	B/H No12/87	72	60	49.2
Mikindani	8	Not Known	Not Known	24	24.0
	9	not known	not known	no pump	-

Source: Mtwara Urban Water Supply and Sewerage Authority

Groundwater from Mtawanya well field has high acidity and contains iron ions. The water treatment facility has, therefore, an aeration system and a coagulation-sedimentation process for reducing iron content and a lime feeder for neutralization. In addition, a bleaching powder injection system is used for disinfection. The coagulation--sedimentation facility is not equipped with any sand filter, and since the honeycomb type accelerator cannot promote a good upward flow in the sedimentation basin, plenty of suspended material flows into the distribution tank. Bleaching powder is not supplied periodically, so that insufficiently treated water is usually distributed without disinfection, resulting in tap water contaminated by colon bacilli in some areas.

The quality of water from the Mikindani source is excellent, and it is distributed without water purification. However, the water is usually distributed without injection of bleaching powder, which is a problem.

In the Mtwara scheme, water is distributed from the distribution tank to most places by gravity except for highland above the elevation of the distribution tank. Three booster pumps are installed in the pump station near the distribution tank, only one of which is working, to pump water to the higher elevation area.

In addition to the absolute shortage of water, an erratic power supply limits production from the wells and constrains pumping to the highly elevated areas, resulting in less than 30% of the demand to be met.

The problems apparent in Mtwara/Mikindani urban water scheme are summed up as follows:

- Users are dissatisfied with the poor service (limited to only 2 hours every 2 days in some places);
- Inadequate coverage of supply network (no network in some areas because their supply deficit does not allow expansion of network);

- Unwillingness to pay for water (typically 20% of private individuals and 80% of governments and institutions seem unwilling to pay); and
- Poor revenue collection rate, which inhibits maintenance and investment.

- **Lindi Urban Water Scheme**

Lindi is bordered by the Indian Ocean to the east and is bounded by hills and narrow valleys to the west. For many years, the scheme has relied almost entirely on the many springs in the surrounding area, rather than wells, with the exception of one shallow well (Mpilipili) in the town.

Whereas the serviced population in this town is about 52,000 (as of 1999) and the water demand amounts to more than 6000m^3/day in C-categorized urban scheme, the supplied water is limited to 1300m^3/day (as of 1999), which is less than 25% of the demand.

This serious shortage of supply is due mainly to a sudden decrease in spring yields (some of the springs have dried up) since 1996. The total yields of four springs in Mmongo, Kitunda, Kimbunga and Liwayawaya decreased from 5470 to 1450m^3/day from 1993 to 1999, as shown in Table 2-6-2. Mbanja spring was developed in 1996, but the total yield of the sources in 1999 amounts to only 2410m^3, adding 150m^3 production from Mpilipili shallow well.

Table 3-5 Variation of discharge from the sources (m^3/day, in dry season)

Source/Year		1978	1984	1990	1993	1996	1997	1998	1999 February
Mmongo spring		1555	1200	620	1320	600	400	400	400
Kitunda Springs	Great Kitunda	1598	1184	1870	1685	0	0	0	0
	Kimbunga	458	259	315	345	50	5	5	0
	Mchororo	354	225	180	259	200	100	50	110
Liwayawaya spring				1710	2120	2000	1300	1200	1450
Mpilipili well		150	150	150	150	150	150	150	150
Mbanja spring						500	400	230	300
Total		4115	3018	4845	4845	2820	2350	2035	2410

Source: Lindi Urban Water Supply and Sewerage Authority

In addition to the serious reduction of the spring yields, such problems as worn-out pumps, a shortage of power supply and leakage from old pipes are reducing the volume transported from the springs to the distribution tanks. Whereas the production capacity of the sources remains at 2410m^3 as of 1999, the actual production from each of the sources totals only 1320m^3 a day as shown in Table 3-6.

Table 3-6 Variation of average water production from the sources (m^3/day, Feb.)

Source/Year		1978	1984	1990	1993	1996	1997	1998	1999 February
Mmongo spring		600	500	500	500	450	350	300	450
Kitunda Springs	Great Kitunda		600	500	700	0	0	0	0
	Kimbunga		100	100	100	50	5	0	0
	Mchororo		50	50	50	40	10	0	0
Liwayawaya spring					600	600	600	600	600
Mpilipili well			150	150	150	150	150	100	120
Mbanja spring							150	150	150
Total		600	1300	1300	2100	1290	1250	1150	1320

Source: Lindi Urban Water Supply and Sewerage Authority

The main source is Liwayawaya spring. Impounded spring water is transported by a 5 km long pipeline from the pump station near the intake to the distribution tank. Three pumps are installed at the pumping station, but only one is working (only for a few hours per day). A motor pump and a hand pump are installed at Mpilipili shallow well, but only the hand pump is used. The motor pump is old, worn and dependent on the erratic power supply.

The quality of water from each source is fairly good; therefore, all of water transported from the source is distributed without any treatment except chlorination. The water in the distribution tank is periodically treated with chlorine (a solution of bleaching powder is poured into the tank); however, this procedure has often been neglected recently because of a shortage of bleaching powder due to the limited water supply budget. There is a low collection rate of water charges due to the insufficient supply of water.

- **Nachingwea Town Water Scheme**

The Nachingwea town water supply scheme is under the jurisdiction of the District Water Engineer, since the authority for urban water supply is not yet established. The population of this town is estimated at 36,000, but the population covered by the town water supply service is limited to 18,720 as of 1999. The town residents not served by the town water scheme are using 27 shallow wells with hand pumps.

The water source for the town water scheme is the set of borehole wells. More than 15 wells have been drilled in and around the town, but only three wells are used as of now, producing 1300m^3/day.

Since the town is located over basement rock area where groundwater development is difficult, many of the drilled wells failed to hit water, or have been abandoned due to

low capacity, falling production and/or poor quality of water. The water sources and their condition are shown in Table 3-7.

Table 3-7 Water source of Nachingwea

Well field	No. of B/H	Est. total yield m^3/h	Pumping Capacity. m^3/h	Power	Transmission pipes		Water Quality	Present use
					Dia (mm)	L (km)		
Mkumba Shamba	6	100	39	Elect. Diesel	200	4.2	Acceptable	2B in use. $600m^3$/day
Mkumba Pacha	2	44	25	Elect. Diesel	150	1.1	Acceptable	1B operational, no diesel
Nam penda	2	11	4	Diesel	75	1.5	Not good tasting	1BH operational, not in use.
Kihue	4	28	19	Elect.	15	11	Not good tasting	Booster pump out of order

Source: MTWARA-LINDI WATER MASTER PLAN April 1986

Mkumba Shamba and Mkumba Pacha wells are located 5 km northeast and 8 km east of the town centre respectively. Water from the wells is transported to the distribution tank in the town by use of booster pumps, and then distributed to 14 public taps and 478 houses by a natural flow system, without any water treatment.

Both the transmission and distribution pipes are superannuated; therefore, water loss by leakage from the pipes is estimated at over half of the production. As a result, there has been a severe restriction of the supply service for several years, such as one day supply a week to each of the seven service areas.

(3) Major Problems and Countermeasures

All of the three urban water supply schemes surveyed have a lot of problems concerning water sources and supply facilities, and also on methodology of operation and maintenance. In particular,

- Water source development is insufficient, and
- Water quality management is not being performed at all or is inadequate.

In order to improve these conditions, the following should be taken into consideration:

- Maximum utilization of the existing facilities by conducting rehabilitation work, rather than expansion of the service area: since the existing schemes are not operating to their full extent according to the capacity originally designed, expansion work should be considered after completion of rehabilitation within the existing service area.
- Application of appropriate technology: minimum use of mechanical and

electrical equipment, which requires special skills for operation and maintenance should be considered. In other words, maximum use of the natural flow (gravity) system is recommended.

- Consideration of cost effectiveness: the project, which is most cost effective, should be first priority aiming at the effectiveness of investment.
- Establishment of measuring system: not only flow metering at the water production site, universal metering should be introduced in the distribution network for all of the urban water schemes (i.e. house connection and public taps, so that the water tariff can be levied in accordance with the rate of water consumption)
- Supply of safe and potable water: in order to supply safe water, all schemes shall include continuous chlorine treatments for disinfection as a minimum requirement.

- **Mtwara Urban Water Scheme**

The major problems found in the Mtwara urban scheme are:

- Shortage in quantity of the water and poor quality of water at Mtawanya well field;
- Inadequacy of the water purification system; and
- Lack of water quality control

An additional well field should be developed at a place where quality of groundwater is fairly good, namely near borehole No.7 in Mtawanya well field, or in places higher than but near the existing distribution tank.

The water should be purified by the combined system of coagulation/ sedimentation and filtering. No filtration facility was constructed at Mtwara water treatment plant due to a shortage of funds; but it is required as it would be preferable for the coagulation and sedimentation system.

The treatment plant of Mtwara is equipped with an examination room for water quality management, but it seems that the facility has not been utilized for many years. The facility should be used effectively to control iron content and acidity. In addition, chlorination is often neglected due to lack of funds to purchase bleaching powder. Constant injection of bleaching powder solution at the treatment plant is strongly recommended, and the periodic measurement of residual chlorine in water from the taps is recommended as well.

- **Lindi Urban Water Scheme**

  Causes of the shortcomings in the Lindi urban water scheme:

  - An absolute shortage of the supply sources;
  - Inadequate management on water flow; and
  - Leakage from transmission/distribution pipes.

  To alleviate these problems, the following measures are recommended:

  - Increase supply by development of groundwater resources: well construction closer to the city center, but more than 500 m from the coastline; when the springs have been developed to capacity, groundwater development trials should follow.
  - Thorough water quantity management: flow meters should be installed.
  - Rehabilitation of the distribution network: reduction of leakage.

- **Nachingwea Town Water Supply Scheme**

  Water quantity management and rehabilitation of the distribution network is recommended, as in the Lindi urban water supply scheme.

3.7 Survey for Water Supply Facility Designing for Selected 100 Villages

3.7.1 Field Surveys for Facility Design

(1) Population scale by village

The field survey for decision-making about facility type began with a survey of the population of the concerned villages, because the type of the facility (Level-2 or Level-1) depends mostly on the population to be served in the village. Other criteria for type selection, such as water resources development availability in the area, ability to pay for O&M, and the type of the cluster (scattered or concentrated) are important but less so than population. If the population is larger than 2000 (or the number of households is over 300), only a Level-2 system will be taken into consideration. On the other hand, Level-1 type will be the first choice for the villages of smaller populations, having regard for the ability to pay for O&M.

Neither the village population given by the 1988 census nor the projected population based on the 1978 and 1988 censuses matches the actual figures in most villages due to significant migrations in the last decade, some due to severe floods in early 1990s especially in the districts of Masasi and Newala.

Although the population data prepared by the village government or ward office may be doubtful in some of the villages, these are most likely to be more reliable than the old census data. The population data provided by the village offices are, therefore, used in the selection procedure of the facility type. The figure of the population from the 1988 census along with the figure from the village statistic is noted in the table of village information, which is attached in the Supporting Report.

(2) Reconnaissance on topographic and clustering condition

When a Level-1 system is to be planned in the concerned village, the number of wells is simply determined by the population to be served. Determining the location of the wells, however, differs in the two types of geological formations. At villages situated in the sedimentary formations, location of the well can be decided solely from the viewpoint of convenience for use (i.e. in the midst of a clustering area or near a primary school or dispensary). At the villages in the basement rock formations, groundwater development availability should be duly considered because the potential area is limited to the fissure-abundant zones of the rocks. Point sources, therefore, cannot be determined only from convenience for use. Points several hundred meters from the population center occasionally have to be selected.

When a Level-2 system was preferred, the following field reconnaissance was made for the designing of the facility:

- fair location of the standpipes depending on the population distribution and the location

of public facilities like schools or dispensaries; and

- the height difference between the reservoir (distribution) tank and the standpipes in order to allow gravity flow from the tank to the taps.

A sketch map was prepared for each village showing the appropriate arrangement of the distribution tank and standpipes, in accordance with the settlement structure. Some sample drawings are attached in the Data Book along with the village survey form.

(3) Condition of existing water supply facility and water use

Thirty-four out of one hundred villages had not been served with a water supply since establishment of the villages. Villagers fetch water from traditional dug wells, nearby rivers, swamps, seepages or springs. Water in most traditional dug wells is muddy and contaminated by bacteria. When the wells run dry, villagers fetch water from the dam or buy it from an adjacent village with a water scheme, walking 1 to 3 hours, or even more than 4 hours, one way.

At the villages where water schemes had once existed, or the facilities were still operating but were in poor condition, interviews were conducted with the village government executives or the members of the water committee to find out why, how and from when the facilities became out of order. In about 63 villages where the under-used water source was within a one-hour walking distance from the village center, the water point was visited and a sample was taken for water quality testing.

Water supply facilities have long been abandoned (often for more than 15 years) at 65 out of 100 villages. There are only 5 out of 68villages with facilities still in operation, and their operational condition is very poor (i.e. distributing water only 1 hour in 2 or 3 days, or the wells dry-up in the dry season). The major problem in the abandoned or poorly operating facilities is the shortage in water resources. One of the reasons of abandonment was that damaged transmission pipes were not repaired or replaced, but neglect of the pipe basically seems to be due to the shortage in water supply sources. The survey results for each of the 100 villages is tabulated in Table 3-8 (1)-(8)

Table 3-8 (1) Water Supply Facility Information of 100 Villages

Mtwara Rural District, Mtwara Region

Division	Ward	Village	Population			Public Water Scheme					Water committee	Water fund	Water source for domestic use as of 2000	Remarks
			Census 1988	Estimated 2000	Actual	Name of scheme covered	Water source	Status	Reservor Tank (m^3)	Public Faucet				
Nanyamba	Nanyamba	Mbembaleo	2,536	3,072	5,600	—	—	—	—	—	exist	exist	Traditional dug well (2km)	Dry season 9km to Nanyamba
	Mtiniko	Maranje	2,064	2,500	2,346	Maranje(1979)	BH	not operating (1986)	45	6	exist	none	Pond (2km)	
		Mtiniko	2,823	3,419	1,166	Mitinko (1989)	BH	not operating (1989)	45	5	exist	exist	Pond (2.3km)	Dry season 7km to Maranje
		Malamba	—	—	1,557	—	—	—	—	—	exist	exist	Pond (8.0km) RW collection	Water vendor 500TSH/Bucket
Ziwani	Ziwani	Ziwani	4,147	5,023	6,700	Ziwani(1978)	BH	not operating (1996)	75	8	exist	none	Dam (500m)	Dry season Dud well (3km)
	Nalingu	Msimbati	3,591	4,350	5,320	—	DW (HP)	operating	—	—	exist	none	DW (HP)	
		Msangamkuu	2,951	3,574	4,980	Msangamkuu (1977)	DW	not operating (1987)	45	10	exist	none	Traditional dug well	HP(DW)(1.6km)
	Nanguruwe	Nanguruwe	2,167	2,625	4,482	Nanguruwe (1970)	DW (HP)	not operating (1983)	50	9	exist	none	Dam (800m)	Dry season Spring (2km)
		Mbawala	2,337	2,831	2,050	Mbawala (1982)	BH	not operating (1995)	45	5	exist	exist	HP(DW)(250m)	Dry season Spring (2km)
Mayanga	Mayanga	Kawawa	2,355	2,853	3,530	Mbawala (1982)	BH	not operating (1991)	6	5	exist	none	Dam (1.5km)	Dry season Dambed (1.5km)
Kitaya	Kitaya	Kitaya	4,412	5,344	2,767	Kitaya(1972)	Lake	not operating (1991)	45	11	exist	none	Ruvuma River (500m)	
		Arusha Chini	2,364	2,863	1,654	Arusha Chini (1975)	BH	not operating (1993)	25	6	exist	none	Flowing Spring (1km)	
	Kiromba	Mayambe Juu	—	—	887	—	—	—	—	—	exist	exist	Ruvuma River (8km)	Water vendor 500TSH/Bucket
	Mahurunga	Kitunguli	1,633	1,978	4,530	Mahurunga(1980)	SW	not operating (1989)	250	6	exist	none	Dug Well (800m)	
		Mahurunga	2,279	2,760	4,628					2	exist	none	DugWell (700m)	
Dihimba	Dihimba	Dihimba	1,244	1,507	1,587	Dihimba (1978)	BH	operating	45	3 (7)	exist	exist	Tap water 10TSH/20l	
		Mpondomo	1,349	1,634	2,556					(5)				

Table 3-8 (2) Water Supply Facility Information of 100 Villages

Tandahimba District, Mtwara Region

Division	Ward	Village	Population			Public Water Scheme					Water committee	Water fund	Water source for domestic use as of 2000	Remarks
			Census 1988	Estimated 2000	Actual	Name of scheme covered	Water source	Status	Reservor Tank (m^3)	Public Faucet				
Namikupa	Mihambwe	Mihambwe	1,792	1,796	3,279	Kitangari (1985)	BH	not operating (1987)	15	6	exist	none	Ruvuma river (8-10 km)	
	Kitama	Kitama	2,918	2,925	6,198	Kitangari (1988)	BH	not operating (1995)	45	4	none	none	Pond (2.0km)	Dry season 10km to Tandahimba
		Mitondi A	1,517	1,521	1,333	None	—	—	—	—	none	none	Traditional Dug Well (2km)	
	Mkoreha	Misufini	—	—	883	Kitangari (1984)	BH	not operating (1984)	8	3	none	none	Ruvuma river (8 km)	Facility was not used once.
Litehu	Luagala	Litehu	1,273	1,276	840	Kitangari (1988)	BH	not operating (1990)	10	6	none	none	Pond (1.5km)	
		Mmeda	778	780	823	None	DW (HP) (1999)	not operating (1999)	—	—	none	none	Pond (300m)	Dug Well was dried up
		Mabeti	—	—	850	None	—	—	—	—	exist	none	Pond(3km)	
	Mkwiti	Mkwiti Chini	1,768	1,772	1,034	None	—	—	—	—	exist	none	Spring (2km)	
	Ngunja	Namindondi Juu	1,310	1,313	1,550	None	DW (HP) (1982)	not operating (1994)	—	—	none	none	Spring (1.6km)	
		Nanjanga	—	—	1,525	None	—	—	—	—	exist	none	3km to Mangombya	
		Mkuti	—	—	1,620	None	—	—	—	—	exist	none	5km to Chikuti	

Table 3-8 (3) Water Supply Facility Information of 100 Villages

Newala District, Mtwara Region

Division	Ward	Village	Population			Public Water Scheme					Water committee	Water fund	Water source for domestic use as of 2000	Remarks
			Census 1988	Estimated 2000	Actual	Name of scheme covered	Water source	Status	Reservor Tank (m^3)	Public Faucet				
Newala	Nanguruwe	Mnanje	813	815	780	None	—	—	—	—	exist	exist	Traditional Dug Well (5km)	Water vendor 100TSH/Bucket
	Mnekachi	Kilidu	781	783	1,780	Mkunya/Makote (1981)	BH	not operating (1991)	10	8	exist	none	River (12km)	Water vendor 450TSH/Bucket
Chilangala	Mnyambe	Mnima	1,172	1,175	1,162	Mwinji (1972)	Spring	not operating (1990)	250	3	none	none	Spring (8km)	
	Chilangala	Miyuyu	792	794	850	Mwinji (1982)	Spring	not operating (1990)	250	3	none	none	Spring(2.5km)	
		Namangudu	—	—	722	None	—	—	—	—	exist	none	Spring(9km)	Water vendor 200TSH/Bucket
Kitangari	Kitangari	Mitanga	—	—	1,271	None	—	—	—	—	none	none	2km to Maputi	10TSH/20L
		Likwaya	—	—	507	None	—	—	—	—	exist	none	3km to Maputi	10TSH/20L
	Malatu	Malatu juu	1,845	1,849	2,230	Mkunya/Makote (1992)	BH	not operating (1992)	—	2	exist	exist	Traditional Dug Well (7km)	
	Mchemo	Mdimba	1,448	1,451	1,362	None	—	—	—	—	exist	none	4.5km to Kitangari Schem	10TSH/20L
	Chiwonga	Chiwonga	—	—	1,558	None	—	—	—	—	exist	exist	9km to Maputi	10TSH/20L
		Mmulunga	1,497	1,501	1,593	None	—	—	—	—	exist	none	8km to Maputi	10TSH/20L

Table 3-8 (4) Water Supply Facility Information of 100 Villages

Masasi District, Mtwara Region

Division	Ward	Village	Population			Public Water Scheme					Water committee	Water fund	Water source for domestic use as of 2000	Remarks
			Census 1988	Estimated 2000	Actual	Name of scheme covered	Water source	Status	Reservor Tank (m^3)	Public Faucet				
Chikundi	Nanganga	Nanganga	2,051	2,644	2,385	Liputu-Mkungu (1978)	Spring	not operating (1991)	45	6	exist	none	Traditional Dug well	
Lisekese	Lisekese	Namkungwi	1,220	1,573	1,339	Mlingula(1979)	BH	not operating	—	4	exist	exist	Traditional Dug well	Dry Season 6km to Matawale
	Mikangaula	Kilosa	1,909	2,461	2,001	None	—	—	—	—	exist	exist	Traditional dug well (1.3km)	
	Namatutwe	Chikoweti	2,259	2,913	3,273	Chikoweti (1982)	BH	not operating	45	3	exist	exist	Traditional dug well	Scheme was incomplete
		Mlingula	3,619	4,666	3,321	Mlingula(1979)	BH	not operating (1982)	45	5	exist	none	Traditional dug well (1km)	Dug well (2km)
	Lukuledi	Chiwale	2,193	2,827	9,567	Chiwale (1983)	Dam	not operating (1987)	45	3	exist	exist	Traditional dug well (1km)	Dam was dried up
Nanyumbu	Nanyumbu	Nanyumbu	1,079	1,391	1,205	Nanyumbu (1978)	DW	not operating (1987)	—	5	exist	exist	Traditional dug well	DW(HP) is salty
		Namasogo	1,026	1,323	1,304	None	—	—	—	—	exist	exist	Traditional dug well (5km)	
Lulindi	Namalenga	Msanga	951	1,226	954	Msanga (1978)	Spring	not operating (1979)	45	5	none	none	Traditional dug well (1.6km)	
Chiungutwa	Chiungutwa	Mpeta	2,399	3,093	2,117	None	20DW (HP	3/20 operating	—	—	exist	exist	Dug well (200m)	Dry Season Mwety River (8km)
	Mbuyuni	Mitonji	831	1,071	2,500	None	2BH (HP)	not operating (1999)	—	—	exist	exist	Traditional dug well (1km)	

Table 3-8 (5) Water Supply Facility Information of 100 Villages

Kilwa District, Lindi Region

Division	Ward	Village	Population			Public Water Scheme					Water committee	Water fund	Water source for domestic use as of 2000	Remarks
			Census 1988	Estimated 2000	Actual	Name of scheme covered	Water source	Status	Reservor Tank (m^3)	Public Faucet				
Pwani	Kikole	Migeregere	1,355	1,887	1,400	Migeregere (1973)	BH	not operating (1983)		8	exist	exist	Nakurukuru(tap) (15km)	Water vendor 200TSH/Bucket
Miteja	Tingi	Mtandango	818	1,139	909	None	—	—	—	—	exist	exist	Traditional dug well (1.5km)	
	Kinjumbi	Somanga Ndumbo	2,188	3,048	3,800	None	TTDW (HP) (1978)	not operating	—	—	exist	exist	Protected dug well	
Pande	Pande Mikoma	Pande Plot	3,485	4,854	3,600	Pande Plot (1972)	BH	not operating (1978)	45	4	exist	exist	Traditional dug well (500m)	
		Mtitimira	801	1,116	1,034	None	—	—	—	—	exist	exist	Traditional dug well (500m)	
	Lihimalyoao	Lihimalyoao	2,622	3,652	4,686	Lihimalyao(1978)	BH	not operating (1994)	45	9	exist	exist	Cave(5km)	
		Namakongoro	1,053	1,467	1,500	Namakongoro (1976)	BH	not operating (1978)	45	7	exist	exist	Traditional dug well	BH was dried up
	Mandawa	Mandawa	4,141	5,768	7,070	None	BH (HP) (1995)	not operating (1997)	—	—	exist	none	River (500m)	Dry season Spring
		Kiwawa	2,109	2,938	1,800	Kiwawa (1974)	DW	not operating (1996)		6	exist	none	River (200m)	Dry Season Traditional dug wel

Table 3-8 (6) Water Supply Facility Information of 100 Villages

Lindi Rural District, Lindi Region

Division	Ward	Village	Population			Public Water Scheme					Water committee	Water fund	Water source for domestic use as of 2000	Remarks
			Census 1988	Estimated 2000	Actual	Name of scheme covered	Water source	Status	Reservor Tank (m^3)	Public Faucet				
Mtama	Nyangao	Chiwerere	945	1,117	1,438	None	—	—	—	—	exist	exist	Namatikiti River (500m)	Dry Season Riverbed
	Nyengedi	Nyengedi	3,563	4,210	3,812	Nyengedi (1974)	DW	not operating (1982)		3	exist	none	Stream (1km)	
		Mtumbya	1,159	1,369	1,250	Mtumbya(1988)	River	not operating (1990)			exist	exist	River (12km)	Scheme was incomplete
	Mtua	Kilimahewa (Muta)	3,775	4,460	4,400	Muta	River	not operating			exist	none	Spring (1km)	
Sudi	Sudi	Madangwa	2,211	2,612	5,603	Madangwa (1976)	Spring	not operating (1979)	90		exist	exist	Spring (600m)	
		Hingawali	2,354	2,781	3,960	None	—	—	—	—	exist	exist	Traditional dug well	
Nyangamara	Nyangamara	Madingo	1,812	2,141	1,611	Madingo (1974)	DW	not operating (1979)		6	exist	exist	Dam (2km)	Dry Season DW (6km)
	Mandwanga	Chiuta	1,738	2,054	2,098	None	—	—	—	—			Traditional dug well	
		Malungo	1,497	1,769	1,566	None	—	—	—	—	exist	exist	Traditional dug well (3km)	
Mingoyo	Kiwalala	Kiwalala	1,989	2,350	9,471	Kiwalala(1974)	DW	not operating (1980)			exist	none	Spring (1km)	
	Mnolela	Mnolela	1,178	1,392	7,367	Mnazimmoja	BH	not operating			exist	exist	Traditional dug well (1.5km)	
Rondo	Chiponda	Chiodya	1,677	1,981	3,425	Rondo (1975)	River	not operating			exist	exist	Spring (5km)	Scheme was incomplete
Ngapa	Ngapa	Kinengene	2,803	3,312	9,020	Kinengene	BH	not operating					HP(BH)	
Mchinga	Mchinga	Kilangala	3,462	4,091	8,773	None	—	—	—	—	exist	none	Traditional dug well (500m)	
	Kilolombwani	Kilolombwani	1,255	1,483	1,160	None	—	—	—	—	exist	exist	Rriver (6km)	
Mipingo	Mipingo	Lihimilo	943	1,114	1,058	None	—	—	—	—	none	none	Rriver (3km)	
Nangaru	Chikonji	Chikonji	3,068	3,625	2,391	None	DW (HP) (1970)	not operating (1970)	—	—	exist	exist	Traditional dug well	

Table 3-8 (7) Water Supply Facility Information of 100 Villages

Ruangwa District, Lindi Region

Division	Ward	Village	Population			Public Water Scheme					Water committee	Water fund	Water source for domestic use as of 2000	Remarks
			Census 1988	Estimated 2000	Actual	Name of scheme covered	Water source	Status	Reservor Tank (m^3)	Public Faucet				
Ruangwa	Malolo	Nanganga	968	1,144	1,150	Nanganga(1981)	Spring	not operating (1987)	45	4	exist	none	River (2km)	
	Likunja	Chilangalile	498	588	966	Chilangalile (1974)	BH	not operating (1988)	—	—	exist	exist	Traditional dug well (4km)	
	Narun'gombe	Machanganja	838	990	1,905	None	—	—	—	—	exist	exist	Traditional dug well (700km)	
		Liuguru	1,612	1,905	3,736	Liuguru (1980)	BH	not operating (1987)	22	7	exist	none	Traditional dug well (1.8km)	
	Namichiga	Mihewe	1,102	1,302	1,017	None	DW (HP) (1980)	not operating (1998)	—	—	exist	none	Dug well (1.2km)	
Mnacho	Luchelegwa	Chinongwe	2,984	3,526	3,395	None	—	—	—	—	exist	exist	Traditional dug well (1km)	Dry season 8km to Mwena Scheme
		Litama	746	881	1,546	None	BH (HP)	not operating (Salty)	—	—	exist	exist	Lukuledi River (4km)	Dry season 8km to Mwena Scheme
		Likwachu	—	—	1,824	None	—	—	—	—	exist	exist	9km to Mwena Scheme	150TSH/20L
		Ipingo	—	—	981	None	BH (HP) (1986)	not operating (1998)(Salty)	—	—	exist	none	Dug well (500m)	Dry Season Riverbed (4km)
Mandawa	Mandawa	Chibula	1,549	1,830	1,192	Lichwachwa(1978)	DW	not operating (1981)	90	7	exist	exist	Traditional dug well (1.6km)	

Table 3-8 (8) Water Supply Facility Information of 100 Villages

Nachingwea District, Lindi Region

Division	Ward	Village	Population			Public Water Scheme					Water committee	Water fund	Water source for domestic use as of 2000	Remarks
			Census 1988	Estimated 2000	Actual	Name of scheme covered	Water source	Status	Reservor Tank (m^3)	Public Faucet				
Mnero	Mnero Miembeni	Mkonjela	1,559	1,655	3,665	Mnero(1980)	BH	not operating (1985)	—	2	exist	exist	5km to Ntila HP	
Ruponda	Marambo	Litula	1,060	1,125	1,793	None	—	—	—	—	exist	exist	Traditional dug well (200m)	
	Mkoka	Rweje	1,295	1,375	1,352	None	DW (HP) (1974)	operating (salty)	—	—	exist	exist	Traditional dug well (1km)	Dry season 10km to Litula TDW
Nambambo	Naipanga	Naipanga	5,066	5,378	17,939	Naipanga(1978)	BH	not operating (1983)(Salty)	45	8	exist	exist	Traditional dug well (4km)	
	Naipanga	Chiumbati Miembeni	1,147	1,218	1,369	None	BH(HP) (1987)	not operating (1989)(Salty)	—	—	exist	exist	Traditional dug well (6.5km)	
	Mkotokuyama	Mandai	1,108	1,176	1,628	Mkotokuyama (1985)	BH	not operating (1985)(Salty)	45	6	exist	exist	Traditional dug well (5km)	
	Ndomoni	Ndomoni	1,280	1,359	1,230	Ndomondo (1980)	BH	not operating	45	—	exist	none	Traditional dug well (3km)	Facility was incomplete
	Mtua	Kipara Mtua	1,334	1,416	2,573	None	—	—	—	—	exist	exist	Dugl well (500m)	Dry season 4km to BH (HP)
	Mpiruka	Mpiruka	2,411	2,560	2,621	Mpiruka (1974)	BH	not operating (1976)	—	1	exist	exist	Traditional dug well (500m)	

Liwale District, Lindi Region

Division	Ward	Village	Population			Public Water Scheme					Water committee	Water fund	Water source for domestic use as of 2000	Remarks
			Census 1988	Estimated 2000	Actual	Name of scheme covered	Water source	Status	Reservor Tank (m^3)	Public Faucet				
Barikiwa	Mlembwe	Mlembwe	1,611	2,270	1,586	None	—	—	—	—	exist	none	Pond (500m)	Dry season Pondbed
Liwale	Liwale B	Mikunya	1,926	2,714	1,100	Mikunya (1986)	BH	not operating (1986)	45	6	exist	none	Dug well (1km)	BH was incomplete
	Mihumo	Mihumo	1,853	2,611	1,771	None	DW (HP) (1983)	not operating (1986)	—	—	exist	exist	Stream (1km)	Dry season Spring
	Mbaya	Mbaya	1,268	1,787	1,442	Kichonda (1975)	DW	not operating (1998)	45	5	exist	none	Liwale River (1km)	Dry season Riverbed
	Ngongowele	Ngongowele	1,535	2,163	1,291	Ngongowele (1971)	DW	not operating (1978)	1.5	5	exist	none	Ruhuu River (4km)	Dry season 8km to Pond

3.7.2 Discussion with the Villagers on Facility Type

In order to make the villagers aware of the project, and also to let them participate from the planning stage of the project, interviews inquiring about the preferred type of water supply facilities were conducted. At the villages where no water scheme had ever existed, people's first choice was the construction of a Level-2 system, without exception. When the necessity of payment for operation and maintenance was explained, however, they switched to the Level-1 system, which has lower O&M costs.

On the other hand, at many of the villages that had been covered especially by a large-scale water scheme, Level-1 schemes were their first preference. That is probably due to poor service in the past. Their frequent requests for water to be supplied to their distribution tank were rarely met. Such experiences are imprinted in their minds so they prefer not to have a system beyond their control. When an independent water scheme inside the village accompanied by a water source well was suggested, they immediately approved the plan, although with some anxiety about the autonomous management of the scheme.

In the end, 15 villages preferred a Level-1 system, 73 villages preferred a Level-2 system and 13 villages didn't reach a consensus or accepted either type. Wherever technically feasible, these preferences determined the facility type for each village.

3.7.3 Criteria for Facility Design

(1) Criteria for determining the facility type

The following criteria are taken into consideration in determining the supply facility type (Level-1 or Level-2 scheme):

- Population scale: the larger the population of the village, the lower the O&M cost per household becomes. Therefore, if the population of the village is over 2000, the Level-2 scheme can always be planned, so long as there is water resources development availability in the village.
- Water resources development availability: if the yield of springs located near to the village is enough to supply water to the village, and if one well to be drilled in the village is expected to have enough production to meet the water demand of the concerned village, a Level-2 scheme can be planned in that village. However, if the presumed capacity of the well is too little for installation of motorized pump, a hand-pump is to be installed, resulting in a Level-1 scheme. (Other wells should be drilled to meet the demand).
- Water level in the well: since the pumping capacity for hand-pumps is limited to more or less 50m, the Level-1 type is not applicable in places where the water level in the

well is lower than 50m beneath the surface of the ground.

(2) Design criteria for Level-2 scheme

A complete Level-2 supply system comprises a water source (borehole well or spring) with pumping equipment (submersible motor pump for wells, centrifugal pump for springs), a distribution (reservoir) tank and a distribution pipeline and standpipes. In general, one independent system is provided for one village. If two candidate villages are adjacent, however, one unit will cover both.

The criteria for a Level-2 supply facility are stated below. Although these criteria will not bring thorough satisfaction to the users, it is believed to be the best considering that the users in the two regions have never experienced an autonomous management water scheme in the past. Once the autonomous management system takes root in this project area, the design can be improved.

- The daily unit supply amount per person (the daily unit demand) is to be set at 20 liters/person/day (ℓ/c/d) for designing of the facility. (The unit supply amount can be adjustable within a range of 15-25 ℓ/c/d depending on the operating hours of the pump, except in a solar-powered system.)
- The factors of water loss and daily maximum will not be considered in setting water demand. In short, supply amount is assumed as the 'demand' and 'consumption amount'.
- Capacity (volume) of the distribution tank will be determined in accordance with population scale, without consideration of peak hour or hourly maximum. The volume of the tank will be about half of the daily supply amount and tanks with volumes of 20, 30, 40, and 50 m3 and will be provided. (Over 50 m3 is necessary in some villages, but the maximum volume is set at 50 m3).
- Standpipes are provided every 100 to 150m. The number of standpipes is in accordance with the population to be served, assuming that 400 persons utilize 1 tap (each standpipe has 2 taps). , However, the total number of standpipes is limited to 5.
- The length of the distribution pipe is in accordance with the extent of the settlement, with a limitation of 500m per village. (If the area length is far over 500m, the pipe diameter is duly enlarged with regard for future extension.)
- Water distribution is by gravity flow from the distribution tank to the standpipes. Elevation of the distribution tank shall, therefore, be duly considered to allow a natural flow to all of the taps (faucets), paying attention to 'the minimum head of 5m for all taps' mentioned in the ministry's design criteria.
- A generator house equipped with a diesel engine generator is to be constructed near to the water source well and the elevated reservoir tank. The pump to be installed in the

well should be capable of pumping water to the distribution tank with a sufficient discharge to meet the demand within 10 hours daily operation.

- The diameter of well casings to be installed in the drilled borehole is 4 inches at the villages of comparatively small water demand (less than 40m^3 a day, population: less than 2000), and for the villages of larger demand than 40m^3/day, the casing diameter will be 6 inches.
- For some of the villages, a solar battery is to be introduced as the energy source for the pump, instead of the diesel engine generator. In the event that the solar energizing system is introduced, downgraded design criteria are to be applied (i.e. unit supply of 10 to 15 ℓ/c/d, and tank volume of 30 m^3).
- Solar power is to be introduced to villages classified as 'very far from the fuel station' and/or where 'the community cannot shoulder the O&M fee because of financial constraints, but the scheme cannot be converted to Level-1 due to very low water level in the well '.

(3) Design criteria for Level-1 scheme

The water supply facilities in Level-1 schemes are point sources without a distribution system. The point source is a shallow or deep borehole equipped with a hand-pump (manual pump). The following are the design criteria for the Level-1 scheme:

- The daily unit supply amount is to be set basically at 20 ℓ/c/d – the same as that in the Level-2 system.
- The number of the wells with hand-pumps is determined in accordance with the population to be served, with a limitation of 5 wells at the most in one village.
- The pumping rate of the hand-pump is to be set at 15 liters/minute. Accordingly, the production rate from 1 well will range from 5.4 to 7.2 m^3 a day, assuming that the pump is being operated 6-8 hours a day.
- The number of people to be served by one well ranges from 270 to 360, averaging 315. The number of wells to be constructed is, therefore, the quotient of total population divided by 315. For the villages of population over 1600 (where 5 wells are not enough), additional well construction should be considered in the future.
- The diameter of the well casing will be 4 inches for all wells.
- The hand pump type for deep wells should carefully be chosen considering the availability of spare parts in Tanzania.

Chapter 4 Socio-Economy in the Study Area

4.1 General Feature of the Socio-Economy of the Area

4.1.1 Methodology Used in Sample Village Survey

Some seven to fourteen villages were chosen in each of the nine districts of the two regions and visited in Stage 1 of the Study to conduct the sample village survey. The purpose of the survey was to understand the socio-economic characteristics and the water supply conditions in the Study Area.

The visited villages were surveyed by means of both observation and interviews. Interviews were conducted mainly for information on socio-economic conditions, while observations were made on water supply conditions. Water quality tests were conducted on water sources and water samples were collected for laboratory tests.

In this study, unstructured personal interviews were conducted. Unstructured interviews are characterized by a flexible approach to questioning, whereby a system of pre-determined questions and standardized techniques of recording information are not strictly followed. In this way the interviewer is allowed greater freedom to ask, in case of need, supplementary questions or omit some questions. Unstructured interviews are the central technique of collecting information in the case of exploratory studies.

In this study the questions were prepared in a sequence with the first questions being easiest to answer. This secured the co-operation of the respondent. In some cases, though, the order of the questions could be rearranged to fit the discussion.

As part of the sample survey, interviews were conducted at 94 randomly selected villages. The number of villages surveyed per district are as follows: Liwale, 10; Nachingwea, 10; Ruangwa, 9; Lindi Rural, 17; Kilwa, 8; Newala, 9;Tandahimba, 10; Masasi , 10; and Mtwara Rural, 10.

The targets for the interview were the village executive officer and the village chairperson. In most cases both were men. Getting women to interview was difficult, despite a deliberate effort.

Although there were only two targeted respondents, in most cases, more than two people took part in the interview (focus group). Having a big group had the advantage of getting opinions from people other than the village executive officers. However, the disadvantage was that with a big group, sometimes the discussion went off track. An effort was needed to keep to the point.

4.1.2 Settlement Characteristics

(1) Establishment of village

Most of the villages in the Lindi Region were a result of a village establishment program established in early 1970s by the government. Isolated small villages were dismantled, and new planned collective village settlements established. One could observe clustering characteristics, where houses were in line mainly along the road. The justification for the program was to provide people with basic amenities like education, health services and water. Most of the traditional villages were, later, converted into Ujamaa villages in 1974, after the period in which the village establishment program was implemented.

Like the Lindi Region, most of the villages in the Mtwara Region predated the village establishment program. In 1974 the villages were converted into Ujamaa villages, by moving scattered communities into clusters. People were settled along the roads with the government's good intentions of providing them with social services such as clean and safe water, medical services and schools.

Enhanced access to social services let some of the villages grow faster and become bigger. As the number of household increased, it became difficult to provide social services as had been intended. This pushed the government to divide the villages into two or more. In turn, that necessitated an up-grade of sub-villages to full village status.

(2) Ethnic groups and languages

Most of the Lindi Regional population belongs to the Makonde, Mwera, Ngindo and Matumbi ethnic groups. The Mwera tribe and Makonde dominate Lindi Rural. Unlike Lindi Rural the major tribe in Kilwa is Matumbi. One quarter of the visited villages in Kilwa District are Matumbi followed by Ngindo tribe while Makonde tribe dominates the Nachingwea and Ruangwa Districts. The Yao and Wangindo are found in Liwale. The minority tribes are the Machinga and Makua. The Makua originates from Masasi in the Mtwara Region. However, one can say the above-mentioned tribes can be found anywhere in the Lindi Region and all the languages related to these tribes are spoken.

The Swahili language is spoken in every village surveyed followed by the language of the dominant ethnic group in that village. Few speak other languages; but the Makonde language is spoken in every district.

In Newala and Mtwara Rural of the Mtwara Region, there is a mixture of tribes although the Makonde are the majority. In Newala and Mtwara 44% of the surveyed villages are Makonde. The Makua tribe is mainly found in the Masasi District. Unlike other districts, Tandahimba is inhabited by the Makonde tribe. Other tribes found in the district are either government employees, businessmen or married women from other parts of the country.

4.1.3 Institutional Developments

(1) Village Leadership

The government structure starts at the grassroots level. The smallest unit is the ten-cell where ten households are clustered together to make a ten-cell unit and to elect the leader. At this level, decisions about social welfare, security and development projects are made. For example the water user groups are formed, based on the ten cells. One domestic water point has to be used by 25 ten cells. Contributions and maintenance for the water domestic point are also based on this arrangement.

The number of ten cells formed depends on the number of the households in the village and reflects the size of the population. A large number of households means a large number of ten cells. For example in Lindi Rural, Mnazi Mmoja village has the most ten cells (98), followed by Mtua (84) and Nyengedi is the third. In the other small villages the number of ten cells ranges from 7 and 32.

(2) Village administrative organization

All the villages in the study area have a village government structure composed of three committees, namely Planning and Finance, Social Welfare and Self-reliance, and Defense and Security.

The local government centrally determines this structure by Local Government Act No. 7 of 1982. In all villages, sub-committees have been created to deal with specific issues such as development projects, construction activities, etc. The important sub-committees found in almost every village are:

- Works
- Water
- Proper utilization of human power
- Health
- Education and Culture.

The village government is empowered to do all the planning and coordinating of the village socio-economic development activities. With the introduction of a multi-party system, there are various party offices in the villages, each having its organizational structure. All these institutions can be utilized to facilitate smooth operation of the water facilities.

In all villages surveyed and interviewed, a village government council is the authority in the village. Most of the village governments have a standard set number of 25 council members. Few exceptional village governments have less than 25 or more members, of which the reasons are not known. In all surveyed villages the number of men representative in the council

outnumber the number of women.

In most village governments there are 7 or 8 women representatives, and 17 or 18 men. When asked why there are few women, interviewed VEO mentioned that women do not seek election as they not enough time to involve themselves in community responsibilities under pressure from many household duties. The small number of women in the village council indicates minimal participation in decision-making at that level. Low involvement of women in decision-making could be a problem in the implementation of development projects including water projects, where women are the target and the main user.

4.1.4 Social Services

(1) Education facilities

Most of the villages have primary schools and the number increases with the size and type of settlement. However, most of the schools lack basic facilities and are characterized by dilapidated buildings and inadequate teachers and teaching materials.

Out of 17 villages surveyed in Lindi Rural, only three villages do not have primary schools. In Nachingwea only one village does not have a primary school. All surveyed villages in Liwale have primary schools. In Ruangwa only 2 out of 6 villages do not have primary schools. 60 to 70% of the villages visited in the districts in Mtwara have primary schools.

During the survey it was difficult to know the number of children who are of school going age but are not at school. There were many reasons such as, the interviewed persons were not aware of the number of children they had. The data is not collected as it is not considered important . The information from those villages that had the data on children who are supposed to be at school is not in this report.

When the villagers were asked why some children are not sent to school, they gave the following reasons:

- Inadequate classrooms to accommodate every child.
- Some parents keep children at home to help out with household chores (child labour). Children help mothers to fetch water and collect firewood.

(2) Medical facilities

Medical facilities are inadequate and poorly distributed. Few villages have dispensaries. In most cases patients travel long distances to access medical facilities. In situations where the dispensaries are available, medicines are either inadequate or not available at all.

In the Lindi Region, 31 villages (57%) out of 54 villages visited have no health facilities in the village. The Mtwara Region is in a similar situation. The 21 villages (54%) out of 39 villages visited are not equipped with the health facilities.

Villages with no health facilities travel long distances (5-15km) to neighboring villages for medical treatment. In serious medical cases, patients are referred to district hospitals, which are available in every district, or to other major hospitals such as Mnero, Nyangao, and Ndanda in both regions.

Two of the district hospitals are Sokoine and Mtwara Hospitals. There are also privately owned missionary hospitals in Ndanda, Mnero, and Nyangao, which provide good services. Traditional herbalists and traditional birth attendants are also available to supplement the services.

Health problems of the regions are not different from those outlined in the region socio-economic profile. Malaria was mentioned in every village in each district as the main health problem followed by diarrhea. Diseases like typhoid, schistosomiasis, eye diseases, worms, TB, measles, venereal diseases, meningitis, pneumonia, skin diseases, and polio are rampant.

(3) Other social facilities

Other social services available in the study area include shops, bars, go-downs, markets, churches, and mosque. Few shops exist in villages. Licensed shops are found in big villages. Kiosks are found everywhere even in tiny sub villages. Big shops, restaurants, bars, and guesthouses are only found in district headquarters. Almost in all district headquarters, the major government institution/departments are available. Although the Islamic religion is dominant in the area, The Roman Catholic religion is more active in providing social services in the project area. The Roman Catholic Church operates several big hospitals that provide services to every one. There are Ndanda, Mnero and Nyangao Hospitals operated by Roman Catholic churches. Other churches also exist and giving assistance to the community.

4.1.5 Infrastructure

(1) Transport

Roads are in poor conditions and this is a major obstacle to development. Poor transport results in a shortage in supply of farm input, insufficient marketing of crops and poor physical accessibility of social services. Villagers walk long distances on bad roads. Vehicles operating along the roads are limited due to high running costs. Out of the surveyed villages in the Mtwara District, only 49% indicated to walk less than 30 minutes to the nearest main road, while the rest walk more than 30 minutes. Only 38% of the surveyed villages are along the main road. The case is different for the surveyed villages of Masasi, where 90% walk more than 30 minutes to the nearest main road. Out of the surveyed villages, 60% are accessible to regular seasonal passenger transport, with only 20% having access to passenger transport more than

once a week. Mtwara Rural is more serviced by public transport as 42% of the surveyed villages can use passenger transport that is available more than once a week. Only 29% of the surveyed villages in Mtwara have no access to passenger transport.

Most people travel on foot or by bicycle. Bicycles are used for fetching water and carrying farm inputs and outputs to and from markets. Bicycles are used as means of doing business. Water vendors use bicycles to fetch and carry water. Twenty liters of water are sold for Tsh. 100 to 500/- depending on the scarcity of water in the village at that time. In dry season, the prices go up to 500/- while in the rainy season, the price may fall to 50/-. Therefore, bicycles themselves can be the source of income. Some villagers rent bicycles to other villagers.

(2) Telephones and electricity

Telephones are found at district headquarters only. None of the visited villages in either region mentioned having a telephone. Occasionally there is police radio and some missionary hospitals have radio. Villagers use radios to send messages in emergency situations. The telephones available at the district level are outdated. The Tanzania Telecommunication Company is in the process of modernizing the telephone system all over the country; and mobile phone services are spreading rapidly. Within 5 or 10 years, the study area will benefit from those developments.

Electricity is only available at district headquarters. Diesel generators are used to generate electricity. All the districts including the regional headquarters (Lindi and Mtwara towns) are not connected to the National grid. Due to fuel shortages, electricity is occasionally rationed. In near future, some big settlements will probably have electricity (during the survey, some electric poles were being positioned). Tandahimba and Ruangwa (new districts) do not have electricity. New installations from Newala and Nachingwea respectively are being made.

4.1.6 Enterprises in the Village

(1) Agriculture and cash crops

Farming is the main activity of the people in the project area. According to the Lindi and Mtwara Region Socio-economic Profile, about 90% of the total agricultural production is produced by individual small-holdings. The principal crops grown are cashew nut, cassava, sorghum, millet, maize, sesame, groundnuts, coconut and paddy rice. The main (or only, in most cases) tools used for cultivation are hand hoes and machetes

In most cases, traditional methods of cultivation are used. Land furrow and mixed cropping are commonly practiced. These practices lead to sustainable crop production. In elevated areas, soil erosion was observed. Erosion occurs during heavy rainfall. Bush clearing is widely used for farm preparation, and is not realized to be a cause of soil erosion. Bush fires are not used for

farm clearing. Flat and ridge cultivation are both practiced. It seems people prefer flat cultivation, as it maximizes the plant population and eases the labor demand for weeding.

Inadequate farm inputs and implements were mentioned in all the surveyed villages. Farmers face the following problems in increasing agricultural production:

- destructive wild animals
- inadequate extension services
- bad weather
- plant diseases
- an unreliable market
- a poor transportation network
- inadequate storage facilities.

The major cash crops produced in the region are cashew nuts, sesame, coconut and groundnuts. Cashew nut trees represent the major source of cash. It was noted during surveys that a peasant farmer's wealth and prestige is measured in the number of cashew nut trees he owns. However, due to a poor market and a decline in the cashew nut price, attention paid to cashew nut farms is poor. The position is now improving with an increase in the cashew nut price. After cashew nuts, sesame ranks second. Coconut, which is mainly grown in the Kilwa District and Lindi Rural, and groundnuts, rank third and fourth respectively.

(2) Livestock

- Lindi

Livestock keeping is not a major economic component in the villages visited in the Lindi Region. Livestock keeping is predominantly traditional and is composed more or less entirely of indigenous stock. Some villages have no cattle, while in others there are only three to five cows.

Lindi Rural and Ruangwa have more cattle and goats/sheep than other districts in the region. Nachingwea ranks second in number of livestock and Liwale comes in last.

Goats are the second most common livestock in all districts after chickens, which is seen to be the main source of meat. Other animals kept are pigs (in non-Muslim communities) and dogs.

The development of livestock keeping has many hindrances. Traditionally, people of Lindi are not livestock keepers, probably due the fact that wild animals, which could be a substitute for livestock meat, are widely available, particularly in Liwale District, which neighbors the Selous Game Reserve. Other principal constraints mentioned in all villages surveyed in Lindi are as follows in descending order:

- livestock diseases
- destructive wild animals
- lack of extension services
- inadequate grazing areas during the dry season and poor feed.

- **Mtwara**

  The contribution of livestock in the whole economy of the Mtwara Region is insignificant. In some villages no cattle is found, and only a few goats.

  For example, in the 10 surveyed villages in Mtwara Rural a total of 119 cows were available, unlike in the 10 surveyed villages in Masasi, where a total of 1176 cows were observed. In the Tandahimba District, there are only 12 cows in 10 villages. Newala has 379 cows in 9 villages. There are more goats in Tandahimba than Newala. Generally, Masasi has more livestock, followed by Mtwara Rural when compared with other districts.

(3) Other economic activities

As pointed out earlier, the main economic activity in the two regions is agriculture. Apart from this, the region has natural forests that are rich in trees harvested for various uses such as timber, poles, fuel and charcoal. Other sectors regarded as productive are the fishing, bee keeping, wildlife, and mining industries. From the survey conducted, it is evident that the economy of Lindi Region is very undeveloped.

Other economic ventures undertaken by the community include handicraft, skilled trades (basket making), lumbering, timber sales, trading wood processing, poultry, bricks, charcoal, firewood cutting and selling and mat making. About 39% of the villages surveyed in the Masasi District are involved in furniture making and 30% involved in wood processing. In Mtwara Rural, 25% of the villages surveyed deal with wood processing, while 28% are involved in furniture making. At 60% of the surveyed villages in Tandahimba, some youths operate kiosks while others are water vendors. Some villagers are involved in lumbering or sell vegetable and fish. Like in Tandahimba, 40% of the surveyed villages in Newala have a kiosk as a second source of income. The other activities are local brewing, grass selling, shops, traditional healing etc.

4.1.7 Household Income

The new Tanzania Government National Water Policy (rural water supply component) stipulates the users' contribution, plus operation and maintenance, as the prerequisite to development of any water project. The household being the main user, household income is the

determining factor in contributions for the program. If the income of the people at the household level is small, affordability will also be low.

The people of the Lindi Region generally have small incomes. From the villages surveyed in Lindi Rural, the majority of people's income lies between Tsh. 0 to 200,000 per household per year (69%). Only 6% of the surveyed villages indicate an annual household income of Tsh. 400,000 and above. The Kilwa District is the poorest compared to other district, as the majority of the household income falls between Tsh. 200,000 and 250,000 per year. The Nachingwea, Ruangwa and Liwale Districts have better incomes compared to other districts. The annual income of these three districts is within a range of Tsh. 250,000 to 350,000.

Where cashew nuts are growing well as a cash crop, people have better incomes. Cashew nuts are growing well in Ruangwa, Nachingwea, and Liwale. Kilwa and Lindi Rural, where cashew nut growing was more neglected, the household incomes have fallen below the other districts. Kilwa and Lindi Rural depend more on coconuts, which do not have good prices as their cash crop. The household income heard in 54 villages in Lindi averages about 240, 000 Tsh./year.

People's income in the Mtwara Region is also not high. The majority of the surveyed villages indicated earnings of Tsh. 200,000 - 250,000 a year. For instance, 80% of the surveyed villages in the Tandahimba district get Tsh. 200,000 per year. Only 29% of the visited villages earn Tsh. 540,000 per year. In the Masasi District, 40% of the surveyed villages earn Tsh. 200,000 a year. Another 40% earn more than Tsh. 450,000 a year. 56% of the visited villages in Newala earn about 200,000 a year. Only 22% of the visited villages earn between 200,000-250,000 a year. About 11% earn between 350,000-400,000 a year. The average income in another 39 villages is approximately 250,000 Tsh./year.

4.2 Detailed Socio-Economic Survey in 100 Villages

In Stage 2 of the Study from June to December 2000, the joint study team visited all of the 100 candidate villages and conducted the detailed surveys on socio-economic conditions, and made the public aware of the issues of gender, sanitation and autonomous management of community-base water supply schemes.

4.2.1 Surveys on Household Economy

Between 5 to 13 (mostly 10) households in 65 villages (totaling 639 households) were randomly picked and questionnaire surveys were conducted on the household financial situation, especially of main and subordinate sources, and the amount of cash income.

The apparent mean annual income of the respondent 639 households is about 350,000 Tsh./year, which seems higher than was indicated during the sampling survey in Phase 1 (240,000 to 250,000/- per year). However, this apparent mean value is due to the fact that about one fourth of high-income (> 500,000) households have pushed up the average. The income of the majority (64%) falls in a range of 50,000 to 500,000 Tsh., which averages 230,000 Tsh., and is similar to the average value obtained in Phase 1.

The 63 households (about 10%) of very low income (< 50,000/- per year) are also involved in the 639 households surveyed, as shown in the income distribution table below.

Table 4-1 Cash income distribution of the candidate villages

Range of annual cash income (Tanzania Shilling)	Number of households			
	Mtwara	Lindi	Sub-total	Percentage
Less than 9,999	1	9	10	2%
10,000 to 19,999	6	10	16	3%
20,000 to 29,999	5	9	14	2%
30,000 to 49,999	13	10	23	4%
50,000 to 99,999	49	47	96	15%
100,000 to 249,999	120	87	207	32%
250,000 to 499,999	53	69	122	19%
500,000 to 999,999	43	52	95	15%
Over 1,000,000	18	3	56	9%
	308	331	639	

The survey methods used in Phase 1 and Phase 2 are different. However, since the actual average household incomes are similar, the above mentioned income distribution pattern may probably suggest the income distribution pattern in one individual village, namely 10-15% of the households in the village are very poor, 60-65% households are medium and 25% are comparatively rich.

The income distribution pattern in each of the communities may be an important factor in the estimation of the O&M fee collection rate as it can help determine the villagers' ability to pay. For example, the households categorized as 'very poor' will not have any ability to pay, so long as the O&M fee is equally collected from all households in the community.

Difficulty in payment of O&M fee by 10 to 15% of the households is, therefore, duly considered in determination of O&M cost, or to set the minimal O&M cost so that all households can pay for it.

4.2.2 Socio-economic Profiles of Selected 100 Villages

The detailed survey on the socio-economic profile of the selected 100 villages was made through interviews with various parties, such as the village government executives, social service committees and water committees in the 100 villages, and through household surveys in 65 villages. The items on household survey are as follows:

1. demographic parameters (composition of the family)
2. occupational status
3. social capital (societies and education)
4. dwelling house-tenure, construction and occupancy
5. domestic energy
6. farmland (distance from house, farm-size, products, etc.)
7. livestock
8. economic problems of the village
9. main source of income
10. water sources in dry season
11. water sources in wet season
12. condition of sources
13. water procurement (distance, unit consumption rate, etc.)
14. water use (other than domestic use)
15. payment for water
16. principal water supply problems
17. coping mechanism during draughts
18. household health problems in the past 1 year
19. coping mechanism for health problem
20. sanitation (latrine, domestic waste, etc.)
21. project awareness (experience in project participation, willingness etc.)

The survey has revealed that the majority of the villages seem to have difficulties in capability to manage and maintain the water schemes due mainly to such conditions as:

- low cash income level
- prevailing low educational level
- paucity of technical level
- insufficient experiences in operation of formal organization
- underdevelopment of social capital to date, etc.

The need for patient social mobilization and training is fully realized for making the coming water schemes sustainable. The regional and district water departments may be responsible for undertaking services on mobilization and training beforehand and during implementation of the schemes. The foreign funding component had better consider budgetary measures for mobilization and training aspects, in consideration of the financial constraints of the government.

The survey result of each village is tabulated in Table 4-2, which includes a general view of each village, focusing mainly on capability to manage and maintain the water schemes. A summary of the household survey is given in Table 4-3.

Table 4-2-1 (1) Village Profile, Lindi Rural District, Lindi Region

Village name	Chiwerere	Mtumbya	Kilimahewa	Madangwa
Village population	1,438	1,250	4,400	5,603
Number of households	399	250	900	1162
Predominant religion	Islam	Islam	Islam	Islam
Principal occupation	subsistence farming	subsistence farming	subsistence farming	subsistence farming
Principal product	cashewnut	cashewnut	cassava	cashewnut
Average annual household income	US$ 370	US$ 617	US$ 501	US$ 157
Main present source of water	river bed	river	spring	spring
Average distance, house to source	500 metres	12 kilometres	1.5 kilometres	1 kilometre
Average daily consumption of water	12 litres per person	10 litres per person	30 litres per person	12 litres per person
Incidence of water-related disease	very high	very high	very high	low
Maintenance of present water source	none	none	none	by users
Availability of technical skills	fair	very slight	fair	very slight
Community association	political parties and youth organisations	political parties	political parties	political parties
Assessment of capability to manage and maintain an improved water source	Indications of sustainability are good in Chiwerere – a strong case for priority treatment.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.

Table 4-2-1 (2) Village Profile, Lindi Rural District, Lindi Region

Village name	**Hingawali**	**Mandingo**	**Malungo**	**Kiwalala**
Village population	3,960	1,611	1,566	9,471
Number of households	514	519	350	1819
Predominant religion	Islam	Islam	Islam	Islam
Principal occupation	subsistence farming	subsistence farming	subsistence farming	subsistence farming
Principal product	maize	simsim	groundnuts	rice
Average annual household income	US$ 123	US$ 617	US$ 370	US$ 185
Main present source of water	traditional wells	traditional wells	traditional wells	spring
Average distance, house to source	3 kilometres	4 kilometres	400 metres	1 kilometre
Average daily consumption of water	12 litres per person	6 litres per person	40 litres per person	21 litres per person
Incidence of water-related disease	extremely high	very high	high	very high
Maintenance of present water source	none	none	none	none
Availability of technical skills	very slight	very slight	very slight	very slight
Community association	political parties and a women's group	political parties and a women's group	political parties	political parties
Assessment of capability to manage and maintain an improved water source	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.

Table 4-2-1 (3) Village Profile, Lindi Rural District, Lindi Region

Village name	**Mnolela**	**Kineng'ene**	**Kilolombwani**	**Lihimilo**
Village population	3,405	9,020	1,160	1,058
Number of households	347	900	209	263
Predominant religion	Islam	Islam	Islam	Islam
Principal occupation	subsistence farming	subsistence farming	subsistence farming	subsistence farming
Principal product	coconuts	maize	cassava	groundnuts
Average annual household income	US$927	US$ 617	US$ 185	US$ 62
Main present source of water	standpipes	ring wells	river	river
Average distance, house to source	3 kilometres	7 kilometres	6 kilometres	3 kilometres
Average daily consumption of water	20 litres per person	20 litres per person	20 litres per person	7 litres per person
Incidence of water-related disease	very high	extremely high	extremely high	extremely high
Maintenance of present water source	some	none	none	none
Availability of technical skills	slight	very slight	very slight	very slight
Community association	political parties and income-generating groups	political parties	political parties	political parties
Assessment of capability to manage and maintain an improved water source	Prospects for maintenance appear to be very poor in Mnolela; but need seems much less than in most villages, by the index of need indicators. Low priority for assistance.	Need for an improved water supply is great at Kineng'ene but indications of sustainability are very poor. This situation creates a case for assistance linked to a programme of social mobilisation, hygiene aware-ness and training of a water committee for maintenance.	Need for an improved water supply is very great at Kilolombwani (the highest in the region by the survey of indicators of need) but indications of sustainability are very poor. This situation creates a case for assistance linked to a programme of social mobilisation, hygiene aware-ness and training of a water committee for maintenance.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the extremely low cash incomes and the under-development of social capital to date.

Table 4-2-1 (4) Village Profile, Lindi Rural District, Lindi Region

Village name	**Chikonji**
Village population	2,391
Number of households	678
Predominant religion	Islam
Principal occupation	subsistence farming
Principal product	cashewnut, millet
Average annual household income	US$ 245
Main present source of water	traditional well
Average distance, house to source	1.5 kilometres
Average daily consumption of water	12 litres per person
Incidence of water-related disease	high
Maintenance of present water source	maintenance by users
Availability of technical skills	low
Community association	political parties only
Assessment of capability to manage and maintain an improved water source	Indications of sustainability at Chikonji are very poor; but the village also ranks far down the ranking in order of need. It should therefore not be prioritised for an improved water supply system.

Table 4-2-2 (1) Village Profile, Kilwa District, Lindi Region

Village name	**Migeregere**	**Mtandango**	**Somanga Ndumbo**	**Pande Plot**
Village population	1,400	909	3,800	3,600
Number of households	226	250	600	420
Predominant religion	Islam	Islam	Islam	Islam
Principal occupation	subsistence farming	subsistence farming	rice farming; some fishing	subsistence farming
Principal product	millet	cassava	rice	cashewnut, cassava
Average annual household income	US$ 250	US$ 370	US$ 1100	US$ 580
Main present source of water	well with hand pump	traditional wells	protected dug wells	traditional wells
Average distance, house to source	8 kilometres	1 kilometre	500 metres	1 kilometre
Average daily consumption of water	14 litres per person	20 litres per person	22 litres per person	12 litres per person
Incidence of water-related disease	high	extremely high	extremely high	high
Maintenance of present water source	none	none	none	almost none
Availability of technical skills	very slight	very slight	very little	very slight
Community association	political parties	political parties	political parties only	political parties
Assessment of capability to manage and maintain an improved water source	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, reducing the high incidence of waterborne illnesses; but the prospects for sustain-able maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the low cash incomes and the absence of formal organisations in the community.	Pande Plot has a very poor prognosis for sustainable development, but great need for an improved water supply. This combination suggests prioritisation after an effective period of social mobilisation and training.

Table 4-2-2 (2) Village Profile, Kilwa District, Lindi Region

Village name	**Mtitimira**	**Lihimalyoao**	**Mandawa**	**Kiwawa**
Village population	1,034	4,686	7,070	1,800
Number of households	233	717	979	350
Predominant religion	Islam	Islam	Islam	Islam
Principal occupation	farming, small business	farming	subsistence farming	subsistence farming
Principal product	cashewnut	cassava	maize	simsim
Average annual household income	US$ 494	US$ 309	US$ 62	US$ 1380
Main present source of water	traditional wells	caves	river	river
Average distance, house to source	1 kilometre	5 kilometres	150 metres	200 metres
Average daily consumption of water	21 litres per person	23 litres per person	7 litres per person	16 litres per person
Incidence of water-related disease	extremely high	very high	extremely high	very high
Maintenance of present water source	none	none	none	villagers do a little maintenance
Availability of technical skills	very little	extremely little	very slight	very slight
Community association	political parties	political parties, football clubs	political parties	political parties
Assessment of capability to manage and maintain an improved water source	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.

Table 4-2-3 (1) Village Profile, Ruangwa District, Lindi Region

Village name	**Nanganga**	**Chilangalile**	**Machanganja**	**Liuguru**
Village population	1,150	966	1,905	3,736
Number of households	324	181	189	586
Predominant religion	Islam	Islam	Islam	Islam
Principal occupation	subsistence farming	subsistence farming	subsistence farming	subsistence farming
Principal product	cashewnut	maize	cassava	cashewnut
Average annual household income	US$ 309	US$ 123	US$ 617	US$ 500
Main present source of water	river	traditional wells	traditional wells	traditional wells
Average distance, house to source	2 kilometres	4 kilometres	1 kilometre	2 kilometres
Average daily consumption of water	30 litres per person	10 litres per person	20 litres per person	19 litres per person
Incidence of water-related disease	extremely high	extremely high	extremely high	extremely high
Maintenance of present water source	none	none	none	digging ,ore wells
Availability of technical skills	very slight	very slight	very slight	very slight
Community association	political parties	political parties and cooperatives	political parties	political parties and co operatives
Assessment of capability to manage and maintain an improved water source	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	Chilangalile scores very highly on the index of need and fairly highly by indications of sustainability. Accordingly it should have high priority.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	Liuguru records the most promising set of sustainability indicators in Ruangwa District It also scores very highly (4th in the whole of Lindi Region) on the indicators of need. That being so, it is prime candidate for priority assistance.

Table 4-2-3 (2) Village Profile, Ruangwa District, Lindi Region

Village name	**Mihewe**	**Chinongwe**	**Litama**	**Likwachu**
Village population	1,017	3,395	1,546	1,824
Number of households	117	855	450	461
Predominant religion	Islam	Islam and Christianity equally	Islam	Christianity and Islam equally
Principal occupation	subsistence farming	subsistence farming	subsistence farming	subsistence farming
Principal product	cashewnut	cashewnut	cashewnut	cashewnut
Average annual household income	US$ 494	US$ 313	US$ 444	US$ 494
Main present source of water	traditional wells	traditional wells	river	traditional wells
Average distance, house to source	2 kilometres	1 kilometre	4 kilometres	5 kilometres
Average daily consumption of water	10 litres per person	10 litres per person	10 litres per person	10 litres per person
Incidence of water-related disease	extremely high	extremely high	high	very high
Maintenance of present water source	none	none	redigging wells	none
Availability of technical skills	very slight	slight	very slight	extremely slight
Community association	political parties	political parties, religious organisations and footballs clubs	political parties	political parties
Assessment of capability to manage and maintain an improved water source	Need for an improved water supply is high at Mihewe but the sustain-ability indications are exceptionally poor. Assistance should proceed after a period of effective social mobilization and training, which might take several years.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, and the very low cash incomes.	Litama villagers' need for an improved water supply is very great (the 2nd highest, by the index of need) but the sustain-ability indications are poor. Assistance should proceed after a period of effective social mobilization and training, which might take several years.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.

Table 4-2-3 (3) Village Profile, Ruangwa District, Lindi Region

Village name	**Ipingo**	**Chibula**
Village population	981	1,192
Number of households	193	349
Predominant religion	Christian	Islam
Principal occupation	subsistence farming	farming
Principal product	cashewnut	cashewnut
Average annual household income	US$ 282	US$ 617
Main present source of water	ring well	traditional wells
Average distance, house to source	1 kilometre	1 kilometre
Average daily consumption of water	16 litres per person	10 litres per person
Incidence of water-related disease	very high	high
Maintenance of present water source	none	none
Availability of technical skills	very slight	very little
Community association	political parties	political parties and UWT (women's group)
Assessment of capability to manage and maintain an improved water source	Ipingo villagers' need for an improved water supply is great but the sustain-ability indications are poor. Assistance should proceed after a period of effective social mobilization and training, which might take several years.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.

Table 4-2-4 (1) Village Profile, Nachingwea District, Lindi Region

Village name	**Mkonjela**	**Litula**	**Rweje**	**Naipanga**
Village population	3,665	1,793	1,352	17,939
Number of households	635	335	455	2563
Predominant religion	Islam and Christian, equally	Islam	Islam	Islam
Principal occupation	subsistence farming	subsistence farming, fishing	subsistence farming	subsistence farming
Principal product	cashewnut	simsim	maize	cassava
Average annual household income	US$ 390	US$ 247	US$ 386	US$ 550
Main present source of water	traditional wells	traditional wells	traditional wells	boreholes
Average distance, house to source	5 kilometres	200 metres	1 kilometre	4 kilometres
Average daily consumption of water	10 litres per person	20 litres per person	10 litres per person	25 litres per person
Incidence of water-related disease	extremely high	extremely high	very high	high
Maintenance of present water source	none	none	none	none
Availability of technical skills	very slight	very slight	very slight	very slight
Community association	political parties	political parties	political parties	political parties
Assessment of capability to manage and maintain an improved water source	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	Litula has average prospects for sustainability of an improved water supply but the second-lowest rating in terms of need – suggesting that water supply improvement need not be a high priority here.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.

Table 4-2-4 (2) Village Profile, Nachingwea District, Lindi Region

Village name	**Chiumbati/Miembeni**	**Mandai**	**Ndomoni**	**Kipara Mtua**
Village population	1,369	1,628	1,236	2,573
Number of households	374	536	360	401
Predominant religion	Christian	Islam	Christian	Christian
Principal occupation	farming	subsistence farming	subsistence farming	subsistence farming
Principal product	cassava	cashewnut	cashewnut	cashewnut
Average annual household income	US$ 617	US$ 370	US$ 222	US$ 864
Main present source of water	traditional wells	traditional wells	traditional dams	protected dug wells
Average distance, house to source	5 kilometres	5 kilometres	3 kilometres	200 metres
Average daily consumption of water	28 litres per person	15 litres per person	30 litres per person	15 litres per person
Incidence of water-related disease	extremely high	very high	high	very high
Maintenance of present water source	none	none	none	none
Availability of technical skills	very little	very slight	very slight	very slight
Community association	political parties	political parties	political parties	political parties
Assessment of capability to manage and maintain an improved water source	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	Mandai appears to be the village where an improved water supply scheme is most likely to be maintained. In many respects, it is a typical village of the region. However, Mandai has a smaller than average house-hold size, lower than average dependency ratio, and more well-schooled residents than most. People are familiar with water source maintenance and payment for water.	Ndomoni is highly ranked by the indicators of sustainability but low in the ranking of need for improved water supplies, suggesting that full cost recovery should be negotiated prior to commencement of works.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the low cash incomes and the under-development of social capital to date.

Table 4-2-4 (3) Village Profile, Nachingwea District, Lindi Region

Village name	**Mpiruka**
Village population	2,621
Number of households	713
Predominant religion	Islam and Christianity, equally
Principal occupation	subsistence farming
Principal product	cashewnut
Average annual household income	US$ 1252
Main present source of water	traditional wells
Average distance, house to source	1 kilometre
Average daily consumption of water	12 litres per person
Incidence of water-related disease	extremely high
Maintenance of present water source	none
Availability of technical skills	very slight
Community association	political parties
Assessment of capability to manage and maintain an improved water source	Analysis of the sustainability indicators shows that Mpiruka has a fairly high prospect of sustaining an improved water supply. The need is great, evidenced by the low per capita consumption.

Table 4-2-5 (1) Village Profile, Liwale District, Lindi Region

Village name	**Mlembwe**	**Mikunya**	**Mihumo**	**Mbaya**
Village population	1,586	1,100	1,771	1,442
Number of households	250	179	333	208
Predominant religion	Islam	Islam	Islam	Islam
Principal occupation	subsistence farming	subsistence farming	subsistence farming	subsistence farming
Principal product	cashewnut	cashewnut	cashewnut	cashewnut
Average annual household income	US$ 741	US$ 1000	US$ 617	US$ 741
Main present source of water	pond	traditional wells	river	river
Average distance, house to source	1 kilometre	1 kilometres	3 kilometres	1 kilometre
Average daily consumption of water	8 litres per person	10 litres per person	30 litres per person	24 litres per person
Incidence of water-related disease	extremely high	extremely high	very high	very high
Maintenance of present water source	none	none	none	none
Availability of technical skills	very slight	very slight	very slight	very slight
Community association	political parties	political parties	political parties	political parties and parents' club
Assessment of capability to manage and maintain an improved water source	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	Mikunya should not be prioritised for water supply improvement. By the indicators of need, it has the lowest requirement for assistance in the whole region.	Mihumo appears to have good prospects for sustainable development and the villages also ranks very high on the index of need. As such, it should be a top priority for an improved water supply scheme.	Mbaya's need is average for the region, which means in fact that it is substantial; but the village ranks low on the index of sustainability indicators. Low priority is suggested.

Table 4-2-5 (2) Village Profile, Liwale District, Lindi Region

Village name	**Ngongowele**
Village population	1,291
Number of households	400
Predominant religion	Islam
Principal occupation	subsistence farming
Principal product	cashewnut
Average annual household income	US$ 370
Main present source of water	river
Average distance, house to source	4 kilometres
Average daily consumption of water	12 litres per person
Incidence of water-related disease	extremely high
Maintenance of present water source	none
Availability of technical skills	very slight
Community association	political parties
Assessment of capability to manage and maintain an improved water source	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.

Table 4-2-6 (1) Village Profile, Mtwara Rural District, Mtwara Region

Village name	**Mbembaleo**	**Maranje**	**Mtiniko**	**Malamba**
Village population	5,600	2,346	1,166	1,557
Number of households	874	671	352	314
Predominant religion	Islam	Islam	Islam	Islam
Principal occupation	subsistence farming	subsistence farming	subsistence farming	subsistence farming
Principal product	cashewnut	cashewnut	cashewnut	cassava
Average annual household income	US$ 370	US$ 620	US$ 617	US$ 490
Main present source of water	traditional wells	pond	pone	traditional dam
Average distance, house to source	2 kilometres	2 kilometres	2 kilometres	8 kilometres
Average daily consumption of water	8 litres per person	7 litres per person	4 litres per person	10 litres per person
Incidence of water-related disease	very high	very high	extremely high	extremely high
Maintenance of present water source	none	none	none	none
Availability of technical skills	very slight	very slight	very slight	very slight
Community association	political parties	political parties	political parties	political parties
Assessment of capability to manage and maintain an improved water source	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The need for an improved water supply is great (ranked highest of all the index of need) but the sustainability indicators are extremely poor. Assistance should proceed after a period of effective social mobilization and training, which might take several years.	The need for an improved water supply is great but the sustainability indicators are very poor. Assistance should proceed after a period of effective social mobilization and training, which might take several years.

Table 4-2-6 (2) Village Profile, Mtwara Rural District, Mtwara Region

Village name	**Ziwani**	**Msimbati**	**Msanga Mkuu**	**Nanguruwe**
Village population	6,700	5,320	4,980	4,980
Number of households	991	1002	1000	not stated
Predominant religion	Islam	Islam	Islam	Islam
Principal occupation	subsistence farming	subsistence farming	subsistence farming	subsistence farming
Principal product	cashewnut	cashewnut	cashewnut	cashewnut
Average annual household income	US$ 249	US$ 432	US$ 927	US$ 864
Main present source of water	traditional dam	protected dug wells	traditional wells	traditional wells
Average distance, house to source	1 kilometre	300 metres	3 kilometres	1 kilometre
Average daily consumption of water	13 litres per person	30 litres per person	30 litres per person	12 litres per person
Incidence of water-related disease	very high	very high	extremely high	extremely high
Maintenance of present water source	none	none	none	none
Availability of technical skills	very slight	very slight	very slight	very slight
Community association	political parties	political parties	political parties	political parties
Assessment of capability to manage and maintain an improved water source	Need, although considerable, is less than average. Ziwani ranked last by indicators of sustainability. It appears to have, in other words, the poorest prospects for maintenance of an improved water supply scheme of any surveyed village, and should not have been prioritised for engineering works. However, it was selected as a pilot study village before the social survey had been concluded. That being so, it will be instructive to witness the outcome of the pilot project.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The need for an improved water supply is great but the sustainability indicators are extremely poor. Assistance should proceed after a period of effective social mobilization and training, which might take several years.	The need for an improved water supply is great but the sustainability indicators are poor. Assistance should proceed after a period of effective social mobilization and training, which might take several years.

Table 4-2-6 (3) Village Profile, Mtwara Rural District, Mtwara Region

Village name	**Mbawala**	**Kawawa**	**Kitaya**	**Arusha Chini**
Village population	2,050	3,530	2,769	1,654
Number of households	950	932	676	365
Predominant religion	Islam	Islam	Islam	Islam
Principal occupation	subsistence farming	subsistence farming	subsistence farming	fishing, farming
Principal product	cassava	cashewnut	cashewnut	cashewnut
Average annual household income	US$ 742	US$ 222	US$ 247	US$ 371
Main present source of water	protected dug wells	traditional dam	river	spring
Average distance, house to source	250 metres	2 kilometres	1 kilometre	500 metres
Average daily consumption of water	9 litres per person	10 litres per person	30 litres per person	22 litres per person
Incidence of water-related disease	extremely high	extremely high	high	extremely high
Maintenance of present water source	none	none	none	none
Availability of technical skills	very slight	very slight	very slight	very little
Community association	political parties	political parties	political parties	political parties and women's groups
Assessment of capability to manage and maintain an improved water source	The need for an improved water supply is great but the sustainability indicators are extremely poor. Assistance should proceed after a period of effective social mobilization and training, which might take several years.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.

Table 4-2-6 (4) Village Profile, Mtwara Rural District, Mtwara Region

Village name	**Mayambe Juu**	**Kitunguli / Mahurunga**	**Dihimba**	**Mpondomo**
Village population	887	4,530	1,587	2,556
Number of households	290	540	365	763
Predominant religion	Islam	Islam	Islam	Islam
Principal occupation	subsistence farming	subsistence farming	subsistence farming	subsistence farming
Principal product	cashewnut	cashewnut	cashewnut	cashewnut
Average annual household income	US$ 740	US$ 370	US$ 309	US$ 340
Main present source of water	river	traditional well	standpipes	standpipes
Average distance, house to source	5 kilometres	400 metres	400 metres	400 metres
Average daily consumption of water	22 litres per person	60 litres per person	40 litres per person	40 litres per person
Incidence of water-related disease	very high	extremely high	extremely high	high
Maintenance of present water source	none	none	none	none
Availability of technical skills	very slight	very slight	very slight	very slight
Community association	political parties	political parties	political parties	political parties
Assessment of capability to manage and maintain an improved water source	The need for an improved water supply is great but the sustainability indicators are very poor. Assistance should proceed after a period of effective social mobilization and training, which might take several years	The community would benefit from an improved water supply, leading to better health; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	Prospects for sustainable maintenance of an improved water supply are very poor in Dihimba and the village also ranks almost last in the indicators of need. It should not be prioritised.	Improvement of the existing system is possible but not a high priority compared with other villages.

Table 4-2-7 (1) Village Profile, Tandahimba District, Mtwara Region

Village name	**Mihambwe**	**Kitama**	**Mitondi**	**Misufini**
Village population	3,279	6,198	1333	883
Number of households	743	690	256	215
Predominant religion	Islam	Islam	Islam	Islam
Principal occupation	subsistence farming	farming	subsistence farming	subsistence farming
Principal product	cashewnut	cashewnut	cashewnut	cashewnut
Average annual household income	US$ 617	US$ 988	US$ 370	US$ 617
Main present source of water	river	traditional dams	traditional wells	river
Average distance, house to source	8 kilometres	2 kilometres	2 kilometres	8 kilometres
Average daily consumption of water	8 litres per person	10 litres per person	3 litres per person	5 litres per person
Incidence of water-related disease	very high	extremely high	very high	extremely high
Maintenance of present water source	none	none	none	none
Availability of technical skills	very slight	very little	very slight	very slight
Community association	political parties	political parties	political parties	political parties
Assessment of capability to manage and maintain an improved water source	Mihambwe ranked among the lowest in terms of sustainability and in order of need for improved water supplies. It should not be prioritised.	Kitama appears to have fairly good prospects for maintenance of an improved water supply but, by the ranking of villages in order of need for water supply improvement, it appears to have the least pressing need. Negotiation about full cost recovery ought to precede installation of any new water scheme.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	Water consumption is so low that a solution has to be found. Income, though low, is well above average and so a simple engineered solution has to be a possibility, following formation of a water committee and development of maintenance skills. Water carriers should preferentially receive training as pump mechanics since they will lose their livelihoods as water vendors.

Table 4-2-7 (2) Village Profile, Tandahimba District, Mtwara Region

Village name	**Litehu**	**Mmeda**	**Mabeti**	**Mkwiti**
Village population	840	823	850	1,034
Number of households	248	225	298	310
Predominant religion	Islam	Islam	Islam	Islam
Principal occupation	subsistence farming	subsistence farming	subsistence farming	subsistence farming
Principal product	cashewnut	cashewnut	cashewnut	cashewnut
Average annual household income	US$ 865	US$ 111	US$ 617	US$ 247
Main present source of water	traditional dams	traditional dam	traditional dams	spring
Average distance, house to source	2 kilometres	300 metres	3 kilometres	2 kilometres
Average daily consumption of water	14 litres per person	10 litres per person	12 litres per person	7 litres per person
Incidence of water-related disease	extremely high	extremely high	extremely high	high
Maintenance of present water source	none	none	none	none
Availability of technical skills	very slight	very slight	very slight	very slight
Community association	political parties	political parties	political parties	political parties
Assessment of capability to manage and maintain an improved water source	Indicators of sustainability are fairly good at Litehu while need for an improved water supply are average – which means, in fact, that there is substantial need. In combination, this suggests high priority for this village.	Mmeda villagers draw water from a nearby dam where the water is easily contaminated; but their incomes are too low to sustain an engineered water supply improvement.	Consumption of water is far too low in this village; but the indications of sustainability are very poor, suggesting need for water supply improvement after a period of hygiene education, social mobilisation and income enhancement.	Mkiti is far from water and very little is fetched. Income is, however, too low to sustain an engineered solution to the problem.

Table 4-2-7 (3) Village Profile, Tandahimba District, Mtwara Region

Village name	**Namindondi Juu**	**Nanjanga**	**Mkuti**
Village population	1,550	1,525	1,620
Number of households	230	145	260
Predominant religion	Islam	Islam	Islam
Principal occupation	subsistence farming	subsistence farming	subsistence farming
Principal product	cashewnut	cashewnut	cashewnut
Average annual household income	US$ 248	US$ 444	US$ 494
Main present source of water	spring	river bed	traditional wells
Average distance, house to source	3 kilometres	20 kilometres	200 metres
Average daily consumption of water	13 litres per person	6 litres per person	20 litres per person
Incidence of water-related disease	extremely high	extremely high	extremely high
Maintenance of present water source	none	none	none
Availability of technical skills	very slight	very slight	very slight
Community association	political parties	political parties	political parties, co-operatives and football clubs
Assessment of capability to manage and maintain an improved water source	Prospects for sustainable maintenance of an improved water supply scheme appear poor at Namindondi Juu. It should not be prioritised.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.

Table 4-2-8 (1) Village Profile, Newala District, Mtwara Region

Village name	**Mnanje**	**Kilidu**	**Mnima**	**Miyuyu**
Village population	780	1,780	1,164	794
Number of households	177	260	323	215
Predominant religion	Islam and Christianity equally	Islam	Christian	Islam
Principal occupation	subsistence farming	subsistence farming	subsistence farming	subsistence farming
Principal product	cashewnut	cashewnut	cassava	cassava
Average annual household income	US$ 247	US$ 617	US$ 123	US$ 312
Main present source of water	traditional dams	river	spring	spring
Average distance, house to source	4 kilometres	15 kilometres	5 kilometres	3 kilometres
Average daily consumption of water	12 litres per person	7 litres per person	10 litres per person	8 litres per person
Incidence of water-related disease	very high	very high	very high	very high
Maintenance of present water source	none	none	none	none
Availability of technical skills	very slight	very slight	very slight	very slight
Community association	political parties and women's groups	political parties, women's groups	political parties and livestock keepers' group	political parties and women's groups
Assessment of capability to manage and maintain an improved water source	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	Young men who fetch water from a great distance to Kilidu village should be prioritised for training as pump maintenance fund is because they would probably lose their livelihood if the village receives an engineered scheme. Training of a water committee should also be initiated.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	Prospects for maintenance of an improved water supply are fairly good in Miyuyu and the need is great.. Very high priority is appropriate.

Table 4-2-8 (2) Village Profile, Newala District, Mtwara Region

Village name	**Namangudu**	**Mitanga**	**Likwaya**	**Malatu Juu**
Village population	722	1,271	507	2,330
Number of households	217	296	127	530
Predominant religion	Islam	Islam	Islam	Islam
Principal occupation	subsistence farming	subsistence farming	subsistence farming	subsistence farming
Principal product	cashewnut	cashewnut	cashewnut	cashewnut
Average annual household income	US$ 185	US$ 618	US$ 186	US$ 247
Main present source of water	standpipes	river bed	river	traditional wells
Average distance, house to source	7 kilometres	8 kilometres	3 kilometres	8 kilometres
Average daily consumption of water	8 litres per person	8 litres per person	8 litres per person	4 litres per person
Incidence of water-related disease	extremely high	very high	extremely high	very high
Maintenance of present water source	none	none	none	none
Availability of technical skills	very slight	very slight	very slight	very slight
Community association	political parties and women's groups	political parties and cultural groups	political parties	political parties
Assessment of capability to manage and maintain an improved water source	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	Mitanga village has the best overall prospect for sustained maintenance of an improved water supply and should be prioritised accordingly.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the extremely low cash incomes and the under-development of social capital to date.	Need for an improved water supply is very great but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.

Table 4-2-8 (3) Village Profile, Newala District, Mtwara Region

Village name	**Mdimba**	**Chiwonga**	**Mmulunga**
Village population	1,362	1,558	1,593
Number of households	320	400	300
Predominant religion	Islam	Islam	Islam
Principal occupation	subsistence farming	farming	subsistence farming
Principal product	cashewnut	cassava	cashewnut
Average annual household income	US$ 247	US$ 123	US$ 370
Main present source of water	standpipes	standpipes	standpipes
Average distance, house to source	4 kilometres	4 kilometres	8 kilometres
Average daily consumption of water	12 litres per person	10 litres per person	6 litres per person
Incidence of water-related disease	very high	extremely high	extremely high
Maintenance of present water source	none	none	dam maintained and contributions made
Availability of technical skills	very slight	very little	very slight
Community association	political parties	political parties, women's groups	political parties
Assessment of capability to manage and maintain an improved water source	The village has a strong sanitation campaign and the prospects for sustainable development are fairly good. Compared with most other villages, however, the need for an improved water supply is not great.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, and the extremely low cash incomes.	Improvements should be based on existing arrangements. Otherwise they might be undermined and the self-reliance progress weakened.. With that proviso, prospect for maintenance should be good.

Table 4-2-9 (1) Village Profile, Masasi District, Mtwara Region

Village name	**Nanganga**	**Namkungwi**	**Kilosa**	**Chikoweti**
Village population	2,385	1,339	2,001	3,273
Number of households	508	226	321	817
Predominant religion	Christian	Islam	Islam	Christian
Principal occupation	subsistence farming	subsistence farming	subsistence farming	subsistence farming
Principal product	cashewnut	cashewnut	cashewnut	cashewnut
Average annual household income	US$ 617	US$ 542	US$	US$ 456
Main present source of water	traditional wells	traditional dam	traditional wells	traditional wells
Average distance, house to source	1 kilometre	7 kilometres	1 kilometre	2.5 kilometres
Average daily consumption of water	12 litres per person	10 litres per person	litres per person	11 litres per person
Incidence of water-related disease	extremely high	very high	extremely high	extremely high
Maintenance of present water source	none	none	none	none
Availability of technical skills	very slight	very slight	very slight	very slight
Community association	political parties	political parties	political parties	political parties
Assessment of capability to manage and maintain an improved water source	Nanganga's need for an improved water supply is great but the sustain -ability indicators are poor. Assistance should proceed after a period of effective social mobilization and training, which might take several years.	Indicators of sustainability are fairly good in Namkungwi while need is average for the district – which, in effect, means that it is great. High priority is thereby suggested.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The sustainability ranking is very low at Chikoweti but so also is need, compared with other villages. This village should not receive high priority.

Table 4-2-9 (2) Village Profile, Masasi District, Mtwara Region

Village name	**Mlingula**	**Chiwale**	**Nanyumbu**	**Namasogo**
Village population	3,321	9,567	1,205	1,304
Number of households	704	1006	334	266
Predominant religion	Christian	Christianity and Islam, equally	Islam	Islam
Principal occupation	subsistence farming	subsistence farming	subsistence farming	subsistence farming
Principal product	cashewnut	cashewnut	simsim	cashewnut
Average annual household income	US$ 617	US$ 309	US$ 864	US$ 123
Main present source of water	traditional wells	traditional wells	traditional wells	traditional well
Average distance, house to source	1 kilometre	1 kilometre	1 kilometre	5 kilometres
Average daily consumption of water	20 litres per person	10 litres per person	32 litres per person	10 litres per person
Incidence of water-related disease	low	extremely high	very high	extremely high
Maintenance of present water source	none	none	none	none
Availability of technical skills	very slight	very slight	slight	very slight
Community association	political parties	political parties	political parties and income generating groups	political parties and women's groups
Assessment of capability to manage and maintain an improved water source	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	Indicators of sustainability are fairly good in Nanyumbu while need is average for the district – which, in effect, means that it is great. High priority is thereby suggested.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.

Table 4-2-9 (3) Village Profile, Masasi District, Mtwara Region

Village name	**Msanga**	**Mpeta**	**Mitonji**
Village population	954	2,117	2,500
Number of households	310	548	348
Predominant religion	Christian	Christian	Islam
Principal occupation	subsistence farming	subsistence farming	subsistence farming
Principal product	cashewnut	simsim	cashewnut
Average annual household income	US$ 617	US$ 123	US$ 370
Main present source of water	traditional wells	protected dug wells	traditional wells
Average distance, house to source	2 kilometres	400 metres	1 kilometre
Average daily consumption of water	8 litres per person	40 litres per person	10 litres per person
Incidence of water-related disease	extremely high	low	extremely high
Maintenance of present water source	none	none	none
Availability of technical skills	very slight	very slight	very slight
Community association	political parties	political parties and youth organisations	political parties and a women's group
Assessment of capability to manage and maintain an improved water source	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.	Mpeta has unusually good indications of sustainability and could be prioritised for that reason, notwithstanding that need is much less than in many villages.	The community would benefit from an improved water supply, leading to better health and diversion of time spent on water procurement to productive activity; but the prospects for sustainable maintenance of an engineered water supply are poor, given the prevailing low educational level and paucity of technical skills, the abundance of cheap labour available to fetch water, the very low cash incomes and the under-development of social capital to date.

Table 4-3 (1) Lindi Region household survey summary

1) Demographic parameters (Composition of the family)
2) Occupational status
3) Social capital (Societies and education)
4) Dwelling house-tenure, construction and occupancy
5) Domestic energy
6) Farmland (Distance from house, farm-size, products, etc.)
7) Livestock
8) Economic problems of the village
9) Main source of income
10) Water sources in dry season
11) Water sources in wet season
12) Condition of sources
13) Water procurement (Distance, unit consumption rate, etc.)
14) Water use (Other than domestic use)
15) Payment for water
16) Principal water supply problems
17) Coping mechanism during draught
18) Household health problems in the past 1 year
19) Coping mechanism for health problem
20) Sanitation (Latrine, domestic waste, etc.)
21) Project awareness (Experience in project participation, willingness, etc.)

1. Demographic parameters

average household size	5	people
females per 100 males	102	
presently unmarried	61	%
under 15 years old	41	%
children per household	2	
children per 100 adults	71	
natural growth rate (birth rate minus death rate)	1.1	%

2. Occupational status

skilled, professional and managerial	1	%
unskilled and semi-skilled	51	%
child labour	1	%
not stated	0	%
unemployed (but seeking work)	0	%
dependants	48	%
dependancy ratio (dependants as % of workers)	94	%

3. Social capital

households belonging to any society other than a religious denomination	76	%
villagers uneducated (no schooling)	39	%
villagers with little education	24	%
villagers with six or more years schooling	37	%

4. Dwelling house – tenure, construction and occupancy

duration of residence in dwelling, by household	12	years
dwellings owner occupied	89	%
dwellings roofed with durable materials	31	%
walls constructed with durable materials	9	%
hard floor (other than simple earth floor)	14	%
rooms per dwelling	2.7	
persons per room	2.0	
windows per 100 occupants	56	

5. Domestic energy

firewood = cooking fuel	94	%
kerosene lamp for indoor lighting	98	%

6. The farm (*shamba*)

average distance to main farm holding	2350	metres
average household farm size	2.8	hectares
cashewnut cultivated this year by	20	% of hh
cassava cultivated this year by	19	% of hh
maize cultivated this year by	20	% of hh
millet cultivated this year by	11	% of hh
rice cultivated this year by	6	% of hh

7. Livestock

chickens	6	per hh
ducks		per hh
cattle		per hh
goats	1	per hh
sheep	1	per hh
pigs		per hh
households with none	30	%

8. Economic problems and coping mechanisms described by respondents

lack of good tools and implements	33	%
wild animals raid crops	32	%
shortage of capital and/or credit	18	%
water problems	**16**	**%**
crop failure	9	%
cost of farm inputs	7	%
insects attack crops	7	%
poor markets	5	%
transport problems	4	%
small income	3	%
no economic problems	4	%
households having **no coping mechanism** to deal with economic problems	39	%

9. Main source of income, by household

sale of farm surplus	82	%
small business	4	%
catering, food sales	3	%
waged employment full-time	2	%
family support	1	%
sale of fish	1	%
casual labour	1	%
sale of timber	1	%
sale of clothes	1	%
brewing		%
no source of income	2	%

average cash income per person per year **US$ 108**

10. Main dry-season source of water, by household

traditional well	34	%
traditional dam	22	%
stream	15	%
spring	7	%
well / borehole with hand pump	5	%
ring well	5	%
pools, puddles	0	%
dry river bed	2	%
piped to compound	1	%
rainwater storage	1	%
bought from vendor	2	%

11. Main wet-season source of water, by household

traditional well	37	%
traditional dam	21	%
stream	8	%
spring	3	%
borehole with hand pump	1	%
ring well	3	%
pools, puddles	8	%
dry river bed	0	%
piped to compound	1	%
rainwater harvesting	7	%
bought from vendor	1	%

12. Condition of source

source described as always dirty by	20	% of hh
source described as always clean by	24	% of hh
whole village (or numerous households) share one source	85	%
source never maintained by anyone	56	%

13. Water procurement

average walking distance from house to dry season source, one way	2600	metres
duration of one dry-season round trip for water	130	minutes
total time per day fetching water	370	minutes
quantity of water per person per day	16	litres
adult males ever help to fetch water	27	% of hh

14. Use of water

brought water used for irrigation	1	%
brought water given to livestock	21	%

15. Payment for water

never pay for water source maintenance	56	% of hh

16. Principal water supply problem

shortage in dry season	31	%
water dirty and scarce in dry season	15	%
water dirty, scarce and far	11	%
distance to source	11	%
water dirty and unsafe	4	%
water salty	5	%
long waiting time at source	4	%
source crowded and chaotic	2	%
high cost of water	1	%
never any problem	5	%

17. Coping mechanism during drought

deepen well	4	%
buy from vendor	3	%
fetch water at night	3	%
dig more wells	3	%
walk further to another source	2	%
maintain own reserve supply of water	1	%
wait longer at source	6	%
use a bicycle to go further	1	%
go to source very early	1	%
use less water	76	%

18. Household health problems (self-described) during the past one year	hh	
malaria	25	%
stomach ache	14	%
respiratory problems	10	%
diarrhoea	9	%
headache	7	%
unspecified fever	6	%
eye infection	5	%
tuberculosis	5	%
nausea, vomiting	4	%
unspecified body pain	4	%
blood pressure	3	%
hernia	2	%
pain in the legs	2	%
pain in the joints, rheumatism, arthritis	2	%

19. Coping mechanism for health problems	hh	
visit hospital as out-patient	37	%
visit dispensary or clinic	19	%
buy medicine at shop	3	%
unspecified treatment	2	%
use medicinal herbs	2	%
admitted to hospital	1	%
visit traditional healer	1	%
do nothing (though sick)	2	%
not applicable (no problems)	32	%

bilharzia, schistosomiasis	2	%
blood disorder, anaemia	2	%
cholera	2	%
never any health problems	32	%

20. Sanitation

households use a pit latrine	98	%
burn or bury domestic waste	81	%
just throw domestic waste outside	17	%

21. Project awareness

had participated in a previous water project	30	%
aware of this project before social survey	29	%
willing to participate in this project	98	%

Table 4-3 (2) Mtwara Region household survey summary

1) Demographic parameters (Composition of the family)
2) Occupational status
3) Social capital (Societies and education)
4) Dwelling house-tenure, construction and occupancy
5) Domestic energy
6) Farmland (Distance from house, farm-size, products, etc.)
7) Livestock
8) Economic problems of the village
9) Main source of income
10) Water sources in dry season
11) Water sources in wet season
12) Condition of sources
13) Water procurement (Distance, unit consumption rate, etc.)
14) Water use (Other than domestic use)
15) Payment for water
16) Principal water supply problems
17) Coping mechanism during draught
18) Household health problems in the past 1 year
19) Coping mechanism for health problem
20) Sanitation (Latrine, domestic waste, etc.)
21) Project awareness (Experience in project participation, willingness, etc.)

1. Demographic parameters

average household size	5	people
females per 100 males	108	
presently unmarried	57	%
under 15 years old	40	%
children per household	2	
children per 100 adults	70	
natural growth rate (birth rate minus death rate)	1.9	%

2. Occupational status

skilled, professional and managerial	1	%
unskilled and semi-skilled	29	%
child labour	0	%
not stated	0	%
unemployed (but seeking work)	0	%
dependants	70	%
dependancy ratio (dependants as % of workers)	233	%

3. Social capital

households belonging to any society other than a religious denomination	80	%
villagers uneducated (no schooling)	38	%
villagers with little education	21	%
villagers with six or more years schooling	41	%

4. Dwelling house – tenure, construction and occupancy

duration of residence in dwelling, by household	12	years
dwellings owner occupied	89	%
dwellings roofed with durable materials	29	%
walls constructed with durable materials	27	%
hard floor (other than simple earth floor)	18	%
rooms per dwelling	2.7	
persons per room	1.7	
windows per 100 occupants	63	

5. Domestic energy

firewood = cooking fuel	99	%
kerosene lamp for indoor lighting	100	%

6. The farm (*shamba*)

average distance to main farm holding	2157	metres
average household farm size	1.9	hectares
cashewnut cultivated this year by	18	% of hh
cassava cultivated this year by	23	% of hh
maize cultivated this year by	19	% of hh
millet cultivated this year by	13	% of hh
rice cultivated this year by	6	% of hh

7. Livestock

chickens	3	per hh
ducks		per hh
cattle		per hh
goats	1	per hh
sheep		per hh
pigs		per hh
households with none	30	%

8. Economic problems and coping mechanisms described by respondents

lack of good tools and implements	45	%
wild animals raid crops	31	%
shortage of capital and/or credit	12	%
water problems	**20**	**%**
crop failure	7	%
cost of farm inputs	7	%
insects attack crops	1	%
poor markets	3	%
transport problems	3	%
small income	7	%
no economic problems	7	%
households having **no coping mechanism** to deal with economic problems	48	%

9. Main source of income, by household

sale of farm surplus	93	%
small business	1	%
catering, food sales		%
waged employment full-time	2	%
family support		%
sale of fish	2	%
self employment	1	%
sale of timber		%
sale of clothes		%
official allowances	2	%
no source of income	0	%

average cash income per person per year **US$ 84**

10. Main dry-season source of water, by household

traditional well	25 %
traditional dam	15 %
stream	9 %
spring	7 %
well / borehole with hand pump	1 %
ring well	4 %
engineered dam	6 %
dry river bed	3 %
piped to compound or neighbourhood	16 %
piped to domestic tap	1 %
bought from vendor	1 %

11. Main wet-season source of water, by household

traditional well	32 %
traditional dam	13 %
stream	4 %
spring	%
borehole with hand pump	1 %
ring well	3 %
pools and puddles	1 %
dry river bed	2 %
piped to compound	5 %
rainwater harvesting	29 %
bought from vendor	0 %

12. Condition of source

source described as always dirty by	14 % of hh
source described as always clean by	32 % of hh
whole village (or numerous households) share one source	67 %
source never maintained by anyone	48 %

13. Water procurement

average walking distance from house to dry season source, one way	2800 metres
duration of one dry-season round trip for water	70 minutes
total time per day fetching water	277 minutes
quantity of water per person per day	15 litres
adult males ever help to fetch water	49 % of hh

14. Use of water

brought water used for irrigation	2 %
brought water given to livestock	15 %

15. Payment for water

never pay for water source maintenance	89 % of hh

16. Principal water supply problem

shortage in dry season	25 %
water dirty and scarce in dry season	1 %
water dirty, scarce and far	6 %
distance to source	14 %
water dirty and unsafe	24 %
water salty	%
long waiting time at source	10 %
source crowded and chaotic	4 %
high cost of water	2 %
never any problem	7 %

17. Coping mechanism during drought

deepen well	1 %
buy from vendor	2 %
fetch water at night	1 %
dig more wells	%
walk further to another source	6 %
maintain own reserve supply of water	%
go very early to the source	%
use a bicycle to go further	1 %
wait longer at source	8 %
use less water	81 %

18. Household health problems (self-described) during the past one year	hh	
malaria	20	%
stomach ache	3	%
respiratory problems	9	%
diarrhoea	6	%
headache	3	%
unspecified fever	1	%
eye infection	2	%
tuberculosis	3	%
toothache	3	%
sore back	1	%
blood pressure	1	%
hernia	2	%
cancer	1	%
pain in the joints, rheumatism, arthritis	2	%

19. Coping mechanism for health problems	hh	
visit hospital as out-patient	37	%
visit dispensary or clinic	33	%
buy medicine at shop	1	%
unspecified treatment		%
use medicinal herbs	1	%
admitted to hospital		%
visit traditional healer	2	%
do nothing (though sick)	1	%
not applicable (no problems)	20	%

childbirth complications	1	%
blood disorder, anaemia	1	%
heart problems	1	%
never any health problems	20	%

20. Sanitation

households use a pit latrine	99	%
burn or bury domestic waste	87	%
just throw domestic waste outside	13	%

21. Project awareness

had participated in a previous water project	34	%
aware of this project before social survey	54	%
willing to participate in this project	99	%