REPUBLIC OF KENYA



MINISTRY OF WATER DEVELOPMENT

MERU

DISTRICT WATER DEVELOPMENT STUDY

1993 - 2013

PART 3

GUIDELINES AND RECOMMENDATIONS FOR INVESTMENT PACKAGES

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WATER RESOURCES
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NAIROBI, KENYA

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PREFACE

It gives me great pleasure to introduce the District Water Development Study for Meru District.

The Ministry of Water Development has the task of planning for water resources development, both at national and district levels. Districts have been assigned a major role in the development of the country as illustrated by the District Focus Strategy for Rural Development Policy. Consistent with this policy the Ministry of Water Development has put great emphasis on the studies for District Water Development Planning.

Water resources development can only be successfully undertaken if the long-term planning reflects the balance between availability and exploitation of water. Extensive investigations and monitoring are needed to determine the potential of the water resources and the effects of development on long-term basis. Presently, the Districts do not have the research capacity to carry out the necessary studies independently. To overcome this situation, the Ministry of Water Development has established a Water Resources Assessment Section that supports the Districts in carrying out these studies. The Section is being strengthened by the Water Resources Assessment and Planning Project.

The present study provides extensive information on the availability of water resources, the existing supply, the future water demand and the investments involved in developing the water resources in Meru District. Equipped with this information the District will be in a better position to plan its supply facilities. It is only after the District succeeds in explaining to the people the limitations of the natural system and the vulnerability of the environment involving them as much as possible in the planning and construction of their water supplies, that the difficult task of providing water to the people will see a good end.

I express the wish that this important study will be optimally used to achieve this common goal.

(E. K. MWONGERA)
Director of Water Development

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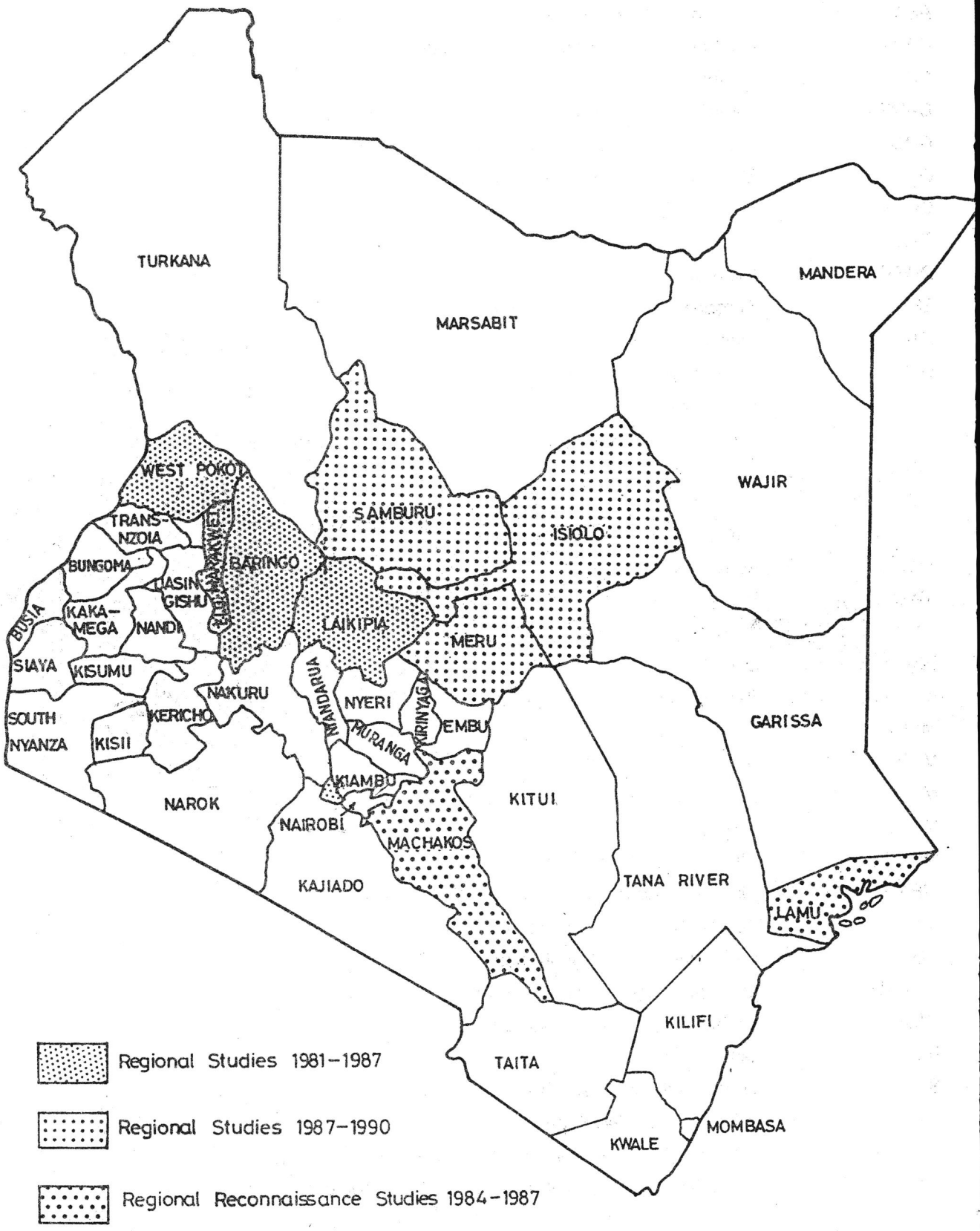
5. Cost Estimate of Domestic and Livestock Water Supply Development

6. Project Proposal - Indicative Investment Packages

ABBREVIATIONS

ASAL	=	Arid and Semi-Arid Lands Development Program
CBWDP	=	Central Baringo Water Development Plan
CC	=	County Council
DANIDA	=	Danish International Development Agency
DDC	=	District Development Committee
DDP	=	Meru District Development Plan 1989-1993
DvDC	=	Divisional Development Committee
DWDP	=	District Water Development Plan
DWDS	=	District Water Development Study
EEC	=	European Economic Commission
FINNIDA	=	Finnish International Development Agency
GOK	=	Government of Kenya
GSK	=	Groundwater Survey Kenya
GTZ	=	Deutsche Gesellschaft fur Technische Zusammenarbeit
KFRWSDP	=	Kenya Finland Rural Water Supply Development Project in Western Province
KIDP	=	Kitui Development Program
Ksh	=	Kenya shilling
KWAHO	=	Kenya Water for Health Organization
KWDP	=	Kwale District Community Water Supply and Sanitation Project
L.U.	=	Livestock Unit
LBDA	=	Lake Basin Development Authority
lpcd	=	liters per capita per day
MoA	=	Ministry of Agriculture
MOH	=	Ministry of Health
MoLD	=	Ministry of Livestock Development
MoWD	=	Ministry of Water Development
MCSS	=	Ministry of Culture and Social Services
MPND	=	Ministry of Planning and National Development
msl	=	Meters above mean sea level
NGO	=	Non-Government Organization
NORAD	=	Norwegian Agency for Development
ODA	=	Overseas Development Agency
Shs	=	Kenya shilling
SIDA	=	Swedish International Development Agency
UNDP	=	United Nations Development Project
UNICEF	=	United Nations International Childrens Emergency Fund
USAID	=	United States Agency for International Development
WECO	=	Western College of Arts
WRAP	=	Water Resources Assessment and Planning Project

WATER RESOURCES ASSESSMENT & PLANNING PROJECT



Regional Assessment Studies under the WRAP Programme 1981-1990

SUMMARY

The present report is Part 3, Guidelines and Recommendations for Investment Packages, which is the third of three reports, composing the Meru District Water Development Study. Part 3 provides the background and methodology for the implementation by the District of investments in the water sector.

Indicative investment packages were developed, which were intended to provide cost estimates of investment projects. Four considerations were identified as central to the design of successful investment projects. These were:

- the appropriate technical choice in terms of ability to produce the required quantity and quality, and impact on the environment; the latter is particularly sensitive as there is increasing pollution of surface water sources;
- the socio-economic base which determines the attitude to participation in the project; income levels differ between the high and low potential areas of Meru District;
- the institutional base for design, construction and operation of the investment project, including community consultation during all of these phases, and
- the financial base of the project including the policy framework, particularly on cost sharing and on district financial autonomy, and the financial systems used.

Each of these considerations effect the economic demand of the people for water on the one hand, and the ability of the MoWD and other bodies to supply it on the other.

The major issues raised when the above factors are considered are:

- supply of water for domestic and livestock use must have priority above irrigation and other uses of water.
- cost sharing policies with respect to government/donor schemes may need to be flexible depending on the community served; full cost sharing (Capital and O&M costs) may be feasible in urban schemes, but for rural schemes cost sharing may have to be limited to recovery of O & M costs.
- even with these limited objectives, the choice of technology must be appropriate to the communities ability and willingness to pay, in particular rural schemes must have minimum O & M costs if they are to be born by the community.
- in order to implement the District Focus policy which gives the District MoWD responsibility for co-ordination the provision of water to the Meru communities, several facets of the operation of the Central and District MoWD should change.

Based on the above considerations, specific criteria were developed for use in the appraisal of investment projects. These criteria were incorporated in a simple checklist, a version of which, as modified by the DWE, should be included in the DWDP. Such checklist will enable quick assessment of the impact and viability of proposed projects.

The checklist covers the following topics:
- water resources
- land use planning/environmental impact
- social impact
- institutional/community participation
- economics/affordability
- finance.

For each Location, the available resources and their allocation between priority uses were analysed. The development of the domestic and livestock supplies is to be according the calculated water demand. Part of this demand is covered already by existing water supplies, which must be taken into account. Supplies classified as good and as fair (the latter only after rehabilitation) were assumed to be able to continue during the plan period at their current supply capacity. All other supplies have not been considered to contribute to the required supply capacity.

The total required development of supplies for the water demand in 2013 (scenario 2) is 168,842 m^3/day of which 70% will be covered by new supplies, 21% by rehabilitated existing supplies and 9% by existing supplies.

Cost estimates of investment packages were prepared for all Locations in Meru for domestic and livestock supplies. Only one type of cost recovery policy was applied for the selection of the technologies, i.e. recovery of full capital and O & M costs.

The detailed cost estimate for the whole district was prepared for supply of the water demand projected under scenario 2 for the years 1993, 2003 and 2013. The total capital costs of the domestic supplies increases from 235 million Shs. in 1993 to 2,619 million Shs in 2013 for new water supplies and increases from 294 million Shs. in 1993 to 530 million Shs in 2013 for rehabilitation of existing supplies. The total (new and rehabilitated supplies) costs per beneficiary increase from 522 Shs. in 1993 to 1,089 Shs. in 2013.

If including livestock supplies then the total cost for new supplies in the year 2013 increases from 2,619 million Shs. to 3,871 million Shs.

The proposed type of supply technologies for the domestic supplies comprise mainly intakes from surface water or springs with distribution to private and communal connections, treatment and storage. Boreholes with motorpumps are planned in areas where surface water or springs yield insufficient water.

In order to implement the District Focus policy which gives the District MoWD responsibility for co-ordinating the provision of water to the Meru communities, several facets of the operation of the Central and District MoWD should change. The most important are:

- District water offices should retain revenue collected as an incentive to better collection and to ease cash flow problems
- the "appropriations in aid" policy with respect to funding of development (capital) works should be clearly specified and revised so as not to disadvantage high cost schemes
- financial systems should be revised to enable these effective management and implementation of District Focus and Cost Sharing policies, in particular, full costs and revenues should be brought together in the one set of accounts
- flexibility in pricing policy is also required by the cost sharing policy catalysing community participation.
- Central office staff, in their role as support to the District, require better training in higher level skills in the areas of training, water resources planning, O & M, financial systems, community mobilisation, technical design, environmental management and project appraisal
- MoWD in general, requires strengthening of the links to other agencies and organisations, both public and private, involved in provision of water supplies.

1. INTRODUCTION

1.1 Purpose and Scope of the Study

The District Water Development Study (DWDS) of Meru District is aimed at providing the basis for the District Water Development Plan (DWDP), which in turn will be the sector input to the District Development Plan (DDP).

The study was undertaken by the Ministry of Water Development in its role of supporting the districts in their task to develop the available water resources in a safe and sustainable way. Two conditions will have to be fulfilled to achieve this goal.

- The development of water resources must be in balance both with the capacity of these resources and with the conditions set by the environment.

- Supply of water to the community must be sustainable, meaning that the proposed schemes be designed in agreement with the technical and financial support capability of the people for whom they will be constructed.

These conditions require a thorough assessment of the situation in the districts and a planning that is in tune with the socio-economic, institutional and technical developments.

The DWDS can be considered the first stage in the process of formulating a DWDP. The study, based on extensive assessments, describes the water resources development potential in comparison to the projected water demand, discusses the viability of different water supply options in terms of sustainability and safety, and provides estimates of the investment levels involved.

The DWDP based on the study will be more specific in that it also comprises the decisions of the district authorities regarding selection and prioritization of the water development schemes. The plan is to cover a period of 20 years, according to MoWD guidelines, starting from 1993 when operation of the first new schemes will supposedly begin. The DWDP will be an important component of the DDP which includes the entire socio-economical planning of the district in perspective to all the available resources. From the above it may be clear that both plans are closely linked and can only be successfully developed in good co-ordination.

The methodology for planning of water resources development, adopted by the Ministry facilitates full participation of the district authorities, community groups and individuals concerned in all stages of the planning process, which is in line with the District Focus Policy. An outline of the general approach is given in Chapter 2 of this report.

In order to provide optimal conditions for district involvement, the DWDS is carried out in three phases. District engineers and institutions concerned with water use and water supply are extensively consulted during the periods of data collection and analysis. The final report includes three volumes, corresponding with the three phases of the study. Each of these volumes is presented and discussed at a DEC-meeting.

The present report on the guidelines and recommendations for investment packages is Part 3 of the DWDS carried out for Meru District within the framework of WRAP.

The report provides the background and methodology for the implementation by the District of investments in the water sector. The report presents cost estimates, which are based on the analysis of the water development possibilities in each Location. These estimates may be used in the preparation of district investment packages, which may be used by the District to formulate concrete project proposals. Also requirements for implementation of investment packages are discussed, with respect to strengthening of institutions, execution of feasibility studies and efforts to secure external funding support.

1.2 International Co-operation

The District Water Development Study was undertaken under Co-operative Agreement between the Governments of Kenya and The Netherlands.

The studies are carried out by the Water Resources Assessment Section of the Ministry of Water Development, Nairobi, Kenya in co-operation with the TNO Institute of Applied Geoscience, Delft, The Netherlands, within the framework of the **Water Resources Assessment and Planning (WRAP)** project.

Consultancy services were provided by the Netherlands Economic Institute, Rotterdam, The Netherlands and the International Institute for Hydraulic and Environmental Engineering, Delft, The Netherlands.

2. GENERAL APPROACH

The District Water Development Study (DWDS) is a base study for preparation of the District Water Development Plan (DWDP). All components that constitute the DWDP are also covered by the DWDS.

The model introduced by the WRAP project for preparation of a DWDP is shown in figure 2.1. The DWDS follows this model in analysing the various components that finally will lead to the formulation of the DWDP. The study includes three phases focusing on different aspects of the planning, namely:

- the compatibility of available water resources with water demand in the present situation and for projected demand scenarios
- the viability of the technical options for water supply development based on environmental and sustainability criteria
- the investments involved in the district water development and the technical, institutional, social and financial factors determining the sustainability of selected solutions

The results obtained in the subsequent phases of the DWDS are presented in Part 1, Part 2 and Part 3 of the DWDS report. An outline of the Study is given below.

Water Demand Study (Part 1)

The water demand study comprises of analyses and projections of the water consumption by all water users in the District. The baseline data available from various sources are often incomplete and/or inaccurate. Therefore, thorough scrutiny of the data is needed to ensure sufficient reliability of further analysis. The data is processed using a Database Management System that handles both the calculation of the water demand and the projection of the baseline data.

The water demand is calculated using the procedure laid down in the Design Manual of the Ministry of Water Development. The procedure compels to projecting the water demand in 5, 15 and 25 years time. This, in turn, requires analysis of the growth trends of population, livestock, agriculture, industries, tourism, etc.

The method adopted provides for projections following three different scenarios: a high growth scenario based on optimal conditions in economical development, a medium growth scenario corresponding with national and district development expectations and a low growth scenario taking into account the less favourable conditions set by the environment.

It may be clear that the DWDS depends on the input from other sectors, such as livestock and agriculture, to complete the projections in the most realistic way.

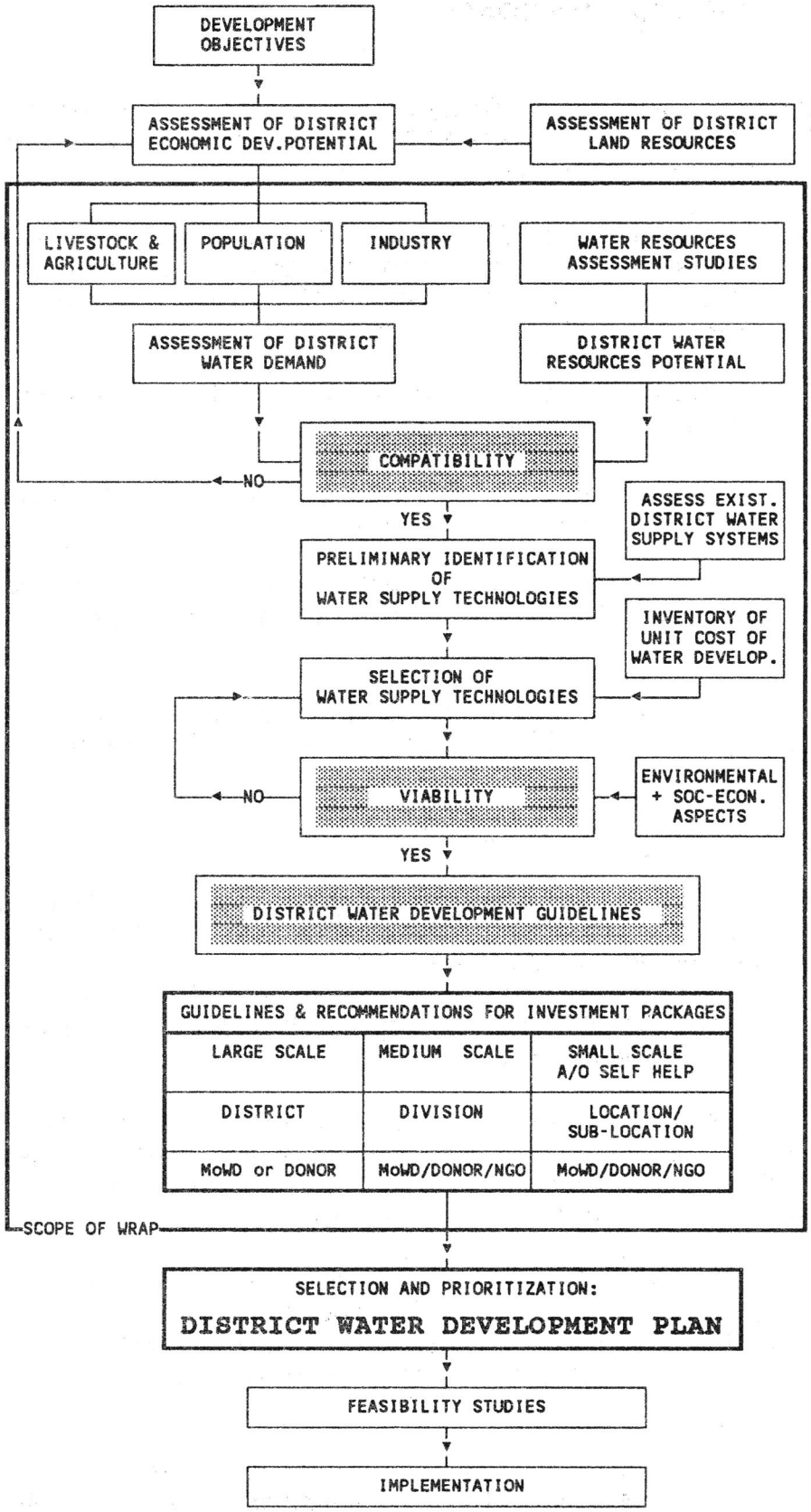


Figure 2.1 **Model for Preparation of District Water Development Plan**

Water Resources Assessment Study (Part 1)

Water resources assessment studies are an essential component of the DWDS. The assessment studies undertaken within the framework of the WRAP project comprise the following:

- An inventory of available data and studies on the water resources in the District
- A field survey including collection of data on surface water and groundwater, rehabilitation of part of the existing measuring stations and installation of temporary measuring stations. Measurements are made of the quantity and quality of water in rivers, springs, wells and boreholes.
- A geophysical reconnaissance survey using vertical electrical or electromagnetic soundings and profiling, aimed at providing more insight into the hydrogeological conditions. The results of the survey are checked and calibrated by drilling of exploratory boreholes and test pumping.
- An analysis of the geological, geophysical, hydrological and hydrogeological maps and data, both from the inventory and from field investigations.

From all this information and after careful and systematic analysis, water availability maps are prepared which show the water development potential of the area. The water resources assessment investigations are described in a separate report and a summary of the main conclusions on the water development potential is given in Part 1 of the DWDS report.

Comparison of Water Demand and Available Resources (Part 1)

Having estimated the water demand over the next 25 years and the water resources available in the District, a close analysis is made of the water development potential to decide whether the projected water demand can be met. This analysis of water demand versus water resources availability is carried out for each Location.

When comparing the demand with the resources, priorities need to be set whether a District can best support human, livestock, agricultural or industrial development. In this respect both quantity and quality of the water must be considered.

What emerges from this process of comparing the anticipated demand with the resources, is a description of the development potential of the District, based on water availability.

Study of Water Supply Development Options (Part 2)

From the actual and projected water demand and the capacity of existing water supply schemes, the need for further development of the water supplies can be determined.

Limited water resources, contrasting interest or expected negative environmental impact may hamper further development. However, in situations with sufficient water available, often more than one supply option can be considered. A selection of the best alternative must then be based on considerations of financial, technical and

environmental viability.

Phase 2 of the DWDS includes:

- Assessment of existing district water supply systems
- Assessment of technical options for water supply improvement
- Inventory of unit costs for water development based on existing supplies
- Preliminary identification of water supply options and cost
- Study of cost-effectiveness of water supply options

The results and conclusions are presented in Part 2 of the DWDS report. Together with Part 1 this forms the basis for the 'District Water Development Guidelines'.

Formulation of Guidelines and Recommendations for Investment Packages (Part 3)

The guidelines and recommendations for the development of the district water resources result in proposals for improvement of the existing water supply situation in the District. The proposed improvements may range from very small local supplies to comprehensive water supply schemes. The investments required to improve the water supply situation have been termed investment packages.

The purpose of the investment packages is to present to the Government of Kenya and interested donors a preliminary estimate of the funds and other inputs needed for water supply development. Each investment package or a combination of them can thus form the core of a water supply project.

Phase 3 of the DWDS includes the following issues:

- Land use, environmental, social, institutional and economic/financial factors to be considered
- Guidelines for assessment of water sector investment proposals
- Examples of investment packages
- Recommendations on required institutional strengthening for implementation of the DWDP
- A framework for a proposal based on the investment packages

The analyses, results, conclusions and recommendations arrived at are presented in Part 3 of the DWDS report. The three parts of DWDS should provide the district authorities with sufficient base information for initiating further development of the water resources in the District.

3 BASIS FOR INVESTMENT

3.1 Overview

This report, Part 3 of the District Water Development Study, is intended to provide the background and methodology for the implementation by the District of investments in the water sector. All three parts of the Study will serve as a basis of the District Water Development Plan (DWDP), to be prepared by the District Water Engineer for submission to the District Development Committee. The DWDP, in turn will provide important inputs into the District Development Plan. This Report and the subsequent DWDP will give the District an additional instrument with which to strengthen the District Focus policy. The Ministry of Water Development (MoWD) will have a co-ordinating role in implementing the DWDP.

Water supply investments must be compatible with the District Development Plan and the DWDP. As introduction this chapter will set out an overview of the technical, social, institutional and financial basis for the preparation of investment packages. These issues have been discussed in Parts 1 and 2 of the Study.

On this base, indicative investment packages, consisting of water supply schemes (or projects), for the District will be developed in three stages. The first stage (Chapter 4) will examine the major factors to be considered with respect to design of these investment packages. This chapter will examine both the factors which influence supply of water, the technical, institutional and financial factors in particular, and factors which determine the (economic) demand for water. Affordability and willingness to pay, and the institutions required for community participation are the key factors discussed with respect to the demand side. Pricing policy and demand management issues will be discussed within a framework of a system of water resources planning used in Part 1 of the Study.

The second stage (Chapter 5) will describe the methodology and criteria for choice of investment, either individual projects or packages, consistent with the DWDP. In this chapter, the limits to investment given by the planning context set out in the Part 1 of the Study will be described. The last stage (Chapter 6) will describe indicative investment packages using the methodology developed in the previous two stages.

The implementation of these investment packages, or any others, will require significant institutional strengthening, feasibility study and efforts to secure external funding support. These requirements will be discussed in the concluding chapter (Chapter 7) of the report.

Throughout the Study, a distinction is made between water systems which are suitable for direct government support, and those systems (usually smaller systems) for which the local community must be the focus of development activity. This distinction is necessary because of the widely differing circumstances of different parts of the District, and because government resources are insufficient to cater for the demand for water systems in this District.

3.2 Technical Base

The various water supply technologies available and appropriate for use in the Meru District were detailed in Part 2, Chapters 5 and 6. These technologies were selected to address the various types of water resources available in the District. They are summarised in Table 3.1 below.

Table 3.1 Results of Cost Effectiveness Analysis

Ranking Number	Technology	Total Yield (m^3/day)	Total Capital Costs (Shs)	Total O&M Costs (Shs)
	Urban Area			
5	Spring, Gravity Distribution, 200 m3 St.	200	4,987,500	6,399,750
6	Spring, Gravity Distribution, 100 m3 St.	100	2,562,500	3,354,750
7	2 Boreholes, Motorpump, Distribution	600	12,662,500	29,812,125
8	2 Boreholes, Motorpump, Distribution	200	5,037,500	11,011,875
10	2 Boreholes, Motorpump, Distribution	100	2,643,750	5,516,438
13	2 Boreholes (100m), Motorpump, Distrib.	200	5,637,500	13,300,875
15	Surface Water, Weir, Distribution	200	5,937,500	15,190,875
16	2 Boreholes, Solar pump, Distribution	100 (2)	3,812,500	3,625,125
20	Surface Water, Weir, Pump, Distribution	200	7,562,500	18,598,125
22	Surface Water, Dam, Pump, Distribution	200	13,187,500	19,779,500
	Rural Centre			
4	Spring, 40 m3 Storage	40	925,000	1,144,500
11	Surface Water, Chamber, Gravity Distr.	40	1,387,500	1,404,375
12	Surface Water, Weir, Gravity Distr.	40	1,425,000	1,412,250
14	Surface Water, Chamber, Hydram, Distr.	40	1,612,500	1,766,625
17	2 Boreholes, Motorpump, Limited Distr.	40	1,787,500	2,244,375
19	2 Boreholes with Windmill	40 (2)	2,150,000	729,750
21	2 Boreholes, Solar pump, Limited Distr.	40 (2)	2,432,500	1,040,025
	Rural Area			
1	Spring	10	37,500	10,500
2	Dug Well with Handpump	10	187,500	10,500
3	Borehole with Handpump	10	262,500	39,375
9	Surface Water, Chamber, Gravity Supply	10	431,250	321,563
18	Dug Well with Windmill	20 (2)	1,012,500	358,313

Notes (1) - Total Capital Costs include investment + replacement costs. All costs apply to a period of 20 years.
(2) - Supply per year during 300 days only.
(3) - Roof and rock catchments and sub-surface dams were not included in the analysis, because more detailed study is needed on their feasibility and because available cost estimates are not sufficiently accurate.

The technologies set out in the Table provide the technical options from which are chosen the systems appropriate to the social, financial and institutional structures applicable to each Location and Sub-location within the District.

In general, these options fall into two categories which reflect economic division of the District. These are:

- the small scale urban systems catering for growing urban populations, and,
- the market centres and other rural schemes which must serve a dual role of providing water to people and to some crops and to animals.

In the future, as more people take up cash cropping, the rural schemes will have to cope with increasing demand from small scale irrigation.

3.3 Socio-economic Base

The District of Meru has four types of settlement for which water supply is required. These are:

- Small and medium size urban areas such as Meru, Nkubu, Chogoria, Maua and Chuka (population >2,000), which serve as major market centres and as service centres. The range of economic activity is relatively wide with extensive government services, small scale industries, retailing of consumer goods and agricultural inputs. The urban area is fairly defined, and little semi-permanent settlement is found around the town areas.

- Rural and market centres such as Igoji, Kanyakine and Mitunguu (population <2,000), in which the permanent, formal sector structures are ranged along one street (shops selling basic consumer goods, retailing of basic agricultural inputs, a coffee shop, a dispensary, etc.). These centres serve a surrounding area of very low density farm houses.

- Farm houses in rural areas, and their associated crops/animals, and

- "Independent" facilities such as tourist lodges, missions, schools and health centres, large scale commercial agriculture, and agro-processing industries (for example coffee factories).

Tourist lodges, and large scale agriculture are formal sector activities carried out by the private sector mainly in the drier parts of the District. Investments for water supply in these industries can thus be left to the private sector, given that the projected investments are in line with the DWDP. Small scale agriculture is the main traditional economic activity and is substantially within the formal economy, the main cash crops being coffee and tea. This activity combined with urban demand, cover the majority of the population who will need varying amounts of government support. They are thus the legitimate focus of government activity in the water sector. However, it should be noted that the approach adopted for these two groups will be, of necessity, quite different.

The average urban (non-agricultural/mining) income is estimated at Shs 1,594 per month in 1988. The Household Survey (see Appendix 6, Part 1) of rural areas undertaken by the University of Nottingham for WRAP in 1989, found that the average yearly income from cash crops over the District was Shs 11,673. The average income (per household which sold surplus) from sales of livestock was Shs 3,398, and from sales of milk Shs 7,911.

District income distribution compared to national income distribution is shown in Table 3.2.

Table 3.2 Distribution of Wage Employment (1987)

	Number Employed								
Income Level (Shs)	Under 215	215 to 399	400 to 699	700 to 999	1000 to 1499	1500 to 1999	2000 to 2999	3000 to 5999	6000+
National Total	838	13,869	63,507	85,329	135,710	72,440	85,379	74,067	45,817
Percent	0	2	11	15	24	13	15	13	8
Meru District	2	21	349	856	1,158	775	1,029	853	257
Percent	0	0	7	16	22	15	19	16	5

Source: Central Bureau of Statistics, Statistical Abstract 1988.

Water is extensively available in the District, but it is also extensively utilised by an active market economy. The District's good transport links to other districts and to Nairobi provide adequate access to markets, although roads within the District are generally in poor condition. This relatively developed market structure indicates that demand for water will continue to rise and that pollution will become a more pressing problem.

Considering the technical options available and the settlement pattern, water will thus be delivered to people and industries in five groupings, which require varying amounts of support of government. These are:

- urban systems with mainly service and small scale industry demand in addition to residential demand,
- market centre systems with some service demand and a small permanent residential demand
- rural supplies for settled farmers for domestic use, for livestock and for small scale irrigation
- supplies to "independent" facilities in the formal sector such as schools (independent commercial facilities (tourist lodges) do not usually require government support), and
- large scale irrigation schemes.

Within these groupings there are social groups which have differing cultural requirements and income levels which will effect their effective demand for the various technical options. That is, these different groups can afford different amounts for their water and have different priorities with respect to availability/quality/use. The result is that they will often demand different things from water supply systems. In order to resolve these competing demands strong institutional systems are required and it is these systems which will now be examined.

3.4 Institutional Base

3.4.1 Context

The existing network of organisations involved in the water sector is complex. With the District Focus Policy, the District is expected to co-ordinate all investment, including investment in water supplies. However, there is a confusion in policy direction between what is known in other countries as "deconcentration", i.e. placing implementation activities of line Ministries at local level while retaining centralised control of staff and budgeting, and "decentralisation", i.e. giving staffing and finance control to the local institutions. The former course has been adopted in Kenya, and, as a consequence, effective District co-ordination of investment, including that in the water sector, is difficult.

Four key activities are required to implement a water supply. It must be planned, designed, constructed and operated. Overall water policy planning, and technical (design) support is the responsibility of the Ministry of Water Development (MoWD). Responsibility for construction and operation is fragmented however. Where design and construction are government responsibilities, local offices of line ministries, including the District Office of the MoWD, have considerable autonomy in design and construction of water supply schemes.

Private formal sector organisations, missions and other entities may obtain permits as "water undertakers", to exploit local water resources (e.g. the Diocese of Meru in the case of the Tuuru water supply). The appointment of a water undertaker is done by the Minister of Water Development under the powers of the Water Act (cap.372). However, once granted, there is little formal need to refer to District level MoWD with respect to water resources planning and utilisation.

Local Water Associations are legal entities which have a Water Permit. They are being formed in some districts to become responsible for existing water systems or to undertake new ones. Permission to utilise water resources under the Water Act is presently given by a committee of the MoWD meeting in Nairobi, but is usually decided on the recommendation of the District Office of the MoWD. The lowest level institutions are the informal Water Committees. There are many examples of such Associations and Committees in Meru District.

In general, the District Office of the MoWD implements, operates and maintains urban/market centre supplies such as at Nkubu, Maua, Chuka etc. The exception to this is the case of Meru itself, where the MoWD produces the water and sells it to the Municipal Council which distributes it. Smaller schemes are undertaken by communities sometimes assisted by an NGO. Self help schemes built recently such that at Ntugi (Central Imenti) had significant MoWD support. Given the constraints to government funding of capital works, this approach, which combines self help with government design and other support, may indicate a new trend in the implementation of rural water supplies (see section 3.4.3 below).

3.4.2 Implementation of District Focus in the Water Sector

The existing institutional base of future water investment in the District is limited. In the context of the District Focus policy, the District Development Committee (DDC),

assisted by the District Executive Committee, is expected to co-ordinate investment in the water sector. This includes expenditures by the Municipal Council (under the Ministry of Local Government). While the structure is in place, the resources to carry out the required project appraisal, prioritisation and implementation are very limited.

The MoWD District offices are being strengthened as part of the "deconcentration" of Ministry activity. The policy of "appropriations in aid" has been instituted which will link future recurrent expenditure funds allocated to districts to their performance in meeting revenue targets established by Treasury. Wages for lower levels of staff will be the responsibility of the district to pay. This may have a considerable impact on efficiency as there are indications that district level staff are under skilled, and that, compared to the resources available to work with, there may be significant over staffing.

The head office of the Ministry in Nairobi will now concentrate on providing policy, training and technical support, especially as key implementation activity has also been taken over by the National Water Conservation and Pipeline Corporation. In this role, it has begun to institutionalise the assessment and planning process developed, to a great extent, through the WRAP project. The water assessment studies and planning reports are now an important resource for the MoWD, and its staff are being trained in the techniques of assessment. The Planning Unit within the Water Resources Assessment Section is responsible for carrying out these studies and assessments.

However, two major issues remain. The first is the lack of effective implementation of decentralisation policy and the second is that there is no clear policy on which organisation(s) should implement projects at district level. There are several options. These include the District office of the MoWD, the Councils, NGO's and local Water Associations. The choice of institution will depend on the existing strength of these institutions, and potential for future strengthening.

These issues are addressed by a coordinated approach by all parties involved. Such an approach is currently being developed in Baringo District with assistance from UNICEF where a district water coordination group has been formed led by an inter-ministerial team and supported by every operational NGO in the district. The inter-ministerial team has representatives of MoWD, MoH and MCSS as well as the DDO and it is to be in contact with all operating organizations in the district who have an interest in water. It has been agreed in Baringo that this group meets every three months for information sharing, decision making, etc.

Thus in Baringo District, responsibility for the district water development strategy is shared by all concerned groups. A grouping of institutions becomes the "lead" agency for community mobilization and implementation in their division. Such matters as overlapping and duplication are worked out. Once plans are agreed it is up to each group to implement in their own way. With this approach it will be possible to implement water programmes by different organizations within the overall district strategy.

In Meru District, the limited autonomy and resources of the District office of the MoWD restrict its project implementation roles. A significant shift in operational procedures would be required for it to take the initiative in this respect (see subsequent chapters for details). The Meru Municipal Council is anxious to undertake a larger role in the provision of water supply to the town, and has some expertise, although considerable strengthening will be required before such a role can be undertaken.

3.4.3 Community Involvement in the Water Sector

Water Associations or committees are, in theory, ideal for the implementation and/or operation of small community schemes. In many areas, these have a strong base in the Meru District. The formal district structure for participation appears less effective, with various community leaders present on the Divisional Development Committees and represented on the DDC by the Divisional District Officer. There is no formal structure of community participation in the provision of MoWD water supplies, although the informal links through chiefs and sub-chiefs to the elders are said to be effective. It is essential that the formal government administrative structure, and the structure of the clans must work in concert for successful design and implementation of water supply projects in rural areas.

The Household Survey (see Appendix 6, Part 1) shows that people are willing to make, and have made, significant contributions to self help schemes, especially in high potential areas. The average amounts contributed in the coffee/tea, coffee, coffee/cotton and cotton zones were Shs 4,023, 2,329, 1,974 and 517 respectively.

The institutional base will also play a key role in the technical option chosen. Options involving water systems which require complex or expensive operations and maintenance support can not, at present, be easily handled by district institutions. Where such systems must be used, extensive support to strengthen these institutions will be required. Such strengthening, although on a more basic level, is particularly important for local community groups where they will have a major role in implementing systems.

In the coordinatory approach in Baringo District communities are involved especially with point source systems. The district team concentrates more on the population centres using conventional piped schemes. Point sources will be community owned and therefore communities are involved from the beginning of discussions on planning, cost sharing and implementation.

It is likely that the extent of involvement of the community and the sophistication of the organisational measures required to manage that participation will vary with the size of water supply. In Meru, there are three examples of self help schemes which point the way to viable organisational models for a variety of scheme sizes.

The smallest self help scheme (capacity 5 l/sec) is that at Ntugi. Formed as a women's group project, the scheme was designed by the District MoWD. The community commenced construction of the works, and only after substantial progress was achieved, the MoWD gave some subsidy for materials. Over 50% of materials cost was contributed by the 80 households connected, and all unskilled labour. District MoWD also supplied limited skilled labour and construction supervision.

A successful scheme which is proposed as a model for medium size supplies is the Murugi-Mugumango Project in Meru. This scheme has over 1100 connections and approximately 60 km of distribution mains. Extensive institutional support for management and design was given to the scheme through NGOs and the MoWD, but the basis had been laid by the people themselves through several earlier attempts at providing water supplies. Labour contribution to construction, another means of cementing the concept of "ownership" of the scheme and encouraging effective participation, is strongly encouraged in the scheme. This scheme is considered unique in that the community has developed a water supply organisation which is approaching

the point where sufficient surplus revenue is generated to cover future capital spending.

A large scale scheme serving a Division with a service population of about 100,000 people, is the Tuuru Water Scheme, run by the Catholic Diocese of Meru. This scheme has successfully brought water to the people in this Division, is well run and contains significant elements of community participation. People participating in the scheme contribute approximately 25% of the capital cost of connection from the mains (usually in labour). Tap committees control the many public taps which supply the majority of people. The scheme is currently overwhelmed by population growth, but significant relief will be given by a second pipeline scheduled to commence construction in 1990. Significant issues must be addressed in the future and before this scheme is seen as a model, including the need to broaden the technical base for design, operation and maintenance, and to achieve better levels of cost recovery.

The participation of the communities in improving their water supply is linked, in both Baringo and Kisumu Districts with the community health programme, which has been running successfully for several years. As with other forms of technology, health education is about changing attitudes and past practices as well as importing knowledge. It is therefore an activity which extends beyond the life of a development project. An essential operational factor is to identify animators/ educators who come from within the communities in order for them to participate in training and to use that training on a long term basis during and after the project. The task for the water coordinators (or water network) will be to draw on these existing human resources in order to spread essential health/water messages.

3.5 Financial Base

3.5.1 Financial Context

Two sets of structures are central to consideration of the financial systems for water supply. These are:

- policies and systems linking national and district levels, and
- systems operating at district level.

Policy at national level is currently under review. The final form of this policy will be seen in a Cabinet Paper currently under preparation. Although this document is not yet available, certain issues to be addressed in the Paper are clear in the context of the Cost Sharing policy set out in the National Development Plan. These are:

- definition of the extent of cost sharing required from various types of schemes
- mechanisms for tariff setting,
- incentives for increased efficiency of revenue collection, particularly through the use of the system of "appropriations in aid" (AIA) such that districts will be able to retain all or most of revenue raised in the district above the set target for recurrent expenditure, and
- authorising stricter enforcement (disconnections).

At present, these policies are not defined, but the direction of policy is clear. The water sector has the following immediate goals:

- to maximise the amount of revenue collected as a proportion of billed, and
- to maximise the amount of water billed as a proportion of water produced.

Although no definite targets have been set for cost recovery, the objective of all government systems is to improve current performance in this respect. Targets for revenue collection set as part of the AIA policy have been distributed for comment, and appear to require considerable adjustment. Further, the mechanism for distribution of appropriations in relation to the estimates system (see below) is not clear. It is of little use increasing the allowed District estimates by the minimum of 80% of funds raised above the target, if the allocated funds are only 50% of District estimates.

The National Development Plan also states that water supplied should be affordable. The review of tariff policy will no doubt give due consideration to this factor .

These policies have significant implications for the structure of the organisations undertaking water supply, the financial systems they employ and the monitoring that is done, and the choice of system for a particular project (in terms of the capital and operational costs). The current systems can now be described.

3.5.2 National-District Financial Systems

National Ministries, including the MoWD, submit yearly budgets for both development (capital) and recurrent expenditures to Treasury. On final approval, the districts are informed of their allocation on a six monthly basis.

Each district has a District Cash Fund (account) from which line Ministries can make payments. For approved capital expenditures, the Authority to Incur Expenditure (AIE) is cleared from central MoWD. AIEs for approved recurrent expenditures are issued by the District MoWD. The Cash Fund is reimbursed from Treasury. Additional resources are also available through the Rural Development Fund and the EC Micro-project Fund on application, although this allocation must be approved centrally by both Treasury and MoWD.

Revenues from consumers in all MoWD schemes and from Meru Municipal Council are not collected by the District MoWD, but by the District Treasury and thence are forwarded to national level. The District MoWD in this system cannot make use of the revenues collected directly.

3.5.3 District Financial Systems

These systems focus on control of individual systems and associated District office support. The existing situation with respect to MoWD schemes in the Meru District may be summarised under the following headings:

a) Monitoring

- Accurate monitoring of water production is sometimes achieved in Meru town through the MoWD, but the Meru Municipal Council's distribution system is not in good condition, and monitoring is difficult. In other MoWD schemes, the monitoring of production is fair, especially for new connections, but some water meters are not serviceable, so monitoring of delivered water is difficult.

Significant levels of unaccounted for water have been found in several schemes under the SIDA Water Use Test (WAFIM) project, and this project is introducing procedures to strengthen the monitoring of delivered water and integrating them with the accounting system. Adequate staff appear available to carry out such monitoring.

- The systems for monitoring of actual revenue collected are fragmented with MoWD forwarding receipts to the District Treasurer.

- Monitoring of construction by contractors appeared adequate, but, hampered by lack of funds for materials and transport for day labour construction, the MoWD's own projects appear to progress very slowly.

- Procedures for monitoring of production, operation and maintenance are simple, comprehensive and, if they were accurately completed, would provide an excellent basis for cost control.

b) Revenue Collection

- Procedures for billing are in place, although the WAFIM project sees possibilities to strengthen them.

- Collection systems are inadequate, especially from the viewpoint of accessibility of customers for payment. Monitoring is made difficult by the fact that District Office revenue clerks are required to collect revenue for water which is forwarded directly to the Ministry of Finance (MoWD revenue clerks act as agents for the District Treasurer). Procedures for sanctions are in place and are increasingly being used against non-payers, both government and private. This has resulted in an increase in collection efficiency (ie. revenue collected as a percentage of revenue earned) increasing from 47% in 1987-88, to 73% in 1988-89, to 82% in 1989-90 (excluding Meru Municipality).

c) Accounting and Capital Budgeting Systems

- Capital budgeting is carried out in a rolling three year period through requests for "development" funds called "estimates". Funds are allocated on a six monthly basis. Development expenditures allocated are a fraction of those requested. The capital budgeting system would be adequate, if it were operated efficiently.

- The accounting and payment system for "development" funds is well designed, and would be adequate if funds were made available on time, and if forms were accurately completed.

- The accounting system for "recurrent" funds is also based on estimates. Again, the amounts allocated are often far short of the amounts required for effective operation. The systems themselves would be adequate for small water schemes if forms were accurately completed.

d) Generally

- In the absence of a system which enables the District office to hold revenue it collects, the "Appropriations In Aid" policy is important as an incentive for better revenue performance. As the mechanisms to implement the policy have yet to

be established, there has been no direct impact on recurrent funding from the AIA policy.

- Management information systems linking these diverse activities are the major flaw in the system. Reporting on revenue collected going through one channel, and on expenditures going through another means that revenues and expenditures directly related to a scheme are not compared. No attempt to allocate overhead costs to schemes is made (such a summary should be available to the DWE). Current informal systems being developed by the DWE Meru are of great use and should be seen as the basis for such monitoring until more comprehensive systems from the WAFIM project are available.

Financial systems similar to those currently operated by the MoWD, in a simplified form, would be adequate for community groups. Such systems are operated by a community based water supply systems in the Murugi - Mugumango and Tuuru Water Supply schemes. These systems record meter readings, invoices, receipts, consumer accounts, and payment vouchers. These records are consolidated in a cash book. More sophisticated systems for larger schemes are being developed through the SIDA WAFIM project and are currently under evaluation.

4 GUIDELINES FOR DESIGN OF INVESTMENT PACKAGES

4.1 Introduction

This chapter describes the various considerations involved in the design of investment options in the Meru District. The design of these options must fit within the framework of water resources planning, and for this reason, the first section of this chapter will outline this framework. The discussion will then focus on the appropriate choice of a given technology for a given project within the constraints of its water resource, socio-economic, institutional and financial context. Discussion of these considerations will be structured by examining, in turn, those concerning supply, (economic) demand and pricing (which brings supply and demand into equilibrium).

In the analysis, it will be assumed that the policies set out in the National Development Plan are to be implemented. In Chapter 7 the institutional and financial strengthening required to implement these policies will be examined.

4.2 Planning Framework

4.2.1 Overview

Because of the extensive water resources in the district and the numerous schemes which already exist to utilise water, water resource planning in Meru must be a generalised set of guidelines, rather than a detailed inventory of proposed projects. Such guidelines must take into account the changing patterns of land and water usage in the district, which are in turn due to social, economic and environmental changes (among others). Given the pressure on resources, types of usage must be prioritised. With these priorities, a system of allocation of water resources can be established. That is, water can be allocated among domestic, industrial, and other uses. This section discusses the issues raised in Part 1 of the Study where water resources were matched to demand.

4.2.2 Major Planning Issues

From the discussions in Chapter 3 a number of key planning issues can be identified. With the continued expansion of population and the cash economy additional pressure is placed on water resources in four areas. These are:

- the need to increase domestic water supplied in all areas
- the increasing movement of population to less fertile and environmentally sensitive lower potential areas where water resources for all uses are limited, and where (large scale) irrigation schemes are planned
- in the high potential areas water quality is threatened by encroachment on catchments (sewerage) and by the spread of cash crop farming and processing practices (eg. pesticides and factory effluent)
- also in the high potential areas, the spread of uncontrolled small scale irrigation presents a significant demand for additional water, and increasing agro-industry is also adding to demand.

Thus, major quantity and quality problems can be foreseen, initially in the dry season, but flood flows are also being heavily utilised. Already several instances of pollution of catchments, and of irrigation being limited by lack of water, have been reported. The planning framework must address these issues.

4.2.3 Priority of Usage

Planning cannot commence unless there is a mechanism established to allocate resources. The ideal mechanism would be a pricing mechanism (see section 4.5), but it is not feasible to rely on this as the institutional supports for its efficient operation are not in place. Initially then, a policy framework must be developed. The one used here is suggested for discussion. The priority suggested is:

1) domestic water supplies (including limited livestock and kitchen gardens)
2) minimum major catchment requirements (ie. minimum required amounts into the Tana and Ewaso Nyiro rivers)
3) agricultural usage, including irrigation and agro-industrial usage (currently coffee factories mainly in wet season); use in low potential areas does not have priority over use in high potential areas where they conflict
4) other uses (e.g. industry)

Priority 3) above is the most open to discussion, as it implies that water remaining above the requirements for 1 and 2 above will be allocated for irrigation in each division along the catchment, starting from the source.

The reason for the choice of this priority system is that there is no effective mechanism to enforce any other regime at present. However, strong arguments could be mounted to favour allocating water to low potential divisions, mainly to foster intra-division equity, as the low potential areas where irrigation schemes are planned are currently the poorest. However, the choice of this priority is likely to be supported by considerations of economic efficiency - using the water in higher potential zones may derive a greater economic benefit. Additionally, criticisms may be levelled at the use of water in low potential areas as being less efficient in resource usage due to higher rates of evaporation, and more potentially environmentally damaging. Both of these issues should be addressed in the assessment procedure for new water schemes suggested for the DWDP (see Chapter 5).

Finally, and most importantly, any system of planning requires an effective institutional system to implement it. This does not currently exist, although the mechanisms of Catchment Boards and Water Permits could be made into such a system (see Chapter 7).

4.2.4 Conclusion

The water resources planning process, the basis of the DWDP, will result in a matching of water available to the various priorities of usage. This matching will be carried out for present uses, and for projections of future uses. Within each priority, a certain level of water will be available. Proposals for utilisation of this water, that is proposals for investment in water supply, will have to be assessed in the context of the DWDP. The remainder of this chapter discusses the considerations for the design of such investments, and the following chapter uses these considerations to develop an assessment system.

4.3 Supply Considerations

4.3.1 Design of Technologies

Given the physical environment of the proposed water supply, a certain range of technical options will be available. These options can be ranged on a scale according to their cost per cubic meter of water delivered over, say, 20 years, which is the period used in the DWDP.

The first set of elements to be considered in the physical environment are, of course, those related to the water resources available. These resources should be considered in relation to the potential (water) demand of the inhabitants, in that the total supply must be adequate for projected population increase (see water demand estimation methodology in Part 1 of this Study). In Meru District, generally adequate resources are available, and these are usually surface water resources. These are usually the cheapest to abstract, but pollution of surface water sometimes means that piping over long distances is required and this is expensive.

Physical and land use constraints will play an important role in Meru, although the availability of surface water is such that for small schemes, of the type usually implemented, the siting, construction and operation will not cause significant problems. For larger schemes, this issue will need to be addressed, particularly where large self-help schemes are planned. "Land use" covers such questions as the actual positioning of the plant, equipment, and associated civil works, in the context of land ownership, and of planned and traditional land use. Additionally, engineering aspects of water systems such as foundations and structural design will be influenced by location. It is important to note that changes in the design due to these considerations may change the order of cost set out in Table 3.1 above. In Meru District, the relatively high densities of settlements and the private nature of most land holdings make it likely that these considerations will be of major importance in the design of schemes.

"Environmental" issues are important, particularly as regards the pollution of water from coffee factories and urban areas. In the future, the impact of pollution from high-density livestock, chemical fertilisers and pesticides spreads, will need to be considered. Environmental issues will have an increasing impact on siting of intakes, other plant and access roads. They will also affect the design of the plant, especially treatment design. In addition, the use of large gravity systems entailing long distances of piping from a remote source and long distribution networks presents erosion possibilities especially where the pipelines cross steep terrain. Provision of water can also lead to indirect environmental effects, over-grazing issues similar to those found in Meru District applying in the semi-arid parts of Meru will influence the type and siting of supplies. In the higher potential areas coffee factory effluent constitute the major current pollution threat and will require higher levels of water treatment. Future pollution threats from agro-chemicals are also significant.

An additional supply consideration, given the condition of many of the self help and MoWD schemes, is that of rehabilitation and maximising the efficiency of existing schemes. New investment should be considered only where the existing scheme, operating at an acceptable level of efficiency, cannot meet the demand in its supply area. Even where this is the case, the rehabilitation of the existing network should be incorporated into the new project.

With a range of feasible technical solutions selected by considering the above mentioned elements, the next phase of the project development can commence.

4.3.2 Socio-Economic Aspects

While most of the important considerations related to these aspects are demand side considerations or related to the final choice of investment options, there are some issues which effect the supply side. In particular, these are the alternative or traditional sources of water and the institutional structures which are appropriate for project design and implementation.

Owing to the relatively high level of development in the high potential areas of the district, traditional practices are not a significant impediment to the development of improved water supplies in these areas. In general, the people realise that clean water and correct sanitation practices are linked to health and are willing to pay for this. The Household Survey found that 74% of respondents in the highest potential zone had participated in a self-help water project. This situation does not always apply in the lower potential areas, however and only 9% of households were involved in such projects in the lowest potential area.

The second impact on the supply side is on the structure of the organisation which will supply water. This organisation must be responsive to the structure of the communities identified above. In the Meru society, the clan elders have key roles in decision making and should be incorporated in the structures of the implementation organisation if this organisation is to receive government and community support.

A possible supply consideration is the possible use of the water system to encourage crop substitution programmes targeted at the Miraa crop. The extensive damage being done to social systems in some parts of the District indicates that this may be a priority for water allocation in addition to those identified in section 4.2 above. This programme too would have to be linked to an education campaign.

Detailed studies as to acceptable and effective forms of education and organisations will be required at feasibility study stage.

4.3.3 Institutional Considerations

With the above issues in mind, the structure of the institutions which will plan, design construct and operate the water system can be considered in more detail. The scale of the projected system will often determine the institutions involved in these activities. These institutions will, in turn, have an impact on the selection of the most appropriate technical option.

The key functions which must be carried out by the selected institutions are:

- information and mobilization of local population
- preliminary design and feasibility study (planning, siting, technology choice)
- approval of project
- detailed design
- construction supervision/construction
- staff training

- operation and maintenance, and
- financial functions (see paragraph 5.2.4 below).

The organisations which undertake these functions, and the community liaison activities which must run in parallel to them, will differ depending on the type of system to be undertaken. The precise allocation of these functions should be a task for the feasibility studies to determine.

In Meru District, the MoWD has the ability to undertake surveys and limited ability in design, construction and operation (including finance) of small scale systems. Assessment studies, feasibility studies, complex design, and training are beyond its capacity, and MoWD headquarters (or other agency) support is required for these activities. The MoWD has also given significant design and other institutional support to Water Associations in the district. The assessment of feasibility studies/proposals should be undertaken by the DDC with advice from the district MoWD, but there are, as yet, insufficient skills in the district to carry out this role properly.

Extensive strengthening of a variety of organisations will thus be required in order to effectively implement either urban or rural/community based projects in the district, under the District Focus Policy.

4.3.4 Financial Aspects

The organisations chosen to implement the project must effectively undertake ALL of the major financial functions associated with any enterprise. This is essential to the sustainability of the project. The key functions and associated systems are:

- accurate monitoring of water production and distribution
- efficient billing systems for water distributed
- efficient collection systems for water billed and effective sanctions against non-payers
- accurate monitoring and cost effective control of construction costs
- ensuring adequate provision for, and cost effective control of, operation and maintenance expenditure
- systems of capital (development expenditure) budgeting which relate to specific water schemes
- accurate and timely reporting of above activities, and
- financial incentives both to individuals and to schemes to implement government policies, e.g cost sharing.

Even if the implementing institution is of a Water Association, these tasks must be carried out, and the systems required for these tasks must be present even if in a simplified form. Variations on the current documentation of the MoWD would appear to be adequate if used correctly.

Where more than one organisation is involved, for example where one authority constructs the scheme and another operates it while a third funds construction, the financial relationships between them must be clear. The extent and terms of subsidy and/or cross-subsidy must be described in the accounting systems of the various organisations. In general, the organisation which will operate the scheme should be given control of the funds and the responsibility to perform to (financial) targets.

In order to achieve the above tasks and co-ordination between agencies, significant strengthening of existing systems will be required. MoWD systems should incorporate concepts suggested in the SIDA Water Use Test Project. Simplified systems along the lines of the current MoWD system will be required for small community systems.

4.4 Demand Considerations

4.4.1 General

The basis of demand for water is the population projections contained in Part 1 of the Study. Different groups of people will have different demands according to their circumstances - which will change over time. The most important change over time will be rising real incomes. People tend to spend more on water as their incomes rise. Projections of district income growth rates are not yet available, however, and water demand estimates contained in Part 1 provide the best estimate of what might be termed "latent" demand in an economic sense. Whether this demand becomes "effective", that is becomes translated into money spent on water, depends on several factors. The most important of these are affordability and willingness to pay.

4.4.2 Affordability

Central to the choice of a system, given a pricing policy (see 5.4 below), is the affordability of that portion of the cost to be borne by the consumers. Accurate data on the incomes of the various groups of consumers can be obtained in feasibility studies. The normally accepted range of affordability is a maximum of 3-5% of total household income of the 20th percentile group. However, this does not mean people are willing to pay this amount.

The results of the Household Survey provide some guide as to the levels of affordability in Meru. Although a wide range of responses was received, on average the amounts stated as affordable monthly contributions for water supplies were Shs 66 per month for standpipe systems, and Shs 140 per month for individual connections. These amounts constitute 4 and 9 percent of average monthly total household income respectively. Added to these amounts are stated average affordable initial contributions of Shs 1,065 and Shs 1,824 respectively.

Experience reinforces these results, as both small and some large scale schemes are being efficiently operated by community groups. In all cases these schemes have had external (MoWD and/or Donor) support for the initial investment (although in some cases limited only to design), but operate and maintain their schemes independent of assistance.

4.4.3 Community Participation/Willingness to Pay

The results of the Household Survey are encouraging with respect to the capability and willingness of the community to contribute in the provision of water. However, certain preconditions for effective participation must be present.

In community based schemes, community participation must start from the feasibility study phase. The participation of the community is vital in determining the type of scheme which they can and will operate successfully. The extent of participation should be much more than the "dig and pay".

The amount that a community is willing to pay will be influenced by cultural issues, the availability of alternative sources (and their cost) and the extent to which they are involved in the project (whether they "own" it or not). Again, these issues must be addressed in a feasibility study of a specific system.

In general, in Meru, the most effective form of community participation with respect to larger scale water supplies has been that undertaken in the Murugi-Mugumango scheme. This scheme was initiated after several self-help schemes had operated in adjacent areas and had determined that only a larger scheme would serve the needs of the community. Implementation of this larger scheme, supported by two NGOs, required the community to form a Co-operative Water Society under Kenyan law. This Society must take formal responsibility for the implementation and operation of the scheme. The process of agreement on the form of the Society enabled the diverse self-help groups, each with its own leadership and constituency, to form a consensus on the objectives and procedures of the scheme. During implementation, members were required to contribute labour to the project in addition to the cash contributions for the scheme. The community thus feels it "owns" the project, and will maintain the scheme to the limits of its financial and organisational ability (these limits should be taken into account when technologies are chosen).

Smaller schemes such as that operated at Ntugi by a women's group, are willing to pay both in cash and in labour, for at least part of the smaller capital investments. The organisation is loose with respect to operational responsibilities, but MoWD support aims to bring the community through a learning process with mechanisms appropriate to the small scale of the system being introduced as needed.

A similar approach to community participation should be considered for all water supplies which serve people who are not in the formal sector.

4.4.4 Institutions for Community Participation

Community participation in a project does not occur without considerable effort. It must be remembered that the benefits obvious to the project promoters are not obvious to the potential recipients. Two basic preconditions for effective community participation are:

- education and
- organisation.

The benefits of the project must be made concrete to the people. If there is no obvious advantage of the scheme, if, for example, the people have adequate clean water, free, from wells near the house, it should be asked if a water supply is, in fact, a high priority for the area. While there is generally water readily available in Meru, this is not the case over the whole District. Different areas in Meru have different priorities for water usage. The priorities for the semi-arid areas are different than those for high potential areas. These preferences must be considered in the planning of any education programme.

The structures and resources for effective participation must also be available from the time of project formulation. These structures include:

- formation and recognition of the community organisation
- establishing a formal process for consultation with the community organisation, and
- providing organisational support, for example in undertaking some administration for these organisations.

Funding of these activities is difficult given the lack of government resources for even routine activities. However, these elements were present in the Murugi-Mugumango scheme discussed above. The NGOs supported the formation of the Water Society, provided support to the administration required for the project, and employed local Meru people for most of the implementation activity.

Records, based on MoWD formats are kept of financial matters in addition to attendance for labour input, and of cash payments. Capital expenditure "topping up" came from one of the NGOs.

4.5 Pricing and Cost Sharing Policies

4.5.1 General

The price of water is the mechanism which brings together supply and demand. Establishing the price of any commodity is a trial and error process but some guidelines can be established in the light of the cost sharing and affordability policies set out in Chapter 3. Two major objectives are to be considered. These are:

- cost recovery, and
- demand management.

Both cost recovery and demand management will be the major issues of pricing policy in Meru.

4.5.2 Cost Sharing

The cost recovery issue is closely linked to choice of technology (supply), and affordability/willingness to pay (demand). As stated in Paragraph 3.5 above, cost recovery policies are not yet firmly established. Thus, three approaches to cost recovery are proposed here. Based on each of these approaches different technologies may be selected. The three approaches to cost recovery are:

1. *Recovery of full capital and operation and maintenance costs* - this is the ideal situation with respect to the government's cost sharing and district focus policy, and appears feasible for urban schemes. Technologies will be selected such that the total cost will be minimised in order to maximise affordability under this cost sharing arrangement.

2. *Recovery of operation and maintenance costs only - partial capital subsidy and hand over to community* - the next best outcome in terms of the cost recovery

objective. The district focus policy is also satisfied. It is likely that this approach will be used for smaller schemes. Technologies will be selected such that operations and maintenance costs are minimised in order to maximise affordability for the recipient community.

3. *Full capital subsidy from government and hand over to community* - Technologies will be selected such that capital costs are minimised. The costs of O/M are not taken into account in selecting technologies. This policy will minimise the cost to the government.

Table 4.1 Technologies Ranked by Minimum Cost by Cost Recovery Policy

Summary of rankings

Supply Area / Technology	Supply Capacity (m^3/day)	Overall Rankings			Type Rankings		
		Capital + O & M (Discounted) Cost/m^3	Capital Cost/m^3	O & M Cost/m^3	Capital + O & M (Discounted) Cost/m^3	Capital Cost/m^3	O & M Cost/m^3
Urban Area							
Spring, Gravity Distribution, 200 m3 St.	200	5	5	8	1	2	1
Spring, Gravity Distribution, 100 m3 St.	100	6	7	10	2	4	2
2 Boreholes, Motorpump, Distribution	600	7	3	15	3	1	4
2 Boreholes, Motorpump, Distribution	200	8	6	16	4	3	5
2 Boreholes, Motorpump, Distribution	100	10	9	17	5	5	6
2 Boreholes (100m), Motorpump, Distrib.	200	13	10	19	6	6	7
Surface Water, Weir, Distribution	200	15	11	20	7	7	8
2 Boreholes, Solar pump, Distribution	100 (2)	16	18	13	8	9	3
Surface Water, Weir, Pump, Distribution	200	20	14	21	9	8	9
Surface Water, Dam, Pump, Distribution	200	22	21	22	10	10	10
Rural Centre							
Spring, 40 m3 Storage	40	4	4	6	1	1	2
Surface Water, Chamber, Gravity Distr.	40	11	12	11	2	2	4
Surface Water, Weir, Gravity Distr.	40	12	13	12	3	3	5
Surface Water, Chamber, Hydram, Distr.	40	14	15	14	4	4	6
2 Boreholes, Motorpump, Limited Distr.	40	17	17	18	5	5	7
2 Boreholes with Windmill	40 (2)	19	20	5	6	6	1
2 Boreholes, Solar pump, Limited Distr.	40 (2)	21	22	7	7	7	3
Rural Area							
Spring	10	1	1	1	1	1	1
Dug Well with Handpump	10	2	2	1	2	2	1
Borehole with Handpump	10	3	8	3	3	3	3
Surface Water, Chamber, Gravity Supply	10	9	16	9	4	4	5
Dug well with Windmill	20 (2)	18	19	4	5	5	4

Note: (1) - Cost/m^3 is Cost per cubic meter capacity
(2) - Supply capacity is not guaranteed all year around

The various technologies identified in Table 3.1 have been ranked according to the three approaches described above and are shown in Table 4.1.

The results of this ranking show little difference between the approaches that minimise Total Cost and Capital Cost. However the approach minimising O & M Cost gives a higher ranking to boreholes with windmills or solar pumps. In the present study it would be too complicated to present investments according to each approach separately, therefore only the approach which minimises total costs will be used in the remaining sections of this document.

4.5.3 Demand Management

The other objective of pricing policy, demand management, also applies in Meru District. Unplanned exploitation of water resources may threaten efficient economic development, and pricing policy may be used to ration scarce resources between users. In the densely settled Meru District this is becoming an issue.

Already, exploitation of the upper reaches of water courses has progressed to the point where irrigation schemes are being forced to curtail water usage. Unplanned exploitation of water resources threatens efficient economic development and pricing policy may be necessary to allocate scarce resources between users. First priority use should be domestic demand - both in Meru and in areas downstream of Meru. Remaining water can be allocated among users, starting with the environmental requirements of the downstream water course (inside and outside the District). Any water available in a Division above these requirements can be consumed for irrigation and agro-industry as a first priority. Any excess is passed on to the next Division.

Allocation of domestic water can be achieved through cost sharing policies where the cost of the water extracted is passed on to the users. There is no comparable policy for other users.

Two institutional elements of demand management are needed to make allocation policy effective. These are enforcement measures and pricing incentives. There is currently no incentive to curtail either legal or illegal water usage. Illegal usage must be stopped by enforcement for which laws exist. Legal usage should be encouraged to become more efficient by charging for water used. There is currently no legal basis for charging user fees for water.

The approval for the usage of water resources is given by the relevant Catchment Board under the Water Apportionment Board of Central MoWD. The user receives a Water Permit and is charged once. The charge is insignificant, for example, an irrigation scheme of some 370 acres was charged Shs 530 in 1979 for approval to extract 740,000 gallons per day. The approval with respect to irrigation systems is virtually always for "flood flow only" extraction. This is unrealistic and unenforceable, as flood flow is precisely the time when water is NOT needed.

While it can be argued that the economy as a whole will benefit from the water and that the government can redistribute profits made through taxes, the result of current policy is that there is no incentive for efficient use of water. In this context, irrigation schemes receive no incentive to utilise water efficiently. The use of furrow irrigation is particularly wasteful. An example will serve to illustrate the extent of water resources lost. The example uses a furrow irrigation scheme of 400 hectares currently using 200 l/sec. This usage can be cut to 100 l/sec with sprinklers. If water is priced at its opportunity cost in situations of scarcity (domestic water) at, say, 3 Shs/m^3, and fields are irrigated for 150 days per year, the water saved per year is 1.3 million m^3, valued at Shs 3.9 million.

While not suggesting that any new regulations should result in pricing water at the same rate as domestic water, the distance between such numbers and a one time charge of less than one percent of the yearly opportunity cost provides a positive dis-incentive for efficient usage. Such issues should be addressed in assessment of new or rehabilitated projects.

5 GUIDELINES FOR APPRAISAL OF INVESTMENT PACKAGES

5.1 Introduction

This chapter will attempt to bring together the considerations discussed above and set out a methodology for the assessment of investment packages. This methodology is intended for use by the DDC and DEC (in conjunction with District MoWD) in assessing investments put to it for approval.

The analysis will be divided into three parts. The first part will outline a methodology to assess the economic/financial viability of the water supply systems in the most general terms. This methodology should be applied in feasibility studies when more detailed data will be available. The second part will set out a process of appraisal of investment proposals so as to help ensure that they are in conformity with the District Development Plan and the DWDP. The third part indicates how prioritisation of proposals may be achieved based on a policy of cost sharing.

The following Chapter will develop indicative investment packages which meet the criteria established in this chapter.

5.2 Economic and Financial Analysis

5.2.1 Introduction

Appraisal of investments in the water sector should include economic and financial analysis of each project/system. Any proposal to utilise water resources should include simple analysis indicating that the proposal is financially viable. For larger investments, an economic analysis should be undertaken. Depending on the data available, economic analysis will be either a cost effectiveness analysis as described in Part 2 paragraph 6.3, or a cost/benefit analysis as described in this chapter. It is expected that, where feasibility analysis studies are required, cost/benefit analysis should be used.

Economic cost/benefit analysis of water supply systems can be divided into financial and economic parts. The financial part approaches the system from an individual's (e.g. the "water undertaker", the community) point of view, whereas the economic part looks at the implications of the system for the nation as a whole. The financial approach thus typically considers revenues and expenditures in the context of cost effectiveness and cost recovery objectives. Economic analysis estimates costs and benefits to the nation, in which items like time savings, health improvement and indirect benefits/disbenefits accruing from the water supply system are considered.

Cost/benefit analysis of water supply systems in urban centres differs considerably from that of water supply in rural areas. In medium size and small urban centres (e.g. Meru, Nkubu and Maua, population >2,000) the analysis is done by comparing the amount of distributed water at an affordable tariff with capital and O&M costs. The methodology to be used for analysis of water supply systems in market centres (population < 2,000) and in other rural areas in Meru District stresses the economic aspects of supply of water. Time savings and, to a lesser degree, health improvement

and indirect economic benefits need to be considered and compared with costs and economic disbenefits.

Financial cost analysis is based on market prices, whereas economic analysis generally uses shadow prices. The economic analysis set out below uses market prices. This is because the distinction between tradables and non-tradables is difficult to make in rural water supply systems and because conversion factors could not be determined within the scope of this report (ref: The value of time spent on collecting water: some estimates for Ukunda, Kenya; Whittington et al, 1989).

The methodology used distinguishes between a) small urban areas and b) rural market centres. For each area a description of benefits and costs is given, followed by an example valuing and comparing the described benefits and costs.

Capital costs and operation and maintenance costs vary between different systems. The relation between these costs and the cost sharing policy, and the effect of both on the choice of systems is discussed in paragraph 5.2.4 on financial analysis. This paragraph also discusses these items in relation to possible sources of funding of projects.

The economic benefits of water supply systems in the District are considered for supply to urban centres and rural market centres. Estimates of benefits of supply of water to small urban areas can be based on willingness to pay. Supply to poorer rural areas in the District often must count benefits in the form of time savings, health improvement and other indirect economic benefits.

5.2.2 Economic Analysis of Water Supply in Urban Areas

a) Benefits

In urban water supply systems benefits of supply of water are reflected in the consumers willingness to pay for the service. This does not necessarily translate into collected revenue, however. Due to inefficient revenue collection, broken down meters and insufficient meter readers etc., revenue collected does not always match with revenue billed (assuming all water distributed is billed). Furthermore, people often are not disconnected after non-payment and therefore have no incentive to pay.
In estimating the benefit of a water supply system it is therefore better to look at the quantities of water produced and distributed. Differences in these figures are caused by leakages in the distribution system. The quantity of water consumed (paid for or not), valued at an affordable tariff, is the best indication of direct benefits of water supply to small urban centres. The affordable tariff is derived from the fact that people spend from 3% - 5% of their income on water.

b) Costs

Costs of water supply systems can be split into capital costs (e.g. materials, equipment, wages of labourers) and operation and maintenance costs (e.g. fuel/electricity, salaries of staff, chemicals, transport, spare parts, tools, costs of repair). Costs are related to water production/distribution and are expressed in Shs./m^3 per year. A ranking according to cost effectiveness per m^3 is shown in table 3.1. This ranking is based on total discounted cost/m^3 for various systems.

c) Comparing Benefits and Costs

When discounted benefits (value of water consumed) are large enough to cover discounted costs, the system is viable from an economic point of view.

5.2.3 Economic Analysis of Water Supply in Rural Areas

a) Benefits

Considerations such as willingness to pay, limited money economy, cultural and traditional use of water etc. make it more difficult to consider revenue as a justification for a water supply system in rural areas including market centres. Time savings, health improvement, saving the cost of boiling water and other indirect economic benefits are therefore the major identifiable benefits of these water schemes.

Time Savings

A water supply system (or an improved distribution system) enables people to get water from a supply point, which is closer/more reliable than the source they originally used. If they spend less time hauling water in the new situation, compared to the old 'without project' situation, the time they save may (and often can) be valued. Women usually collect water and therefore their time savings have to be considered. The time they save can be used for extra care for children, activities in the house, milking and processing of dairy and income generating casual work.

Valuation of time savings by women due to an improved or new water supply system will be based on rural-female income level. Total time saved will be calculated by estimating the number of households, their water needs and time saved as compared to existing sources.

The Household Survey indicated that the average return journey time was around 70 minutes in the low potential areas, and around 15 minutes in the highest potential zones. The difference was due both to the higher density of surface water sources in the high potential areas, and to the greater prevalence of piped supplies in these areas.

Health Improvement

Health improvement resulting from improved or new water supply is extremely important, but difficult to value, and it is not expected that the situation in Meru offers possibilities to do so. Other masking variables (improved sanitation, electricity etc.) are present. However, the results of estimates form other areas (for example, Meru District) may be used as a guide if they can be obtained.

Other Economic Benefits

These benefits will probably fall into two categories in the Meru context. These are:

- the money and time saved from not having to boil water (although the Household Survey indicates that few households do boil water), and
- indirect benefits from water supply; these benefits relate to the long run and are a result of possible economic development of the District due to better water usage.

Because of the more regular supply of water agricultural production may increase, and small scale industry may develop. Since the main source of income for Meru people is farming, development in water availability and quality, is very important for their income/wealth. At this stage, such future developments are difficult to estimate without detailed study which is beyond the scope of the present study.

b) Costs

The costs of rural water supply systems can also be split in capital costs and O&M costs. These costs are however, unlike costs of urban water supply systems, not the only costs which are to be taken into account. Supply of water to rural areas brings some economic costs with it. For example, in a community-run scheme, people have to participate in operation and maintenance activities and co-ordination meetings. This requires time which they could not have spent on income producing activities in a 'without project' situation. People have to pay for water consumption and they often have to walk considerable distances in order to pay their monthly bills.

c) Comparing Benefits and Costs

Health and time savings benefits accruing from water supply justify a certain cost range of water supply systems. Additional economic benefits enlarge the range of viable systems.

Further selection of systems will include technical aspects (not discussed in this chapter) and cost recovery aspects (discussed below).

As in urban water supply benefits should cover costs.

5.2.4 Financial Analysis

Financial analysis is carried out from the viewpoint of an individual entity, usually either from the viewpoint of the community or of the government. It uses projections of money expenditures and incomes over time. Inflation must be considered in these projections. The extent to which expenditures, like capital and O&M costs, are matched by incomes or revenues, such as payments by the community, is the basis of the analysis. The difference between revenues and expenditures is the net cash flow. At the most basic level, a project is viable from a financial point of view if net cash flow remains positive.

a) Community's viewpoint

In the perspective of a community, the cash flow is largely determined by:

- the government policy on cost sharing (i.e how much of expenditures are to be met by the community), and
- the amount the community can afford/is willing to contribute (i.e how much revenue can be collected).

Capital expenditures of a water supply system can be met by:

- grants and/or loans sourced from one or more donors (usually channelled

through the government), or from the government itself

- money contributions from the community, and

- labour and/or materials contributions from the community.

When capital contributions of the community are insufficient to meet cost sharing requirements, additional expenditures may be paid for by a loan which will have to be paid back by the community through charges levied for use of the water (i.e the revenue of the system).

System revenues must cover expenditures on O&M as government policies require this level of cost sharing as a minimum. Such expenditures include operators, chemicals, fuel, electricity, and periodic replacement of parts.

Viable projects, from the point of view of a community, are projects where the system revenues can meet the required level of cost sharing. Depending on the components of that cost sharing, different strategies will be adopted. If the community must bear the cost of both capital and O&M expenditures, then systems which are most cost effective with respect to total costs should be chosen (see Table 4.1). If the community must bear the O&M expenditures only, then systems which are most cost effective with respect to O&M costs should be chosen (see Table 4.1).

Feasibility studies of future investments should focus on the cash flow of the community scheme. Sources and applications of funds should be identified over the life of the investment. Revenue projections should carefully consider issues of affordability/ willingness to pay.

b) Government's viewpoint

As the institutional structure of the MoWD stands at the present time, cost recovery policy cannot be made coherent. As the funds expended on schemes and the revenues from them flow through different and multi-layered channels, matching expenditures to revenues is difficult. This situation will change in the future, when the enforcement of cost sharing policies, such as set out above, will be possible as the District Offices of the MoWD are strengthened.

At present, severe limits on MoWD capital works budgets requires that capital expenditures be minimised. Such investment is often not recommended as economically efficient or as financially affordable for the recipient community, but is a possible short term strategy in the present context (see Table 4.1).

Current recommendations for institutional strengthening provide the possibility that the accounts of the District will give a clear picture of the trading, profit and balance sheet position of the systems under MoWD control. Such systems are also required for Meru Town Council's system. Investment decisions can then be made in this context. Feasibility studies of future investments should consider the impact of proposed schemes on the viability of the District MoWD as an entity. Investments, particularly in small urban areas, should obtain an acceptable financial rate of return. Investments which cannot meet such criteria should receive a subsidy specific to each scheme.

5.3 Appraisal Methodology

5.3.1 General

The purpose of developing a methodology for investment appraisal is to ensure that any proposed investments will be consistent with, in the first instance, the DWDP, and secondly, with the District Development Plan. It is intended for use by the DDC or DEC, supported by the District MoWD, in order to give these institutions the central role they merit under the District Focus policy.

For this reason the criteria used in the appraisal include factors which are not strictly water resources issues. The methodology developed is intended to provide basic assessment of investment proposals which will be neither too time consuming or skill-intensive for use in the District. Nevertheless, Districts will need some strengthening before this methodology can be fully applied.

It should be noted that each project or supply system should be assessed individually. These projects can be aggregated into a package, but appraisal remains primarily at the level of the individual project as conditions vary so much between locations.

Criteria will be established for appraisal of investment projects in the following categories:

- water resources
- land use planning/environmental impact
- social impact
- institutional/community participation
- economic
- affordability
- financial.

Simple checklists will be established to test a project against each of these sets of criteria. The checklists ask "plain English" questions which will trigger consideration of major issues. If there is any doubt as to the answers to the questions, technical support can be sought from the MoWD, Ministry of Planning and National Development and other ministries.

The checklist, as amended by the district organisations, should be included in the DWDP. For those proposing to use water, it will provide a guide to the major factors which they must consider, and on which their proposal will be judged.

For those investments that the District proposes to initiate, a process for prioritisation of projects will also be described. Establishing priority for projects is useful in the event that insufficient funds are available at a given time to carry out all viable projects, or where some projects in a programme of implementation of a given investment package cannot proceed. Decisions can then be made as to which projects should be delayed or brought forward. The methodology used is tailored to the existing and potentially achievable levels of appraisal skills in the District.

5.3.2 Development of Criteria

a) Water Resources

The basis for these criteria is the Water Resources Assessment Study by WRAP. This study contains all the existing basic data on the availability and quality of both surfacewater and groundwater. The basic questions to be answered are:

Does the proposed technology make optimum use of the available water source?

> *e.g. if a surfacewater intake is proposed, will it provide the required head? or if a groundwater source is proposed, does the pump capacity match the well yield?*

Can the required present and future water supply be met from the indicated water source throughout the year?

> *e.g. if a surfacewater reservoir is proposed, how will siltation affects its capacity? or if a surfacewater intake is proposed, are low flows sufficient? or if a groundwater source is proposed, how will groundwater levels develop in future?*

In ASAL areas can the required water supply be maintained during drought periods?

Is there an alternative water source and has it been considered? Maybe to serve as alternative if the first source is out of order?

> *i.e. a system using two different sources is more reliable*

Is the quality of the water suitable for its intended use?

> *e.g. for livestock water supply quality criteria are less than for domestic water supply*

b) Land Use/Environmental Impact

The basis for these criteria are the District Development Plan and documents on land resources (e.g. from EMI-ASAL). The basic questions to be answered are:

Does the project supply water to activities consistent with the District Development Plan?

> *e.g. is water provided for expansion of irrigation?*

Are the facilities/plant of the project consistent with the existing and future usage?

> *e.g. can the water sources supply the quantities required by the present and projected land use?*

> *e.g. is wastewater treatment upstream capable of coping with increased loads or does the water supply treatment have to be designed for future upgrading?*

Are the facilities/plant of the project consistent with plans for urban/rural development?

e.g. is there sufficient capacity for likely increases in production of the local crops?

e.g. will the proposed site of the reservoir not sterilise mineral deposits, or block the most appropriate route for an upgraded access road?

Will the facilities/plant of the project, or their construction, have an adverse environmental impact?

The major forms of impact to be considered in Meru District are:

- *pollution from processing plants, especially coffee plants*
- *pollution from urban areas especially stormwater runoff and sewerage*
- *the degradation of vegetation cover and soils from erosion*
- *the impact of dams which intercept surface water causing downstream wet lands to dry up - this may have a significant impact on some wildlife*
- *heavy pumping of ground water may cause springs to dry up, affecting animals and sometimes people.*
- *possible pollution of water sources from agricultural inputs and farm waste.*

c) Social Impact

It is difficult to discuss appropriate criteria for social assessment in the absence of a socio-economic study of the District which is designed to develop such criteria. However, some significant issues have been raised in consultation with local people. These are:

Where traditional groups are affected by the scheme, does the proposed scheme work within the cultural context of those groups?

This issue should be balanced against development goals in so far as sub-groups, such as women, within these groups should be given the opportunity to develop their talents

Does the proposed scheme improve the welfare of the people of the District, particularly lower income groups and/or women?

i.e. does it provide employment, or does it provide opportunities for people to earn income from conditions created by the scheme?

d) Institutional/Community Participation Issues

d1) Institutions

The major tasks which must be addressed with respect to institutional issues are design, construction and operation/maintenance of the systems. The organisation, or grouping of organisations must be able to carry out these tasks effectively. One organisation should be in charge of co-ordinating these tasks, and, preferably, this organisation should be that which will operate and maintain the project. The key issues are thus:

Which organisation is co-ordinating the project?

Does it have a realistic project organisational structure and implementation schedule?

Which organisations have responsibility for design, construction and operation of the schemes?

Are skills and financial resources available for each of these organisations to undertake their tasks?

If not, who is to supply training/funds to achieve the required levels of performance?

Are there written agreements with the co-ordinating organisation to support the above statements?

d2) Community Participation

Community participation can occur in any of the above tasks. In small scale water supply projects, it is likely that it will occur in all of these tasks. The organisation of this participation is thus a key element in the successful implementation of the project. The main issues involved are:

Are the leaders of the community organisation representative of the community?

i.e. are the ones promising resource inputs capable of organising the delivery of those inputs?

Can they deliver the promised labour and money inputs to the project on time?

i.e. does the community have the resources?

Can the community organisation effectively carry out the liaison activities that are required to implement the project?

e.g. with government, contractors etc.

Is the organisation recognised by the local government agencies and will/can they provide the organisational and logistic support required?

e) Economic Issues

The methodology required to undertake an economic assessment of the project is set out in Paragraph 5.2 above. For small scale projects which are to be implemented and paid for by the community, it may be assumed that the economic benefit is proven by the level of commitment shown. Where substantial levels of government or donor funds are to be used, a feasibility study of the project should include an assessment of economic viability, and the average/indicative values used in the above analysis should be replaced with those applicable to the specific project.

f) Affordability Issues

Based on the above analysis, the issue of affordability can be addressed. The Household Survey indicates the levels of affordability which the respondents found to

be acceptable. These levels cannot be regarded as definitive, but can be taken as a guide. The issues of affordability and willingness to pay are complex, and bound up with slowly changing traditional beliefs and priorities.

If the community is to implement and pay for the water scheme, there is little need to assess willingness to pay. Only confirmation of this must be obtained in feasibility studies. Where government and/or donor involvement is envisaged, the feasibility studies must address this issue in some detail.

In the latter case, the main consideration is the level of cost sharing required by the government or donor agency. This will determine the fee or tariff set in the scheme. General guidelines which are likely to be adopted require full cost recovery in urban schemes, and, outside urban areas, recovery of operation and maintenance costs. The basic questions are:

Does the sum involved in cost recovery constitute more than 5% of the income of, say, the poorest 20% of the population?

if so, use another technology or review level of cost sharing

If not, what is the community attitude to paying this amount of money?

if negative, as it often is, then additional questions are required

Is there an acceptable alternative source and what is the cost?

if there is no alternative, or if it is more expensive than the proposed scheme, then there is a good prospect of achieving a sufficient level of willingness to pay given adequate institutional systems and political support

if there is an alternative which is acceptable to the people, even if the water is technically inferior, another technology should be considered, or the level of cost recovery should be reviewed.

g) Financial Issues

The key financial issue is the sustainability of the project. With the above analysis complete, and concurrently with the determination of affordability, it is possible to project likely demand for (see Paragraphs 4.3 and 5.2), and the costs of, the scheme over time. The feasibility study must identify the sources of funds for design, construction and operation/maintenance. The projection of the expenditure of these funds must be realistic. A basic cash flow analysis can then be carried out to identify potential liquidity problems, and measures developed to overcome them. The financial return on the project can also be calculated.

Financial systems for revenue collection and recording financial flows (simple records of costs and receipts) have been developed, and could be applied to even the smallest schemes. For larger schemes, simple procedures for capital budgeting and funding of preventative maintenance schemes could be developed based on experience in some NGO projects. These types of procedures will take some time to establish, however.

The key criteria are thus:

Does the cash flow show that expenditures are covered by revenues through the life of the project?

Are procedures for revenue collection and monitoring of revenues and expenditures described and realistic?

5.3.3 Prioritisation

Usually there are several projects competing for available funds. Often these funds are insufficient to implement all of the projects. A method must be found to rank these projects for access to available funds. That is, they must be given a priority ranking.

The prioritisation process is a difficult one because it involves judgements as to the value of performance in one criterion against performance in another. This weighting process is contentious. Unless extensive resources are available to carry out a valid Multi-Criteria Analysis, it is better to assess a project as to whether it achieves an acceptable level of performance in all criteria, and then prioritise on one. This one is often financial.

The suggested method of prioritisation focuses on the sustainability of the project. Basically, it consists of ensuring that all of the questions set out above in each of the criteria categories have a satisfactory answer. Then, priority is assessed according to how well projects meet the cost sharing policy.

Revenue from the system and its expenditures will be estimated in the financial analysis as set out in 5.3.2 g) above. The extent to which this revenue covers costs will thus determine the extent to which the cost sharing policy is being implemented.

First priority projects will recover both capital and operation and maintenance (O&M) costs. Second priority projects will recover O&M costs. Third priority projects will be economically viable and be ranked according to the extent of recovery of O&M costs. Other projects should not be implemented.

6 DESIGN OF INVESTMENT PACKAGES

6.1 Introduction

In the context of the above chapters and using the information in the other parts of this study, this chapter will present cost estimates, which may be used in the preparation of district investment packages. It will also define the limits of resource usage by Location as determined in Part 1 of the Study. This information will provide the basis for rational design and monitoring of water supply investment in the District.

Because of the complex nature of planning (see Chapter 4) for water development in the District, it is not possible to define investment packages in any detail. Feasibility studies must determine the form of schemes appropriate for various physical and settlement situations in Meru, and for the possible types of cost recovery policy applicable.

In general, design of investments for domestic water supply will take into account:

- the potential of surface water and groundwater resources in the District by Location, based on the findings of the Water Resources Assessment Study

- the current water supply coverage by existing supply facilities

- the different water qualities required for domestic supply and non-domestic supply

- the four types of domestic water supply schemes which cover four of the five groups for which government participation in the provision of water supplies is necessary in some form. These are:

  . urban systems with mainly service and small scale industry demand in addition to residential demand,

  . market centre systems with some service demand, in addition to residential and livestock demand,

  . systems for rural population (often in combination with supply of market centres) with residential demand, demand from institutions, demand from livestock, small scale irrigation and small scale (agro-)industry, and

  . systems for independent institutions (schools, health centres, etc.) located outside centres

- the selection of technologies according the three cost recovery approaches set out in Paragraph 4.4, which yield three different rankings, presented in table 4.1.

  The three approaches are:

  Approach 1 : selection of technologies according minimal discounted total cost per m^3 produced giving possibility for recovery of full capital and operation and maintenance costs

Approach 2 : selection of technologies according minimal operation and maintenance costs per m^3 produced, which will maximise the affordability to the community.

Approach 3 : selection of technologies according minimal capital costs per m^3 produced which will minimise the capital cost to the government or other donor.

As already explained in chapter 4.5 cost estimates of domestic supplies will only be provided for cost recovery approach 1.

Not included in the present study are the investments required for the development of the fifth type of water supply: large scale irrigation. More studies will be needed to determine the viability of irrigation projects and to prepare reliable cost estimates. However from the analysis of the water resources, it is possible to obtain an estimate of the irrigable area in the District. This is presented in chapter 6.4.

6.2 Overview of Methodology

For each Location the required type and number of domestic water supply facilities are determined according the following steps (see also chapter 7, Part 1):

1. Specify water demand - determine the scenario and the year for which the investment package is to be prepared; the water demand will be provided by the dBase program.

2. Differentiate the water demand for the four supply priorities:
   - domestic supply
   - livestock supply
   - minimum catchment requirements
   - agricultural usage
   - other usage

3. Select the supply technologies appropriate to the supplies required by choosing the least cost option for the required water supply quantity. The choice of the least cost option will use the approach suggested in section 4.5.1, the minimum discounted total costs per m^3 produced,
   and by considering the water resources potential in the Location as described in chapter 7, Part 1.

4. Determine required supply development for domestic and livestock by subtracting existing supply capacity which is in good condition (from Part 2) from water demand. Assign water available according to priority. Then determine available supply for development of other supply priorities.

5. Specify the average capital costs (or investment costs) per unit supply for domestic and livestock supply.

6. Calculate total investment costs for each Location. Analyze for each Location the number of people served and the average costs per capita.

6.3 Indicative Technologies

The types of technology appropriate to the circumstances of a particular scheme will vary according to the projected demand and the cost recovery policy in use. Water demand has been determined in Part 1 for the years 1993, 2003 and 2013 using two different scenarios.

Scenario 1 described in Part 1 of this study, will give the base level of investment as it includes the minimum growth which may occur in the District. An investment package based on scenario 1 may be seen as giving the investment level required for the first phase of development.

Scenario 2 corresponds more with the growth rates as envisaged by the District in the DDP 1989-1993, which, to be achieved, require changes in social, cultural and institutional conditions. An investment package based on scenario 2 therefore gives the investment level required for the next phase of development after scenario 1.

The various cost recovery approaches have been summarised in section 6.2 above and table 4.1 shows the impact of these approaches on technology choice.

However, as explained before it is not possible to define investment packages in detail. This implies that selection of technologies can be done on the basis of only few criteria. At the level of the present study these criteria are water availability and costs.

The water availability is compared with the ultimate demand for the year 2013, calculated according scenario 2 (see chapter 7, Part 1). The use of scenario 2 (high growth) implies that the present planning provides maximum preservation of resources for domestic, livestock and industrial uses, for at least until 2013. Agricultural use will be restricted to the resources not in need for these uses, which resources are in affect still quite substantial (see table 7.1 in Part 1).

The choice of technology is related to the type of water source e.g surfacewater, spring, groundwater, or rainwater. The allocation of the resources therefore leads automatically to certain technologies to be applied.

The range of choice is limited, e.g for surfacewater the type of intake and/or treatment, for groundwater the type of pump in the borehole, etc. However the costs involved can differ significantly, due to the quality of materials used, but also depending on the level of sophistication of the supply distribution.

At the level of this study it is not possible to make detailed choices, therefore only generalized unit costs are used. With these an indication can be provided of the total costs of water supply development. Subsequent feasibility studies should enable further refinement of these cost estimates (see chapter 7.3).

The phasing of the required investments is an important decision to be made by the District. Future annual investments should be related to the capacity of the District to absorp these. This aspect was not studied here, therefore seperation of the cost estimates in phases is not presented.

6.4 Allocation of Resources among Investments

For each Location, the available resources and their allocation between priority uses are set out in the following tables and in Appendices 1-5.

The development of the domestic and livestock supplies is to be according the calculated water demand. Part of this demand is covered already by existing water supplies, which must be taken into account. However supply capacities of existing supplies are not always accurately known and also not complete. Therefore the estimated required capacity of additional supplies must be treated with some caution and may only be considered as a first approximation.

The information on the supply capacity of the existing supplies is taken from tables 4.13 and 4.14 in Part 2. Supplies with their current working condition classified as good are assumed to be able to continue during the plan period at their current supply capacity. Supplies with their current working condition classified as fair are assumed to be able to continue only after some rehabilitation is carried out. This is indicated separately in the tables. All other supplies have not been considered to contribute to the required supply capacity.

The required supply capacity in the ultimate year (2013) of the plan period is thus assumed to be covered by:

1. Existing supplies which are currently in good working condition
2. Existing supplies which are currently in fair working condition, and therefore do need some rehabilitation
3. New water supplies which need to be constructed

The supply capacity from each of these supplies is indicated separately in the tables.

The required development of the domestic supplies is summarized per Division in table 6.1 and per Location in Appendix 1.

Table 6.1 Domestic Water Supply Development

DIVISION	1988 - Existing Situation					2013 - Scenario 2		REQUIRED DEVELOPMENT OF SUPPLIES		
	Total Population	Population Covered		Existing Capacity		Total Population	Required Capacity (m^3/day)	Additional Population Covered	Capacity Development	
		Total	%	Good (m^3/day)	To Rehab. (m^3/day)				New (m^3/day)	Rehabilitat. (m^3/day)
C. IMENTI	134,014	43,480	32	743	7,090	385,578	20,381	342,098	12,548	7,090
IGEMBE	130,592	46,820	36	4,377	990	379,952	18,730	333,132	13,363	990
N. IMENTI	153,197	73,190	48	293	7,000	442,800	29,007	369,610	21,714	7,000
NITHI	205,527	59,514	29	4,350	9,597	606,436	33,669	546,922	19,722	9,597
NTONYIRI	116,692	85,500	73	300	1,410	285,892	9,585	200,392	7,875	1,410
S. IMENTI	149,568	54,675	37	590	6,149	452,844	26,700	398,169	19,961	6,149
THARAKA	72,618	13,750	19	300	0	166,715	4,570	152,965	4,270	0
TIGANIA	203,155	68,100	34	4,044	1,500	534,503	22,452	466,403	17,123	1,500
TIMAU	33,783	7,683	23	416	1,582	89,067	3,748	81,384	1,755	1,577
MERU TOTAL	1,199,146	452,712	38	15,413	35,318	3,343,787	168,842	2,891,075	118,331	35,313

Note: 1. Existing capacity is not known accurately and also known for only part of the supplies.

The required development of the domestic and livestock supplies together is summarized per Division in table 6.2 and per Location in Appendix 2, and is also presented on Plate 2, where for each location the contribution of new, existing and rehabilitated supplies to the supply capacity is indicated in a pie diagram.

The supply of livestock separately from domestic supply was not analysed but may easily be determined by comparing tables 6.2 and 6.1. In some areas supply to livestock may be catered for independently, either from livestock water supplies or from natural sources (e.g Tharaka Division), which will reduce the required capacities as indicated in table 6.2 and Appendix 2.

Table 6.2 Domestic and Livestock Water Supply Development

DIVISION	1988 - Existing Situation					2013 - Scenario 2		REQUIRED DEVELOPMENT OF SUPPLIES		
	Total Population	Population Covered		Existing Capacity		Total Population	Required Capacity (m^3/day)	Additional Population Covered	Capacity Development	
		Total	%	Good (m^3/day)	To Rehab. (m^3/day)				New (m^3/day)	Rehabilitat. (m^3/day)
C. IMENTI	134,014	43,480	32	743	7,090	385,578	24,870	342,098	17,037	7,090
IGEMBE	130,592	46,820	36	4,377	990	379,952	21,072	333,132	15,705	990
N. IMENTI	153,197	73,190	48	293	7,000	442,800	34,535	369,610	27,242	7,000
NITHI	205,527	59,514	29	4,350	9,597	606,436	46,792	546,922	32,845	9,597
NTONYIRI	116,692	85,500	73	300	1,410	285,892	16,783	200,392	15,073	1,410
S. IMENTI	149,568	54,675	37	590	6,149	452,844	32,286	398,169	25,547	6,149
THARAKA	72,618	13,750	19	300	0	166,715	8,713	152,965	8,413	0
TIGANIA	203,155	68,100	34	4,044	1,500	534,503	33,739	466,403	28,195	1,500
TIMAU	33,783	7,683	23	416	1,582	89,067	7,090	81,384	5,092	1,582
MERU TOTAL	1,199,146	452,712	38	15,413	35,318	3,343,787	225,880	2,891,075	175,149	35,318

Notes: 1. Existing capacity is not known accurately and also known for only part of the supplies.

The development of irrigation in the District depends on the water availability. As explained before this was determined according the priorities in the allocation of resources. In the analysis water availability for industrial and agricultural use was combined and no distinction was made between these two water uses (Part 1, chapter 7).

Assuming the situation that all available water allocated for industries, irrigation or other uses is actually used for irrigation only, then the maximum irrigable area may be estimated. The water requirement per hectare was obtained from the Design Manual of the MoWD. The areas are summarized per Division in table 6.3 and per Location in Appendix 3, and are also shown on Plate 3. The maximum irrigable area in the District based on water availability is 23,775 ha or 3.5% of the District area. The largest areas are found in Nithi Division and South Imenti Division.

Use of groundwater for irrigation was not considered, although some areas have potential for high yielding boreholes. If feasible then this may increase the irrigable area, especially in Ntonyiri Division.

Table 6.3 Irrigable Area Based on Water Availability

DIVISION	Total Area (km^2)	Land Potential in % of Total Divisional Area			Available for Irrigation (m^3/day)	Coverage in % of Area	Coverage in hectares		
		High	Medium	Low			High	Medium	Low
CENTRAL IMENTI	475	46	40	15	143,750	5.7	2,688	-	-
IGEMBE	634	35	41	24	73,700	1.3	827	-	-
NORTH IMENTI	511	45	24	30	77,050	2.5	1,225	51	-
NITHI	689	39	47	14	406,700	10.2	5,776	1,267	-
NTONYIRI	1,325	19	26	55	16,750	0.1	174	-	-
SOUTH IMENTI	405	68	23	9	252,000	12.7	5,149	-	-
THARAKA	1,403	0	31	69	331,200	2.4	0	3,413	-
TIGANIA	660	33	35	32	162,400	3.3	2,195	-	-
TIMAU	761	44	28	28	59,700	1.3	1,009	-	-
MERU TOTAL	6,863	29	33	38	1,523,250	3.5	19,043	4,732	-

Note: Coverage in hectares based on irrigation water requirement in m^3/ha/year from MoWD Design Manual

6.5 Preliminary Cost Estimates

The costs of water supply development for domestic and livestock water supplies were estimated using unit costs for the required supply capacities. The unit costs are based on the cost estimates presented in Part 2 (price level 1988). In the cost calculation no differentiation was made between the Divisions.

The unit costs applied are for new supplies:

- surfacewater 22,000 Shs per m^3/day capacity
- groundwater 23,700 Shs per m^3/day capacity

and for rehabilitation of existing supplies:

- surfacewater 15,000 Shs per m^3/day capacity.

There are no existing supplies using groundwater requiring rehabilitation. Existing surfacewater supplies in good working condition continue as they are and are assumed not to require any financial input.

This methodology of cost calculation is expected to provide only a first approximate of the required financial input. More detailed costs should be expected from the feasibility studies, which will follow the implementation of the District Water Development Plan.

Table 6.4 Summary of Costs Domestic Water Supply Development

Year	Total Costs (million Shs)		Total Costs (Shs) per Beneficiary
	New Supplies	Rehabilitation of Existing Supplies	
1993	235	294	522
2003	839	442	730
2013	2,619	530	1,089

The total costs and the costs per beneficiary are summarized in tables 6.4, 6.5 and 6.6, and per Location in Appendices 4 and 5.

The total costs amount to very high sums, which may be understood as phasing of investments was not included in this preliminary cost estimate. The costs per beneficiary may be compared with the contributions to water supplies from households, which were analysed with the household survey (Appendix 6, Part 1).

The household survey asked people how much they had contributed to water supply projects in the past and how much they are willing to contribute to water supply projects in the future. On average people expressed that they are willing to contribute 100 Shs. per person for standpipes and 180 Shs. per person for individual connections. Actual contributions in the past were 400 Shs. per person for the tea zone, 220 Shs. per person for the coffee zone and 50 Shs. per person for the cotton zone.

The results from the household survey indicate that the required contributions from the beneficiaries are above their present level of contributions. However it must be understood that the presented cost estimates are related to water supplies with very good supply reliability, much better than most of the existing water projects in the area. Once this is realised then people may be willing to contribute more than what was indicated in the household survey.

The costs per beneficiary indicated in table 6.5 show different cost levels between the Divisions. This represents the already existing supply coverage, where Divisions with a currently good supply coverage have lower costs per beneficiary to supply the additional future water demand (e.g in Igembe Division due to water supply programmes by Plan International).

Table 6.6 presents the costs involved in supplying the combined domestic and livestock water demands. Similar unit costs were applied as for domestic supply only. The additional demand from livestock will be covered mainly by new supplies.

Table 6.5 Preliminary Cost Estimate of Domestic Water Supply Development

DIVISION	Year 1993 Additional Population Covered	New Water Supplies		Rehabilitated Water Supplies		TOTAL COSTS (Ksh.)	TOTAL COSTS PER BENEFIC. (Ksh.)
		Capacity Developm. (m^3/day)	Total Cost (Ksh.)	Capacity Developm. (m^3/day)	Total Cost (Ksh.)		
C. IMENTI	121,970	133	2,926,000	4,046	60,690,000	63,616,000	522
IGEMBE	114,396	955	21,010,000	290	4,350,000	25,360,000	222
N. IMENTI	113,684	1,749	38,478,000	5,772	86,580,000	125,058,000	1,100
NITHI	195,069	1,090	23,980,000	2,815	42,225,000	66,205,000	339
NTONYIRI	53,848	1,166	26,094,000	1,410	21,150,000	47,244,000	877
S. IMENTI	131,351	2,046	45,012,000	3,675	55,125,000	100,137,000	762
THARAKA	71,909	1,231	27,082,000	0	0	27,082,000	377
TIGANIA	177,981	2,189	48,758,100	1,122	16,830,000	65,588,100	369
TIMAU	33,255	79	1,738,000	466	6,990,000	8,728,000	262
MERU TOTAL	1,013,463	10,638	235,078,100	19,596	293,940,000	529,018,100	522

DIVISION	Year 2003 Additional Population Covered	New Water Supplies		Rehabilitated Water Supplies		TOTAL COSTS (Ksh.)	TOTAL COSTS PER BENEFIC. (Ksh.)
		Capacity Developm. (m^3/day)	Total Cost (Ksh.)	Capacity Developm. (m^3/day)	Total Cost (Ksh.)		
C. IMENTI	208,946	3,327	73,194,000	5,475	82,125,000	155,319,000	743
IGEMBE	199,863	3,479	78,493,000	990	14,850,000	93,343,000	467
N. IMENTI	214,096	7,375	163,440,000	7,000	105,000,000	268,440,000	1,254
NITHI	332,378	4,987	109,714,000	6,560	98,400,000	208,114,000	626
NTONYIRI	113,673	3,403	77,246,000	1,410	21,150,000	98,396,000	866
S. IMENTI	234,479	6,249	137,478,000	5,544	83,160,000	220,638,000	941
THARAKA	105,620	2,273	50,006,000	0	0	50,006,000	473
TIGANIA	293,944	6,306	140,092,000	1,500	22,500,000	162,592,000	553
TIMAU	52,588	424	9,328,000	970	14,550,000	23,878,000	454
MERU TOTAL	1,755,587	37,823	838,991,000	29,449	441,735,000	1,280,726,000	730

DIVISION	Year 2013 Additional Population Covered	New Water Supplies		Rehabilitated Water Supplies		TOTAL COSTS (Ksh.)	TOTAL COSTS PER BENEFIC. (Ksh.)
		Capacity Developm. (m^3/day)	Total Cost (Ksh.)	Capacity Developm. (m^3/day)	Total Cost (Ksh.)		
C. IMENTI	342,098	12,548	276,056,000	7,090	106,350,000	382,406,000	1,118
IGEMBE	333,132	13,363	298,236,000	990	14,850,000	313,086,000	940
N. IMENTI	369,610	21,714	479,408,000	7,000	105,000,000	584,408,000	1,581
NITHI	546,922	19,722	433,884,000	9,597	143,955,000	577,839,000	1,057
NTONYIRI	200,392	7,875	180,050,000	1,410	21,150,000	201,200,000	1,004
S. IMENTI	398,169	19,961	439,142,000	6,149	92,235,000	531,377,000	1,335
THARAKA	152,965	4,270	93,940,000	0	0	93,940,000	614
TIGANIA	466,403	17,123	380,106,000	1,500	22,500,000	402,606,000	863
TIMAU	81,384	1,755	38,610,000	1,577	23,655,000	62,265,000	765
MERU TOTAL	2,891,075	118,331	2,619,432,000	35,313	529,695,000	3,149,127,000	1,089

Table 6.6 Preliminary Cost Estimate of Domestic and Livestock Water Supply Development

DIVISION	Year 1993 Additional Population Covered	New Water Supplies		Rehabilitated Water Supplies		TOTAL COSTS (Ksh.)	TOTAL COSTS PER BENEFIC. (Ksh.)
		Capacity Developm. (m^3/day)	Total Cost (Ksh.)	Capacity Developm. (m^3/day)	Total Cost (Ksh.)		
C. IMENTI	121,970	1,084	23,848,000	5,026	75,390,000	99,238,000	814
IGEMBE	114,396	1,408	30,976,000	290	0	30,976,000	271
N. IMENTI	113,684	3,570	78,540,000	6,228	93,420,000	171,960,000	1,513
NITHI	195,069	2,314	50,908,000	7,308	109,620,000	160,528,000	823
NTONYIRI	53,848	3,477	78,194,000	1,410	21,150,000	99,344,000	1,845
S. IMENTI	131,351	3,724	81,928,000	4,429	66,435,000	148,363,000	1,130
THARAKA	71,909	2,636	57,992,000	0	0	57,992,000	806
TIGANIA	177,981	5,051	111,943,100	1,388	20,820,000	132,763,100	746
TIMAU	33,255	242	5,324,000	1,442	21,630,000	26,954,000	811
MERU TOTAL	1,013,463	23,506	519,653,100	27,521	408,465,000	928,118,100	916

DIVISION	Year 2003 Additional Population Covered	New Water Supplies		Rehabilitated Water Supplies		TOTAL COSTS (Ksh.)	TOTAL COSTS PER BENEFIC. (Ksh.)
		Capacity Developm. (m^3/day)	Total Cost (Ksh.)	Capacity Developm. (m^3/day)	Total Cost (Ksh.)		
C. IMENTI	208,946	5,105	112,310,000	6,638	99,570,000	211,880,000	1,014
IGEMBE	199,863	4,836	108,942,000	990	14,850,000	123,792,000	619
N. IMENTI	214,096	10,913	241,786,000	7,000	105,000,000	346,786,000	1,620
NITHI	332,378	10,953	240,966,000	9,471	142,065,000	383,031,000	1,152
NTONYIRI	113,673	7,480	168,810,000	1,410	21,150,000	189,960,000	1,671
S. IMENTI	234,479	9,530	209,660,000	5,944	89,160,000	298,820,000	1,274
THARAKA	105,620	4,719	103,818,000	0	0	103,818,000	983
TIGANIA	293,944	12,583	278,526,000	1,500	22,500,000	301,026,000	1,024
TIMAU	52,588	1,757	38,654,000	1,582	23,730,000	62,384,000	1,186
MERU TOTAL	1,755,587	67,876	1,503,472,000	34,535	518,025,000	2,021,497,000	1,151

DIVISION	Year 2013 Additional Population Covered	New Water Supplies		Rehabilitated Water Supplies		TOTAL COSTS (Ksh.)	TOTAL COSTS PER BENEFIC. (Ksh.)
		Capacity Developm. (m^3/day)	Total Cost (Ksh.)	Capacity Developm. (m^3/day)	Total Cost (Ksh.)		
C. IMENTI	342,098	17,037	374,814,000	7,090	106,350,000	481,164,000	1,407
IGEMBE	333,132	15,705	349,760,000	990	14,850,000	364,610,000	1,094
N. IMENTI	369,610	27,242	601,024,000	7,000	105,000,000	706,024,000	1,910
NITHI	546,922	32,845	722,590,000	9,597	143,955,000	866,545,000	1,584
NTONYIRI	200,392	15,073	340,106,000	1,410	21,150,000	361,256,000	1,803
S. IMENTI	398,169	25,547	562,034,000	6,149	92,235,000	654,269,000	1,643
THARAKA	152,965	8,413	185,086,000	0	0	185,086,000	1,210
TIGANIA	466,403	28,195	623,690,000	1,500	22,500,000	646,190,000	1,385
TIMAU	81,384	5,092	112,024,000	1,582	23,730,000	135,754,000	1,668
MERU TOTAL	2,891,075	175,149	3,871,128,000	35,318	529,770,000	4,400,898,000	1,522

7 RECOMMENDATIONS FOR IMPLEMENTATION OF PACKAGES

7.1 General Institutional Aspects

7.1.1 Introduction

The cost estimates described in Chapter 6 are the first step in the preparation of physical investments. In order to implement these investments significant institutional strengthening measures will be necessary. The required investments should include an indicative allowance for institution building and this institution building is described below. As set out in Paragraph 3.4, different approaches are possible with respect to the choice of roles for different organisations. These different roles imply different institutional strengthening measures.

It is necessary, then, to specify the roles each institution will play in any implementation of District Focus Policy in the Meru District. The roles chosen reflect the existing capacities and "orientation" of these organisations. In summary, they are:

- overall co-ordination with DDC, administration of project appraisal - DDO
- water resources planning - Central MoWD
- water project appraisal and water supply for urban centres (except Meru town) - District MoWD
- water supply for Meru town - Meru Municipal Council
- water supply for market centres and rural areas - community, assisted by District MoWD and NGOs.

Given these roles, the organisational strengthening required can be described.

7.1.2 Organisations

a) Central Ministry of Water Development (MoWD)

Water resources assessment and planning will remain a central MoWD function for the immediate future. The skills and facilities required will only be available, and the activity is better co-ordinated from, Nairobi. Despite significant progress in institutionalising this process, additional steps remain to be implemented. These are:

- additional formal and on-the-job training of MoWD staff in the Resources Assessment Section in techniques required, this training must be given to officers who will remain within the section for a sufficient time to train replacements

- additional and replacement of equipment (to be determined)

- additional (given existing zero capability) capacity and systems to strengthen District MoWD Offices in their role as semi-autonomous water supply agencies, specifically the ability to execute training in resources assessment, preparation of the DWDP, O&M procedures, environmental management, enforcement, financial systems management and techniques of community mobilisation; this

activity should be supported by improved information linkages between Central Office and District

- improve internal co-ordination between the RA Section and other sections of the MoWD especially with respect to pricing policy and planning of water resource usage in catchments, and

- improve links with other ministries and NGOs with respect to usage of water resources.

b) District Ministry of Water Development

The aim of the institutional strengthening of the District MoWD is to create, as far as is practical, an autonomous water agency focused on the District's needs. The key roles of the District MoWD will be:

- with Central MoWD support, preparation of DWDP

- support to DDO in appraisal of proposals for utilisation of water resources, and in preparing proposals for investment packages in conformity with the DWDP

- enforcement of environmental and resource allocation aspects of the DWDP

- efficient construction and/or operation and maintenance of "urban" water supply systems where required

- support to all other types of water supply systems through Local Government, Community groups and Water Associations in assessment, planning, design, implementation, project appraisal, community participation (through NGOs too) and financial systems

- training of trainers/training of Local Government/Community groups/Water Associations.

In order to fulfil these roles District MoWD will require:

- training in appraisal of proposals for utilisation of water resources

- training in methodology for the preparation of the DWDP

- training and resources to enforce the provisions of the DWDP

- training in support to all other types of water supply systems in assessment, planning, project appraisal, community participation and financial systems

- training to train members of Local Government/Community groups/Water Associations in these skills.

- legislation and/or regulations under the Water Act and possible revenue acts to enable the District Office to carry out the above roles

The efficient construction and/or operation and maintenance of "urban" water supply systems is constrained by two factors. These are:

1) Districts do have limited control of revenue collected from their systems. This provides no incentive for efficient operation of these systems at District level. The appropriation in aid policy has not yet had significant impact on this situation.

2) As a consequence, District Offices are over-staffed, under skilled, and under equipped.

The systems for giving the District such financial and administrative control are currently being developed. Support for their implementation is thus important.

c) Meru Municipal Council

Additional staff and training in operation and maintenance are required. Procedures for O&M need to be strengthened. Given the size of the distribution system in Meru town, full cost recovery (i.e. including capital costs) should be possible in the long run (say ten years). In the interim, recovery of O&M costs should be possible after several years (timing should be confirmed by feasibility studies). The systems being developed for the District, giving it clear financial and administrative control over financial matters should be adapted and introduced to the Council's water supply administration.

d) District Development Office

Current staffing of the District Office is adequate for required liaison activities. In order to strengthen the co-ordination role of the DDO, increased training of DDO staff in Water Resources Planning would be an asset. Such training should be part of a programme which would result in the officers trained remaining in positions where they could utilise such training, at least until they had a chance to train replacements.

In addition, some revision of the legal and/or administrative base for the DDC's oversight of water matters may be necessary.

e) Community Groups

While community participation in design, construction, operation and maintenance is possible within the cultural context of the Meru people, different parts of the District are capable of undertaking different levels of responsibility. Thus, close liaison with the chiefs and sub-chiefs will be necessary to understand the situation in a particular area. Initially, especially for small groups, full cost recovery (i.e. including capital costs) and autonomous administration of water systems, will not be possible. However, such policies should be objectives, and progressively introduced as the community moves towards a formal, money economy. The MoWD already carries out such activities on a limited scale.

7.2 Investment Funding

Implementation of an investment programme requires the acquisition of a source of funds for feasibility studies and for capital investment. This source may be, in addition to local or GOK funds, such agencies as the World Bank, the African Development Bank, NGOs, the EC, and many different bi-lateral donors.

Each of these organisations have different criteria for assessment of funding proposals, but there are many aspects of their assessment process in common.

7.3 Feasibility Studies

7.3.1 Introduction

Once the institutional strengthening arrangements are resolved in outline, and a likely source of funding identified, a detailed feasibility study must be undertaken for projects and programmes. This may in many cases as well encompass the design for the new water supply, enabling an efficient transition to implementation. Although detailed requirements of funding agencies will differ, the feasibility study should incorporate all the appraisal criteria set out in Paragraph 5.3 above. Each project within a package should be studied individually, and the institutional and financial impact of the whole programme on the organisations involved should be detailed separately.

7.3.2 Key Implementation Requirements

The study of alternative approaches to implementation of the project/programme should address several key issues. These are:

- technical soundness,
- social impact,
- institutional arrangements, including source of funds,
- financial/economic viability, including phasing of the project and
- recommended project priority where there is more than one project.

The basic methodologies for appraisal are set out in Chapter 5 above.

Additional institutional strengthening activities required for implementation but not covered in Paragraph 7.1 will include training counterpart staff of the MoWD to undertake their responsibilities in the feasibility study phase.

In addition to participation in the studies themselves, significant community strengthening activities in preparation for implementation are also required at feasibility phase. This entails information of and discussion with the population and assistance in the formation of (water) committees by the population.

7.4 Implementation

Implementation from feasibility phase onwards includes detailed design, construction and setting up routine operations. These phases contain many activities, each of which should be detailed in a project proposal (Appendix 6). These activities must be funded and monitored, and the structure of the organisation which is to co-ordinate the project package must be capable of:

- disbursing capital funds to recipients according to established procedures, and
- gathering and processing the required data for monitoring.

This will require training of staff, and additional equipment and resources if the MoWD is to take on this co-ordinating role.

Effective community participation in construction and operation will require a flexible approach to implementation on the part of the support organisations, principally the MoWD. Where local communities are not familiar with the requirements for management of formal sector organisations, such as a water supply, close contact over a prolonged period of time will be required to develop and refine workable systems. Adequate skills and resources for such an approach must be identified at feasibility phase and be in place for construction and operation phases.

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APPENDIX 1

DOMESTIC WATER SUPPLY DEVELOPMENT

APPENDIX 1

DOMESTIC WATER SUPPLY DEVELOPMENT

1. Demand year 1993 - Scenario 2
2. Demand year 2003 - Scenario 2
3. Demand year 2013 - Scenario 2

DOMESTIC WATER SUPPLY DEVELOPMENT MERU DISTRICT

LOCATION	1988 - Existing Situation: Total Population	Population Covered: Total	Population Covered: %	Existing Capacity: Good (m3/day)	Existing Capacity: To Rehab. (m3/day)	1993 - Scenario 2: Total Population	Required Capacity (m3/day)	REQUIRED DEVELOPMENT OF SUPPLIES: Additional Population Covered	Capacity Development: New (m3/day)	Capacity Development: Rehabilitat. (m3/day)
CENTRAL IMENTI										
ABOTHUGUCHI	36,294	12,900	36		1,470	45,231	1,577	32,331	107	1,470
GATIMBI	32,434	5,200	16		1,620	40,420	1,303	35,220	0	1,303
MWANGANTHIA	40,654	17,380	43		4,000	49,667	1,273	32,287	0	1,273
KIBIRICHIA	24,632	8,000	32	743		30,132	769	22,132	26	0
TOTAL	134,014	43,480	32	743	7,090	165,450	4,922	121,970	133	4,046
GEMBE										
KANGETA	16,358	6,000	37		120	19,523	434	13,523	314	120
KIEGOI	10,196	2,170	21	778		12,706	377	10,536	0	0
KAKACHIU	43,337	12,450	29	1,745	271	53,150	1,296	40,700	0	0
MAUA	33,704	13,200	39	1,594	429	42,194	1,340	28,994	0	0
UJIA	26,997	13,000	48	260	170	33,643	1,071	20,643	641	170
TOTAL	130,592	46,820	36	4,377	990	161,216	4,518	114,396	955	290
ORTH IMENTI										
IIRUA	22,070	9,600	43			26,987	855	17,387	855	0
UIRI	13,766	6,000	44			16,353	330	10,353	330	0
TIMA	60,978	27,290	45	60	5,600	73,847	4,432	46,557	0	4,372
YAKI	41,165	23,300	57	233	1,400	51,385	1,785	28,085	152	1,400
IAKI	15,218	7,000	46			18,302	412	11,302	412	0
TOTAL	153,197	73,190	48	293	7,000	186,874	7,814	113,684	1,749	5,772
ITHI										
AGUMONI	24,455	(19,000)	0		2,333	30,111	879	30,111	0	879
WONGE	16,039	6,400	40			19,930	642	13,530	642	0
ARINGANI	49,555	16,314	33	415	6,100	61,896	2,107	45,582	0	1,692
UTHAMBI	32,125	12,200	38	1,400	364	39,755	1,372	27,555	0	0
HOGORIA	31,277	13,600	43	1,335	800	39,363	1,579	25,763	0	244
IERA	38,986	11,000	28	1,200		48,000	1,358	37,000	158	0
ANJUKI	13,090		0			15,528	290	15,528	290	0
TOTAL	205,527	59,514	29	4,350	9,597	254,583	8,227	195,069	1,090	2,815
TONYIRI										
THIMA	44,643	39,000	87		680	53,430	1,204	14,430	524	680
UTUATI	39,146	34,000	87		530	46,406	854	12,406	324	530
NTUBETWE-KIONG	14,655	8,500	58		150	17,621	378	9,121	228	150
THIRU-RUUJINE	18,248	4,000	22	300	50	21,891	440	17,891	90	50
TOTAL	116,692	85,500	73	300	1,410	139,348	2,876	53,848	1,166	1,410

DOMESTIC WATER SUPPLY DEVELOPMENT MERU DISTRICT

LOCATION	1988 - Existing Situation: Total Population	Population Covered: Total	Population Covered: %	Existing Capacity: Good (m3/day)	Existing Capacity: To Rehab. (m3/day)	1993 - Scenario 2: Total Population	Required Capacity (m3/day)	REQUIRED DEVELOPMENT OF SUPPLIES: Additional Population Covered	Capacity Development: New (m3/day)	Capacity Development: Rehabilitat (m3/day)
SOUTH IMENTI										
IGOJI	19,446	10,000	51		1,400	24,142	840	14,142	0	840
MITINE	24,688	15,000	61		2,090	29,899	820	14,899	0	820
ABOGETA	16,076		0			20,034	646	20,034	646	0
IGOKI	12,461	3,180	26		430	15,529	501	12,349	71	430
NKUENE	40,434	10,795	27	216	743	51,521	2,197	40,726	1,238	743
MITUNGUU	15,137	5,500	36	374		18,500	465	13,000	91	0
KANYAKINE	21,326	10,200	48		1,486	26,401	842	16,201	0	842
TOTAL	149,568	54,675	37	590	6,149	186,026	6,311	131,351	2,046	3,675
THARAKA										
GIKINGO	11,003		0			12,820	189	12,820	189	0
MARIMANTI	29,307	3,000	10	50		34,705	645	31,705	595	0
N. THARAKA	13,683	3,000	22			16,067	258	13,067	258	0
S. THARAKA	18,625	7,750	42	250		22,067	439	14,317	189	0
TOTAL	72,618	13,750	19	300	0	85,659	1,531	71,909	1,231	0
TIGANIA										
MITUNTU	8,593	8,100	94	740		10,072	168	1,972	0	0
URINGU	16,361	6,600	40	300		20,337	653	13,737	353	0
MBEU	14,113		0			17,255	411	17,255	411	0
KIANJAI	23,256	12,000	52	629		28,770	919	16,770	290	0
AKITHII	36,131	19,600	54	1,510		42,589	726	22,989	0	0
MUTHARA	25,973	11,750	45	715		31,189	657	19,439	0	0
KARAMA	15,731	3,000	19	150		19,375	523	16,375	373	0
MIKINDURI	36,845	7,050	19		1,500	44,696	1,122	37,646	0	1,122
THANGATHA	26,152		0			31,798	762	31,798	762	0
	203,155	68,100	34	4,044	1,500	246,081	5,941	177,981	2,189	1,122
TIMAU										
ONTULILI	11,720	1,730	15	380	270	14,536	412	12,806	0	32
KIRIMARA	10,443	4,663	45	36	130	12,453	245	7,790	79	130
KISIMA	11,620	1,290	11		1,182	13,949	304	12,659	0	304
TOTAL	33,783	7,683	23	416	1,582	40,938	961	33,255	79	466
MERU TOTAL	1,199,146	452,712	38	15,413	35,318	1,466,175	43,101	1,013,463	10,638	19,596

Notes: 1. Existing capacity is not known accurately and also known for only part of the supplies.

DOMESTIC WATER SUPPLY DEVELOPMENT MERU DISTRICT

LOCATION	1988 - Existing Situation: Total Population	Population Covered: Total	Population Covered: %	Existing Capacity: Good (m3/day)	Existing Capacity: To Rehab. (m3/day)	2013 - Scenario 2: Total Population	Required Capacity (m3/day)	REQUIRED DEVELOPMENT OF SUPPLIES: Additional Population Covered	Capacity New (m3/day)	Development Rehabilitat. (m3/day)
CENTRAL IMENTI										
BOTHUGUCHI	36,294	12,900	36		1,470	109,084	6,794	96,184	5,324	1,470
ATIMBI	32,434	5,200	16		1,620	97,481	5,651	92,281	4,031	1,620
WANGANTHIA	40,654	17,380	43		4,000	111,149	4,872	93,769	872	4,000
IBIRICHIA	24,632	8,000	32	743		67,864	3,064	59,864	2,321	0
TOTAL	134,014	43,480	32	743	7,090	385,578	20,381	342,098	12,548	7,090
GEMBE										
NGETA	16,358	6,000	37		120	39,995	1,505	33,995	1,385	120
EGOI	10,196	2,170	21	778		30,643	1,643	28,473	865	0
ACHIU	43,337	12,450	29	1,745	271	120,397	5,066	107,947	3,050	271
UA	33,704	13,200	39	1,594	429	107,781	5,821	94,581	3,798	429
IA	26,997	13,000	48	260	170	81,136	4,695	68,136	4,265	170
TOTAL	130,592	46,820	36	4,377	990	379,952	18,730	333,132	13,363	990
NRTH IMENTI										
IRUA	22,070	9,600	43			60,798	3,459	51,198	3,459	0
IRI	13,766	6,000	44			32,734	1,056	26,734	1,056	0
IMA	60,978	27,290	45	60	5,600	185,778	15,539	158,488	9,879	5,600
AKI	41,165	23,300	57	233	1,400	124,802	7,422	101,502	5,789	1,400
AKI	15,218	7,000	46			38,688	1,531	31,688	1,531	0
TOTAL	153,197	73,190	48	293	7,000	442,800	29,007	369,610	21,714	7,000
THI										
GUMONI	24,455	(19,000)	0		2,333	69,462	3,563	69,462	1,230	2,333
ONGE	16,039	6,400	40			47,543	2,656	41,143	2,656	0
RINGANI	49,555	16,314	33	415	6,100	153,996	8,775	137,682	2,260	6,100
THAMBI	32,125	12,200	38	1,400	364	93,460	5,510	81,260	3,746	364
OGORIA	31,277	13,600	43	1,335	800	100,613	6,882	87,013	4,747	800
ERA	38,986	11,000	28	1,200		110,461	5,376	99,461	4,176	0
JUKI	13,090		0			30,901	907	30,901	907	0
TOTAL	205,527	59,514	29	4,350	9,597	606,436	33,669	546,922	19,722	9,597
NYIRI										
IMA	44,643	39,000	87		680	110,762	4,077	71,762	3,397	680
UATI	39,146	34,000	87		530	92,380	2,741	58,380	2,211	530
UBETWE-KIONG	14,655	8,500	58		150	37,033	1,236	28,533	1,086	150
IRU-RUUJINE	18,248	4,000	22	300	50	45,717	1,531	41,717	1,181	50
TOTAL	116,692	85,500	73	300	1,410	285,892	9,585	200,392	7,875	1,410

DOMESTIC WATER SUPPLY DEVELOPMENT MERU DISTRICT

LOCATION	1988 - Existing Situation: Total Population	Population Covered: Total	Population Covered: %	Existing Capacity: Good (m3/day)	Existing Capacity: To Rehab. (m3/day)	2013 - Scenario 2: Total Population	Required Capacity (m3/day)	REQUIRED DEVELOPMENT OF SUPPLIES: Additional Population Covered	Capacity Development: New (m3/day)	Capacity Development: Rehabilitat. (m3/day)
SOUTH IMENTI										
IGOJI	19,446	10,000	51		1,400	57,417	3,353	47,417	1,953	1,400
MITINE	24,688	15,000	61		2,090	64,995	3,004	49,995	914	2,090
ABOGETA	16,076		0			48,316	2,812	48,316	2,812	0
IGOKI	12,461	3,180	26		430	37,452	2,186	34,272	1,756	430
NKUENE	40,434	10,795	27	216	743	141,112	10,075	130,317	9,116	743
MITUNGUU	15,137	5,500	36	374		41,461	1,820	35,961	1,446	0
KANYAKINE	21,326	10,200	48		1,486	62,091	3,450	51,891	1,964	1,486
TOTAL	149,568	54,675	37	590	6,149	452,844	26,700	398,169	19,961	6,149
THARAKA										
GIKINGO	11,003		0			23,650	518	23,650	518	0
MARIMANTI	29,307	3,000	10	50		68,634	1,944	65,634	1,894	0
N. THARAKA	13,683	3,000	22			30,687	773	27,687	773	0
S. THARAKA	18,625	7,750	42	250		43,744	1,335	35,994	1,085	0
TOTAL	72,618	13,750	19	300	0	166,715	4,570	152,965	4,270	0
TIGANIA										
MITUNTU	8,593	8,100	94	700		19,122	485	11,022	0	0
URINGU	16,361	6,600	40	300		48,590	2,782	41,990	2,482	0
MBEU	14,113		0			38,574	1,546	38,574	1,546	0
KIANJAI	23,256	12,000	52	629		67,480	3,739	55,480	3,110	0
AKITHII	36,131	19,600	54	1,550		82,790	2,252	63,190	702	0
MUTHARA	25,973	11,750	45	715		65,630	2,505	53,880	1,790	0
KARAMA	15,731	3,000	19	150		44,822	2,163	41,822	2,013	0
MIKINDURI	36,845	7,050	19		1,500	97,743	4,269	90,693	2,769	1,500
THANGATHA	26,152		0			69,752	2,711	69,752	2,711	0
	203,155	68,100	34	4,044	1,500	534,503	22,452	466,403	17,123	1,500
TIMAU										
ONTULILI	11,720	1,730	15	380	270	34,418	1,756	32,688	1,106	270
KIRIMARA	10,443	4,663	45	36	130	25,351	815	20,688	649	130
KISIMA	11,620	1,290	11		1,182	29,298	1,177	28,008	0	1,177
TOTAL	33,783	7,683	23	416	1,582	89,067	3,748	81,384	1,755	1,577
MERU TOTAL	1,199,146	452,712	38	15,413	35,318	3,343,787	168,842	2,891,075	118,331	35,313

Notes: 1. Existing capacity is not known accurately and also known for only part of the supplies.

APPENDIX 2

DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT

APPENDIX 2

DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT

APPENDIX 2

DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT

1. Demand year 1993 - Scenario 2
2. Demand year 2003 - Scenario 2
3. Demand year 2013 - Scenario 2

MESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT MERU DISTRICT

CATION	1988 - Existing Situation: Total Population	Population Covered: Total	Population Covered: %	Existing Capacity: Good (m3/day)	Existing Capacity: To Rehab. (m3/day)	1993 - Scenario 2: Total Population	Required Capacity (m3/day)	REQUIRED DEVELOPMENT OF SUPPLIES: Additional Population Covered	Capacity New (m3/day)	Development Rehabilitat. (m3/day)
TRAL IMENTI										
THUGUCHI	36,294	12,900	36		1,470	45,231	2,195	32,331	725	1,470
IMBI	32,434	5,200	16		1,620	40,420	1,533	35,220	0	1,533
NGANTHIA	40,654	17,380	43		4,000	49,667	2,023	32,287	0	2,023
IRICHIA	24,632	8,000	32	743		30,132	1,102	22,132	359	0
TOTAL	134,014	43,480	32	743	7,090	165,450	6,853	121,970	1,084	5,026
MBE										
GETA	16,358	6,000	37		120	19,523	729	13,523	609	120
GOI	10,196	2,170	21	778		12,706	406	10,536	0	0
CHIU	43,337	12,450	29	1,745	271	53,150	1,457	40,700	0	0
A	33,704	13,200	39	1,594	429	42,194	1,540	28,994	0	0
A	26,997	13,000	48	260	170	33,643	1,229	20,643	799	170
TOTAL	130,592	46,820	36	4,377	990	161,216	5,361	114,396	1,408	290
TH IMENTI										
RUA	22,070	9,600	43			26,987	1,188	17,387	1,188	0
RI	13,766	6,000	44			16,353	792	10,353	792	0
MA	60,978	27,290	45	60	5,600	73,847	4,888	46,557	0	4,828
KI	41,165	23,300	57	233	1,400	51,385	2,318	28,085	685	1,400
KI	15,218	7,000	46			18,302	905	11,302	905	0
TOTAL	153,197	73,190	48	293	7,000	186,874	10,091	113,684	3,570	6,228
HI										
UMONI	24,455	(19,000)	0		2,333	30,111	1,213	30,111	0	1,213
NGE	16,039	6,400	40			19,930	776	13,530	776	0
NGANI	49,555	16,314	33	415	6,100	61,896	5,583	45,582	0	5,168
HAMBI	32,125	12,200	38	1,400	364	39,755	1,982	27,555	218	364
GORIA	31,277	13,600	43	1,335	800	39,363	1,898	25,763	0	563
RA	38,986	11,000	28	1,200		48,000	1,991	37,000	791	0
UKI	13,090		0			15,528	529	15,528	529	0
TOTAL	205,527	59,514	29	4,350	9,597	254,583	13,972	195,069	2,314	7,308
YIRI										
MA	44,643	39,000	87		680	53,430	2,710	14,430	2,030	680
ATI	39,146	34,000	87		530	46,406	1,037	12,406	507	530
BETWE-KIONG	14,655	8,500	58		150	17,621	765	9,121	615	150
RU-RUUJINE	18,248	4,000	22	300	50	21,891	675	17,891	325	50
TOTAL	116,692	85,500	73	300	1,410	139,348	5,187	53,848	3,477	1,410

DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT MERU DISTRICT

LOCATION	1988 - Existing Situation: Total Population	Population Covered: Total	Population Covered: %	Existing Capacity: Good (m3/day)	Existing Capacity: To Rehab. (m3/day)	1993 - Scenario 2: Total Population	Required Capacity (m3/day)	REQUIRED DEVELOPMENT OF SUPPLIES: Additional Population Covered	Capacity Development: New (m3/day)	Capacity Development: Rehabilitat (m3/day)
SOUTH IMENTI										
IGOJI	19,446	10,000	51		1,400	24,142	1,068	14,142	0	1,068
MITINE	24,688	15,000	61		2,090	29,899	1,065	14,899	0	1,065
ABOGETA	16,076		0			20,034	955	20,034	955	0
IGOKI	12,461	3,180	26		430	15,529	1,160	12,349	730	430
NKUENE	40,434	10,795	27	216	743	51,521	2,657	40,726	1,698	743
MITUNGUU	15,137	5,500	36	374		18,500	715	13,000	341	0
KANYAKINE	21,326	10,200	48		1,486	26,401	1,123	16,201	0	1,123
TOTAL	149,568	54,675	37	590	6,149	186,026	8,743	131,351	3,724	4,429
THARAKA										
GIKINGO	11,003		0			12,820	295	12,820	295	0
MARIMANTI	29,307	3,000	10	50		34,705	1,514	31,705	1,464	0
N. THARAKA	13,683	3,000	22			16,067	622	13,067	622	0
S. THARAKA	18,625	7,750	42	250		22,067	505	14,317	255	0
TOTAL	72,618	13,750	19	300	0	85,659	2,936	71,909	2,636	0
TIGANIA										
MITUNTU	8,593	8,100	94	740		10,072	271	1,972	0	0
URINGU	16,361	6,600	40	300		20,337	783	13,737	483	0
MBEU	14,113		0			17,255	644	17,255	644	0
KIANJAI	23,256	12,000	52	629		28,770	1,365	16,770	736	0
AKITHII	36,131	19,600	54	1,510		42,589	1,388	22,989	0	0
MUTHARA	25,973	11,750	45	715		31,189	2,484	19,439	1,769	0
KARAMA	15,731	3,000	19	150		19,375	531	16,375	381	0
MIKINDURI	36,845	7,050	19		1,500	44,696	1,388	37,646	0	1,388
THANGATHA	26,152		0			31,798	1,038	31,798	1,038	0
	203,155	68,100	34	4,044	1,500	246,081	9,892	177,981	5,051	1,388
TIMAU										
ONTULILI	11,720	1,730	15	380	270	14,536	572	12,806	0	192
KIRIMARA	10,443	4,663	45	36	130	12,453	408	7,790	242	130
KISIMA	11,620	1,290	11		1,182	13,949	1,120	12,659	0	1,120
TOTAL	33,783	7,683	23	416	1,582	40,938	2,100	33,255	242	1,442
MERU TOTAL	1,199,146	452,712	38	15,413	35,318	1,466,175	65,135	1,013,463	23,506	27,521

Notes: 1. Existing capacity is not known accurately and also known for only part of the supplies.

OMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT MERU DISTRICT

OCATION	1988 - Existing Situation: Total Population	Population Covered: Total	Population Covered: %	Existing Capacity: Good (m3/day)	Existing Capacity: To Rehab. (m3/day)	2003 - Scenario 2: Total Population	Required Capacity (m3/day)	REQUIRED DEVELOPMENT OF SUPPLIES: Additional Population Covered	Capacity Development: New (m3/day)	Capacity Development: Rehabilitat. (m3/day)
NTRAL IMENTI										
OTHUGUCHI	36,294	12,900	36		1,470	70,242	4,022	57,342	2,552	1,470
TIMBI	32,434	5,200	16		1,620	62,771	2,913	57,571	1,293	1,620
ANGANTHIA	40,654	17,380	43		4,000	74,238	3,548	56,858	0	3,548
BIRICHIA	24,632	8,000	32	743		45,175	2,003	37,175	1,260	0
TOTAL	134,014	43,480	32	743	7,090	252,426	12,486	208,946	5,105	6,638
EMBE										
NGETA	16,358	6,000	37		120	27,875	1,308	21,875	1,188	120
EGOI	10,196	2,170	21	778		19,732	790	17,562	0	0
ACHIU	43,337	12,450	29	1,745	271	79,975	2,728	67,525	712	271
UA	33,704	13,200	39	1,594	429	66,855	3,008	53,655	985	429
A	26,997	13,000	48	260	170	52,246	2,381	39,246	1,951	170
TOTAL	130,592	46,820	36	4,377	990	246,683	10,215	199,863	4,836	990
RTH IMENTI										
RUA	22,070	9,600	43			40,446	2,170	30,846	2,170	0
RI	13,766	6,000	44			23,114	1,323	17,114	1,323	0
MA	60,978	27,290	45	60	5,600	117,099	8,906	89,809	3,246	5,600
KI	41,165	23,300	57	233	1,400	80,074	4,255	56,774	2,622	1,400
KI	15,218	7,000	46			26,553	1,552	19,553	1,552	0
TOTAL	153,197	73,190	48	293	7,000	287,286	18,206	214,096	10,913	7,000
HI										
UMONI	24,455	(19,000)	0		2,333	45,703	2,207	45,703	0	2,207
NGE	16,039	6,400	40			30,779	1,439	24,379	1,439	0
INGANI	49,555	16,314	33	415	6,100	97,144	9,517	80,830	3,002	6,100
HAMBI	32,125	12,200	38	1,400	364	60,929	3,534	48,729	1,770	364
GORIA	31,277	13,600	43	1,335	800	62,657	3,613	49,057	1,478	800
RA	38,986	11,000	28	1,200		72,797	3,561	61,797	2,361	0
JUKI	13,090		0			21,883	903	21,883	903	0
TOTAL	205,527	59,514	29	4,350	9,597	391,892	24,774	332,378	10,953	9,471
NYIRI										
IMA	44,643	39,000	87		680	76,725	4,859	37,725	4,179	680
UATI	39,146	34,000	87		530	65,358	1,807	31,358	1,277	530
UBETWE-KIONG	14,655	8,500	58		150	25,515	1,297	17,015	1,147	150
IRU-RUUJINE	18,248	4,000	22	300	50	31,575	1,227	27,575	877	50
TOTAL	116,692	85,500	73	300	1,410	199,173	9,190	113,673	7,480	1,410

DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT MERU DISTRICT

LOCATION	1988 - Existing Situation: Total Population	Population Covered: Total	Population Covered: %	Existing Capacity: Good (m3/day)	Existing Capacity: To Rehab. (m3/day)	2003 - Scenario 2: Total Population	Required Capacity (m3/day)	REQUIRED DEVELOPMENT OF SUPPLIES: Additional Population Covered	Capacity Development: New (m3/day)	Capacity Development: Rehabilita (m3/day)
SOUTH IMENTI										
IGOJI	19,446	10,000	51		1,400	37,226	1,936	27,226	536	1,400
MITINE	24,688	15,000	61		2,090	43,995	1,885	28,995	0	1,885
ABOGETA	16,076		0			31,112	1,737	31,112	1,737	0
IGOKI	12,461	3,180	26		430	24,116	1,971	20,936	1,541	430
NKUENE	40,434	10,795	27	216	743	84,556	5,216	73,761	4,257	743
MITUNGUU	15,137	5,500	36	374		27,670	1,270	22,170	896	0
KANYAKINE	21,326	10,200	48		1,486	40,479	2,049	30,279	563	1,486
TOTAL	149,568	54,675	37	590	6,149	289,154	16,064	234,479	9,530	5,944
THARAKA										
GIKINGO	11,003		0			17,403	489	17,403	489	0
MARIMANTI	29,307	3,000	10	50		48,750	2,573	45,750	2,523	0
N. THARAKA	13,683	3,000	22			22,182	1,093	19,182	1,093	0
S. THARAKA	18,625	7,750	42	250		31,035	864	23,285	614	0
TOTAL	72,618	13,750	19	300	0	119,370	5,019	105,620	4,719	0
TIGANIA										
MITUNTU	8,593	8,100	94	740		13,860	455	5,760	0	0
URINGU	16,361	6,600	40	300		31,431	1,482	24,831	1,182	0
MBEU	14,113		0			25,793	1,140	25,793	1,140	0
KIANJAI	23,256	12,000	52	629		44,052	2,437	32,052	1,808	0
AKITHII	36,131	19,600	54	1,510		59,287	2,411	39,687	901	0
MUTHARA	25,973	11,750	45	715		45,142	4,448	33,392	3,733	0
KARAMA	15,731	3,000	19	150		29,442	1,056	26,442	906	0
MIKINDURI	36,845	7,050	19		1,500	65,973	2,542	58,923	1,042	1,500
THANGATHA	26,152		0			47,064	1,871	47,064	1,871	0
	203,155	68,100	34	4,044	1,500	362,044	17,842	293,944	12,583	1,500
TIMAU										
ONTULILI	11,720	1,730	15	380	270	22,362	1,047	20,632	397	270
KIRIMARA	10,443	4,663	45	36	130	17,739	715	13,076	549	130
KISIMA	11,620	1,290	11		1,182	20,170	1,993	18,880	811	1,182
TOTAL	33,783	7,683	23	416	1,582	60,271	3,755	52,588	1,757	1,582
MERU TOTAL	1,199,146	452,712	38	15,413	35,318	2,208,299	117,551	1,755,587	67,876	34,535

Notes: 1. Existing capacity is not known accurately and also known for only part of the supplies.

DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT MERU DISTRICT

LOCATION	1988 - Existing Situation: Total Population	Population Covered: Total	Population Covered: %	Existing Capacity: Good (m3/day)	Existing Capacity: To Rehab. (m3/day)	2013 - Scenario 2: Total Population	Required Capacity (m3/day)	REQUIRED DEVELOPMENT OF SUPPLIES: Additional Population Covered	Capacity New (m3/day)	Development Rehabilitat. (m3/day)
CENTRAL IMENTI										
ABOTHUGUCHI	36,294	12,900	36		1,470	109,084	8,149	96,184	6,679	1,470
GATIMBI	32,434	5,200	16		1,620	97,481	6,154	92,281	4,534	1,620
MWANGANTHIA	40,654	17,380	43		4,000	111,149	6,678	93,769	2,678	4,000
KIBIRICHIA	24,632	8,000	32	743		67,864	3,889	59,864	3,146	0
TOTAL	134,014	43,480	32	743	7,090	385,578	24,870	342,098	17,037	7,090
IGEMBE										
KANGETA	16,358	6,000	37		120	39,995	2,451	33,995	2,331	120
KIEGOI	10,196	2,170	21	778		30,643	1,708	28,473	930	0
AKACHIU	43,337	12,450	29	1,745	271	120,397	5,487	107,947	3,471	271
MAUA	33,704	13,200	39	1,594	429	107,781	6,385	94,581	4,362	429
NJIA	26,997	13,000	48	260	170	81,136	5,041	68,136	4,611	170
TOTAL	130,592	46,820	36	4,377	990	379,952	21,072	333,132	15,705	990
NORTH IMENTI										
IIRUA	22,070	9,600	43			60,798	4,295	51,198	4,295	0
UIRI	13,766	6,000	44			32,734	2,282	26,734	2,282	0
TIMA	60,978	27,290	45	60	5,600	185,778	16,539	158,488	10,879	5,600
YAKI	41,165	23,300	57	233	1,400	124,802	8,590	101,502	6,957	1,400
IAKI	15,218	7,000	46			38,688	2,829	31,688	2,829	0
TOTAL	153,197	73,190	48	293	7,000	442,800	34,535	369,610	27,242	7,000
ITHI										
AGUMONI	24,455	(19,000)	0		2,333	69,462	4,397	69,462	2,064	2,333
ONGE	16,039	6,400	40			47,543	2,950	41,143	2,950	0
RINGANI	49,555	16,314	33	415	6,100	153,996	16,515	137,682	10,000	6,100
THAMBI	32,125	12,200	38	1,400	364	93,460	6,890	81,260	5,126	364
OGORIA	31,277	13,600	43	1,335	800	100,613	7,582	87,013	5,447	800
ERA	38,986	11,000	28	1,200		110,461	6,881	99,461	5,681	0
NJUKI	13,090		0			30,901	1,577	30,901	1,577	0
TOTAL	205,527	59,514	29	4,350	9,597	606,436	46,792	546,922	32,845	9,597
ONYIRI										
HIMA	44,643	39,000	87		680	110,762	8,909	71,762	8,229	680
TUATI	39,146	34,000	87		530	92,380	3,327	58,380	2,797	530
TUBETWE-KIONG	14,655	8,500	58		150	37,033	2,264	28,533	2,114	150
IRU-RUUJINE	18,248	4,000	22	300	50	45,717	2,283	41,717	1,933	50
TOTAL	116,692	85,500	73	300	1,410	285,892	16,783	200,392	15,073	1,410

DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT MERU DISTRICT

LOCATION	1988 - Existing Situation: Total Population	Population Covered: Total	Population Covered: %	Existing Capacity: Good (m3/day)	Existing Capacity: To Rehab. (m3/day)	2013 - Scenario 2: Total Population	Required Capacity (m3/day)	REQUIRED DEVELOPMENT OF SUPPLIES: Additional Population Covered	Capacity Development: New (m3/day)	Capacity Development: Rehabilitat. (m3/day)
SOUTH IMENTI										
IGOJI	19,446	10,000	51		1,400	57,417	3,854	47,417	2,454	1,400
MITINE	24,688	15,000	61		2,090	64,995	3,662	49,995	1,572	2,090
ABOGETA	16,076		0			48,316	3,489	48,316	3,489	0
IGOKI	12,461	3,180	26		430	37,452	3,632	34,272	3,202	430
NKUENE	40,434	10,795	27	216	743	141,112	11,082	130,317	10,123	743
MITUNGUU	15,137	5,500	36	374		41,461	2,430	35,961	2,056	0
KANYAKINE	21,326	10,200	48		1,486	62,091	4,137	51,891	2,651	1,486
TOTAL	149,568	54,675	37	590	6,149	452,844	32,286	398,169	25,547	6,149
THARAKA										
GIKINGO	11,003		0			23,650	857	23,650	857	0
MARIMANTI	29,307	3,000	10	50		68,634	4,502	65,634	4,452	0
N. THARAKA	13,683	3,000	22			30,687	1,816	27,687	1,816	0
S. THARAKA	18,625	7,750	42	250		43,744	1,538	35,994	1,288	0
TOTAL	72,618	13,750	19	300	0	166,715	8,713	152,965	8,413	0
TIGANIA										
MITUNTU	8,593	8,100	94	740		19,122	815	11,022	75	0
URINGU	16,361	6,600	40	300		48,590	3,068	41,990	2,768	0
MBEU	14,113		0			38,574	2,165	38,574	2,165	0
KIANJAI	23,256	12,000	52	629		67,480	4,765	55,480	4,136	0
AKITHII	36,131	19,600	54	1,510		82,790	4,376	63,190	2,866	0
MUTHARA	25,973	11,750	45	715		65,630	7,900	53,880	7,185	0
KARAMA	15,731	3,000	19	150		44,822	2,181	41,822	2,031	0
MIKINDURI	36,845	7,050	19		1,500	97,743	4,966	90,693	3,466	1,500
THANGATHA	26,152		0			69,752	3,503	69,752	3,503	0
	203,155	68,100	34	4,044	1,500	534,503	33,739	466,403	28,195	1,500
TIMAU										
ONTULILI	11,720	1,730	15	380	270	34,418	2,107	32,688	1,457	270
KIRIMARA	10,443	4,663	45	36	130	25,351	1,315	20,688	1,149	130
KISIMA	11,620	1,290	11		1,182	29,298	3,668	28,008	2,486	1,182
TOTAL	33,783	7,683	23	416	1,582	89,067	7,090	81,384	5,092	1,582
MERU TOTAL	1,199,146	452,712	38	15,413	35,318	3,343,787	225,880	2,891,075	175,149	35,318

Notes: 1. Existing capacity is not known accurately and also known for only part of the supplies.

APPENDIX 3

IRRIGATION WATER AVAILABILITY

WATER RESOURCES ASSESSMENT & PLANNING PROJECT MERU DISTRICT STUDY

LOCATION	Available for Irrigation m3/day	Irrig. Water Requirement m3/ha/year	Coverage in % of Area	Total Area km2	Land Potential in % of Total Locational Area High	Medium	Low	Coverage in hectares High	Medium	Low
CENTRAL IMENTI										
ABOTHUGUCHI	37,621	6,000	15.4	62	100	0	0	954		
GATIMBI	18,450	7,000	7.0	57	100	0	0	401		
MWANGANTHIA	61,447	10,000	4.2	225	20	61	19	935		
KIBIRICHIA	26,232	10,000	3.0	131	40	40	20	399		
TOTAL	143,750		5.7	475	46	40	15	2,688		
IGEMBE										
KANGETA	3,076	12,000	0.3	112	25	20	55	39		
KIEGOI	1,627	10,000	1.3	19	100	0	0	25		
AKACHIU	37,289	13,000	2.2	195	26	74	0	436		
MAUA	29,502	15,000	1.5	193	6	47	47	299		
NJIA	2,206	12,000	0.2	115	100	0	0	28		
TOTAL	73,700		1.3	634	35	41	24	827	0	
NORTH IMENTI										
KIIRUA	3,636	12,000	0.4	114	40	24	36	46		
RUIRI	4,378	13,000	0.3	148	0	50	50	0	51	
NTIMA	16,106	7,000	6.7	52	100	0	0	350		
NYAKI	14,364	9,000	2.3	107	100	0	0	243		
GIAKI	38,568	10,000	6.5	90	30	25	45	587		
TOTAL	77,050		2.5	511	45	24	30	1,225	51	
NITHI										
MAGUMONI	50,846	8,000	9.1	106	30	50	20	967		
MWONGE	10,176	7,000	10.0	22	85	15	0	221		
KARINGANI	66,961	8,000	8.1	158	42	58	0	1,273		
MUTHAMBI	53,155	8,000	12.3	82	64	28	8	1,010		
CHOGORIA	37,963	7,000	14.2	58	100	0	0	825		
KIERA	87,594	9,000	10.8	137	30	70	0	1,480		
KANJUKI	100,006	12,000	10.1	126	0	47	53	0	1,267	
TOTAL	406,700		10.2	689	39	47	14	5,776	1,267	0
NTONYIRI										
ITHIMA	6,000	14,000	0.1	500	30	20	50	65		
MUTUATI	8,800	15,000	0.1	627	12	23	65	89		
ANTUBETWE-KION	950	16,000	0.1	89	10	60	30	9		
ATHIRU-RUUJINE	1,000	14,000	0.1	109	20	40	40	11		
TOTAL	16,750		0.1	1,325	19	26	55	174		

WATER RESOURCES ASSESSMENT & PLANNING PROJECT MERU DISTRICT STUDY

LOCATION	Available for Irrigation m3/day	Irrig. Water Requirement m3/ha/year	Coverage in % of Area	Total Area km2	Land Potential in % of Total Locational Area High	Medium	Low	Coverage in hectares High	Medium	Low
SOUTH IMENTI										
IGOJI	22,657	7,000	13.3	37	88	12	0	492		
MITINE	52,662	7,000	13.3	86	57	20	23	1,144		
ABOGETA	33,305	7,000	14.8	49	100	0	0	724		
IGOKI	23,269	7,000	13.3	38	100	0	0	506		
NKUENE	35,316	7,000	13.2	58	100	0	0	767		
MITUNGUU	45,314	9,000	10.3	74	24	56	20	766		
KANYAKINE	39,478	8,000	11.9	63	51	49	0	750		
TOTAL	252,000		12.7	405	68	23	9	5,149	0	
THARAKA										
GIKINGO	41,530	16,000	2.2	183	0	10	90	0	395	
MARIMANTI	83,061	14,000	2.5	366	0	45	55	0	902	
N. THARAKA	137,300	16,000	2.2	605	0	27	73	0	1,305	
S. THARAKA	69,309	13,000	3.3	249	0	38	62	0	811	
TOTAL	331,200		2.4	1,403	0	31	69	0	3,413	0
TIGANIA										
MITUNTU	11,764	14,000	2.0	65	5	15	80	128		
URINGU	4,973	10,000	1.1	68	87	13	0	76		
MBEU	17,291	10,000	5.1	52	20	80	0	263		
KIANJAI	10,745	10,000	4.4	37	62	38	0	163		
AKITHII	20,482	10,000	4.4	71	10	19	71	311		
MUTHARA	23,900	12,000	3.4	88	40	12	48	303		
KARAMA	5,691	12,000	1.8	41	70	20	10	72		
MIKINDURI	25,109	10,000	4.2	91	44	29	27	382		
THANGATHA	42,445	13,000	3.4	147	7	67	26	497		
	162,400		3.3	660	33	35	32	2,195	0	
TIMAU										
ONTULILI	18,959	9,000	1.5	207	80	20	0	320		
KIRIMARA	15,845	9,000	1.5	173	10	42	48	268		
KISIMA	24,896	9,000	1.1	381	40	25	35	421		
TOTAL	59,700		1.3	761	44	28	28	1,009	0	
MERU TOTAL	1,523,250		3.5	6,863				19,043	4,732	

APPENDIX 4

COST ESTIMATE

OF

DOMESTIC WATER SUPPLY DEVELOPMENT

APPENDIX 4

COST ESTIMATE

OF

DOMESTIC WATER SUPPLY DEVELOPMENT

1. Demand year 1993 - Scenario 2
2. Demand year 2003 - Scenario 2
3. Demand year 2013 - Scenario 2

T ESTIMATE OF DOMESTIC WATER SUPPLY DEVELOPMENT - 1993 MERU DISTRICT

	Year 1993 Additional Population Covered	New Water Supplies Capacity Developm. (m3/day)	Water Source	Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	Rehabilitated Water Supplies Capacity Developm. (m3/day)	Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	TOTAL COSTS (Ksh.)	TOTAL COSTS PER BENEFIC. (Ksh.)
ATION										
RAL IMENTI										
HUGUCHI	32,331	107	S	22,000	2,354,000	1,470	15,000	22,050,000	24,404,000	755
MBI	35,220	0	S	22,000	0	1,303	15,000	19,545,000	19,545,000	555
GANTHIA	32,287	0	S	22,000	0	1,273	15,000	19,095,000	19,095,000	591
RICHIA	22,132	26	S	22,000	572,000	0			572,000	26
TOTAL	121,970	133			2,926,000	4,046		60,690,000	63,616,000	522
BE										
ETA	13,523	314	S	22,000	6,908,000	120	15,000	1,800,000	8,708,000	644
OI	10,536	0	S	22,000	0	0			0	0
HIU	40,700	0	S	22,000	0	0	15,000	0	0	0
	28,994	0	S	22,000	0	0	15,000	0	0	0
	20,643	641	S	22,000	14,102,000	170	15,000	2,550,000	16,652,000	807
TOTAL	114,396	955			21,010,000	290		4,350,000	25,360,000	222
H IMENTI										
UA	17,387	855	S	22,000	18,810,000	0			18,810,000	1,082
	10,353	330	S	22,000	7,260,000	0			7,260,000	701
A	46,557	0	S	22,000	0	4,372	15,000	65,580,000	65,580,000	1,409
	28,085	152	S	22,000	3,344,000	1,400	15,000	21,000,000	24,344,000	867
	11,302	412	S	22,000	9,064,000	0			9,064,000	802
TOTAL	113,684	1,749			38,478,000	5,772		86,580,000	125,058,000	1,100
MONI	30,111	0	S	22,000	0	879	15,000	13,185,000	13,185,000	438
GE	13,530	642	S	22,000	14,124,000	0			14,124,000	1,044
NGANI	45,582	0	S	22,000	0	1,692	15,000	25,380,000	25,380,000	557
MBI	27,555	0	S	22,000	0	0	15,000	0	0	0
RIA	25,763	0	S	22,000	0	244	15,000	3,660,000	3,660,000	142
	37,000	158	S	22,000	3,476,000	0			3,476,000	94
KI	15,528	290	S	22,000	6,380,000	0			6,380,000	411
OTAL	195,069	1,090			23,980,000	2,815		42,225,000	66,205,000	339
IRI										
A	14,430	264	S	22,000	5,808,000	680	15,000	10,200,000	16,008,000	1,109
		260	GW	23,700	6,162,000				6,162,000	427
TI	12,406	324	S	22,000	7,128,000	530	15,000	7,950,000	15,078,000	1,215
ETWE-K.	9,121	228	S	22,000	5,016,000	150	15,000	2,250,000	7,266,000	797
U-RUUJ.	17,891	90	S	22,000	1,980,000	50	15,000	750,000	2,730,000	153
OTAL	53,848	1,166			26,094,000	1,410		21,150,000	47,244,000	877

COST ESTIMATE OF DOMESTIC WATER SUPPLY DEVELOPMENT - 1993 MERU DISTRICT

LOCATION	Year 1993 Additional Population Covered	New Water Supplies Capacity Developm. (m3/day)	Water Source	Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	Rehabilitated Water Supplies Capacity Developm. (m3/day)	Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	TOTAL COSTS (Ksh.)	TOTAL COSTS PE BENEFIC (Ksh.)
SOUTH IMENTI										
IGOJI	14,142	0	S	22,000	0	840	15,000	12,600,000	12,600,000	891
MITINE	14,899	0	S	22,000	0	820	15,000	12,300,000	12,300,000	826
ABOGETA	20,034	646	S	22,000	14,212,000	0			14,212,000	709
IGOKI	12,349	71	S	22,000	1,562,000	430	15,000	6,450,000	8,012,000	649
NKUENE	40,726	1,238	S	22,000	27,236,000	743	15,000	11,145,000	38,381,000	942
MITUNGUU	13,000	91	S	22,000	2,002,000	0			2,002,000	154
KANYAKINE	16,201	0	S	22,000	0	842	15,000	12,630,000	12,630,000	780
TOTAL	131,351	2,046			45,012,000	3,675		55,125,000	100,137,000	762
THARAKA										
GIKINGO	12,820	189	S	22,000	4,158,000	0			4,158,000	324
MARIMANTI	31,705	595	S	22,000	13,090,000	0			13,090,000	413
N. THARAKA	13,067	258	S	22,000	5,676,000	0	15,000	0	5,676,000	434
S. THARAKA	14,317	189	S	22,000	4,158,000	0			4,158,000	290
TOTAL	71,909	1,231			27,082,000	0		0	27,082,000	377
TIGANIA										
MITUNTU	1,972	0	S	22,000	0	0			0	0
URINGU	13,737	0	S	22,000	0	0			0	0
		353	Gw	23,700	8,366,100				8,366,100	609
MBEU	17,255	411	S	22,000	9,042,000	0			9,042,000	524
KIANJAI	16,770	290	S	22,000	6,380,000	0			6,380,000	380
AKITHII	22,989	0	S	22,000	0	0			0	0
MUTHARA	19,439	0	S	22,000	0	0			0	0
KARAMA	16,375	373	S	22,000	8,206,000	0			8,206,000	501
MIKINDURI	37,646	0	S	22,000	0	1,122	15,000	16,830,000	16,830,000	447
THANGATHA	31,798	762	S	22,000	16,764,000	0			16,764,000	527
	177,981	2,189			48,758,100	1,122		16,830,000	65,588,100	369
TIMAU										
ONTULILI	12,806	0	S	22,000	0	32	15,000	480,000	480,000	37
KIRIMARA	7,790	79	S	22,000	1,738,000	130	15,000	1,950,000	3,688,000	473
KISIMA	12,659	0	S	22,000	0	304	15,000	4,560,000	4,560,000	360
TOTAL	33,255	79			1,738,000	466		6,990,000	8,728,000	262
MERU TOTAL	1,013,463	10,638			235,078,100	19,596		293,940,000	529,018,100	522

Notes: Gw = Groundwater
S = Surface Water or Spring

T ESTIMATE OF DOMESTIC WATER SUPPLY DEVELOPMENT - 2003 MERU DISTRICT

ATION	Year 2003 Additional Population Covered	New Capacity Developm. (m3/day)	Water Source	Water Supplies Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	Rehabilitated Water Supplies Capacity Developm. (m3/day)	Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	TOTAL COSTS (Ksh.)	TOTAL COSTS PER BENEFIC. (Ksh.)
RAL IMENTI										
HUGUCHI	57,342	1,637	S	22,000	36,014,000	1,470	15,000	22,050,000	58,064,000	1,013
MBI	57,571	952	S	22,000	20,944,000	1,620	15,000	24,300,000	45,244,000	786
GANTHIA	56,858	0	S	22,000	0	2,385	15,000	35,775,000	35,775,000	629
RICHIA	37,175	738	S	22,000	16,236,000	0			16,236,000	437
TOTAL	208,946	3,327			73,194,000	5,475		82,125,000	155,319,000	743
BE										
ETA	21,875	509	S	22,000	11,198,000	120	15,000	1,800,000	12,998,000	594
		150	Gw	23,700	3,555,000				3,555,000	163
OI	17,562	0	S	22,000	0	0			0	0
HIU	67,525	452	S	22,000	9,944,000	271	15,000	4,065,000	14,009,000	207
	53,655	650	S	22,000	14,300,000	429	15,000	6,435,000	20,735,000	386
	39,246	718	S	22,000	15,796,000	170	15,000	2,550,000	18,346,000	467
		1,000	Gw	23,700	23,700,000				23,700,000	604
TOTAL	199,863	3,479			78,493,000	990		14,850,000	93,343,000	467
H IMENTI										
UA	30,846	1,144	S	22,000	25,168,000	0			25,168,000	816
		500	Gw	23,700	11,850,000				11,850,000	384
	17,114	371	S	22,000	8,162,000	0			8,162,000	477
		200	Gw	23,700	4,740,000				4,740,000	277
A	89,809	2,571	S	22,000	56,562,000	5,600	15,000	84,000,000	140,562,000	1,565
	56,774	1,833	S	22,000	40,326,000	1,400	15,000	21,000,000	61,326,000	1,080
	19,553	756	S	22,000	16,632,000	0			16,632,000	851
TOTAL	214,096	7,375			163,440,000	7,000		105,000,000	268,440,000	1,254
ONI	45,703	0	S	22,000	0	1,680	15,000	25,200,000	25,200,000	551
E	24,379	1,241	S	22,000	27,302,000	0			27,302,000	1,120
GANI	80,830	0	S	22,000	0	3,716	15,000	55,740,000	55,740,000	690
MBI	48,729	852	S	22,000	18,744,000	364	15,000	5,460,000	24,204,000	497
RIA	49,057	1,005	S	22,000	22,110,000	800	15,000	12,000,000	34,110,000	695
	61,797	1,386	S	22,000	30,492,000	0			30,492,000	493
KI	21,883	503	S	22,000	11,066,000	0			11,066,000	506
OTAL	332,378	4,987			109,714,000	6,560		98,400,000	208,114,000	626

COST ESTIMATE OF DOMESTIC WATER SUPPLY DEVELOPMENT - 2003 MERU DISTRICT

LOCATION	Year 2003 Additional Population Covered	New Water Supplies Capacity Developm. (m3/day)	Water Source	Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	Rehabilitated Water Supplies Capacity Developm. (m3/day)	Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	TOTAL COSTS (Ksh.)	TOTAL COSTS BENEF (Ksh.
NTONYIRI										
ITHIMA	37,725	781	S	22,000	17,182,000	680	15,000	10,200,000	27,382,000	726
		700	Gw	23,700	16,590,000				16,590,000	440
MUTUATI	31,358	450	S	22,000	9,900,000	530	15,000	7,950,000	17,850,000	569
		500	Gw	23,700	11,850,000				11,850,000	378
ANTUBETWE-KIO	17,015	315	S	22,000	6,930,000	150	15,000	2,250,000	9,180,000	540
		200	Gw	23,700	4,740,000				4,740,000	279
ATHIRU-RUUJIN	27,575	457	S	22,000	10,054,000	50	15,000	750,000	10,804,000	392
		0	Gw	23,700	0				0	0
TOTAL	113,673	3,403			77,246,000	1,410		21,150,000	98,396,000	866
SOUTH IMENTI										
IGOJI	27,226	198	S	22,000	4,356,000	1,400	15,000	21,000,000	25,356,000	931
MITINE	28,995	0	S	22,000	0	1,485	15,000	22,275,000	22,275,000	768
ABOGETA	31,112	1,279	S	22,000	28,138,000	0			28,138,000	904
IGOKI	20,936	565	S	22,000	12,430,000	430	15,000	6,450,000	18,880,000	902
NKUENE	73,761	3,577	S	22,000	78,694,000	743	15,000	11,145,000	89,839,000	1,218
MITUNGUU	22,170	506	S	22,000	11,132,000	0			11,132,000	502
KANYAKINE	30,279	124	S	22,000	2,728,000	1,486	15,000	22,290,000	25,018,000	826
TOTAL	234,479	6,249			137,478,000	5,544		83,160,000	220,638,000	94
THARAKA										
GIKINGO	17,403	300	S	22,000	6,600,000	0			6,600,000	379
MARIMANTI	45,750	1,034	S	22,000	22,748,000	0			22,748,000	497
N. THARAKA	19,182	441	S	22,000	9,702,000	0	15,000	0	9,702,000	506
S. THARAKA	23,285	498	S	22,000	10,956,000	0			10,956,000	471
TOTAL	105,620	2,273			50,006,000	0		0	50,006,000	473
TIGANIA										
MITUNTU	5,760	0	S	22,000	0	0			0	
URINGU	24,831	188	S	22,000	4,136,000	0			4,136,000	161
		800	Gw	23,700	18,960,000				18,960,000	764
MBEU	25,793	760	S	22,000	16,720,000	0			16,720,000	648
KIANJAI	32,052	1,132	S	22,000	24,904,000	0			24,904,000	771
AKITHII	39,687	0	S	22,000	0	0			0	
MUTHARA	33,392	514	S	22,000	11,308,000	0			11,308,000	339
KARAMA	26,442	894	S	22,000	19,668,000	0			19,668,000	744
MIKINDURI	58,923	614	S	22,000	13,508,000	1,500	15,000	22,500,000	36,008,000	611
THANGATHA	47,064	1,404	S	22,000	30,888,000	0			30,888,000	656
	293,944	6,306			140,092,000	1,500		22,500,000	162,592,000	551

ESTIMATE OF DOMESTIC WATER SUPPLY DEVELOPMENT - 2003 MERU DISTRICT

ION	Year 2003 Additional Population Covered	New Water Supplies Capacity Developm. (m3/day)	Water Source	Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	Rehabilitated Water Supplies Capacity Developm. (m3/day)	Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	TOTAL COSTS (Ksh.)	TOTAL COSTS PER BENEFIC. (Ksh.)
ILI	20,632	160	S	22,000	3,520,000	270	15,000	4,050,000	7,570,000	367
ARA	13,076	264	S	22,000	5,808,000	130	15,000	1,950,000	7,758,000	593
A	18,880	0	S	22,000	0	570	15,000	8,550,000	8,550,000	453
OTAL	52,588	424			9,328,000	970		14,550,000	23,878,000	454
TOTAL	1,755,587	37,823			838,991,000	29,449		441,735,000	1,280,726,000	730

GW = Groundwater
S = Surface Water or Spring

COST ESTIMATE OF DOMESTIC WATER SUPPLY DEVELOPMENT - 2013 MERU DISTRICT

LOCATION	Year 2013 Additional Population Covered	New Water Supplies Capacity Developm. (m3/day)	Water Source	Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	Rehabilitated Water Supplies Capacity Developm. (m3/day)	Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	TOTAL COSTS (Ksh.)	TOTAL COSTS BENEF (Ksh.
CENTRAL IMENTI										
ABOTHUGUCHI	96,184	5,324	S	22,000	117,128,000	1,470	15,000	22,050,000	139,178,000	1,44
GATIMBI	92,281	4,031	S	22,000	88,682,000	1,620	15,000	24,300,000	112,982,000	1,22
MWANGANTHIA	93,769	872	S	22,000	19,184,000	4,000	15,000	60,000,000	79,184,000	84
KIBIRICHIA	59,864	2,321	S	22,000	51,062,000	0			51,062,000	85
TOTAL	342,098	12,548			276,056,000	7,090		106,350,000	382,406,000	1,11
IGEMBE										
KANGETA	35,995	885	S	22,000	19,470,000	120	15,000	1,800,000	21,270,000	62
		500	Gw	23,700	11,850,000				11,850,000	34
KIEGOI	28,473	865	S	22,000	19,030,000	0			19,030,000	66
AKACHIU	107,947	3,050	S	22,000	67,100,000	271	15,000	4,065,000	71,165,000	65
MAUA	94,581	3,796	S	22,000	83,556,000	429	15,000	6,435,000	89,991,000	95
NJIA	68,136	2,265	S	22,000	49,830,000	170	15,000	2,550,000	52,380,000	76
		2,000	Gw	23,700	47,400,000				47,400,000	69
TOTAL	333,132	13,363			298,236,000	990		14,850,000	313,086,000	94
NORTH IMENTI										
KIIRUA	51,198	2,959	S	22,000	65,098,000	0			65,098,000	1,27
		500	Gw	23,700	11,850,000				11,850,000	23
RUIRI	26,734	556	S	22,000	12,232,000	0			12,232,000	45
		500	Gw	23,700	11,850,000				11,850,000	44
NTIMA	158,488	9,879	S	22,000	217,338,000	5,600	15,000	84,000,000	301,338,000	1,90
NYAKI	101,502	5,789	S	22,000	127,358,000	1,400	15,000	21,000,000	148,358,000	1,46
GIAKI	31,686	1,531	S	22,000	33,682,000	0			33,682,000	1,06
TOTAL	369,610	21,714			479,408,000	7,000		105,000,000	584,408,000	1,58
NITHI										
MAGUMONI	69,462	1,230	S	22,000	27,060,000	2,333	15,000	34,995,000	62,055,000	89
MWONGE	41,143	2,656	S	22,000	58,432,000	0			58,432,000	1,42
KARINGANI	137,682	2,260	S	22,000	49,720,000	6,100	15,000	91,500,000	141,220,000	1,02
MUTHAMBI	81,260	3,746	S	22,000	82,412,000	364	15,000	5,460,000	87,872,000	1,08
CHOGORIA	87,013	4,747	S	22,000	104,434,000	800	15,000	12,000,000	116,434,000	1,33
KIERA	99,461	4,176	S	22,000	91,872,000	0			91,872,000	92
KANJUKI	30,901	907	S	22,000	19,954,000	0			19,954,000	64
TOTAL	546,922	19,722			433,884,000	9,597		143,955,000	577,839,000	1,05

COST ESTIMATE OF DOMESTIC WATER SUPPLY DEVELOPMENT - 2013 MERU DISTRICT

LOCATION	Year 2013 Additional Population Covered	New Water Supplies Capacity Developm. (m3/day)	Water Source	Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	Rehabilitated Water Supplies Capacity Developm. (m3/day)	Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	TOTAL COSTS (Ksh.)	TOTAL COSTS PER BENEFIC. (Ksh.)
NTONYIRI										
ITHIMA	71,762	1,397	S	22,000	30,734,000	680	15,000	10,200,000	40,934,000	570
		2,000	Gw	23,700	47,400,000				47,400,000	661
MUTUATI	58,380	1,211	S	22,000	26,642,000	530	15,000	7,950,000	34,592,000	593
		1,000	Gw	23,700	23,700,000				23,700,000	406
ANTUBETWE-KIO	28,533	586	S	22,000	12,892,000	150	15,000	2,250,000	15,142,000	531
		500	Gw	23,700	11,850,000				11,850,000	415
ATHIRU-RUUJIN	41,717	681	S	22,000	14,982,000	50	15,000	750,000	15,732,000	377
		500	Gw	23,700	11,850,000				11,850,000	284
TOTAL	200,392	7,875			180,050,000	1,410		21,150,000	201,200,000	1,004
SOUTH IMENTI										
IGOJI	47,417	1,953	S	22,000	42,966,000	1,400	15,000	21,000,000	63,966,000	1,349
MITINE	49,995	914	S	22,000	20,108,000	2,090	15,000	31,350,000	51,458,000	1,029
ABOGETA	48,316	2,812	S	22,000	61,864,000	0			61,864,000	1,280
IGOKI	34,272	1,756	S	22,000	38,632,000	430	15,000	6,450,000	45,082,000	1,315
NKUENE	130,317	9,116	S	22,000	200,552,000	743	15,000	11,145,000	211,697,000	1,624
MITUNGUU	35,961	1,446	S	22,000	31,812,000	0			31,812,000	885
KANYAKINE	51,891	1,964	S	22,000	43,208,000	1,486	15,000	22,290,000	65,498,000	1,262
TOTAL	398,169	19,961			439,142,000	6,149		92,235,000	531,377,000	1,335
THARAKA										
GIKINGO	23,650	518	S	22,000	11,396,000	0			11,396,000	482
MARIMANTI	65,634	1,894	S	22,000	41,668,000	0			41,668,000	635
N. THARAKA	27,687	773	S	22,000	17,006,000	0	15,000	0	17,006,000	614
S. THARAKA	35,994	1,085	S	22,000	23,870,000	0			23,870,000	663
TOTAL	152,965	4,270			93,940,000	0		0	93,940,000	614
IGANIA										
MITUNTU	11,022	0	S	22,000	0	0			0	0
URINGU	41,990	482	S	22,000	10,604,000	0			10,604,000	253
		2,000	Gw	23,700	47,400,000				47,400,000	1,129
BEU	38,574	1,546	S	22,000	34,012,000	0			34,012,000	882
IANJAI	55,480	3,110	S	22,000	68,420,000	0			68,420,000	1,233
KITHII	63,190	702	S	22,000	15,444,000	0			15,444,000	244
UTHARA	53,880	1,790	S	22,000	39,380,000	0			39,380,000	731
ARAMA	41,822	2,013	S	22,000	44,286,000	0			44,286,000	1,059
IKINDURI	90,693	2,769	S	22,000	60,918,000	1,500	15,000	22,500,000	83,418,000	920
HANGATHA	69,752	2,711	S	22,000	59,642,000	0			59,642,000	855
	466,403	17,123			380,106,000	1,500		22,500,000	402,606,000	863

COST ESTIMATE OF DOMESTIC WATER SUPPLY DEVELOPMENT - 2013 MERU DISTRICT

LOCATION	Year 2013 Additional Population Covered	New Water Supplies Capacity Developm. (m3/day)	Water Source	Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	Rehabilitated Water Supplies Capacity Developm. (m3/day)	Unit Cost (Ksh. per m3/day)	Total Cost (Ksh.)	TOTAL COSTS (Ksh.)	TOTAL COSTS BENEF (Ksh.
TIMAU										
ONTULILI	32,688	1,106	S	22,000	24,332,000	270	15,000	4,050,000	28,382,000	868
KIRIMARA	20,688	649	S	22,000	14,278,000	130	15,000	1,950,000	16,228,000	784
KISIMA	28,008	0	S	22,000	0	1,177	15,000	17,655,000	17,655,000	630
TOTAL	81,384	1,755			38,610,000	1,577		23,655,000	62,265,000	765
MERU TOTAL	2,891,075	118,331			2,619,432,000	35,313		529,695,000	3,149,127,000	1,089

Notes: Gw = Groundwater
S = Surface Water or Spring

APPENDIX 5

COST ESTIMATE

OF

DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT

APPENDIX 5

COST ESTIMATE

OF

DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT

1. Demand year 1993 - Scenario 2
2. Demand year 2003 - Scenario 2
3. Demand year 2013 - Scenario 2

ST ESTIMATE OF DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT MERU DISTRICT

ATION	Year 1993 Total Population Covered	New Required Capacity m3/day	Water Source	Supplies Unit Cost Ksh. per m3/day	Total Cost Ksh.	Rehabilitated Water Supplies Required Capacity m3/day	Unit Cost Ksh. per m3/day	Total Cost Ksh.	TOTAL COSTS Ksh.	TOTAL COSTS PER BENEFICIARY Ksh.
TRAL IMENTI										
THUGUCHI	32,331	725	S	22,000	15,950,000	1,470	15,000	22,050,000	38,000,000	1,175
IMBI	35,220	0	S	22,000	0	1,533	15,000	22,995,000	22,995,000	653
NGANTHIA	32,287	0	S	22,000	0	2,023	15,000	30,345,000	30,345,000	940
RICHIA	22,132	359	S	22,000	7,898,000	0			7,898,000	357
TOTAL	121,970	1,084			23,848,000	5,026		75,390,000	99,238,000	814
BE										
ETA	13,523	609	S	22,000	13,398,000	120			13,398,000	991
OI	10,536	0	S	22,000	0	0			0	0
HIU	40,700	0	S	22,000	0	0	15,000	0	0	0
	28,994	0	S	22,000	0	0	15,000	0	0	0
	20,643	799	S	22,000	17,578,000	170			17,578,000	852
TOTAL	114,396	1,408			30,976,000	290		0	30,976,000	271
H IMENTI										
UA	17,387	1,188	S	22,000	26,136,000	0			26,136,000	1,503
I	10,353	792	S	22,000	17,424,000	0			17,424,000	1,683
A	46,557	0	S	22,000	0	4,828	15,000	72,420,000	72,420,000	1,556
I	28,085	685	S	22,000	15,070,000	1,400	15,000	21,000,000	36,070,000	1,284
I	11,302	905	S	22,000	19,910,000	0			19,910,000	1,762
TOTAL	113,684	3,570			78,540,000	6,228		93,420,000	171,960,000	1,513
I										
MONI	30,111	0	S	22,000	0	1,213	15,000	18,195,000	18,195,000	604
GE	13,530	776	S	22,000	17,072,000	0			17,072,000	1,262
NGANI	45,582	0	S	22,000	0	5,168	15,000	77,520,000	77,520,000	1,701
AMBI	27,555	218	S	22,000	4,796,000	364	15,000	5,460,000	10,256,000	372
ORIA	25,763	0	S	22,000	0	563	15,000	8,445,000	8,445,000	328
A	37,000	791	S	22,000	17,402,000	0			17,402,000	470
UKI	15,528	529	S	22,000	11,638,000	0			11,638,000	749
TOTAL	195,069	2,314			50,908,000	7,308		109,620,000	160,528,000	823
IRI										
A	14,430	1,030	S	22,000	22,660,000	680	15,000	10,200,000	32,860,000	2,277
		1,000	Gw	23,700	23,700,000				23,700,000	1,642
TI	12,406	507	S	22,000	11,154,000	530	15,000	7,950,000	19,104,000	1,540
ETWE-K.	9,121	615	S	22,000	13,530,000	150	15,000	2,250,000	15,780,000	1,730
U-RUUJ.	17,891	325	S	22,000	7,150,000	50	15,000	750,000	7,900,000	442
OTAL	53,848	3,477			78,194,000	1,410		21,150,000	99,344,000	1,845

COST ESTIMATE OF DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT MERU DISTRICT

LOCATION	Year 1993 Total Population Covered	New Water Supplies Required Capacity m3/day	Water Source	Unit Cost Ksh. per m3/day	Total Cost Ksh.	Rehabilitated Water Supplies Required Capacity m3/day	Unit Cost Ksh. per m3/day	Total Cost Ksh.	TOTAL COSTS Ksh.	TOTAL COS PER BENEFICIA Ksh.
SOUTH IMENTI										
IGOJI	14,142	0	S	22,000	0	1,068	15,000	16,020,000	16,020,000	1,133
MITINE	14,899	0	S	22,000	0	1,065	15,000	15,975,000	15,975,000	1,072
ABOGETA	20,034	955	S	22,000	21,010,000	0			21,010,000	1,049
IGOKI	12,349	730	S	22,000	16,060,000	430	15,000	6,450,000	22,510,000	1,823
NKUENE	40,726	1,698	S	22,000	37,356,000	743	15,000	11,145,000	48,501,000	1,191
MITUNGUU	13,000	341	S	22,000	7,502,000	0			7,502,000	577
KANYAKINE	16,201	0	S	22,000	0	1,123	15,000	16,845,000	16,845,000	1,040
TOTAL	131,351	3,724			81,928,000	4,429		66,435,000	148,363,000	1,130
THARAKA										
GIKINGO	12,820	295	S	22,000	6,490,000	0			6,490,000	506
MARIMANTI	31,705	1,464	S	22,000	32,208,000	0			32,208,000	1,016
N. THARAKA	13,067	622	S	22,000	13,684,000	0			13,684,000	1,047
S. THARAKA	14,317	255	S	22,000	5,610,000	0			5,610,000	392
TOTAL	71,909	2,636			57,992,000	0		0	57,992,000	806
TIGANIA										
MITUNTU	1,972	0	S	22,000	0	0			0	0
URINGU	13,737	0	S	22,000	0	0			0	0
		483	Gw	23,700	11,447,100				11,447,100	833
MBEU	17,255	644	S	22,000	14,168,000	0			14,168,000	821
KIANJAI	16,770	736	S	22,000	16,192,000	0			16,192,000	966
AKITHII	22,989	0	S	22,000	0	0			0	0
MUTHARA	19,439	1,769	S	22,000	38,918,000	0			38,918,000	2,002
KARAMA	16,375	381	S	22,000	8,382,000	0			8,382,000	512
MIKINDURI	37,646	0	S	22,000	0	1,388	15,000	20,820,000	20,820,000	553
THANGATHA	31,798	1,038	S	22,000	22,836,000	0			22,836,000	718
	177,981	5,051			111,943,100	1,388		20,820,000	132,763,100	746
TIMAU										
ONTULILI	12,806	0	S	22,000	0	192	15,000	2,880,000	2,880,000	225
KIRIMARA	7,790	242	S	22,000	5,324,000	130	15,000	1,950,000	7,274,000	934
KISIMA	12,659	0	S	22,000	0	1,120	15,000	16,800,000	16,800,000	1,327
TOTAL	33,255	242			5,324,000	1,442		21,630,000	26,954,000	811
MERU TOTAL	1,013,463	23,506			519,653,100	27,521		408,465,000	928,118,100	916

Notes: Gw = Groundwater
S = Surface Water or Spring

OST ESTIMATE DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT MERU DISTRICT

CATION	Year 2003 Total Population Covered	New Water Supplies Required Capacity m3/day	Water Source	Unit Cost Ksh. per m3/day	Total Cost Ksh.	Rehabilitated Water Supplies Required Capacity m3/day	Unit Cost Ksh. per m3/day	Total Cost Ksh.	TOTAL COSTS Ksh.	TOTAL COSTS PER BENEFICIARY Ksh.
NTRAL IMENTI										
OTHUGUCHI	57,342	2,552	S	22,000	56,144,000	1,470	15,000	22,050,000	78,194,000	1,364
TIMBI	57,571	1,293	S	22,000	28,446,000	1,620	15,000	24,300,000	52,746,000	916
NGANTHIA	56,858	0	S	22,000	0	3,548	15,000	53,220,000	53,220,000	936
BIRICHIA	37,175	1,260	S	22,000	27,720,000	0			27,720,000	746
TOTAL	208,946	5,105			112,310,000	6,638		99,570,000	211,880,000	1,014
MBE										
GETA	21,875	688	S	22,000	15,136,000	120	15,000	1,800,000	16,936,000	774
		500	Gw	23,700	11,850,000				11,850,000	542
GOI	17,562	0	S	22,000	0	0			0	0
CHIU	67,525	712	S	22,000	15,664,000	271	15,000	4,065,000	19,729,000	292
A	53,655	985	S	22,000	21,670,000	429	15,000	6,435,000	28,105,000	524
A	39,246	951	S	22,000	20,922,000	170	15,000	2,550,000	23,472,000	598
		1,000	Gw	23,700	23,700,000				23,700,000	604
TOTAL	199,863	4,836			108,942,000	990		14,850,000	123,792,000	619
TH IMENTI										
RUA	30,846	1,670	S	22,000	36,740,000	0			36,740,000	1,191
		500	Gw	23,700	11,850,000				11,850,000	384
RI	17,114	823	S	22,000	18,106,000	0			18,106,000	1,058
		500	Gw	23,700	11,850,000				11,850,000	692
MA	89,809	3,246	S	22,000	71,412,000	5,600	15,000	84,000,000	155,412,000	1,730
KI	56,774	2,622	S	22,000	57,684,000	1,400	15,000	21,000,000	78,684,000	1,386
KI	19,553	1,552	S	22,000	34,144,000	0			34,144,000	1,746
TOTAL	214,096	10,913			241,786,000	7,000		105,000,000	346,786,000	1,620
HI										
UMONI	45,703	0	S	22,000	0	2,207	15,000	33,105,000	33,105,000	724
GE	24,379	1,439	S	22,000	31,658,000	0			31,658,000	1,299
NGANI	80,830	3,002	S	22,000	66,044,000	6,100	15,000	91,500,000	157,544,000	1,949
AMBI	48,729	1,770	S	22,000	38,940,000	364	15,000	5,460,000	44,400,000	911
ORIA	49,057	1,478	S	22,000	32,516,000	800	15,000	12,000,000	44,516,000	907
A	61,797	2,361	S	22,000	51,942,000	0			51,942,000	841
UKI	21,883	903	S	22,000	19,866,000	0			19,866,000	908
TOTAL	332,378	10,953			240,966,000	9,471		142,065,000	383,031,000	1,152

COST ESTIMATE DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT MERU DISTRICT

LOCATION	Year 2003 Total Population Covered	New Water Supplies Required Capacity m3/day	Water Source	Unit Cost Ksh. per m3/day	Total Cost Ksh.	Rehabilitated Water Supplies Required Capacity m3/day	Unit Cost Ksh. per m3/day	Total Cost Ksh.	TOTAL COSTS Ksh.	TOTAL PER BENEFI Ks
NTONYIRI										
ITHIMA	37,725	2,679	S	22,000	58,938,000	680	15,000	10,200,000	69,138,000	1,8
		1,500	GW	23,700	35,550,000				35,550,000	9
MUTUATI	31,358	777	S	22,000	17,094,000	530	15,000	7,950,000	25,044,000	1
		500	GW	23,700	11,850,000				11,850,000	1
ANTUBETWE-K.	17,015	647	S	22,000	14,234,000	150	15,000	2,250,000	16,484,000	9
		500	GW	23,700	11,850,000				11,850,000	6
ATHIRU-RUUJ.	27,575	877	S	22,000	19,294,000	50	15,000	750,000	20,044,000	1
		0	GW	23,700	0				0	
TOTAL	113,673	7,480			168,810,000	1,410		21,150,000	189,960,000	1,
SOUTH IMENTI										
IGOJI	27,226	536	S	22,000	11,792,000	1,400	15,000	21,000,000	32,792,000	1,
MITINE	28,995	0	S	22,000	0	1,885	15,000	28,275,000	28,275,000	
ABOGETA	31,112	1,737	S	22,000	38,214,000	0			38,214,000	1,
IGOKI	20,936	1,541	S	22,000	33,902,000	430	15,000	6,450,000	40,352,000	1,
NKUENE	73,761	4,257	S	22,000	93,654,000	743	15,000	11,145,000	104,799,000	1,
MITUNGUU	22,170	896	S	22,000	19,712,000	0			19,712,000	
KANYAKINE	30,279	563	S	22,000	12,386,000	1,486	15,000	22,290,000	34,676,000	1,
TOTAL	234,479	9,530			209,660,000	5,944		89,160,000	298,820,000	1,
THARAKA										
GIKINGO	17,403	489	S	22,000	10,758,000	0			10,758,000	
MARIMANTI	45,750	2,523	S	22,000	55,506,000	0			55,506,000	1,
N. THARAKA	19,182	1,093	S	22,000	24,046,000	0			24,046,000	1,
S. THARAKA	23,285	614	S	22,000	13,508,000	0			13,508,000	
TOTAL	105,620	4,719			103,818,000	0			103,818,000	
TIGANIA										
MITUNTU	5,760	0	S	22,000	0	0			0	
URINGU	24,831	182	S	22,000	4,004,000	0			4,004,000	
		1,000	GW	23,700	23,700,000				23,700,000	
MBEU	25,793	1,140	S	22,000	25,080,000	0			25,080,000	
KIANJAI	32,052	1,808	S	22,000	39,776,000	0			39,776,000	1,
AKITHII	39,687	901	S	22,000	19,822,000	0			19,822,000	
MUTHARA	33,392	3,733	S	22,000	82,126,000	0			82,126,000	2,
KARAMA	26,442	906	S	22,000	19,932,000	0			19,932,000	
MIKINDURI	58,923	1,042	S	22,000	22,924,000	1,500	15,000	22,500,000	45,424,000	
THANGATHA	47,064	1,871	S	22,000	41,162,000	0			41,162,000	
	293,944	12,583			278,526,000	1,500		22,500,000	301,026,000	1,

OST ESTIMATE DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT MERU DISTRICT

OCATION	Year 2003 Total Population Covered	New Water Supplies Required Capacity m3/day	Water Source	Unit Cost Ksh. per m3/day	Total Cost Ksh.	Rehabilitated Water Supplies Required Capacity m3/day	Unit Cost Ksh. per m3/day	Total Cost Ksh.	TOTAL COSTS Ksh.	TOTAL COSTS PER BENEFICIARY Ksh.
MAU										
TULILI	20,632	397	S	22,000	8,734,000	270	15,000	4,050,000	12,784,000	620
RIMARA	13,076	549	S	22,000	12,078,000	130	15,000	1,950,000	14,028,000	1,073
SIMA	18,880	811	S	22,000	17,842,000	1,182	15,000	17,730,000	35,572,000	1,884
TOTAL	52,588	1,757			38,654,000	1,582		23,730,000	62,384,000	1,186
RU TOTAL	1,755,587	67,876			1,503,472,000	34,535		518,025,000	2,021,497,000	1,151

tes: Gw = Groundwater
S = Surface Water or Spring

COST ESTIMATE DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT MERU DISTRICT

LOCATION	Year 2013 Total Population Covered	New Water Supplies Required Capacity m3/day	Water Source	Unit Cost Ksh. per m3/day	Total Cost Ksh.	Rehabilitated Water Supplies Required Capacity m3/day	Unit Cost Ksh. per m3/day	Total Cost Ksh.	TOTAL COSTS Ksh.	TOTAL C PER BENEFIC Ksh
CENTRAL IMENTI										
ABOTHUGUCHI	96,184	6,679	S	22,000	146,938,000	1,470	15,000	22,050,000	168,988,000	1,75
GATIMBI	92,281	4,534	S	22,000	99,748,000	1,620	15,000	24,300,000	124,048,000	1,34
MWANGANTHIA	93,769	2,678	S	22,000	58,916,000	4,000	15,000	60,000,000	118,916,000	1,26
KIBIRICHIA	59,864	3,146	S	22,000	69,212,000	0			69,212,000	1,15
TOTAL	342,098	17,037			374,814,000	7,090		106,350,000	481,164,000	1,40
IGEMBE										
KANGETA	33,995	1,831	S	22,000	40,282,000	120	15,000	1,800,000	42,082,000	1,23
		500	Gw	23,700	11,850,000				11,850,000	34
KIEGOI	28,473	930	S	22,000	20,460,000	0			20,460,000	71
AKACHIU	107,947	3,471	S	22,000	76,362,000	271	15,000	4,065,000	80,427,000	74
MAUA	94,581	4,362	S	22,000	95,964,000	429	15,000	6,435,000	102,399,000	1,08
NJIA	68,136	2,611	S	22,000	57,442,000	170	15,000	2,550,000	59,992,000	88
		2,000	Gw	23,700	47,400,000				47,400,000	69
TOTAL	333,132	15,705			349,760,000	990		14,850,000	364,610,000	1,09
NORTH IMENTI										
KIIRUA	51,198	3,795	S	22,000	83,490,000	0			83,490,000	1,63
		500	Gw	23,700	11,850,000				11,850,000	23
RUIRI	26,734	1,782	S	22,000	39,204,000	0			39,204,000	1,46
		500	Gw	23,700	11,850,000				11,850,000	44
NTIMA	158,488	10,879	S	22,000	239,338,000	5,600	15,000	84,000,000	323,338,000	2,04
NYAKI	101,502	6,957	S	22,000	153,054,000	1,400	15,000	21,000,000	174,054,000	1,71
GIAKI	31,688	2,829	S	22,000	62,238,000	0			62,238,000	1,96
TOTAL	369,610	27,242			601,024,000	7,000		105,000,000	706,024,000	1,91
NITHI										
MAGUMONI	69,462	2,064	S	22,000	45,408,000	2,333	15,000	34,995,000	80,403,000	1,15
MWONGE	41,143	2,950	S	22,000	64,900,000	0			64,900,000	1,57
KARINGANI	137,682	10,000	S	22,000	220,000,000	6,100	15,000	91,500,000	311,500,000	2,26
MUTHAMBI	81,260	5,126	S	22,000	112,772,000	364	15,000	5,460,000	118,232,000	1,45
CHOGORIA	87,013	5,447	S	22,000	119,834,000	800	15,000	12,000,000	131,834,000	1,51
KIERA	99,461	5,681	S	22,000	124,982,000	0			124,982,000	1,25
KANJUKI	30,901	1,577	S	22,000	34,694,000	0			34,694,000	1,12
TOTAL	546,922	32,845			722,590,000	9,597		143,955,000	866,545,000	1,58

COST ESTIMATE DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT MERU DISTRICT

LOCATION	Year 2013 Total Population Covered	New Water Supplies Required Capacity m3/day	Water Source	Unit Cost Ksh. per m3/day	Total Cost Ksh.	Rehabilitated Water Supplies Required Capacity m3/day	Unit Cost Ksh. per m3/day	Total Cost Ksh.	TOTAL COSTS Ksh.	TOTAL COSTS PER BENEFICIARY Ksh.
TONYIRI										
THIMA	71,762	5,729	S	22,000	126,038,000	680	15,000	10,200,000	136,238,000	1,898
		2,500	Gw	23,700	59,250,000				59,250,000	826
UTUATI	58,380	1,797	S	22,000	39,534,000	530	15,000	7,950,000	47,484,000	813
		1,000	Gw	23,700	23,700,000				23,700,000	406
NTUBETWE-K.	28,533	1,364	S	22,000	30,008,000	150	15,000	2,250,000	32,258,000	1,131
		750	Gw	23,700	17,775,000				17,775,000	623
THIRU-RUUJ.	41,717	1,183	S	22,000	26,026,000	50	15,000	750,000	26,776,000	642
		750	Gw	23,700	17,775,000				17,775,000	426
TOTAL	200,392	15,073			340,106,000	1,410		21,150,000	361,256,000	1,803
OUTH IMENTI										
GOJI	47,417	2,454	S	22,000	53,988,000	1,400	15,000	21,000,000	74,988,000	1,581
ITINE	49,995	1,572	S	22,000	34,584,000	2,090	15,000	31,350,000	65,934,000	1,319
BOGETA	48,316	3,489	S	22,000	76,758,000	0			76,758,000	1,589
GOKI	34,272	3,202	S	22,000	70,444,000	430	15,000	6,450,000	76,894,000	2,244
KUENE	130,317	10,123	S	22,000	222,706,000	743	15,000	11,145,000	233,851,000	1,794
TUNGUU	35,961	2,056	S	22,000	45,232,000	0			45,232,000	1,258
NYAKINE	51,891	2,651	S	22,000	58,322,000	1,486	15,000	22,290,000	80,612,000	1,553
TOTAL	398,169	25,547			562,034,000	6,149		92,235,000	654,269,000	1,643
MARAKA										
KINGO	23,650	857	S	22,000	18,854,000	0			18,854,000	797
RIMANTI	65,634	4,452	S	22,000	97,944,000	0			97,944,000	1,492
THARAKA	27,687	1,816	S	22,000	39,952,000	0			39,952,000	1,443
THARAKA	35,994	1,288	S	22,000	28,336,000	0			28,336,000	787
TOTAL	152,965	8,413			185,086,000	0			185,086,000	1,210
IGANIA										
ITUNTU	11,022	75	S	22,000	1,650,000	0			1,650,000	150
INGU	41,990	768	S	22,000	16,896,000	0			16,896,000	402
		2,000	Gw	23,700	47,400,000				47,400,000	1,129
EU	38,574	2,165	S	22,000	47,630,000	0			47,630,000	1,235
ANJAI	55,480	4,136	S	22,000	90,992,000	0			90,992,000	1,640
ITHII	63,190	2,866	S	22,000	63,052,000	0			63,052,000	998
THARA	53,880	7,185	S	22,000	158,070,000	0			158,070,000	2,934
RAMA	41,822	2,031	S	22,000	44,682,000	0			44,682,000	1,068
KINDURI	90,693	3,466	S	22,000	76,252,000	1,500	15,000	22,500,000	98,752,000	1,089
ANGATHA	69,752	3,503	S	22,000	77,066,000	0			77,066,000	1,105
	466,403	28,195			623,690,000	1,500		22,500,000	646,190,000	1,385

COST ESTIMATE DOMESTIC AND LIVESTOCK WATER SUPPLY DEVELOPMENT MERU DISTRICT

LOCATION	Year 2013 Total Population Covered	New Water Supplies Required Capacity m3/day	Water Source	Unit Cost Ksh. per m3/day	Total Cost Ksh.	Rehabilitated Water Supplies Required Capacity m3/day	Unit Cost Ksh. per m3/day	Total Cost Ksh.	TOTAL COSTS Ksh.	TOTAL CO PER BENEFIC Ksh
TIMAU										
ONTULILI	32,688	1,457	S	22,000	32,054,000	270	15,000	4,050,000	36,104,000	1,10
KIRIMARA	20,688	1,149	S	22,000	25,278,000	130	15,000	1,950,000	27,228,000	1,31
KISIMA	28,008	2,486	S	22,000	54,692,000	1,182	15,000	17,730,000	72,422,000	2,58
TOTAL	81,384	5,092			112,024,000	1,582		23,730,000	135,754,000	1,66
MERU TOTAL	2,891,075	175,149			3,871,128,000	35,318		529,770,000	4,400,898,000	1,52

Notes: Gw = Groundwater
S = Surface Water or Spring

APPENDIX 6

PROJECT PROPOSAL - INDICATIVE INVESTMENT PACKAGES

APPENDIX 6

PROJECT PROPOSAL - INDICATIVE INVESTMENT PACKAGES

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Appendix 6 PROJECT PROPOSAL - INDICATIVE INVESTMENT PACKAGES

1 INTRODUCTION

This appendix is intended to provide the basic structure of a proposal to a funding agency for funds to implement a rural water supply project. The requirements and emphasis of these agencies will differ, but many key aspects of these proposals are common to most. The major topics covered in the proposal are:

1) Summary of Project

2) Background

- policy context
- previous assistance
- pattern of settlement
- institutional setting

3) Project description

- objectives and scope
- description
- justification

4) Implementation Arrangements

- scope of work and activities
- inputs
- outputs

5) Costing and Counterpart Resources

- costing
- counterpart resources

The proposal will describe and justify funding of the programme implied by the investment packages developed in Chapter 5 of Part 3. The description will be set out in terms of the technical, social, institutional and financial/economic aspects of the programme.

The project will implement water supply systems over the Meru District, in accordance with the District Water Development Plan (DWDP). This plan takes into account previous and continuing activity in the water sector the District.

The overall objective of the project is to implement sustainable rural water supply systems, focusing on ASAL areas. In order to achieve this objective several lower level objectives are required. It requires extensive strengthening of institutional procedures and structures to implement such an objective. Specifically:

- development of a viable systems of designing, funding, implementing, operating and maintaining water supply systems at DISTRICT level

- such systems are to include mechanisms of COST SHARING in order to ensure the systems are viable in the long run, and

- the systems should utilise technologies which are appropriate to the physical, cultural and affordability contexts of the communities in which they are used.

It must be realised that the responsibility for submitting a project proposal to a funding agency lies with the District Development Committee. This proposal should thus be seen as an example which may have to be revised to include additional issues raised by the District. This revision could cover aspects of technology choice, project area, time schedule, etc. The investments described in the proposal could also be broken into smaller packages.

2 BACKGROUND

2.1 Policy context

Four major policies shape the development of rural water supply in Kenya. The primary policy is a general one set out in the National Development Plan 1989-1993. This sets the target of providing every household with a potable water source within 4 kilometres.

The other three objectives have a determining role in the way this policy is achieved. They are:

- the District focus policy,
- the policy of cost sharing, and
- the policy of ensuring access to lower income groups (affordability).

These policies can, in some institutional contexts, be contradictory. However, the task of the proposed project is to develop an institutional system in which such objectives can be met.

In addition, consideration should be given to the priority accorded to development of Arid and Semi-Arid Lands (ASAL). Many of the areas where water supply is a central issue are ASAL.

2.2 Previous Assistance

Previous assistance to Kenya in the water sector has been extensive. Bi-laterals, multi-laterals, NGOs and others have been active in the sector. However, no major water supply projects focusing on the Meru District have been implemented. The two key projects, currently being implemented, which form the basis of the proposed project are:

- the Water Resources Assessment and Planning (WRAP) Project, and
- the Swedish International Development Agency (SIDA) Water Use Test Project / Water and Finance Management Project (henceforth referred to as "the SIDA project").

The WRAP project, and the Meru District Water Development Study (MDWDS) produced by the project, form the basis of the proposed project. The MDWDS identifies the water resources and projected demand for these resources in the District. It also suggests, in general terms, the level of investment required to satisfy this demand. The proposed project provides a mechanism to implement this investment.

Both the WRAP and SIDA projects make recommendations for institutional strengthening which are also incorporated in this proposal. The SIDA project focuses on the administrative and financial systems required by the District Office of the MoWD.

Also incorporated into the proposal is the experience of the Embu Meru Isiolo (EMI) ASAL Programme with respect to the development of water resources for livestock.

2.3 District Profile

The District of Meru has four types of settlement for which water supply is required. These are:

- Small and medium size urban areas such as Meru, Nkubu, Chogoria, Maua and Chuka (population >2,000), which serve as major market centres and as service centres. The range of economic activity is relatively wide with extensive government services, small scale industries, retailing of consumer goods and agricultural inputs. The urban area is fairly defined, and little semi-permanent settlement is found around the town areas.

- Rural and market centres such as Igoji, Kanyakine and Mitunguu (population <2,000), in which the permanent, formal sector structures are ranged along one street (shops selling basic consumer goods, retailing of basic agricultural inputs, a coffee shop, a dispensary, etc.). These centres serve a surrounding area of very low density farm houses.

- Farm houses in rural areas, and their associated crops/animals, and

- "Independent" facilities such as tourist lodges, missions, schools and health centres, large scale commercial agriculture, and agro-processing industries (for example coffee factories).

Tourist lodges, and large scale agriculture are formal sector activities carried out by the private sector mainly in the drier parts of the District. Investments for water supply in these industries can thus be left to the private sector, given that the projected investments are in line with the DWDP. Small scale agriculture is the main traditional economic activity and is substantially within the formal economy, the main cash crops being coffee and tea. This activity combined with urban demand, cover the majority of the population who will need varying amounts of government support. They are thus the legitimate focus of government activity in the water sector. However, it should be noted that the approach adopted for these two groups will be, of necessity, quite different.

The average urban (non-agricultural/mining) income is estimated at Shs 1,594 per month in 1988. A Household Survey of rural areas undertaken by the University of Nottingham for WRAP in 1989, found that the average yearly income from cash crops over the District was Shs 11,673. The average income (per household which sold surplus) from sales of livestock was Shs 3,398, and from sales of milk Shs 7,911.

Water is extensively available in the District, but it is also extensively utilised by an active market economy. The District's good transport links to other districts and to Nairobi provide adequate access to markets, although roads within the District are generally in poor condition. This relatively developed market structure indicates that demand for water will continue to rise and that pollution will become a more pressing problem.

Considering the technical options available and the settlement pattern, water will thus be delivered to people and industries in five groupings, which require varying amounts of support of government. These are:

- urban systems with mainly service and small scale industry demand in addition to residential demand,
- market centre systems with some service demand and a small permanent residential demand
- rural supplies for settled farmers for domestic use, for livestock and for small scale irrigation
- supplies to "independent" facilities in the formal sector such as schools (independent commercial facilities (tourist lodges) do not usually require government support), and
- large scale irrigation schemes.

Within these groupings there are social groups which have differing cultural requirements and income levels which will effect their effective demand for the various technical options. That is, these different groups can afford different amounts for their water and have different priorities with respect to availability/quality/use. The result is that they will often demand different things from water supply systems. In order to resolve these competing demands strong institutional systems are required and it is these systems which will now be examined.

2.4 Institutional Setting

2.4.1 Context

The existing network of organisations involved in the water sector is complex. With the District Focus Policy, the District is expected to co-ordinate all investment, including investment in water supplies. However, this policy has yet to move fully from one of "deconcentration", i.e. placing implementation activities of line Ministries at local level while retaining centralised control of staff and budgeting, to one of true "decentralisation", i.e. giving staffing and finance control to the local institutions. This process requires extensive support, especially by providing systems and funding for effective district co-ordination and implementation of investment in the water sector. As will be seen below, providing this support is a major objective of this project.

Four key activities are required to implement a water supply. It must be planned, designed, constructed and operated. Overall water policy planning, and technical (design) support is the responsibility of the

Ministry of Water Development (MoWD). Responsibility for construction and operation is fragmented however. When undertaken by the MoWD, local offices of the MoWD, have considerable autonomy in design and construction of water supply schemes. Other ministries also design and construct water supplies.

Private formal sector organisations, missions and other entities may obtain permits as "water undertakers", to exploit local water resources. The appointment of a water undertaker is done by the Minister of Water Development under the powers of the Water Act (cap.372).

Local Water Associations are legal entities which have a Water Permit. They are being formed in some districts to become responsible for existing water systems or to undertake new ones. Permission to utilise water resources under the Water Act is presently given by a committee of the MoWD meeting in Nairobi, but is usually decided on the recommendation of the District Office of the MoWD. The lowest level institutions are the informal water committees.

In general, the District Office of the MoWD implements urban/market centre supplies and smaller schemes are undertaken by communities sometimes assisted by an NGO. Co-ordination of these activities is to be achieved by the District Water Development Plan, based on the MDWDS.

2.4.2 Implementation of District Focus in the Water Sector

The existing institutional base of future water investment in the District is limited. In the context of the District Focus policy, the District Development Committee (DDC), assisted by the District Executive Committee, is expected to co-ordinate investment in the water sector. This includes expenditures by the Municipal Council (under the Ministry of Local Government). As stated above, the instrument used to achieve this co-ordination is the District Water Development Plan (DWDP). This plan is prepared by the DWE. While the structure for implementation of the plan is in place, the resources to carry out the required project appraisal, prioritisation and implementation are very limited. It is this situation that the project is intended to address.

The three key aspects of implementation which require strengthening are:

1) The administrative and financial systems of the District Offices of the MoWD.
The MoWD District offices are being strengthened as part of the "deconcentration" of Ministry activity. The policy of "appropriations in aid" has been instituted which will link future recurrent expenditure funds allocated to districts to their performance in meeting revenue targets established by Treasury. Wages for lower levels of staff are now the responsibility of the district to pay. This may have a considerable impact on efficiency as there are indications that district level staff are under skilled, and that, compared to the resources available to work with, there may be significant over staffing.

2) The support systems both the District Offices and to community groups provided by central MoWD.
The head office of the Ministry in Nairobi will now concentrate on providing policy, training and technical support, especially as key implementation activity has also been taken over by the National Water Conservation and Pipeline Corporation. In this role, it has begun to institutionalise the assessment and planning process developed, to a great extent, through the WRAP project. The water assessment studies and planning reports are now an important resource for the MoWD, and its staff are being trained in the techniques of assessment. The Planning Unit within the Water Resources Assessment Section is responsible for carrying out these studies and assessments.

3) Co-ordination of the organisations which will implement the plan.
Currently, there is no clear policy on which organisation(s) should implement projects at district level. There are several options. These include the District office of the MoWD, the Municipal Council, NGO's and local Water Associations. The choice of institution will depend on the existing strength of these institutions, and potential for future strengthening.

One apparently successful method has been adopted in the Baringo District. It has been developed with assistance from UNICEF. A district water coordination group has been formed led by an inter-ministerial team and supported by every operational NGO in the district. The inter-ministerial team has representatives of MoWD, MoH and MCSS as well as the DDO and it is to be in contact with all operating organizations in the district who have an interest in water. It has been agreed in Baringo that this group

meets every three months for information sharing, decision making, etc.

Thus, the responsibility for development and implementation of the district plan for water development is shared by all concerned groups. Individual groups become the "lead" agency for community mobilization and implementation in their Division. Such matters as overlapping and duplication are worked out. Once plans are agreed it is up to each group to implement in their own way. With this approach it will be possible to implement water programmes by different organizations within the overall district strategy.

2.4.3 Community Involvement in the Water Sector

It is expected that the communities involved will play a central role in planning, implementing and maintaining the water supplies identified as viable under the proposed project. This is particularly the case for the small scale rural schemes. However, these communities require significant support over a considerable period in order to take on this role. The proposed project should identify and provide such support.

Water Associations or committees are, in theory, ideal for the implementation and/or operation of small community schemes. In many areas, these have a strong base in the Meru District. The formal district structure for participation appears less effective, with various community leaders present on the Divisional Development Committees and represented on the DDC by the Divisional District Officer. There is no formal structure of community participation in the provision of MoWD water supplies, although the informal links through chiefs and sub-chiefs to the elders are said to be effective. It is essential that the formal government administrative structure, and the structure of the clans must work in concert for successful design and implementation of water supply projects in rural areas.

The Household Survey shows that people are willing to make, and have made, significant contributions to self help schemes, especially in high potential areas. The average amounts contributed in the coffee/tea, coffee, coffee/cotton and cotton zones were Shs 4,023, 2,329, 1,974 and 517 respectively.

The institutional base will also play a key role in the technical option chosen. Options involving water systems which require complex or expensive operations and maintenance support can not, at present, be easily handled by district institutions. Where such systems must be used, extensive support to strengthen these institutions will be required. Such strengthening, although on a more basic level, is particularly important for local community groups where they will have a major role in implementing systems.

3 PROJECT DESCRIPTION

3.1 Project Objectives and Scope

The goal of project activity in the water sector in the District is to support environmentally sustainable development in order to provide for an equitable distribution of the nation's economic growth. Such activity is necessary in view of the increasing population, livestock and agricultural pressure on, and the sensitive nature of the environment in, this area.

The overall objective of the project is:

- to implement sustainable rural water supply systems.

In order to achieve this objective several lower level objectives are required. It requires extensive strengthening of institutional procedures and structures to implement such an objective. Specifically:

- development of a viable systems of designing, funding, implementing, operating and maintaining water supply systems at DISTRICT level
- such systems are to include mechanisms of COST SHARING in order to ensure the systems are viable in the long run, and
- the systems should utilise technologies which are appropriate to the physical, cultural and affordability contexts of the communities in which they are used.

The project will implement water supply systems over the Meru District, in accordance with the District Water Development Plan (DWDP). This plan takes into account previous and continuing activity in the water sector by the District. An indicative level of physical investment was estimated by the MDWDS. The total amount of required investment for domestic supplies was some Kshs 3,149 million (approximately US$ 120 million), and Kshs 4,400 million (approximately US$ 165 million) if including livestock supplies.

The distribution of this investment over the Divisions in the District is shown in Appendix 4 and 5.

3.2 Project Description

3.2.1 Overview

The project will be divided into three phases. The first phase will consist of feasibility studies. The second phase will carry out detailed design in consultation with the community where appropriate, and commence the institutional strengthening activities identified in the Feasibility studies. The third phase will consist of implementing the remaining institutional strengthening activities and construction of the water supply systems. These phases are described in detail below.

Briefly, the roles each institution will play in any implementation of the project in Meru District reflect the existing capacities and "orientation" of these organisations, government objectives, and potential of these organisations. In summary, they are:

- overall co-ordination with DDC - DDO
- water resources planning - central MoWD
- water project appraisal and water supply for urban centres - District MoWD
- water supply for market centres and rural areas- community, assisted by District MoWD, DDO, other ministries and NGOs.

3.2.2 Feasibility Studies

In the context of the DWDP, the major activities required to prepare the feasibility studies are:

- detail survey - physical and socio-economic of potential sites identified in the DWDP
- preliminary design and costing of water systems and institutional/community structures for implementation
- liaison with community groups on self help aspects

- assessment of proposed designs on the following criteria:

  . water resources
  . land use planning/environmental impact
  . social impact
  . institutional/community participation
  . economic
  . affordability
  . financial.

3.2.3 Detailed Design

Major activities involved in this phase are:

- physical survey of feasible sites
- design and documentation of water systems and implementation of first round of institutional strengthening (training in planning, design, community participation, and construction supervision; implementation of financial systems) and structures for community participation
- liaison with community groups on self help aspects

3.2.4 Implementation

The major activities are:

- land acquisition, if any
- tender of construction
- construction of systems and supervision thereof
- second round institutional strengthening (training in community participation, operation & maintenance)
- operation and maintenance systems

3.2.5 Project Duration

It is difficult to determine accurately the duration of the project, as much depends on bringing the rural communities involved along with the planning process and involving them in it. As such this process will proceed from one step to the next, and the design of the approach to the next step will depend on the experience in the proceeding step. This is so-called "process planning". Other parts of the studies, the surveys and the planning and design of the urban supplies can be implemented in a more programmed manner. This being said, it is expected that initial commitment to the project will be for three years. Projected date of commencement is July 1992.

It is estimated that the feasibility study phase will last 24 months, the detailed design phase 12 months, and the implementation phase 24 months.

The project will have a formal mid-term and final review in addition to reports will be completed at the end of each phase and bi-monthly progress reports which will be required throughout the project.

3.2.6 Project Location

The project will be based in MoWD headoffice, the office of the District Water Engineer in Meru, and in project sites throughout the District as identified in the feasibility study phase.

3.3 Project Justification

3.3.1 General

In the DWDS for Meru District, criteria for appraisal of investment options were established in the following categories:

- water resources
- land use planning/environmental impact
- social impact
- institutional/community participation
- economic
- affordability
- financial.

Simple checklists were established to test a project against each of these sets of criteria. These will be used in Section 3.3.2 below to assess the proposed project in general terms.

A prioritisation of projects will also be carried out using the methodology described in the DWDP. The methodology used is tailored to the existing and potentially achievable levels of assessment skills in the District.

3.3.2 Detailed Justification

a) Water Resources

The project will use the water resources identified in the MDWDS to meet demand in an efficient manner, rather than in a haphazard and potentially environmentally damaging way.

The yield of the proposed project water source has been analysed and it was found that the required quantity of water can be supplied during the lifetime of the project. The variation of the yield during the year is such that at minimum flow periods the water demand can be sufficiently met.

The traditional water sources are mainly rivers and springs. It is expected that the direct use of these sources will decline, because the project provides water closer to the homes of the people. The importance of a better water quality provided by the project needs to be explained to the population to be really appreciated. This will have to be done in combination with a campaign on improved sanitation measures.

b) Land Use/Environmental Impact

The project is intended to foster sustainable economic development in the District. It supplies water to activities consistent with the District Development Plan. In particular:

- water for livestock is provided to encourage zero grazing
- sufficient investment is planned to allow for increase in small scale irrigation.

The facilities/plant of the project are consistent with plans for urban/rural development.

- the systems are sized to cater for projected rural and urban growth
- no significant physical constraints appear to limit siting or sizing of systems.

Neither the facilities/plant of the project, nor their construction, are likely to have an adverse environmental impact. The major forms of impact to be considered in the Meru District are:

- pollution from processing plants, especially coffee plants
- pollution from urban areas especially stormwater runoff and sewerage
- the degradation of vegetation cover (forests) and soils from increased land-use
- the impact of supplies which intercept surface water causing downstream wetlands to dry up - this may have a significant impact on some wildlife,
- heavy pumping of ground water may cause springs to dry up, effecting animals and sometimes people - at this stage this is not expected to be a problem for the proposed sites

c) Social Impact

The project is intended to foster inter-regional equity and to support community development in one of the poorest areas of Kenya.

Traditional groups are affected by projects, but the programme is designed to work within the cultural context of those groups. Developed within this context, the mechanisms for community participation in design, implementation, operation and maintenance will be central to the project.

The proposed project will improve the welfare of the people of the District, particularly lower income groups and women. The self-help components of the project provide employment for women in particular. Additional water provides opportunities for small scale agriculture and, possibly, additional cash income.

d) Institutional/Community Participation Issues

The project will strengthen government and community institutions in line with the District Focus policy.

Institutions

The major tasks which must be addressed with respect to institutional issues are design, construction and operation/maintenance of the systems. The organisation, or grouping of organisations must be able to carry out these tasks effectively.

As set out in the project description above, the roles each institution will play in any implementation of the project reflect the existing capacities and "orientation" of these organisations, government objectives, and potential of these organisations. In summary, they are:

- overall co-ordination - DDO
- water resources planning - central MoWD
- water project appraisal and water supply for urban centres - District MoWD
- water supply for market centres and rural areas- community, assisted by District MoWD and NGOs.

Design and construction supervision will be supported by the project which will also strengthen MoWD counterparts at head office and district levels in these roles. The MoWD has agreed to provide the required staff and facilities for the project as set out in Section 5.

This appears to be a realistic project organisational structure and the implementation schedule set out in Section 4 also appears viable.

Community Participation

Community participation will occur in many aspects of the project. In small scale water supply projects, it is likely that it will occur in design, construction and operation activities. The organisation of this participation is thus a key element in the successful implementation of the project.

Community committees are to be formed with the support of the chiefs and elders in each area. If insufficient support exists for the formation of the committee, no project will be attempted. Local DDO and MoWD staff will assess whether the leaders of the community organisation are representative of the community in order to ensure that the promised community inputs will be delivered.

Socio-economic surveys will check if the communities can deliver the promised labour and money inputs to the project on time.

This approach has been effective in ensuring community participation in Meru District in the past. Local government agencies were prepared, given project support, to provide the organisational and logistic support required for such activity.

e) Economic and Financial Issues

The project will assess the economic viability of each sub-project. The methodology required to undertake an economic assessment of the project is set out in the DWDP. The feasibility study phase of the project will include such an assessment for each scheme.

Affordability

The Household Survey indicates the levels of affordability which the respondents found to be acceptable. These levels cannot be regarded as definitive, but can be taken as a guide. The issues of affordability and willingness to pay are complex, and bound up with slowly changing traditional beliefs and priorities. Feasibility studies will address this issue in some detail.

The main consideration is the level of cost sharing required. This will determine the fee or tariff set in the scheme. In general, the guidelines which will apply in respect to urban schemes are that full recovery of capital and all operation and maintenance costs is to be achieved over a period of ten years. Outside urban areas, full recovery of operations and maintenance costs will be required, and community contribution to capital works will also be a factor in deciding the priority of the scheme - the more contribution the higher the priority.

Basic affordability criteria are:

- the sum involved in cost recovery should not constitute more than 5% of the income of the poorest 20% of the population
- if there is no alternative water source, or if it is more expensive than the proposed scheme, then there is a good prospect of achieving a sufficient level of willingness to pay given adequate institutional systems and political support
- if there is an alternative which is acceptable to the people, even if the water is technically inferior, a new technology should be considered, or the level of cost recovery should be reviewed.

Financial Issues

The key financial issue is the sustainability of the project. With the above analysis complete, and concurrently with the determination of affordability, it is possible to project likely demand, and the costs of each sub-project over time. The feasibility study must identify the sources of funds for design, construction and operation/maintenance. The projection of the expenditure of these funds must be realistic. A basic cashflow analysis can then be carried out to identify potential liquidity problems, and measures developed to overcome them. The financial return on the project can also be calculated.

Financial systems for revenue collection and recording financial flows (simple records of costs and receipts) have been developed, and could be applied to even the smallest schemes. For larger schemes, simple procedures for capital budgeting and funding of preventative maintenance schemes could be developed based on experience in some NGO projects. These types of procedures will be designed in the feasibility study phase and implemented during subsequent phases of the project.

3.3.3 Prioritisation

The project will prioritise the investments (sub-projects) identified in the feasibility studies. The suggested method of prioritisation focuses on the sustainability of the project. Basically, it consists of ensuring that all of the questions set out above in each of the criteria categories have a satisfactory answer. Then, priority is assessed according to how well projects meet the cost sharing policy.

First priority projects will recover both capital and operation and maintenance (O&M) costs. Second priority projects will recover O&M costs. Third priority projects will be economically viable and be ranked according to the extent of recovery of O&M costs. Other projects should not be implemented.

Tables 3.1 and 3.2 set out the total required investments for domestic and livestock supplies as estimated from preliminary data. Detailed sub-project ranking will be confirmed by the feasibility phase of the project.

The proposed projects for the different supply areas were based on recovery of both capital and O&M costs

Table 3.1 Preliminary Cost Estimate of Domestic Water Supply Development

DIVISION	Year 1993 Additional Population Covered	New Water Supplies		Rehabilitated Water Supplies		TOTAL COSTS	TOTAL COSTS PER BENEFIC.
		Capacity Developm. (m3/day)	Total Cost (Ksh.)	Capacity Developm. (m3/day)	Total Cost (Ksh.)	(Ksh.)	(Ksh.)
C. IMENTI	121,970	133	2,926,000	4,046	60,690,000	63,616,000	522
IGEMBE	114,396	955	21,010,000	290	4,350,000	25,360,000	222
N. IMENTI	113,684	1,749	38,478,000	5,772	86,580,000	125,058,000	1,100
NITHI	195,069	1,090	23,980,000	2,815	42,225,000	66,205,000	339
NTONYIRI	53,848	1,166	26,094,000	1,410	21,150,000	47,244,000	877
S. IMENTI	131,351	2,046	45,012,000	3,675	55,125,000	100,137,000	762
THARAKA	71,909	1,231	27,082,000	0	0	27,082,000	377
TIGANIA	177,981	2,189	48,758,100	1,122	16,830,000	65,588,100	369
TIMAU	33,255	79	1,738,000	466	6,990,000	8,728,000	262
MERU TOTAL	1,013,463	10,638	235,078,100	19,596	293,940,000	529,018,100	522

DIVISION	Year 2003 Additional Population Covered	New Water Supplies		Rehabilitated Water Supplies		TOTAL COSTS	TOTAL COSTS PER BENEFIC.
		Capacity Developm. (m3/day)	Total Cost (Ksh.)	Capacity Developm. (m3/day)	Total Cost (Ksh.)	(Ksh.)	(Ksh.)
C. IMENTI	208,946	3,327	73,194,000	5,475	82,125,000	155,319,000	743
IGEMBE	199,863	3,479	78,493,000	990	14,850,000	93,343,000	467
N. IMENTI	214,096	7,375	163,440,000	7,000	105,000,000	268,440,000	1,254
NITHI	332,378	4,987	109,714,000	6,560	98,400,000	208,114,000	626
NTONYIRI	113,673	3,403	77,246,000	1,410	21,150,000	98,396,000	866
S. IMENTI	234,479	6,249	137,478,000	5,544	83,160,000	220,638,000	941
THARAKA	105,620	2,273	50,006,000	0	0	50,006,000	473
TIGANIA	293,944	6,306	140,092,000	1,500	22,500,000	162,592,000	553
TIMAU	52,588	424	9,328,000	970	14,550,000	23,878,000	454
MERU TOTAL	1,755,587	37,823	838,991,000	29,449	441,735,000	1,280,726,000	730

DIVISION	Year 2013 Additional Population Covered	New Water Supplies		Rehabilitated Water Supplies		TOTAL COSTS	TOTAL COSTS PER BENEFIC.
		Capacity Developm. (m3/day)	Total Cost (Ksh.)	Capacity Developm. (m3/day)	Total Cost (Ksh.)	(Ksh.)	(Ksh.)
C. IMENTI	342,098	12,548	276,056,000	7,090	106,350,000	382,406,000	1,118
IGEMBE	333,132	13,363	298,236,000	990	14,850,000	313,086,000	940
N. IMENTI	369,610	21,714	479,408,000	7,000	105,000,000	584,408,000	1,581
NITHI	546,922	19,722	433,884,000	9,597	143,955,000	577,839,000	1,057
NTONYIRI	200,392	7,875	180,050,000	1,410	21,150,000	201,200,000	1,004
S. IMENTI	398,169	19,961	439,142,000	6,149	92,235,000	531,377,000	1,335
THARAKA	152,965	4,270	93,940,000	0	0	93,940,000	614
TIGANIA	466,403	17,123	380,106,000	1,500	22,500,000	402,606,000	863
TIMAU	81,384	1,755	38,610,000	1,577	23,655,000	62,265,000	765
MERU TOTAL	2,891,075	118,331	2,619,432,000	35,313	529,695,000	3,149,127,000	1,089

Table 3.2 Preliminary Cost Estimate of Domestic and Livestock Water Supply Development

DIVISION	Year 1993 Additional Population Covered	New Water Supplies		Rehabilitated Water Supplies		TOTAL COSTS (Ksh.)	TOTAL COSTS PER BENEFIC. (Ksh.)
		Capacity Developm. (m3/day)	Total Cost (Ksh.)	Capacity Developm. (m3/day)	Total Cost (Ksh.)		
C. IMENTI	121,970	1,084	23,848,000	5,026	75,390,000	99,238,000	814
IGEMBE	114,396	1,408	30,976,000	290	0	30,976,000	271
N. IMENTI	113,684	3,570	78,540,000	6,228	93,420,000	171,960,000	1,513
NITHI	195,069	2,314	50,908,000	7,308	109,620,000	160,528,000	823
NTONYIRI	53,848	3,477	78,194,000	1,410	21,150,000	99,344,000	1,845
S. IMENTI	131,351	3,724	81,928,000	4,429	66,435,000	148,363,000	1,130
THARAKA	71,909	2,636	57,992,000	0	0	57,992,000	806
TIGANIA	177,981	5,051	111,943,100	1,388	20,820,000	132,763,100	746
TIMAU	33,255	242	5,324,000	1,442	21,630,000	26,954,000	811
MERU TOTAL	1,013,463	23,506	519,653,100	27,521	408,465,000	928,118,100	916

DIVISION	Year 2003 Additional Population Covered	New Water Supplies		Rehabilitated Water Supplies		TOTAL COSTS (Ksh.)	TOTAL COSTS PER BENEFIC. (Ksh.)
		Capacity Developm. (m3/day)	Total Cost (Ksh.)	Capacity Developm. (m3/day)	Total Cost (Ksh.)		
C. IMENTI	208,946	5,105	112,310,000	6,638	99,570,000	211,880,000	1,014
IGEMBE	199,863	4,836	108,942,000	990	14,850,000	123,792,000	619
N. IMENTI	214,096	10,913	241,786,000	7,000	105,000,000	346,786,000	1,620
NITHI	332,378	10,953	240,966,000	9,471	142,065,000	383,031,000	1,152
NTONYIRI	113,673	7,480	168,810,000	1,410	21,150,000	189,960,000	1,671
S. IMENTI	234,479	9,530	209,660,000	5,944	89,160,000	298,820,000	1,274
THARAKA	105,620	4,719	103,818,000	0	0	103,818,000	983
TIGANIA	293,944	12,583	278,526,000	1,500	22,500,000	301,026,000	1,024
TIMAU	52,588	1,757	38,654,000	1,582	23,730,000	62,384,000	1,186
MERU TOTAL	1,755,587	67,876	1,503,472,000	34,535	518,025,000	2,021,497,000	1,151

DIVISION	Year 2013 Additional Population Covered	New Water Supplies		Rehabilitated Water Supplies		TOTAL COSTS (Ksh.)	TOTAL COSTS PER BENEFIC. (Ksh.)
		Capacity Developm. (m3/day)	Total Cost (Ksh.)	Capacity Developm. (m3/day)	Total Cost (Ksh.)		
C. IMENTI	342,098	17,037	374,814,000	7,090	106,350,000	481,164,000	1,407
IGEMBE	333,132	15,705	349,760,000	990	14,850,000	364,610,000	1,094
N. IMENTI	369,610	27,242	601,024,000	7,000	105,000,000	706,024,000	1,910
NITHI	546,922	32,845	722,590,000	9,597	143,955,000	866,545,000	1,584
NTONYIRI	200,392	15,073	340,106,000	1,410	21,150,000	361,256,000	1,803
S. IMENTI	398,169	25,547	562,034,000	6,149	92,235,000	654,269,000	1,643
THARAKA	152,965	8,413	185,086,000	0	0	185,086,000	1,210
TIGANIA	466,403	28,195	623,690,000	1,500	22,500,000	646,190,000	1,385
TIMAU	81,384	5,092	112,024,000	1,582	23,730,000	135,754,000	1,668
MERU TOTAL	2,891,075	175,149	3,871,128,000	35,318	529,770,000	4,400,898,000	1,522

4 PROJECT IMPLEMENTATION

4.1 Scope of Work and Activities

4.1.1 Feasibility Study Phase

Two separate streams of Technical Assistance (TA) are required. The first is required to support the MoWD in its project preparation activity. The second is to carry out the detailed feasibility study activity. Thus the two main activities involved in this phase of the project are:

1) TA support to the MoWD in Project Preparation.

The main tasks are:

- liaison with various concerned agencies for input to the DWDP
- finalise the DWDP
- conduct on-the-job training in parallel with TA for feasibility studies.

2) TA support for Feasibility studies.

The main tasks are:

- detail survey, physical and socio-economic of potential sites identified in the DWDP
- preliminary design of water systems and institutional/community structures for implementation
- liaison with community groups on self help aspects
- assessment of proposed designs on the following criteria.

4.1.2 Detailed Design Phase

The division of the responsibility for the various activities involved in the detailed design phase between MoWD and TA resources will be determined at the mid-term review of the project. However, the main activities involved in this phase of the project are:

- physical survey of feasible sites
- design and documentation of water systems and implementation of first round of institutional strengthening (training in planning, design, community participation, and construction supervision; implementation of financial systems) and structures for community participation
- liaison with community groups on self help aspects

4.1.3 Implementation Phase

Again, the division of the responsibility for the various activities involved in the implementation phase between MoWD and TA resources will be determined towards the end of the design phase. However, the main activities involved in this phase of the project are:

- land acquisition, if any
- tender of construction
- construction of systems and supervision thereof
- second round institutional strengthening (training in community participation, operation & maintenance)
- operation and maintenance systems

4.2 Inputs

Key personnel inputs to each key activity in the feasibility phase of the project are described in Figure 4.1. Equipment and other inputs to the project are described in Figure 4.2. These inputs are to be supplied by donor and government funding as described in section 5 below.

Figure 4.1 Personnel Inputs and Outputs

ACTIVITY	MONTHS 1–12	MONTHS 13–24	MONTHS 25–36	TOTAL MONTHS	COST	TRAVEL COST Extern.	TRAVEL COST Local
Activity 1 **DWDP Support TA**							
Inputs:							
1) Foreign Personnel							
Team Leader	**********	**********		24			
Planner/Engineer	** ** *	* ***		9			
Volunteer	**********	**********		24			
2) Government Personnel							
Project Manager	**********	**********		24			
DWE	**********	**********		24			
HO Engineer	**********	**********		24			
Hydrologist	**********	**********		24			
etc							
3) Support Staff							
Secretary	**********	**********		24			
Assistant	**********	**********		24			
Outputs:	Draft DWDP Draft Institution Rpt	Final DWDP & Institution Rpts					
Activity 2 **FS Support TA**							
Inputs:							
1) Foreign Personnel							
Team Leader	******	**********	**********	30			
Planner/Engineer	******	**********	**********	30			
Sociologist	******	**********	**********	30			
Engineer (Water Supply)		**********	**********	24			
Surveyor	******			6			
Economist/Finance	**	** ** **	** **	12			
Environmental	**	** ** **	** **	12			
Institutional	**	** ** **	** **	12			
2) Local Consultants							
Deputy Team Leader	******	**********	**********	30			
Planner/Engineer	******	**********	**********	30			
Sociologist	******	**********	**********	30			
Engineer (Water Supply)		**********	**********	24			
Surveyor	******			6			
Economist/Finance	**	** ** **	** **	12			
etc							
3) Government Personnel							
Project Manager	******	**********	**********	30			
Engineer Counterp. x 4	******	**********	**********	120			
4) Support Staff							
Office Manager	******	**********	**********	30			
Secretary x 2	******	**********	**********	60			
Assistant	******	**********	**********	30			
Drivers x 4	******	**********	**********	120			
Cleaner	******	**********	**********	30			
Outputs:	Draft Physical & Social Rpts	Draft FS Rpt Final Physical & Social Rpts	Final FS Rpt				

4.3 Outputs

4.3.1 Outputs of Project Preparation TA

Institutional Outputs

a) Central Ministry of Water Development (MoWD)

The outputs are:

- additional formal and on-the-job training of MoWD staff in the Resources Assessment (RA) Section in techniques required, this training must be given to officers who will remain within the section for a sufficient time to train replacements
- additional equipment (to be determined)
- additional (given existing zero capability) capacity and systems to strengthen District MoWD offices in their role as semi-autonomous water supply agencies, specifically the ability to train in resources assessment, preparation of the DWDP, O&M procedures, financial systems management and techniques of community mobilisation; this activity will be supported by improved in information linkages between central office and District
- improved internal co-ordination between the RA Section and other sections of the MoWD, and
- improved links with other ministries with respect to usage of water resources.

b) District Ministry of Water Development

Outputs are:

- training in appraisal of proposals for utilisation of water resources
- training in methodology for the preparation of the DWDP
- improved construction and operation and maintenance of "urban" water supply systems through implementation of financial and administrative systems giving effective control these activities at district level
- training in support to all other types of water supply systems in assessment, planning, project appraisal, community participation and financial systems
- training to train members of Local Government/Community groups/Water Associations in these skills
- legislation and/or regulations under the Water Act and possible revenue acts to enable the District office to carry out the above roles

c) District Development Office

Outputs are:

- an assistant DDO with specific responsibility for water matters
- training in Water Resources Planning for this person
- revision of the legal and/or administrative base for the DDC's oversight of water matters.

d) Community Groups

Outputs are:

- education and community awareness campaigns initiated through the chiefs and sub-chiefs
- strengthen cost recovery and administration of water systems.

Reports

Outputs are:

- inception report (first bi-monthly report)
- bi-monthly reports
- mid-term institutional report
- final institutional report
- the DWDP for the Meru District.

Figure 4.2 Non-personnel Inputs

ACTIVITY	MONTHS 1 12 | 13 24 | 25 36	ITEMS (OUTPUT)	COST
Activity 1 **DWDP Support TA**			
Inputs:			
1) Foreign			
Procurement	******	Photocopier?	
Training	****** **********	Community Participation - KWAHO?	
	****** **********	Planning & Assessment - TNO?	
	****** **********	Economics/Finance - Rotterdam/IHS?	
Office	********** **********	Consumables	
2) Local			
Office	********** **********	Space & Equipment	
Activity 2 **FS Support TA**			
Inputs:			
1) Foreign			
Procurement - Vehicles	******	4WD x 4	
- Major Equipment	******	photocopier & computers	
Training	**********	?	
Office	****** ********** **********		
2) Local			
Information	****** ********** **********		
Counterparts?	****** ********** **********		

4.3.2 Outputs of the Feasibility Study TA

Major reporting outputs are described and scheduled in Figure 4.1. The major reporting requirements are:

- inception report (first bi-monthly report)
- bi-monthly reports
- physical and social survey report
- mid-term draft feasibility report
- final feasibility report.

The feasibility report will assess each sub-project identified on the criteria established in the DWDP. In addition, the institutional and financial requirements for design and implementation of the sub-projects assess as viable will be detailed.

4.3.3 Implementation of Design, Construction and Operation

Implementation from feasibility phase onwards includes outputs of detailed design and implementation phases. These phases involve many activities, which are be detailed by the feasibility studies. These activities require:

- resources (money, staff and equipment) for design activity
- systems for disbursing capital funds to recipients according to established procedures
- systems for gathering and processing the required data for monitoring, and
- additional training for MoWD and other organisations involved in implementation.

Outputs will thus be:

- detailed designs and documentation for sub-projects
- completed water supply projects as detailed in Table 3.1
- adequate administration, resource planning and financial systems in place in order to operate these projects efficiently and on a sustainable basis, and
- trained staff in place where required.
- additional equipment and resources.

Effective community participation in construction and operation will require a flexible approach to implementation on the part of the support organisations, principally the MoWD. Where local communities are not familiar with the requirements for management of formal sector organisations, such as a water supply, close contact over a prolonged period of time will be required to develop and refine workable systems. Adequate skills and resources for such an approach must be identified at feasibility phase and be in place for construction and operation phases.

5. COSTING AND COUNTERPART RESOURCES

5.1 Costing

by inputs by activity/overheads in section 4.2

5.2 Counterpart Resources

5.2.1 Implementing Agency

Ministry of Water Development:

- Planning Unit, Resource Assessment Section
- District Water Engineer, Meru District

5.2.2 Counterpart Contribution

by inputs by activity/overheads in section 4.2