APPENDIX K

POPULATION AND WATER DEMAND PROJECTIONS

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1. POPULATION

1.1 Baseline Situation and Census Results

National population censuses have been held in Kenya every ten years since 1969. Each census has covered the whole country in detail and the results have been the primary basis for national projections and planning.

The national census figures were therefore assessed for every sub-location within each of the water supply projects. Information from the 1969, 1979 and 1989 censuses were used in the analysis.

Due to widespread changes in sub-location boundaries, each sub-location growth rate was adjusted appropriately to allow for changes in area.

It was found, especially in the smaller areas, that the growth rates between the 1969 and 1979 census, and the 1979 and 1989 census indicated considerable changes in short term trends, but that the longer term growth rates indicated from the 1969 and 1989 census provided a more uniform trend that was in fairly close agreement with District and National trends and predictions. This is consistent with the assumption that reliability and accuracy of data increases with the length and quantity of data, and suggests that the growth rates obtained from assessment of the 1969 and 1989 population figures would be more reliable than using the shorter term between the 1979 and 1989 censuses.

The National and District Growth rates between 1969 and 1989 are indicated below,

Table K.1.1 National and District Population Growth Rates

	1969 to 1989 Annual Growth Rate
National Growth Rate	3.43 %
Meru District Growth Rate	3.12 %
Isiolo District Growth Rate	4.31 %

(Note: rates adjusted where appropriate to suit changes in administrative boundaries).

These figures indicate that population growth rates in Kenya, during the twenty years between 1969 and 1989, have been among the highest in the world. Since the 1989 census, there has been no similar widescale and detailed population survey, although a number of local population estimates have been made. These however do not give sufficient justification for adopting alternative growth characteristics. Therefore, the current (1997) population levels have been estimated using the average 1969-1989 annual growth rates.

The exception being Maua where, due to raw water source constraints, the supply area is limited to the urban areas of Amwathi sub-location only. Since the growth characteristics of urban areas is different from rural areas, the growth rate for the whole sub-location can not be applied in this instance. A higher growth rate has therefore been assumed to allow for the higher level of urbanisation in the supply area and also due to the location of the new District Offices close to the supply area.

Details by sub-location of the 1969, 1979 and 1989 populations and growth rates, adjusted for changes in sub-location boundaries, have been integrated to provide appropriate figures for the individual scheme areas as given in ***Table K.1.2***.

Table K.1.2 1989 Scheme Populations and Current Population Estimates.

Project	Kenya	Eastern Province	Meru	Nkubu	Isiolo	Chuka (1)	Chogoria	Maua (2)	Tigania
1989 population	21,443,636	3,768,677	125,191	6,881	18,658	62,784	25,148	3,223	51,826
1969-1989 annual growth rate	3.4%	3.65%	3.6%	3.5%	4.2%	2.7%	3.4%	3.4%	2.4%
1997 population	28,000,000	5,020,000	165,980	9,471	25,679	81,034	32,134	5,537	63,891

Notes *(1) Chuka population includes for additional area outside supply area, for which water will be delivered from the proposed treatment plant.*

(2) The growth given rate for Maua is the inter-censal growth rate for the whole of Amwathi sub-location. Maua supply area however is limited to the urban areas within the sub-location. A higher growth rate has therefore been applied to arrive at the current population.

1.2 Future Projections

Future population projections were estimated after consideration of the above baseline figures together with a review of a number of past studies and reports and have also taken a number of additional factors into account, including:

1) Analysis of past census results and trends

2) District Development Plans

3) National Master Water Plan

4) Water Resources Assessment Project for Meru and Isiolo Districts

5) Local development

6) Population pressures and migration

7) Land potential

8) Government population policies

(1) Census Results

As discussed above, an analysis of the census results has been used to estimate the current population levels for each of the schemes. They have also been used, together with levels of urbanisation given by the WRAP project, to estimate the growth rate of different categories of water supply consumers, as discussed below.

The population distribution for each supply area was calculated by integrating the housing and land classification, (as defined in the 1986 Design Manual), for each sub-location contained within each scheme. The results are indicated below.

Table K.1.3 Distribution of Land and Housing Classification for Projects

Land Classification		Meru	Nkubu	Isiolo	Chuka	Chogoria	Maua	Tigania
Rural	High	72%	48%	0%	74%	94%	34%	54%
	Medium	0%	0%	0%	21%	0%	51%	16%
	Low	0%	0%	33%	0%	0%	0%	30%
Urban	High	3%	8%	3%	0%	0%	0%	0%
	Medium	8%	26%	13%	2%	3%	6%	0%
	Low	17%	18%	50%	3%	3%	9%	0%

Source: WRAP District Water Assessment Reports for Meru and Isiolo Districts.

Comparing the above results with ***Table K.1.2***, it can be seen that a correlation exists between growth rate and degree of urbanisation, confirming that urban areas are growing at a higher rate than rural areas and, that the adoption of different growth rates for urban and rural areas is a valid approach. A statistical analysis of the figures indicates that the historic trend, averaged over the supply areas can be represented by:

Annual growth rate = 2.2% x % urbanization + 2.8%

This formula implies the following average growth rates for totally rural and totally urban areas within the scheme supply areas:

1) Rural population growth rate: 2.8% per annum

2) Urban population growth rate: 5.0% per annum

This average **urban** growth rate is below those adopted by both the National Master Water Plan and the WRAP project as indicated in the following sections.

The **rural** growth rate found from the analysis of census figures for the 7 schemes is significantly higher than that used by the NWMP but, considering most of the rural area is high potential land, the growth rate is lower than that adopted by the WRAP project.

(2) District Development Plans

In preparing the District Development Plans for future development, other factors such as land potential, population densities, agricultural, commercial and industrial trends are taken into account. The respective projected growth trends adopted by the different Districts covered by this project are given below:

Table K.1.4 District Development Plan Growth Rates

Development Plan	Growth rates adopted		
	1979-1993	1993-1994	1994-1996
Tharaka-Nithi	3.96 %	3.54 %	3.50 %
Meru	3.34 %	3.28 %	3.37 %
Isiolo	4.87 %	4.87 %	4.87 %

In each case, it would appear that these growth rates adopted for the District Development Plans are slightly higher than the historic growth rates found from the 1989 census results.

(3) National Water Master Plan (1992)

The National Water Master Plan projected population growth rates per Location for the whole of Kenya. These projections differentiated between urban and rural growth. The growth rates adopted for the Master Plan appropriate to the different water supply projects under this study are indicated below:

Table K.1.5 NWMP Growth Rates

Project	1990-2000	1990-2000	2000-2010	2000-2010
	Rural growth	Urban growth	Rural growth	Urban growth
Meru	2.26%	9.35%	1.9%	5.2%
Nkubu	2.26%	9.35%	1.9%	5.2%
Isiolo	0.71 %	12.9 %	4.0%	6.0%
Chuka	2.26%	7.5%	1.9%	4.15%
Chogoria	2.26%	N/A	1.9%	3.1%
Maua	2.26%	7.5%	1.9%	4.15%
Tigania	2.26%	N/A	1.9%	N/A

These rates are generally lower for rural areas and higher for urban areas than those found from the census results. After allowing for the relative degree of urbanization, the overall growth rate is slightly lower than historic growth rates. However, the principal of adopting different growth rates for urban and rural populations is an improvement in projection technique over the use of an average growth rate applied to the whole District. This is particularly true when, as in the present study, it is required to predict the future spatial distribution of population in areas with different degrees of urbanisation. The projections also indicate a declining growth rate for the future, which reflects Government policy to slow down the present very high level of population increase.

(4) Water Resources Assessment Study (1991)

In 1991 The Water Resources Assessment and Planning Project (WRAP) submitted comprehensive water resources assessment studies for both Isiolo and Meru Districts. These studies projected population and water demand estimates per Sub-Location using a number of different categories of urban and rural population. These projections are therefore more detailed than either the District Development Plan or the National Master Water Plan. For projection purposes, standardised growth rates were used for different housing and land categories, as indicated below:

Table K.1.6 WRAP Growth Rates

	Meru District (Scenario 1)	Isiolo District
Meru Municipality	4.2%	
Isiolo Town		5%
Other Urban centers	7.2%	
Rural centers		5%
High potential rural areas	4.0%	4.0%
Medium potential rural areas	3.5%	4.0%
Low potential rural areas	2.5%	4.0%

The 1989 census figures, which indicate slightly lower growth rates than the above, were published after the study had been completed. For this reason, the WRAP Meru Scenario 2, which indicated even higher growth rates has not been included in the table.

The advantage of this method of using different growth rates for different areas of land potential and urban development is that the resultant overall growth rate adjusts automatically to suit the characteristics of different areas. In addition, the different classifications were chosen to correspond with water service levels defined in the 1986 MOWD Design Manual which are still valid. They can therefore be used directly to assist water demand, revenue and tariff calculations.

Disadvantages of the WRAP method include the need for prior knowledge of the distribution of land and housing classifications in each sub-location, and that it applied a constant growth rate over the design period.

However, it is relatively easy to incorporate changes in growth rate over the design period. Also, the WRAP study itself investigated the whole area and defined the distribution of land and urban development for each sub-location, using a base year of 1988. Therefore, if the WRAP population distribution characteristics are used as 1988 baseline conditions, future projections can be readily made by application of selected appropriate growth rates for each population category.

(5) Local Development

The impact of localised development plans need to be superimposed on the background historical growth characteristics of areas. There are two important

developments currently taking place in the supply areas, due to the newly formed Districts of Tharaka-Nithi and Nyambeni.

The location of the new District offices for Tharaka Nithi at Chuka Town, and for Nyambeni close to Maua Town, will have a significant impact on the development of these towns. Rapid growth is already evident in Chuka by the intense construction activity taking place in, and around, the municipality. The District Planning Officer for Tharaka Nithi District is projecting an annual growth rate of 12% for Chuka Town which, judging by the existing construction activity, would appear to be justified. The new District Offices for Nyambeni District have been proposed to be located about 4 km north of the centre of Maua Town. It is outside the area that can be served by this project. Nevertheless, considerable growth of the town is expected to result, and an annual growth rate of 7% per annum has been adopted.

(6) Population Pressures and Migration

The high population growth rates in the country are leading to high rural population densities placing an increased pressure on the limited agricultural land available. The socio-economic survey indicated that currently 60% of households in the supply areas live on plots of less than 2 acres, with an average family size of 7.4.

Current annual growth rates of around 3.5% will result in roughly doubling the population over 20 years or, halving the land available per household.

To avoid the increased poverty that would result from this pressure on land, a number of changes are expected to take place: agricultural production will become more efficient, there will be a tendency towards industrialisation encouraging migration to towns, and the rural population growth will slow.

The impact of this process is already evident by the relatively high urban population growth rates compared to rural areas.

However, this migration itself creates pressures on land around the urban areas resulting in high urban land and rental costs and will result in growth of satellite areas around the urban centres, where people can live in cheaper housing but still in commutable distance. The current growth of Nkubu, located 12 km south of Meru, would appear to be as a result of this process.

(7) Land Potential

The population density that agricultural land can sustain depends upon its agricultural potential. ***Table K.1.3*** shows that, apart from Isiolo, the land in the supply areas are generally high agricultural potential, and can therefore support relatively high population densities.

However, past attempts to calculate the land carrying capacity for different categories of land have not been successful. This study has therefore adopted a similar approach to the WRAP project which logically suggested that growth will be distributed over the rural areas, with more constraint on growth in the lower agricultural potential areas.

(8) Government Policy

The Government is concerned over the high population growth rate in the country, and the impact it will have, if not restrained, on the environment and on household income. It therefore wishes to see the present high population growth rates lowered, and has introduced a number of measures, such as using advertisements and educational means to try and reduce the growth rate.

However, in an environment where life expectancy has been historically low, large family units have been needed to ensure adequate future household labour. There are therefore very fundamental reasons behind the large family culture which exists in Kenya and many other developing countries, and to ask a Kenyan farmer to limit his family size is similar to asking someone in the developed world to work without a insurance and a pension arrangement.

Without more direct incentives therefore, the existing culture will not change rapidly.

(9) Projections

Generally, based on the analysis of historic data, growth rates were found to be influenced by the degree of urbanization within the individual supply area. It was also assumed that the current high population growth rates will slow down over the design horizon in response to Government population policy. However, due to population pressure on rural land, the reduction in growth would be felt mostly in the rural areas, and that the urban areas would continue to grow at similar rates to present.

The final projections have been based on consideration of the above factors. The format is similar to that developed for projections by the WRAP project. Growth rates were assumed to vary gradually over the plan horizon using the figures given below:

The growth rates adopted for future projections varied with the particular circumstances.

Table K.1.7 Annual Population Growth Rates for Household Categories

Scheme	Year	Rural			Urban		
		High Potential	Medium Potential	Low Potential	High Class	Medium Class	Low Class
General	1997	3.0%	2.5%	2.0%	5.0%	5.0%	5.0%
	2000	2.5%	2.0%	1.0%	5.0%	5.0%	5.0%
	2010	2.0%	1.0%	1.0%	5.0%	5.0%	5.0%
Chuka	1997	3.0%	2.5%	2.0%	11.5%	11.5.0%	11.5%
	2000	2.5%	2.0%	1.0%	12.0%	12.0%	12.0%
	2010	2.0%	1.0%	1.0%	7.0%	7.0%	7.0%
Maua	1997	3.0%	2.5%	2.0%	7.0%	7.0%	7.0%
	2000	2.5%	2.0%	1.0%	7.0%	7.0%	7.0%
	2010	2.0%	1.0%	1.0%	7.0%	7.0%	7.0%

The resultant detailed annual projections for each land and housing category for each scheme are given in the tables at the end of this chapter, and are summarised below:

Table K.1.8 Population Projections

Year / Project	1989	1997	2000	2010
Meru	125,191	165,980	183,527	251,668
Nkubu	6,882	9,471	10,648	15,611
Isiolo	18,658	25,679	29,029	43,648
Chuka *(1)*	31,265	41,502	46,238	64,433
Total	62,784	81,034	88,861	116,577
Chogoria	25,148	32,134	34,920	44,376
Maua	3,223	5,537	6,763	13,344
Tigania *(2)*	51,826	63,891	68,891	83,121

Notes (1) Chuka intake and treatment plant to be sized for a larger area than required to serve the Municipal area alone.
(2) Figures for new Tigania scheme only

1.3 Livestock Projections

Numbers of existing livestock within the supply areas have been taken from a number of sources:

1) The livestock census conducted by WRAP in Meru Districts in 1988 in collaboration with the district local administration for each sub-location,

2) The socio-economic survey results,

3) Discussions with local District Officers.

The results of these exercises are shown below, using the following conversion factors in assessing the number of Livestock Units:

1 Livestock unit = 1 Grade Cow = 3 indigenous cows = 15 sheep or goats. Poultry were not included, but camels have been accounted for assuming 1 camel = 3 livestock units.

Table K.1.9 Estimates of Existing Livestock Numbers as Livestock Units per 1000 Population

Project	WRAP	District Water Office	Socio-economic survey
Meru	202		250
Nkubu	191		226
Isiolo	-	1206	235
Chuka	267		231
Chogoria	209		319
Maua	80		210
Tigania	194		226

In most cases, there is a fairly close agreement between the figures given by WRAP and by the socio-economic survey, although the survey findings generally indicate a slightly higher level of livestock ownership.

WRAP did not produce a Livestock figure for Isiolo. The DWO's estimate looks high in comparison to the other figures but is due to the fact that it reflects the nomadic nature of the surrounding environment, and has therefore been adopted rather than the survey figure, which reflects the permanent livestock levels.

The WRAP study findings were based on a much larger census population than this study's survey and should therefore be more accurate. They have been adopted as baseline levels for future projections.

The WRAP studies, after consultation with the various District Livestock Officers used two growth scenarios. Scenario 1 adopted a uniform growth rate for livestock of 2.0% per

annum. Scenario 2 used higher initial growth rates of up to 6% depending upon land potential, but declining in the future. The sensitivity of the different growth rates to overall water demand were investigated, but as the livestock water demand represented only a small percentage of the total, the sensitivity of the overall water demand projections to different livestock growth rate assumptions was found to be virtually nil. A uniform growth rate of 2.0%, was therefore adopted for present purposes, using the 1988 WRAP figures per sub-location for livestock numbers, except for Isiolo, where the figures obtained from the District Offices were used.

1.4 Industry

The supply areas are generally predominantly rural in character, except for the relatively small urban centers where economic activity is concentrated on commercial trading, shops, bars etc. There are some isolated industries in the rural areas which are mainly coffee and tea factories or timber mills.

The coffee factories are a major water user and obtain large quantities of water from surface water sources, but return most of this water to the rivers, although often in a polluted state. They do not wish to connect to piped water supply schemes, since they do not require good quality treated water, the cost of which would be prohibitive. Their activities however do require monitoring and control.

Meru Town is the exception. It has a significant industrial base which is likely to grow. Current industries include Milling (4), Cotton, Fruit processing, Milk Processing, Animal feed industry, Timber manufacturers (5), Coffee (5), Tannery, Tea Factories. The most significant water users are the coffee and milk processing factories but these do not currently obtain water from the Ministry supply. However other industries do, and during interviews with management staff, the lack of sufficient water was given as a significant constraint to their operations.

Assuming that water will not be a constraint in the future, it is reasonable to assume that industry will grow at least at the same rate as population growth, but will tend to concentrate around the urban areas.

1.5 Institutions

(1) Schools

The number of pupils attending schools in each sub-location, and the distribution between day schools with and without WCs and boarding schools have been taken

from the WRAP estimates. The total number of pupils in each sub-location averages at 32% of the total population. This percentage is close to the level of 30% suggested in the MLRRWD Design Manual, and is also close to the percentage of people within the school attending age groups indicated by the 1989 census. It is therefore likely to represent a maximum level of attendance. This high levels of pupils will however reduce with a declining growth rate, and a figure of 30% has been used for projection purposes.

The proportion of pupils in schools with WC, without WCs and at boarding schools in each sub-location has been assumed to remain constant for future projections.

(2) Administrative Staff

The numbers of administrative staff in District, Divisional offices etc. were also estimated on a sub-location basis. The number of staff varied widely from a maximum of 27 per 1,000 population in Isiolo to below 1 per 1,000 in Chogoria and Nkubu. With some adjustment to allow for local circumstances, the numbers of administrative staff have been assumed to grow at the same rate as the population.

1.6 Health Facilities

The existing numbers of health centers, hospital beds etc were established initially from the WRAP estimates. These were verified and discussed at District level and adjusted accordingly, with an average of 5 beds per 1,000 outpatients. The numbers of hospital beds, number of outpatients and dispensaries has been assumed to grow in parallel to population growth.

1.7 Commercial

Commercial activity in each supply area was assessed by the numbers of hotel beds, shops and bars in each sub-location which, for future projections, was also assumed to grow pro-rata with population.

1.8 Irrigation

It is evident that many people with individual connections currently use water to a greater or lesser degree for irrigation. The present situation, with virtually no effectively metered connections, encourages this practice, as water costs are not related to consumption.

It is considered however that the introduction of full metering together with a full cost recovery tariff system will effectively stop this practice except for a few wealthy

households. In these cases the high per capita unit consumption rate adopted for high class housing allows for some limited watering of gardens etc.

Due to the high cost of metered piped water, it would be uneconomical for any large irrigation consumer to obtain water from the piped system. It has been assumed therefore that such consumers will make their own arrangements for irrigation water.

It is therefore not proposed to make any separate allowance for irrigation from the piped water supply system. Water source assessment will however make appropriate allowances for existing water users.

2. WATER DEMAND

2.1 Water Consumption Rates

The per capita consumption rates recommended in the 1986 MOWD Design Manual were found by the consumer survey to be reasonable for metered connections. It was also found however that consumption of up to 5 times higher is to be expected if meters are not connected. This is an important finding since it supports the MLRRWD's current policy to introduce full metering to its supplies and, assuming full metering is affected, it supports the use of design manual consumption rates, as given below, for design.

Table K.2.1 Unit Consumption Rates

Category			unit	Demand
Individual connections	Rural	High potential land	l/c/d	60
		Medium potential land	l/c/d	50
		Low potential land	l/c/d	40
	Urban	High class housing	l/c/d	250
		Medium class housing	l/c/d	150
		Low class housing	l/c/d	75
Water Kiosks/communal water points	Rural		l/c/d	10
	Urban		l/c/d	20
Schools		Boarding	l/c/d	50
		Day school with WC	l/c/d	25
		Day school without WC	l/c/d	5
Hospitals		Regional	l/bed/d	400
		District	l/bed/d	200
		Other	l/bed/d	100
		Out patients	l/patient/d	20
Dispensary/Health centre			m3/day	5
Hotels		High class	l/bed/d	600
		Medium class	l/bed/d	300
		Low class	l/bed/d	50
Offices			l/c/d	25
Bars			l/day	500
Shops			l/day	100
Unspecified industry			m3/ha/d	20

These consumption rates assume that:

(1) All individual connections will be metered.

(2) Billing will take place on a monthly basis using a stepped tariff designed to constrain high water usage.

(3) All water kiosks will be metered, and water paid for.

(4) The consumption rates include an allowance for 20% losses.

These consumption rates are comparable with consumption rates used elsewhere internationally, both in developing and developed countries. They are also within the range of consumption rates that the public awareness survey suggests should be affordable. However, the per capita consumption rates for the existing schemes tended to be significantly higher than those given in the design manual. There are a number of reasons for this, including:

1) Higher levels of water losses

2) Very few meters have been installed, and few of these are working. Hence, in practice, flat rates are being used for billing, which are not related to the amount of water consumed.

3) Illegal connections

4) Poor and inadequate data

5) Tariff levels are low compared to income levels

Following discussions with the MLRRWD it was decided that, for design purposes and, for assessing the adequacy of existing facilities, the Design Manual guidelines should be adopted. This assumes that a programme will be initiated to investigate the reasons for the apparent current high consumption rates, and appropriate action taken to rectify the situation. This will include water loss surveys, tariffs index linked to costs, the effective metering of all connections, regular meter reading, preventative maintenance and effective revenue billing and collection.

2.2 Service Levels

Guidance for the distribution between individual connection and other water users is also given in the 1986 MOWD Design Manual. This suggests connection levels for the different household categories as indicated below:

Table K.2.2 Service Levels as Percent of Individual Connections within Service Areas

Category		Initial	Intermediate	Design Horizon
Rural	High	20%	40%	80%
	Medium	10%	20%	40%
	Low	5%	10%	20%
Urban	High	100%	100%	100%
	Medium	100%	100%	100%
	Low	10%	30%	50%

Results of the consumer survey also indicated that, assuming good reliability of water supplies, higher affordability and connection levels than suggested above could be expected at the current tariff level. However, in order to achieve greater cost recovery, it will be necessary to increase the current tariff levels in the future. This will have the effect of reducing this high level of affordability.

Without a detailed study specifically targeting the price elasticity of water, it is not possible to accurately predict future trends, other than by using internationally accepted levels of affordability in terms of percentage of income available for water.

However, it is possible to "engineer" connection and consumption levels by making appropriate adjustments for connection charges, the water tariff structure, and the degree of cost recovery. Assuming this approach will be adopted, the MOWD design guidelines for levels of individual connections, as given above, can be used.

It has been assumed that all hospitals, administrative offices and commercial premises will be connected to the water supply schemes.

However, most livestock will be watered "free" at traditional water sources. After discussion at District level, it has been assumed that only 15% of livestock will obtain water from the piped system for which owners will have to pay.

The industrial water consumption rate assumes fairly high water using industries. Nevertheless, due to the low industrial level in the rural areas, the estimated industrial consumption, even assuming 100% connection rates, results in only a very small industrial consumption in nearly all supply areas. These demand levels have therefore been adopted. For Meru however, the level of industrial activity is higher but, most of these industries do not require treated water and do not therefore use the Ministry's supply. For projection purposes therefore, only 20% of the industries in the Meru supply area have been assumed to connect to the piped water system.

2.3 Water Demand Projections

Water demand was projected according to the criteria and assumption outlined in previous sections. The sensitivity of assumptions for different consumer category is shown in ***Table K. 2.3***.

Table K.2.3 Sensitivity of Overall Demand by Different Consumer Category

Consumer Category	Assumptions	Comments on Sensitivity to Overall Demand
a) Number of pupils	30% of total population	The total water demand is not sensitive to alternative assumptions of numbers of pupils
b) Proportion of schools with and without WCs	Will remain constant	Not sensitive to alternative assumptions
c) Institutional and commercial growth	Will be the same as population growth	Not sensitive to alternative assumptions
d) Industrial growth	As population growth	The resultant industrial demand represents 18% of total demand and is therefore, subject to the type of industry involved, sensitive to alternative assumptions. Lower growth rates were not considered realistic and, higher growth rates, due to their speculative nature, and their resultant impact on investment were not considered justified at this stage. In this respect the resultant projections could be viewed as conservative.
e) Institutional and commercial connections	All will receive water connections	There is little sensitivity to this assumption, which, provided the establishments are within reasonable distance of a supply main, is realistic.
f) Industrial connection rate	All urban industries, but no rural industries for processing water	Sensitivity is as d) above. However it is considered reasonable for rural industries such as coffee factories to continue to use untreated water from local streams for processing requirements

Source: JICA Study Team

Water demand projections based on the design criteria and population projections given in the previous Sections are detailed for each category of consumer and for each year over the design horizon on the attached ***Tables K.2.6 to K.2.12.***

These tables contain a considerable amount of information. However, it is deemed advantageous to contain all the information for one scheme on a single page to gain a good overview of the project and, to assist sensitivity studies, to gain a better overall understanding of how changes in assumptions will impact on the ultimate water demand forecast. The tables are divided into 5 sections:

(1) Baseline Data:

Baseline population, livestock, industrial, institutional and commercial data are provided for each sub-location within the supply area. The population is as given in the 1989 census, other sub-location details have been based on the data and assumptions given in Section 2.2 above. If only a part of a sub-location is located within the supply area, appropriate adjustments have been made to the overall population, and to the distribution between rural and urban populations. For example it is only possible to serve the urban population in Maua, and the population distribution for Maua therefore indicates 100% urban, although the urban population currently only represents 15% of Amwathi's total population. The right hand column of this section totals the baseline information for the whole supply area.

(2) Projection Assumptions:

This section provides all the projection assumptions made in developing the projections for growth of population, livestock, institutional, industrial and commercial facilities. It provides population and livestock growth rates and the distribution of the types of schools, health and commercial facilities.

(3) Service Levels:

This provides the assumed level of connections for the different consumer categories for the planning years of 1997, 2000 and 2010, together with per capita consumption rates, and expected peak factor per consumer category.

(4) Annual Projections:

This section indicates the annual projections for each category of consumer based on the data given in the first two sections: baseline data and projection assumptions.

(5) Water Demand Projections:

The final section applies the service levels to the projected numbers of each category of consumers to provide the annual water demand projections.

The results of these projections are summarised below:

Table K.2.4 Total Water Demand Projections for 2000 and 2010

Project Year	Meru m3/d	Nkubu m3/d	Isiolo m3/d	Chuka (1) m3/d	Chogoria m3/d	Maua m3/d	Tigania (2) m3/d
2000	13,188	1,142	3,970	2,192	1,578	719	2,125
2010	22,725	1,915	6,372	4403	2,886	1,493	3,778

Note (1) Chuka supply area only
(2) New Tigania supply area only

Table K.2.5 Breakdown of 2010 Water Demand by Consumer Category

Project	Meru m3/d	Nkubu m3/d	Isiolo m3/d	Chuka (1) m3/d	Chogoria m3/d	Maua m3/d	Tigania (2) m3/d
Domestic	17,311	1,577	2,859	3,659	2,371	1,181	3,193
Livestock	306	25	258	100	61	16	127
Industry	3,627	91	234	206	106	83	64
Institution	779	87	2,760	160	239	54	184
Health	217	73	120	55	71	46	51
Commerce	485	63	140	223	36	114	159

TABLES

Table K.2.6 Water Demand Projections for Meru Water Supply

MERU WATER SUPPLY — *Baseline data for area to be fed from combined intake and treatment works* — *Service Levels* — *Table K.2.6* — *1997/10/3*

Baseline Data			Baseline data														Total Base-line
Locations			Town	Ntima U.Igoki	Ntima Ntakira	Ntima L.Igoki	Ntima Nthimbiri	Ntima Mpuri	Ntima Ngonyi	Nyika Mulathanka	Nyika Thuura	Nyika Chungu	Nyika Muruthu	Nyika Nkabune	U.Abothoguchi Kathiri	U.Abothoguchi Githongo	Kithirune	
Sub-Locations																	
1989 Census figures			5	56	10	6	9	6	9	5	45	46	16	9	28	15	16	
1989 population				26913	9414	4759	5324	4492	5227	5054	8879	13499	8021	3645	14172	7094	8698	125,191
Population distribution & growth (WRAP 1988 estimates)																		
Rural areas		High		0%	77%	80%	100%	100%	100%	0%	100%	100%	100%	100%	100%	100%	100%	72.0%
Land potential:.....		Med		0%	0%	0%				0%								0.0%
		Low		0%	0%	0%				0%								0.0%
Urban area		High		10%	2%	2%				10%								2.8%
housing class:.....		Med		30%	7%	6%				30%								8.4%
		Low		60%	14%	12%				60%								16.8%
Livestock numbers:		Grade	1076	716	1454	850	1554	874	633	614	2196	333	3547	932	5000	1440	3500	24,719
		Indig								153	549	83	549	233		360		1,927
		Shoats	703	704	616	946	763	729	675	330	2770	420	4566	1175	325	504	562	15,788
Total Livestock Units.....			1123	763	1495	913	1605	933	678	667	2564	389	4034	1088	5022	1594	3537	26,414
Note: The following are assumed to increase in proportion with the population, within the limits specified:																		
Industry		ha	450										1					451
Institutions																		26%
Day pupils with WC																		-
Day pupils without WC			655	3908	2221	1335	1280	2123	1600	981	2446	2772	2650	0	3318	1460	2421	29,170
Boarding pupils				61	336	217	0	143				298			723	1247	329	3,354
Admin office staff			1000	0	0					10	5		3			5	3	1,026
Hlth Health Cntr/Disp'ry		Nr	2	2	0								1	1		2		8
Regional Hospitals		Beds	0	0	0													-
District Hospitals		Beds	311	0	0													311
Other Hospitals		Beds	57	0	0													57
Outpatients per day		Nr	1254	121	0								170	13		270		1,828
Commercial	High	Beds	120	0	0													120
Hotel	Med	Beds	100	0	0	30												130
class:	Low	Beds	400	0	0													400
	Bars		25	0	0	3				3	10		9		15	20	9	94
	Shops		354	0	0					12	49		40		52	58	68	633

Projection assumptions — Assume varying growth rates as follows:

	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	2.0%	2.0%	2.0%

Projection constraints

Pupil/pop ratio...		30%
% of schools...	with WC...	0%
	no WC....	90%
	Boarding	10%
% of Hospital Beds	Regional...	0%
	District...	85%
	Other	15%
% of Hotel Beds	High.....	18%
	Medium...	20%
	Low.....	62%

			Service Levels				Peak Factor
			Percentage connection			Rate	
			1997	2000	2010	l/c/d	
Domestic Demand							
ICs	Rural	High	20%	40%	80%	60	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
	Urban	High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs	Rural unconnected supplies					10	3
	Urban unconnected supplies					20	3
Livestock							1.5
	Total Livestock Un		15%	15%	15%	50	
Industry	ha			20%		20000	1.8
Institutions							2
Day pupils with WC				100%		25	
Day pupils without WC				100%		5	
Boarding pupils				100%		50	
Admin office staff				100%		25	
Hlth Centre	Nr			100%		5000	2
Region	Beds			100%		400	
District	Beds			100%		200	
Other H	Beds			100%		100	
Outpati	Nr			100%		20	
Commerc High	Beds			100%		600	1.8
Med	Beds			100%		300	
Low	Beds			100%		50	
Bars				100%		500	
Shops				100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification High	Medium	Low	Total Population	Livestock Pop'n LU	Industry ha	Pupil Pop'n	Admin staff	Health Facilities Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	114,145	-	-	5,142	15,564	31,129	165,980	31,567	597.9	49,794	1,360	11	488	2424	861.8	125	639
1998	117,379	-	-	5,399	16,343	32,685	171,806	32,198	618.3	51,542	1,407	11	505	2506	891.1	129	868
1999	120,509	-	-	5,669	17,160	34,320	177,657	32,842	639.4	53,297	1,455	11	522	2592	921.5	133	897
2000	123,522	-	-	5,952	18,018	36,036	183,527	33,499	661.2	55,058	1,504	12	539	2680	952.9	138	928
2001	126,548	-	-	6,250	18,919	37,837	189,554	34,169	682.4	56,866	1,552	12	557	2766	983.5	142	958
2002	129,585	-	-	6,562	19,865	39,729	195,741	34,853	704.3	58,722	1,602	12	575	2854	1015	147	988
2003	132,630	-	-	6,890	20,858	41,716	202,094	35,550	726.8	60,628	1,654	13	593	2946	1048	151	1020
2004	135,681	-	-	7,235	21,901	43,801	208,618	36,261	750.2	62,585	1,707	13	612	3041	1081	156	1053
2005	138,734	-	-	7,597	22,996	45,992	215,318	36,986	774.2	64,595	1,761	14	632	3138	1116	161	1087
2006	141,786	-	-	7,977	24,146	48,291	222,199	37,726	799.1	66,660	1,818	14	652	3239	1152	167	1122
2007	144,834	-	-	8,375	25,353	50,705	229,268	38,480	824.7	68,780	1,876	15	673	3343	1189	172	1157
2008	147,876	-	-	8,794	26,620	53,241	236,531	39,250	851.2	70,959	1,936	15	695	3450	1227	177	1195
2009	150,907	-	-	9,234	27,951	55,903	243,996	40,035	878.5	73,199	1,998	16	717	3561	1266	183	1233
2010	153,925	-	-	9,696	29,349	58,698	251,668	40,835	906.6	75,500	2,063	16	740	3675	1307	189	1273

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	1,370	913	3654	560	6,597	237	2,392	514	143	320	10,302	2.08
1998	1,878	861	4210	545	7,493	241	2,473	532	148	331	11,219	2.06
1999	2,410	803	4592	526	8,332	246	2,558	550	153	342	12,181	2.05
2000	2,965	741	5002	504	9,212	251	2,645	568	158	354	13,188	2.04
2001	3,341	709	5308	515	9,872	256	2,729	587	163	365	13,974	2.03
2002	3,732	674	5633	524	10,564	261	2,817	606	168	377	14,794	2.03
2003	4,138	637	5978	534	11,286	267	2,907	626	174	389	15,649	2.02
2004	4,559	597	6342	543	12,041	272	3,001	646	179	401	16,541	2.02
2005	4,994	555	6728	552	12,830	277	3,097	667	185	414	17,470	2.02
2006	5,445	510	7137	560	13,652	283	3,196	688	191	428	18,428	2.01
2007	5,909	463	7570	568	14,511	289	3,299	710	197	441	19,447	2.01
2008	6,388	414	8028	575	15,406	294	3,405	732	204	455	20,496	2.00
2009	6,881	362	8514	581	16,339	300	3,514	756	210	470	21,589	2.00
2010	7,388	308	9027	587	17,311	306	3,627	779	217	485	22,725	2.00

Table K.2.7 Water Demand Projections for Nkubu Water Supply

NKUBU WATER SUPPLY — *Baseline Data* — *Service Levels* — *Table K.2.7* — 1997/10/9

Sub-Location		Sub Locations: Kathera 16	* Note 60 % of sub-location only included in supply area, hence urban/rural population adusted accordingly									Total Base-line	Projection assumptions: Assume varying growth rates as follows: 1997	2000	2010
1989 Census figures															
1989 population		6881	100%									6,882			
Population distribution & growth (WRAP 1988 estimates)															
Rural area land potential:	High	48%										3,303	3.0%	2.5%	2.0%
	Med	0%										-	2.5%	2.0%	1.0%
	Low	0%										-	2.0%	2.0%	1.0%
Urban area housing class	High	8%										550	5.0%	5.0%	5.0%
	Med	25%										1,789	5.0%	5.0%	5.0%
	Low	18%										1,239	5.0%	5.0%	5.0%
Livestock numbers:	Grade	2113										2,113			
	Indig	0										-			
	Shoats	1184										1,184			
Total Livestock Units.....		2192	0	0	0	0	0	0	0	0		2,192	2.0%	2.0%	2.0%
Note: The following are assumed to increase in proportion with the population, within the limits specified:															
Industry	ha	2										2			
Institutions												54%	Pupil/pop ratio..		30%
Day pupils with WC		0										-	%of	with WC	0%
Day pupils without WC		2580										2,580	schools:	no WC...	70%
Boarding pupils		1104										1,104		Boarding	30%
Admin office staff		4										4			
Hlth Health Centre/Dispencaries	Nr	0										-			
Regional Hospitals	Beds	0										-	% of	Regional	0%
District Hospitals	Beds	0										-	Hospital	District	0%
Other Hospitals	Beds	320										320	Beds	Other.....	100%
Outpatients per day	Nr	500										500			
Commercial High class hotels	Beds	0										-	% of	High.....	
Med class hotels	Beds	0										-	Hotel	Medium	
Low class hotels	Beds	0										-	Beds:	Low...	
Bars		27										27			
Shops		142										142			

Projection constraints

		Comments	Peak Factor	Rate l/c/d	Service Levels: Percentage connections 1997	2000	2010
Domestic Demand							
ICs Rural ICs Land potential	High		2	60	20%	40%	80%
	Med			50	10%	20%	40%
	Low			40	5%	10%	20%
Urban IC Housing class	High		2	250	100%	100%	100%
	Med			150	100%	100%	100%
	Low			75	10%	30%	50%
WKs Rural unconnected supplies			3	10			
Urban unconnected supplies			3	20			
Livestock			1.5				
Total Livestock Units.....				50	15%	15%	15%
Industry	ha		1.8	20000		100%	
Institutions			2				
Day pupils with WC				25		100%	
Day pupils without WC				5		100%	
Boarding pupils				50		100%	
Admin office staff				25		100%	
Hlth Health Centre/Dispencarie	Nr		2	5000		100%	
Regional Hospitals	Beds			400		100%	
District Hospitals	Beds			200		100%	
Other Hospitals	Beds			100		100%	
Outpatients per day	Nr			20		100%	
Commercial High class hotels	Beds		1.8	600		100%	
Med class hotels	Beds			300		100%	
Low class hotels	Beds			50		100%	
Bars				500		100%	
Shops				100		100%	

Projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Industry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	4,184	-	-	813	2,643	1,830	9,471	2,520	2.8	2,841	6	0	440	688	0	37	195
1998	4,303	-	-	854	2,775	1,921	9,853	2,672	2.9	2,956	6	0	458	716	0	39	203
1999	4,417	-	-	897	2,914	2,018	10,246	2,725	3.0	3,074	6	0	476	744	0	40	211
2000	4,528	-	-	942	3,060	2,118	10,648	2,780	3.1	3,194	6	0	495	774	0	42	220
2001	4,639	-	-	989	3,213	2,224	11,064	2,835	3.2	3,319	6	0	514	804	0	43	228
2002	4,750	-	-	1,038	3,374	2,336	11,497	2,892	3.3	3,449	7	0	535	835	0	45	237
2003	4,862	-	-	1,090	3,542	2,452	11,946	2,950	3.5	3,584	7	0	555	868	0	47	246
2004	4,973	-	-	1,144	3,719	2,575	12,412	3,009	3.6	3,724	7	0	577	902	0	49	256
2005	5,085	-	-	1,202	3,905	2,704	12,896	3,069	3.7	3,869	7	0	600	937	0	51	266
2006	5,197	-	-	1,262	4,101	2,839	13,398	3,131	3.9	4,019	8	0	623	973	0	53	276
2007	5,309	-	-	1,325	4,306	2,981	13,920	3,193	4.0	4,176	8	0	647	1011	0	55	287
2008	5,420	-	-	1,391	4,521	3,130	14,462	3,257	4.2	4,339	8	0	672	1051	0	57	298
2009	5,532	-	-	1,461	4,747	3,286	15,025	3,322	4.4	4,508	9	0	699	1092	0	59	310
2010	5,642	-	-	1,534	4,984	3,451	15,611	3,389	4.5	4,683	9	0	726	1134	0	61	322

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	50	33	614	33	730	20	55	53	44	38	940	2.04
1998	69	32	654	32	786	20	57	55	46	40	1,004	2.03
1999	88	29	697	31	845	20	60	57	48	41	1,071	2.03
2000	109	27	742	30	908	21	62	59	50	43	1,142	2.02
2001	122	26	782	30	961	21	64	62	51	44	1,204	2.02
2002	137	25	825	31	1,017	22	67	64	54	46	1,270	2.02
2003	152	23	870	31	1,076	22	69	66	56	48	1,338	2.02
2004	167	22	917	32	1,138	23	72	69	58	50	1,410	2.01
2005	183	20	967	32	1,203	23	75	72	60	52	1,485	2.01
2006	200	19	1020	33	1,271	23	78	74	62	54	1,563	2.01
2007	217	17	1075	33	1,342	24	81	77	65	56	1,646	2.01
2008	234	15	1134	34	1,417	24	84	80	67	58	1,731	2.00
2009	252	13	1195	34	1,495	25	87	84	70	61	1,821	2.00
2010	271	11	1260	35	1,577	25	91	87	73	63	1,915	2.00

Table K.2.8 Water Demand Projections for Isiolo Water Supply

ISIOLO WATER SUPPLY — *Baseline data for area to be fed from combined intake and treatment works*

Baseline Data			Baseline data			Total Baseline
Locations			Central	Isiolo E	Institutional	
Sub-Locations			8	15		
1989 Census figures						18,658
1989 population			12486	6172		
Population distribution & growth (WRAP 1988 estimates)						
Rural areas		High	0%	0%		0.0%
Land potential:.....		Med	0%	0%		0.0%
		Low	0%	100%		33.1%
Urban area		High	5%	0%		3.3%
housing class:.....		Med	20%	0%		13.4%
		Low	75%	0%		50.2%
Livestock numbers:		Grade	250	0		250
		Indig	50000	0		50,000
		Shoats	80000	0		80,000
Total Livestock Units.....			22250	0	0	22,250
Note: The following are assumed to increase in proportion with the population, within the limits specified:						
Industry		ha	5			5
Institutions						33%
Day pupils with WC			4908	1263		6,171
Day pupils without WC			0	0		-
Boarding pupils			0	0		-
Other institutions			500	0	7500	8,000
Hlth Health Cntr/Disp'ry		Nr	3	0		3
Regional Hospitals		Beds	0	0		-
District Hospitals		Beds	160	0		160
Other Hospitals		Beds	44	0		44
Outpatients per day		Nr	350	0		350
Commercial	High	Beds	0	0		-
Hotel	Med	Beds	50	0		50
class:	Low	Beds	200	0		200
	Bars		10	0		10
	Shops		300	0		300

Projection assumptions			
Assume varying growth rates as follows:	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	2.0%	2.0%	2.0%

Projection constraints			
Pupil/pop ratio.....			30%
% of schools:	with WC....		100%
	no WC.....		0%
	Boarding....		0%
% of Hospital Beds	Regional....		0%
	District.....		78%
	Other.....		22%
% of Hotel Beds:	High.....		0%
	Medium.....		20%
	Low		80%

Service Levels — *Table K.2.8* — *1997/10/3*

			Service Levels: Percentage connections 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs Rural | Land potential		High	20%	40%	80%	60	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
Urban Housing class		High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs Rural unconnected supplies						10	3
Urban unconnected supplies						20	3
Livestock							1.5
Total Livestock Units.....			15%	15%	15%	50	
Industry		ha		100%		20000	1.8
Institutions							2
Day pupils with WC				100%		25	
Day pupils without WC				100%		5	
Boarding pupils				100%		50	
Other institutional demand				100%		130	
Hlth Health Centre/Dispence		Nr		100%		5000	2
Regional Hospitals		Beds		100%		400	
District Hospitals		Beds		100%		200	
Other Hospitals		Beds		100%		100	
Outpatients per day		Nr		100%		20	
Commercial High class hotels		Beds		100%		600	1.8
Med class hotels		Beds		100%		300	
Low class hotels		Beds		100%		50	
Bars				100%		500	
Shops				100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Industry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	-	-	7,231	922	3,690	13,836	25,679	26,591	6.9	7,704	11,010	4	281	482	344.1	14	413
1998	-	-	7,376	968	3,874	14,527	26,746	27,123	7.2	8,024	11,470	4	292	502	358.4	14	430
1999	-	-	7,524	1,017	4,068	15,254	27,862	27,665	7.5	8,359	11,948	4	305	523	373.4	15	448
2000	-	-	7,674	1,068	4,271	16,015	29,029	28,218	7.8	8,709	12,447	5	317	545	389	16	467
2001	-	-	7,820	1,121	4,485	16,817	30,243	28,783	8.1	9,073	12,965	5	331	567	405.2	16	486
2002	-	-	7,961	1,177	4,709	17,658	31,505	29,358	8.4	9,451	13,505	5	344	591	422	17	506
2003	-	-	8,096	1,236	4,944	18,541	32,817	29,946	8.8	9,845	14,067	5	359	615	439.6	18	528
2004	-	-	8,226	1,296	5,191	19,468	34,183	30,544	9.2	10,255	14,652	5	374	641	457.9	18	549
2005	-	-	8,349	1,363	5,451	20,442	35,604	31,155	9.5	10,681	15,262	6	389	668	477	19	572
2006	-	-	8,466	1,431	5,724	21,464	37,084	31,778	9.9	11,126	15,898	6	405	696	496.8	20	596
2007	-	-	8,576	1,502	6,010	22,537	38,625	32,414	10.3	11,587	16,560	6	422	724	517.5	21	621
2008	-	-	8,679	1,578	6,310	23,664	40,230	33,062	10.8	12,069	17,249	6	440	755	539	22	647
2009	-	-	8,774	1,656	6,626	24,847	41,903	33,724	11.2	12,571	17,967	7	458	786	561.5	22	674
2010	-	-	8,862	1,739	6,957	26,089	43,648	34,398	11.7	13,094	18,715	7	477	819	584.8	23	702

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	14	69	888	249	1,220	199	138	1,624	71	83	3,334	2.05
1998	20	69	1005	242	1,335	203	143	1,692	74	86	3,534	2.05
1999	25	69	1131	234	1,459	207	149	1,762	77	90	3,745	2.04
2000	31	69	1268	224	1,592	212	156	1,836	80	93	3,968	2.03
2001	34	70	1357	229	1,689	216	162	1,912	83	97	4,160	2.03
2002	38	70	1451	233	1,792	220	169	1,992	87	101	4,361	2.03
2003	42	70	1551	237	1,901	225	176	2,075	90	106	4,572	2.03
2004	46	71	1658	241	2,016	229	183	2,161	94	110	4,794	2.03
2005	50	71	1772	245	2,138	234	191	2,251	98	114	5,026	2.03
2006	54	71	1892	249	2,267	238	199	2,345	102	119	5,270	2.03
2007	58	71	2021	252	2,403	243	207	2,442	106	124	5,526	2.02
2008	62	71	2157	256	2,547	248	216	2,544	111	129	5,794	2.02
2009	67	71	2302	258	2,699	253	225	2,650	115	135	6,076	2.02
2010	71	71	2457	261	2,859	258	234	2,760	120	140	6,372	2.02

Table K.2.9 Water Demand Projections for Chuka Water Supply

CHUKA WATER SUPPLY — *Baseline data for area to be fed from combined intake and treatment works*

Baseline Data			Baseline data												Total Base-line	Projection assumptions Assume varying growth rates as follows:		
Locations			Karingani							Muthambi			Mwonge					
Sub-Locations			Mugiriwa	Muiru	Mariani	Ndagani	Chuka T	Kinang'Ondu		Kithangani						1997	2000	2010
1989 Census figures					25%					15%								
1989 population			8073	6639	1252	6264	3848	4680		499					31,265			
Population distribution & growth (WRAP 1988 estimates)																		
Rural areas		High	100%	100%	0%	70%	52%	100%		0%					82.4%	3.0%	2.5%	2.0%
Land potential:.....		Med	0%	0%	100%	30%	0%	0%		100%					11.6%	2.5%	2.0%	1.0%
		Low	0%	0%	0%	0%	0%	0%		0%					0.0%	2.0%	2.0%	1.0%
Urban area		High	0%	0%	0%	0%	0%	0%		0%					0.0%	11.5%	12.0%	7.0%
housing class:.....		Med	0%	0%	0%	0%	19%	0%		0%					2.3%	11.5%	12.0%	7.0%
		Low	0%	0%	0%	0%	29%	0%		0%					3.6%	11.5%	12.0%	7.0%
Livestock numbers:		Grade	1847	1720	617	1526	179	1333		507					7,729			
		Indig	462				49	0		127					638			
		Shoats	1115	3200	839	1685	248	1638		1446					10,171			
Total Livestock Units.....			2075	1933	673	1638	212	1442		646					8,620	2.0%	2.0%	2.0%
Note: The following are assumed to increase in proportion with the population, within the limits specified:																		
Industry		ha	3	1		1		0							5			
Institutions															29%			
Day pupils with WC								0		0					-			
Day pupils without WC			2101	1856	280	2083		1890		136					8,351			
Boarding pupils			277					323							600			
Admin office staff							100	0							100			
Hlth	Health Cntr/Disp'ry	Nr	1	2				0		1					4			
	Regional Hospitals	Beds						0		0					-			
	District Hospitals	Beds				31		0		0					31			
	Other Hospitals	Beds				4		0		0					4			
	Outpatients per day	Nr	8	12		240		0		9					269			
Commercial	High	Beds						0		0					-			
	Hotel Med	Beds						0		0					-			
	class: Low	Beds						0		0					-			
	Bars		14	25		11	23	0		1					74			
	Shops		58	109		38	500	0		6					711			

Projection constraints			
Pupil/pop ratio.....			30%
% of schools:	with WC.....		0%
	no WC.....		93%
	Boarding..		7%
% of Hospital Beds	Regional....		0%
	District.....		89%
	Other.....		11%
% of Hotel Beds:	High.....		
	Medium.....		
	Low		

Service Levels — *Table K.2.9* — 1997/10/3

			Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs Rural f Land potential		High	20%	40%	80%	50	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
Urban Housing class		High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs Rural unconnected supplies						10	3
Urban unconnected supplies						20	3
Livestock							1.5
Total Livestock Units.....			15%	15%	15%	50	
Industry		ha		100%		20000	1.6
Institutions							2
Day pupils with WC				100%		25	
Day pupils without WC				100%		5	
Boarding pupils				100%		50	
Admin office staff				100%		25	
Hlth Health Centre/Dispenca		Nr		100%		5000	2
Regional Hospitals		Beds		100%		400	
District Hospitals		Beds		100%		200	
Other Hospitals		Beds		100%		100	
Outpatients per day		Nr		100%		20	
Commercial High class hotels		Beds		100%		600	1.8
Med class hotels		Beds		100%		300	
Low class hotels		Beds		100%		50	
Bars				100%		500	
Shops				100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Ind-ustry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	32,654	4,435	-	-	1,747	2,666	41,502	10,301	6.6	12,451	133	5	46	357	0	98	944
1998	33,580	4,539	-	-	1,950	2,977	43,046	10,507	6.9	12,914	138	6	48	370	0	102	978
1999	34,475	4,637	-	-	2,181	3,329	44,622	10,718	7.1	13,387	143	6	50	384	0	106	1014
2000	35,337	4,730	-	-	2,443	3,729	46,238	10,932	7.4	13,871	148	6	52	398	0	109	1052
2001	36,203	4,820	-	-	2,724	4,157	47,904	11,151	7.6	14,371	153	6	54	411	0	113	1087
2002	37,072	4,906	-	-	3,023	4,615	49,616	11,374	7.9	14,885	158	6	55	425	0	117	1124
2003	37,943	4,990	-	-	3,341	5,099	51,373	11,601	8.2	15,412	163	7	57	439	0	121	1162
2004	38,816	5,070	-	-	3,675	5,609	53,169	11,833	8.4	15,951	169	7	59	454	0	125	1201
2005	39,689	5,146	-	-	4,024	6,142	55,001	12,070	8.7	16,500	175	7	61	470	0	129	1241
2006	40,562	5,218	-	-	4,386	6,695	56,861	12,311	9.0	17,058	180	7	63	485	0	134	1283
2007	41,434	5,286	-	-	4,759	7,264	58,743	12,557	9.3	17,623	187	7	65	502	0	138	1326
2008	42,304	5,349	-	-	5,140	7,845	60,638	12,808	9.6	18,191	193	8	67	519	0	143	1371
2009	43,171	5,408	-	-	5,525	8,433	62,538	13,065	10.0	18,761	199	8	70	536	0	148	1417
2010	44,035	5,462	-	-	5,912	9,024	64,433	13,326	10.3	19,330	206	8	72	554	0	153	1465

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	414	301	282	48	1,045	77	133	103	35	143	1,537	2.17
1998	568	286	330	50	1,232	79	138	107	37	149	1,741	2.14
1999	728	269	385	51	1,433	80	143	111	38	154	1,959	2.11
2000	895	250	450	52	1,648	82	148	115	39	160	2,192	2.09
2001	1,009	240	508	57	1,814	84	153	119	41	165	2,375	2.08
2002	1,127	230	571	61	1,989	85	158	123	42	171	2,568	2.07
2003	1,249	219	639	65	2,172	87	163	128	43	177	2,770	2.06
2004	1,375	207	711	70	2,363	89	169	132	45	183	2,980	2.05
2005	1,506	195	786	74	2,562	91	175	137	46	189	3,199	2.05
2006	1,641	182	869	78	2,769	92	180	141	48	195	3,426	2.04
2007	1,780	167	954	81	2,983	94	187	146	50	202	3,661	2.03
2008	1,924	153	1042	85	3,203	96	193	151	51	208	3,902	2.03
2009	2,071	137	1132	88	3,429	98	199	155	53	216	4,150	2.02
2010	2,223	121	1225	90	3,659	100	206	160	55	223	4,403	2.02

Table K.2.10 Water Demand Projections for Chogoria Water Supply

CHOGORIA WATER SUPPLY — *Baseline data*

			Sub Locations: Chogoria	Total Base-line	Projection assumptions: Assume varying growth rates as follows: 1997	2000	2010
Sub-Location			22				
1999 Census figures				9,390			
1989 population			9390				
Population distribution & growth (WRAP 1988 estimates)				8,075	3.0%	2.5%	2.0%
Rural area land potential:		High	86%	-	2.5%	2.0%	1.0%
		Med	0%	-	2.0%	2.0%	1.0%
		Low	0%	-	5.0%	5.0%	5.0%
Urban area housing class		High	0%	563	5.0%	5.0%	5.0%
		Med	6%	751	5.0%	5.0%	5.0%
		Low	8%	1,260			
Livestock numbers:		Grade	1260	-			
		Indig	0	802	2.0%	2.0%	2.0%
		Shoats	802	1,313	Projection constraints		
Total Livestock Units			1313				
Note: The following are assumed to increase in proportion with the population, within the limits specified:				1			
Industry		ha	1	44%	Pupil/pop ratio..		30%
Institutions				-	%of schools:	with WC	0%
Day pupils with WC			0	2,271		no WC..	55%
Day pupils without WC			2271	1,825		Boarding	45%
Boarding pupils			1825	-			
Admin office staff			0	-			
Hlth Health Centre/Dispencaries		Nr	0	-	% of Hospital Beds	Regional	0%
Regional Hospitals		Beds	0	-		District.	0%
District Hospitals		Beds	0	300		Other.....	100%
Other Hospitals		Beds	300	250			
Outpatients per day		Nr	250	-	% of Hotel Beds	High	
Commercial	High class hotels	Beds	0	-		Medium.	
	Med class hotels	Beds	0	-		Low....	
	Low class hotels	Beds	0	9			
	Bars		9	52			
	Shops		52				

Service Levels — *Table K.2.10* — 1997/10/8

			Service Levels: Percentage connections 1997	2000	2010	Rate l/c/d	Peak Factor
% urban..... 14.0%							
Domestic Demand							
ICs Rural ICs Land potential		High	20%	40%	80%	60	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
Urban IC Housing class		High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs Rural unconnected supplies						10	3
Urban unconnected supplies						20	3
Livestock							1.5
Total Livestock Units.....			15%	15%	15%	50	
Industry		ha		100%		20000	1.8
Institutions							2
Day pupils with WC				100%		25	
Day pupils without WC				100%		5	
Boarding pupils				100%		50	
Admin office staff				100%		25	
Hlth Health Centre/Dispencarie		Nr		100%		5000	2
Regional Hospitals		Beds		100%		400	
District Hospitals		Beds		100%		200	
Other Hospitals		Beds		100%		100	
Outpatients per day		Nr		100%		20	
Commercial	High class hotels	Beds		100%		600	1.8
	Med class hotels	Beds		100%		300	
	Low class hotels	Beds		100%		50	
	Bars			100%		500	
	Shops			100%		100	

Annual Projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Industry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	10,230	-	-	-	832	1,110	12,172	1,570	1.3	3,652	-	0	383	319	0	12	66
1998	10,520	-	-	-	874	1,165	12,559	1,601	1.3	3,768	-	0	394	326	0	12	68
1999	10,800	-	-	-	918	1,224	12,941	1,633	1.4	3,882	-	0	405	338	0	12	70
2000	11,070	-	-	-	964	1,285	13,318	1,666	1.4	3,996	-	0	417	347	0	12	72
2001	11,341	-	-	-	1,012	1,349	13,702	1,699	1.4	4,111	-	0	427	356	0	13	74
2002	11,613	-	-	-	1,062	1,416	14,092	1,733	1.5	4,228	-	0	437	364	0	13	76
2003	11,886	-	-	-	1,115	1,487	14,489	1,768	1.5	4,347	-	0	448	373	0	13	78
2004	12,160	-	-	-	1,171	1,562	14,893	1,803	1.5	4,468	-	0	458	382	0	14	79
2005	12,433	-	-	-	1,230	1,640	15,303	1,839	1.6	4,591	-	0	470	391	0	14	81
2006	12,707	-	-	-	1,291	1,722	15,720	1,876	1.6	4,716	-	0	481	401	0	14	83
2007	12,980	-	-	-	1,356	1,808	16,144	1,913	1.6	4,843	-	0	493	411	0	15	85
2008	13,253	-	-	-	1,424	1,898	16,575	1,952	1.7	4,972	-	0	505	421	0	15	87
2009	13,524	-	-	-	1,495	1,993	17,012	1,991	1.7	5,104	-	0	517	431	0	16	90
2010	13,795	-	-	-	1,570	2,093	17,457	2,031	1.8	5,237	-	0	529	441	0	16	92

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	123	82	133	20	358	12	26	66	38	12	511	2.17
1998	168	77	145	19	411	12	26	68	39	13	569	2.15
1999	216	72	159	19	466	12	27	70	41	13	628	2.12
2000	266	66	173	18	524	12	28	72	42	13	691	2.10
2001	299	64	184	18	565	13	28	74	43	14	737	2.09
2002	334	60	195	19	609	13	29	76	44	14	785	2.08
2003	371	57	207	19	654	13	30	78	45	14	835	2.07
2004	409	54	220	19	702	14	31	80	46	15	887	2.06
2005	448	50	234	20	751	14	31	82	47	15	940	2.06
2006	488	46	248	20	802	14	32	85	48	16	996	2.05
2007	530	42	263	20	854	14	33	87	49	16	1,054	2.04
2008	573	37	279	21	909	15	34	89	50	16	1,114	2.04
2009	617	32	296	21	966	15	34	92	52	17	1,175	2.03
2010	662	28	314	21	1,025	15	35	94	53	17	1,239	2.02

Table K.2.11 Water Demand Projections for Maua Water Supply

Maua Water Supply			Baseline data									Total Base-line	Projections: Projection assumptions — Assume varying growth rates as follows:	1997	2000	2010
Sub-Location			Amwathi													
% of population within supply area			15%													
1989 Census figures			21485													
Supply area population			3,223									3,223				
Population distribution & growth (WRAP 1988 estimates)																
Rural area land potential:		High	0%									0		3.0%	2.5%	2.0%
		Med	0%									0		2.5%	2.0%	1.0%
		Low	0%									-		2.0%	2.0%	1.0%
Urban area housing class		High	0%									-		7.0%	7.0%	7.0%
		Med	40%									1,289		7.0%	7.0%	7.0%
		Low	60%									1,934		7.0%	7.0%	7.0%
Livestock numbers:		Grade	496									496				
		Indig	1986									1,986				
		Shoats	3349									3,349				
Total Livestock Units			1381		0	0	0	0	0	0	0	1,381		2.0%	2.0%	2.0%
Note: The following are assumed to increase in proportion with the population, within the limits specified:													Projection constraints			
Industry		ha	1									1				
Institutions												182%	Pupil/pop ratio..			30%
Day pupils with WC			0									-	% of	with WC..		0%
Day pupils without WC			5445									5,445	schools:	no WC...		93%
Boarding pupils			429									429		Boarding		7%
Admin office staff			200									200				
Hlth	Health Centre/Dispencaries	Nr	0									-				
	Regional Hospitals	Beds	0									-	% of	Regional..		0%
	District Hospitals	Beds	0									-	Hospital	District..		0%
	Other Hospitals	Beds	110									110	Beds	Other....		100%
	Outpatients per day	Nr	35									35				
Commercial	High class hotels	Beds	0									-				
	Med class hotels	Beds	0									-	% of	High ...		0%
	Low class hotels	Beds	200									200	Hotel	Medium..		0%
	Bars		15									15	Beds:	Low..		100%
	Shops		100									100				

Service Levels				Service Levels: Percentage connections 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand								
ICs	Rural ICs Land potential	High		20%	40%	80%	60	2
		Med		10%	20%	40%	50	
		Low		5%	10%	20%	40	
	Urban IC Housing class	High		100%	100%	100%	250	2
		Med		100%	100%	100%	150	
		Low		10%	30%	50%	75	
WKs	Rural unconnected supplies						10	3
	Urban unconnected supplies						20	3
Livestock								1.5
	Total Livestock Units			15%	15%	15%	50	
Industry			ha		100%		20000	1.8
Institutions								2
	Day pupils with WC				100%		25	
	Day pupils without WC				100%		5	
	Boarding pupils				100%		50	
	Admin office staff				100%		25	
Hlth	Health Centre/Dispencarie		Nr		100%		5000	2
	Regional Hospitals		Beds		100%		400	
	District Hospitals		Beds		100%		200	
	Other Hospitals		Beds		100%		100	
	Outpatients per day		Nr		100%		20	
Commercial	High class hotels		Beds		100%		600	1.8
	Med class hotels		Beds		100%		300	
	Low class hotels		Beds		100%		50	
	Bars				100%		500	
	Shops				100%		100	

Table K.2.11
1997/10/3

Projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Industry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	0	0	-	-	2,215	3,322	5,537	1,651	1.7	1,661	344	0	189	60	344	26	172
1998	0	0	-	-	2,370	3,555	5,925	1,684	1.8	1,777	368	0	202	64	368	28	184
1999	0	0	-	-	2,536	3,804	6,340	1,717	2.0	1,902	393	0	216	69	393	30	197
2000	0	0	-	-	2,713	4,070	6,783	1,752	2.1	2,035	421	0	232	74	421	32	210
2001	0	0	-	-	2,903	4,355	7,258	1,787	2.3	2,177	450	0	248	79	450	34	225
2002	0	0	-	-	3,107	4,660	7,766	1,823	2.4	2,330	482	0	265	84	482	36	241
2003	0	0	-	-	3,324	4,986	8,310	1,859	2.6	2,493	516	0	284	90	516	39	258
2004	0	0	-	-	3,557	5,335	8,892	1,896	2.8	2,668	552	0	303	97	552	41	276
2005	0	0	-	-	3,806	5,708	9,514	1,934	3.0	2,854	590	0	325	103	590	44	295
2006	0	0	-	-	4,072	6,108	10,180	1,973	3.2	3,054	632	0	347	111	632	47	316
2007	0	0	-	-	4,357	6,536	10,893	2,012	3.4	3,268	676	0	372	118	676	51	338
2008	0	0	-	-	4,662	6,993	11,655	2,052	3.6	3,497	723	0	398	127	723	54	362
2009	0	0	-	-	4,988	7,483	12,471	2,094	3.9	3,741	774	0	426	135	774	58	387
2010	0	0	-	-	5,338	8,006	13,344	2,135	4.1	4,003	828	0	455	145	828	62	414

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	0	0	357	60	417	12	34	22	19	47	552	2.07
1998	0	0	400	59	459	13	37	24	20	51	603	2.06
1999	0	0	447	58	505	13	39	26	22	54	659	2.05
2000	0	0	499	57	556	13	42	27	23	58	719	2.04
2001	0	0	540	59	599	13	45	29	25	62	774	2.04
2002	0	0	585	62	646	14	48	31	27	66	832	2.04
2003	0	0	639	64	697	14	52	34	28	71	896	2.04
2004	0	0	686	66	752	14	55	36	30	76	963	2.03
2005	0	0	742	69	811	15	59	38	33	81	1,036	2.03
2006	0	0	803	71	874	15	63	41	35	87	1,115	2.03
2007	0	0	869	73	942	15	68	44	37	93	1,199	2.03
2008	0	0	941	76	1,016	15	72	47	40	99	1,290	2.03
2009	0	0	1018	78	1,095	16	77	50	43	106	1,388	2.02
2010	0	0	1101	80	1,181	16	83	54	46	114	1,493	2.02

Table K.2.12 Water Demand Projections for Tigania Water Supply

New Tigania Water Supply — *Baseline data*

Locations			Nkomo	Mathene	Kiguchw	Athwana	Antuambur	Kithee								Total Base-line
Sub-locations																
% of sub-location within supply area			100%	100%	100%	100%	60%	100%								
1989 Census figures			35	26	3800%	10	26	29								51,826
1989 population			8213	9595	13375	3863	6980	9800								
Population distribution & growth (WRAP 1988 estimates)																
Rural areas		High	80%	100%	100%	30%	0%	0%								59.2%
Land potential:.....		Med	20%	0%	0%	70%	0%	10%								10.3%
		Low	0%	0%	0%	0%	100%	90%								30.5%
Urban area		High	0%	0%	0%	0%	0%	0%								0.0%
housing class:.....		Med	0%	0%	0%	0%	0%	0%								0.0%
		Low	0%	0%	0%	0%	0%	0%								0.0%
Livestock numbers:		Grade	627	1973	361	264	444	440								4,114
		Indig	1752	7912	1445	1055	1775	1760								15,699
		Shoats	1740	13556	780	1214	5325	1531								24,146
Total Livestock Units.....			1327	5519	895	697	1391	1129	0	0	0	0	0	0	0	10,957
Note: The following are assumed to increase in proportion with the population, within the limits specified:																2
Industry		ha					2									34%
Institutions																-
Day pupils with WC																16,792
Day pupils without WC			2873	2567	2729	2145	3720	2758								810
Boarding pupils				794			16									194
Admin office staff			40	102		2		50								3
Hlth Health Cntr/Disp'ry		Nr	1				1	1								-
Regional Hospitals		Beds														-
District Hospitals		Beds														170
Other Hospitals		Beds		80				90								1,191
Outpatients per day		Nr	225	656			160	150								-
Commercial	High	Beds														-
Hotel	Med	Beds														-
class:	Low	Beds														117
	Bars		26	9	27	11	44									404
	Shops		119	36	42	13	165	29								

Projection assumptions

Assume varying growth rates as follows:

	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	2.0%	2.0%	2.0%

Projection constraints

Pupil/pop ratio.....		30%
%of schools:	with WC....	0%
	no WC.....	95%
	Boarding...	5%
% of Hospital Beds	Regional....	0%
	District.....	0%
	Other.....	100%
% of Hotel Beds:	High.....	
	Medium....	
	Low.....	

Service Levels — *Table K.2.12* — 1997/10/3

			Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs Rural Land potential	High		20%	40%	80%	60	2
	Med		10%	20%	40%	50	
	Low		5%	10%	20%	40	
Urban Housing class	High		100%	100%	100%	250	2
	Med		100%	100%	100%	150	
	Low		10%	30%	50%	75	
WKs Rural unconnected supplies						10	3
Urban unconnected supplies						20	3
Livestock							1.5
Total Livestock Units.....			15%	15%	15%	50	
Industry		ha		100%		20000	1.8
Institutions							2
Day pupils with WC				100%		25	
Day pupils without WC				100%		5	
Boarding pupils				100%		50	
Admin office staff				100%		25	
Hlth Health Centre/Dispenca		Nr		100%		5000	2
Regional Hospitals		Beds		100%		400	
District Hospitals		Beds		100%		200	
Other Hospitals		Beds		100%		100	
Outpatients per day		Nr		100%		20	
Commercial High class hotels		Beds		100%		600	1.8
Med class hotels		Beds		100%		300	
Low class hotels		Beds		100%		50	
Bars				100%		500	
Shops				100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Ind-ustry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	38,899	6,490	18,512	-	-	-	63,891	13,094	2.5	19,167	239	4	210	1468	0	144	498
1998	39,991	6,642	18,882	-	-	-	65,515	13,356	2.5	19,654	245	4	215	1504	0	148	510
1999	41,057	6,785	19,260	-	-	-	67,103	13,623	2.6	20,131	251	4	220	1540	0	151	522
2000	42,084	6,921	19,645	-	-	-	68,650	13,896	2.6	20,595	257	4	225	1578	0	155	535
2001	43,115	7,053	20,019	-	-	-	70,186	14,174	2.7	21,056	262	4	230	1608	0	158	545
2002	44,149	7,180	20,379	-	-	-	71,708	14,457	2.8	21,512	267	4	234	1639	0	161	556
2003	45,187	7,302	20,725	-	-	-	73,214	14,746	2.8	21,964	272	4	238	1671	0	164	567
2004	46,226	7,418	21,057	-	-	-	74,702	15,041	2.9	22,411	277	4	243	1703	0	167	578
2005	47,266	7,530	21,373	-	-	-	76,169	15,342	2.9	22,851	283	4	248	1736	0	171	589
2006	48,306	7,635	21,672	-	-	-	77,613	15,649	3.0	23,284	288	4	253	1769	0	174	600
2007	49,345	7,734	21,954	-	-	-	79,033	15,962	3.0	23,710	294	5	257	1804	0	177	612
2008	50,381	7,827	22,217	-	-	-	80,425	16,281	3.1	24,128	299	5	262	1838	0	181	624
2009	51,414	7,913	22,462	-	-	-	81,789	16,607	3.1	24,537	305	5	267	1874	0	184	636
2010	52,442	7,992	22,686	-	-	-	83,121	16,939	3.2	24,936	311	5	273	1910	0	188	648

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	536	545	0	0	1,082	98	49	142	39	122	1,532	2.30
1998	734	527	0	0	1,262	100	51	145	40	125	1,723	2.26
1999	942	507	0	0	1,449	102	52	149	41	128	1,921	2.22
2000	1,158	485	0	0	1,642	104	53	152	42	131	2,125	2.19
2001	1,304	475	0	0	1,779	106	54	155	43	134	2,271	2.17
2002	1,455	463	0	0	1,919	108	55	159	44	136	2,421	2.15
2003	1,613	451	0	0	2,064	111	56	162	45	139	2,576	2.14
2004	1,775	438	0	0	2,213	113	57	165	46	141	2,735	2.12
2005	1,943	423	0	0	2,366	115	58	169	47	144	2,899	2.11
2006	2,116	408	0	0	2,524	117	59	172	48	147	3,067	2.10
2007	2,294	391	0	0	2,685	120	61	175	48	150	3,239	2.09
2008	2,477	373	0	0	2,851	122	62	178	49	153	3,415	2.08
2009	2,666	354	0	0	3,020	125	63	181	50	156	3,595	2.07
2010	2,859	334	0	0	3,193	127	64	184	51	159	3,778	2.06

MERU WATER SUPPLY — *Baseline data for area to be fed from combined intake and treatment works*

Baseline Data			Baseline data													Total Base-line
Locations			Town	Ntima U Igoki	Ntima Ntakira	Ntima L Igoki	Ntima Nthimbiri	Ntima Mpuri	Ntima Ngonyi	Nyika Mulathunki	Nyika Thuura	Nyika Chungu	Nyika Munithu	Nyika Nkabune	U.Abothoguchi Kathen	U.Abothoguchi Githongo	Kithirune	
Sub-Locations																		
1989 Census figures			5	56	10	6	8	6	9	5	45	48	16	8	28	15	18	
1989 population				26913	9414	4759	5324	4492	5227	5054	8679	13499	8021	3645	14172	7094	8698	125,191
Population distribution & growth (WRAP 1988 estimates)																		
Rural areas		High		0%	77%	80%	100%	100%	100%	0%	100%	100%	100%	100%	100%	100%	100%	72.0%
Land potential:.....		Med		0%	0%	0%				0%								0.0%
		Low		0%	0%	0%				0%								0.0%
Urban area		High		10%	2%	2%				10%								2.8%
housing class		Med		30%	7%	6%				30%								8.4%
		Low		60%	14%	12%				60%								16.8%
Livestock numbers:		Grade	1076	716	1454	850	1554	874	633	814	2196	333	3547	932	5000	1440	3500	24,719
		Indig								153	549	83	549	233		360		1,927
		Shoats	703	704	616	946	763	729	675	330	2770	420	4566	1175	325	504	562	15,788
Total Livestock Units.....			1123	763	1485	913	1605	923	678	687	2564	389	4034	1088	5022	1594	3537	26,414
Note: The following are assumed to increase in proportion with the population, within the limits specified:																		
Industry		ha	450										1					451
Institutions																		26%
Day pupils with WC																		-
Day pupils without WC			555	3908	2221	1335	1280	2123	1600	981	2446	2772	2650	0	3318	1460	2421	29,170
Boarding pupils				61	338	217	0	143				298			723	1247	329	3,354
Admin office staff			1000	0	0					10	5		3			5	3	1,026
Hlth Health Cntr/Disp'ry		Nr	2	2	0								1	1		2		8
Regional Hospitals		Beds	0	0	0													-
District Hospitals		Beds	311	0	0													311
Other Hospitals		Beds	57	0	0													57
Outpatients per day		Nr	1254	121	0								170	13		270		1,828
Commercial	High	Beds	120	0	0													120
Hotel	Med	Beds	100	0	0	30												130
class:	Low	Beds	400	0	0													400
	Bars		25	0	0	3				3	10		9		15	20	9	94
	Shops		354	0	0					12	49		40		52	58	68	633

Service Levels

02/07/97

Projection assumptions

Assume varying growth rates as follows:

	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
Livestock	2.0%	2.0%	2.0%

Projection constraints

Pupil/pop ratio...			30%
%of schools:	with WC..	0%	
	no WC....	90%	
	Boarding	10%	
% of Hospital Beds	Regional..	0%	
	District..	85%	
	Other....	15%	
% of Hotel Beds:	High.....	18%	
	Medium..	20%	
	Low.....	62%	

			Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs	Rural	High	20%	40%	80%	80	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
	Urban	High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs	Rural unconnected supplies					10	3
	Urban unconnected supplies					20	3
Livestock							1.5
	Total Livestock Un		15%	15%	15%	50	
Industry	ha			20%		20000	1.8
Institutions							2
Day pupils with WC				100%		25	
Day pupils without WC				100%		5	
Boarding pupils				100%		50	
Admin office staff				100%		25	
Hlth	Centre Nr			100%		5000	2
	Region Beds			100%		400	
	District Beds			100%		200	
	Other H Beds			100%		100	
	Outpati Nr			100%		20	
Commerc	High	Beds		100%		600	1.8
	Med	Beds		100%		300	
	Low	Beds		100%		50	
	Bars			100%		500	
	Shops			100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification High	Medium	Low	Total Population	Livestock Pop'n LU	Industry ha	Pupil Pop'n	Admin staff	Health Facilities Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	114,145	-	-	5,142	15,564	31,129	165,980	31,567	597.9	49,794	1,360	11	488	2424	861.8	125	839
1998	117,379	-	-	5,399	16,343	32,685	171,806	32,198	618.3	51,542	1,407	11	505	2506	891.1	129	868
1999	120,509	-	-	5,669	17,160	34,320	177,657	32,842	639.4	53,297	1,455	11	522	2592	921.5	133	897
2000	123,522	-	-	5,952	18,018	36,036	183,527	33,499	661.2	55,058	1,504	12	539	2680	952.9	138	928
2001	126,548	-	-	6,250	18,919	37,837	189,554	34,169	682.4	56,866	1,552	12	557	2768	983.5	142	958
2002	129,585	-	-	6,562	19,865	39,729	195,741	34,853	704.3	58,722	1,602	12	575	2854	1015	147	988
2003	132,630	-	-	6,890	20,858	41,716	202,094	35,550	726.8	60,628	1,654	13	593	2948	1048	151	1020
2004	135,681	-	-	7,235	21,901	43,801	208,618	36,261	750.2	62,585	1,707	13	612	3041	1081	156	1053
2005	138,734	-	-	7,597	22,996	45,992	215,318	36,986	774.2	64,595	1,761	14	632	3138	1116	161	1087
2006	141,786	-	-	7,977	24,146	48,291	222,199	37,726	799.1	66,660	1,818	14	652	3239	1152	167	1122
2007	144,834	-	-	8,375	25,353	50,706	229,268	38,480	824.7	68,780	1,876	15	673	3343	1189	172	1157
2008	147,876	-	-	8,794	26,620	53,241	236,531	39,250	851.2	70,959	1,936	15	695	3450	1227	177	1195
2009	150,907	-	-	9,234	27,951	55,903	243,998	40,035	878.5	73,199	1,998	16	717	3561	1266	183	1233
2010	153,925	-	-	9,696	29,349	58,698	251,668	40,835	906.6	75,500	2,063	16	740	3675	1307	189	1273

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	1,370	913	3854	560	6,697	237	2,392	514	143	320	10,302	2.08
1998	1,878	861	4210	545	7,493	241	2,473	532	148	331	11,219	2.06
1999	2,410	803	4592	526	8,332	246	2,558	550	153	342	12,181	2.05
2000	2,965	741	5002	504	9,212	251	2,645	568	158	354	13,188	2.04
2001	3,341	709	5306	515	9,872	256	2,729	587	163	365	13,974	2.03
2002	3,732	674	5633	524	10,564	261	2,817	606	168	377	14,794	2.03
2003	4,138	637	5978	534	11,286	267	2,907	626	174	389	15,649	2.02
2004	4,559	597	6342	543	12,041	272	3,001	646	179	401	16,541	2.02
2005	4,994	555	6728	552	12,830	277	3,097	667	185	414	17,470	2.02
2006	5,445	510	7137	560	13,652	283	3,196	688	191	428	18,436	2.01
2007	5,909	463	7570	568	14,511	289	3,299	710	197	441	19,447	2.01
2008	6,388	414	8028	575	15,406	294	3,405	732	204	455	20,496	2.00
2009	6,881	362	8514	581	16,339	300	3,514	756	210	470	21,589	2.00
2010	7,388	308	9027	587	17,311	306	3,627	779	217	485	22,725	2.00

MERU WATER SUPPLY — Baseline data for area to be fed from combined intake and treatment works

Baseline Data			Baseline data:														Total Base-line
Locations			Ntima	Ntima	Ntima	Ntima	Ntima	Ntima	Ntima	Nyika	Nyika	Nyika	Nyika	Nyika	U Abothoguchi		
Sub-Locations			Town	U.Igoki	Makira	L Igoki	Nthumbiri	Mpuri	Ngonyi	Muiathanki	Thuuru	Chungu	Munithu	Nkubune	Katheri	Githongo	Kithrune	
1989 Census figures					10												
1989 population					9414												9,414
Population distribution & growth (WRAP 1988 estimates)																	
Rural areas		High			77%												77.0%
Land potential:.....		Med			0%												0.0%
		Low			0%												0.0%
Urban area		High			2%												2.0%
housing class:..		Med			7%												7.0%
		Low			14%												14.0%
Livestock numbers:		Grade			1454												1,454
		Indig															-
		Shoats			616												616
Total Livestock Units.....					1495												1,495
Note: The following are assumed to increase in proportion with the population, within the limits specified:																	-
Industry		ha															27%
Institutions																	-
Day pupils with WC																	2,221
Day pupils without WC					2221												336
Boarding pupils					336												-
Admin office staff					0												-
Hlth Health Cntr/Disp'ry		Nr			0												-
Regional Hospitals		Beds			0												-
District Hospitals		Beds			0												-
Other Hospitals		Beds			0												-
Outpatients per day		Nr			0												-
Commercial	High	Beds			0												-
Hotel	Med	Beds			0												-
class:	Low	Beds			0												-
	Bars				0												-
	Shops				0												-

Service Levels

28/06/97

Projection assumptions: Assume varying growth rates as follows:	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	2.0%	2.0%	2.0%
Projection constraints			
Pupil/pop ratio..			30%
%of schools:	with WC.		0%
	no WC....		87%
	Boarding		13%
% of Hospital Beds	Regional		0%
	District...		0%
	Other. ..		0%
% of Hotel Beds:	High.		
	Medium..		
	Low.. ...		

			Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs	Rural	High	20%	40%	80%	60	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
	Urban	High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs	Rural unconnected supplies					10	3
	Urban unconnected supplies					20	3
Livestock							1.5
	Total Livestock Ur		15%	15%	15%	50	
Industry	ha			20%		20000	1.8
Institutions							2
	Day pupils with WC			100%		25	
	Day pupils without WC			100%		5	
	Boarding pupils			100%		50	
	Admin office staff			100%		25	
Hlth	Centre Nr			100%		5000	2
	Region Beds			100%		400	
	District Beds			100%		200	
	Other F Beds			100%		100	
	Outpati Nr			100%		20	
Commerc	High	Beds		100%		600	1.8
	Med	Beds		100%		300	
	Low	Beds		100%		50	
	Bars			100%		500	
	Shops			100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification High	Medium	Low	Total Population	Livestock Pop'n LU	Indu-stry ha	Pupil Pop'n	Admin staff	Health Facilities Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	9,163	-	-	278	974	1,947	12,382	1,787	-	3,714	-	0	0	0	0	0	0
1998	9,443	-	-	292	1,022	2,045	12,802	1,822	-	3,841	-	0	0	0	0	0	0
1999	9,695	-	-	307	1,073	2,147	13,221	1,859	-	3,966	-	0	0	0	0	0	0
2000	9,937	-	-	322	1,127	2,254	13,640	1,896	-	4,092	-	0	0	0	0	0	0
2001	10,180	-	-	338	1,183	2,367	14,089	1,934	-	4,221	-	0	0	0	0	0	0
2002	10,425	-	-	355	1,243	2,485	14,508	1,973	-	4,352	-	0	0	0	0	0	0
2003	10,670	-	-	373	1,305	2,609	14,957	2,012	-	4,487	-	0	0	0	0	0	0
2004	10,915	-	-	391	1,370	2,740	15,416	2,052	-	4,625	-	0	0	0	0	0	0
2005	11,161	-	-	411	1,438	2,877	15,887	2,093	-	4,766	-	0	0	0	0	0	0
2006	11,406	-	-	432	1,510	3,021	16,369	2,135	-	4,911	-	0	0	0	0	0	0
2007	11,651	-	-	453	1,586	3,172	16,862	2,178	-	5,059	-	0	0	0	0	0	0
2008	11,896	-	-	475	1,665	3,330	17,367	2,222	-	5,210	-	0	0	0	0	0	0
2009	12,140	-	-	500	1,746	3,497	17,885	2,266	-	5,365	-	0	0	0	0	0	0
2010	12,383	-	-	525	1,836	3,672	18,415	2,311	-	5,524	-	0	0	0	0	0	0

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	110	73	230	35	449	13	-	36	-	-	498	2.20
1998	151	69	252	34	506	14	-	37	-	-	557	2.17
1999	194	65	275	33	567	14	-	38	-	-	619	2.15
2000	236	60	300	32	630	14	-	39	-	-	684	2.12
2001	269	57	319	32	677	15	-	41	-	-	732	2.11
2002	300	54	339	33	726	15	-	42	-	-	783	2.10
2003	333	51	359	33	777	15	-	43	-	-	835	2.09
2004	367	48	381	34	830	15	-	45	-	-	890	2.08
2005	402	45	405	35	886	16	-	45	-	-	947	2.08
2006	436	41	430	35	944	16	-	47	-	-	1,007	2.07
2007	475	37	456	36	1,004	16	-	49	-	-	1,069	2.06
2008	514	33	484	36	1,067	17	-	50	-	-	1,134	2.05
2009	554	29	513	36	1,132	17	-	52	-	-	1,201	2.05
2010	594	25	544	37	1,200	17	-	53	-	-	1,271	2.04

MERU WATER SUPPLY — *Baseline data for area to be fed from combined intake and treatment works*

Baseline Data		Baseline data														Total Base-line
Locations			Ntima	Ntima	Ntima	Ntima	Ntima	Ntima	Nyika	Nyika	Nyika	Nyika	Nyika	U.Abothoguchi		
Sub-Locations		Town	U.Igoki	Ntakiro	L.Igoki	Nthimbiri	Maun	Ngonyi	Mulathranko	Thuura	Chungu	Munithu	Nkabune	Katheri	Githongo	Kithiuke	
1989 Census figures					6											
1989 population					4759											4,759
Population distribution & growth (WRAP 1988 estimates)																
Rural areas	High				80%											80.0%
Land potential:.....	Med				0%											0.0%
	Low				0%											0.0%
Urban area	High				2%											2.0%
housing class:	Med				6%											6.0%
	Low				12%											12.0%
Livestock numbers:	Grade				850											850
	Indig															-
	Shoats				946											946
Total Livestock Units.....					913											913
Note: The following are assumed to increase in proportion with the population, within the limits specified:																
Industry	ha															-
Institutions																33%
Day pupils with WC																-
Day pupils without WC					1335											1,335
Boarding pupils					217											217
Admin office staff																-
Hlth Health Cntr/Disp'ry	Nr															-
Regional Hospitals	Beds															-
District Hospitals	Beds															-
Other Hospitals	Beds															-
Outpatients per day	Nr															-
Commercial High	Beds															-
Hotel Med	Beds				30											30
class: Low	Beds															-
Bars					3											3
Shops																-

Service Levels

Projection assumptions — Assume varying growth rates as follows:

	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	2.0%	2.0%	2.0%

Projection constraints

Pupil/pop ratio...		30%
%of schools:	with WC..	0%
	no WC....	86%
	Boarding.	14%
% of Hospital Beds	Regional..	0%
	District...	0%
	Other.....	0%
% of Hotel Beds'	High.....	0%
	Medium..	100%
	Low.....	0%

28/06/97

			Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs	Rural	High	20%	40%	80%	60	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
	Urban	High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs	Rural unconnected supplies					10	3
	Urban unconnected supplies					20	3
Livestock							1.5
	Total Livestock Ur		15%	15%	15%	50	
Industry	ha			20%		20000	1.8
Institutions							2
	Day pupils with WC			100%		25	
	Day pupils without WC			100%		5	
	Boarding pupils			100%		50	
	Admin office staff			100%		25	
Hlth	Centre Nr			100%		5000	2
	Region Beds			100%		400	
	District Beds			100%		200	
	Other H Beds			100%		100	
	Outpati Nr			100%		20	
Commerc	High	Beds		100%		600	1.8
	Med	Beds		100%		300	
	Low	Beds		100%		50	
	Bars			100%		500	
	Shops			100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Ind-ustry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels: Total beds	Bars	Shops
1997	4,823	-	-	141	422	844	6,229	1,091	-	1,869	-	0	0	0	39.77	4	0
1998	4,959	-	-	148	443	886	6,436	1,113	-	1,931	-	0	0	0	41.13	4	0
1999	5,092	-	-	155	465	930	6,642	1,135	-	1,993	-	0	0	0	42.53	4	0
2000	5,219	-	-	163	488	977	6,847	1,158	-	2,054	-	0	0	0	43.98	4	0
2001	5,347	-	-	171	513	1,026	7,056	1,181	-	2,117	-	0	0	0	45.39	5	0
2002	5,475	-	-	179	538	1,077	7,270	1,205	-	2,181	-	0	0	0	46.85	5	0
2003	5,604	-	-	188	565	1,131	7,488	1,229	-	2,247	-	0	0	0	48.35	5	0
2004	5,733	-	-	198	594	1,187	7,712	1,253	-	2,313	-	0	0	0	49.9	5	0
2005	5,862	-	-	208	623	1,247	7,939	1,279	-	2,382	-	0	0	0	51.5	5	0
2006	5,991	-	-	218	654	1,309	8,172	1,304	-	2,452	-	0	0	0	53.15	5	0
2007	6,120	-	-	229	687	1,374	8,410	1,330	-	2,523	-	0	0	0	54.86	5	0
2008	6,248	-	-	241	722	1,443	8,653	1,357	-	2,596	-	0	0	0	56.62	6	0
2009	6,376	-	-	253	758	1,515	8,902	1,384	-	2,670	-	0	0	0	58.43	6	0
2010	6,504	-	-	265	796	1,591	9,155	1,412	-	2,747	-	0	0	0	60.31	6	0

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	58	39	105	15	216	8	-	18	-	14	257	2.18
1998	79	36	114	15	245	8	-	19	-	14	286	2.15
1999	102	34	125	14	275	9	-	19	-	15	317	2.13
2000	125	31	136	14	306	9	-	20	-	15	350	2.11
2001	141	30	144	14	329	9	-	20	-	16	374	2.10
2002	158	28	153	14	353	9	-	21	-	16	400	2.09
2003	175	27	162	14	379	9	-	22	-	17	426	2.08
2004	193	25	172	15	405	9	-	22	-	17	454	2.07
2005	211	23	183	15	432	10	-	23	-	18	483	2.06
2006	230	22	194	15	461	10	-	24	-	19	513	2.05
2007	250	20	206	15	490	10	-	24	-	19	544	2.05
2008	270	17	218	16	521	10	-	25	-	20	576	2.04
2009	291	15	231	16	553	10	-	26	-	20	610	2.04
2010	312	13	245	16	586	11	-	26	-	21	645	2.03

MERU WATER SUPPLY — Baseline data for area to be fed from combined intake and treatment works

Baseline Data

Locations		Baseline data														Total Base-line
Sub-Locations		Town	Ntima U.Igoki	Ntima Ntakiro	Ntima L.Igoki	Ntima Nthimbiri	Ntima Mpuri	Ntima Ngonyi	Nyika Mulathanka	Nyika Thuura	Nyika Cirungu	Nyika Munithu	Nyika Nkobune	U.Abothuguchi Katheri	Githongo	Kithirune	
1989 Census figures						s										
1989 population						5324										5,324
Population distribution & growth (WRAP 1988 estimates)																
Rural areas	High					100%										100.0%
Land potential:.....	Med															0.0%
	Low															0.0%
Urban area	High															0.0%
housing class:.....	Med															0.0%
	Low															0.0%
Livestock numbers:	Grade					1554										1,554
	Indig															-
	Shoats					763										763
Total Livestock Units.....						1605										1,605
Note: The following are assumed to increase in proportion with the population, within the limits specified:																-
Industry	ha															-
Institutions																24%
Day pupils with WC																-
Day pupils without WC						1280										1,280
Boarding pupils						0										-
Admin office staff																-
Hlth Health Cntr/Disp'ry	Nr															-
Regional Hospitals	Beds															-
District Hospitals	Beds															-
Other Hospitals	Beds															-
Outpatients per day	Nr															-
Commercial High	Beds															-
Hotel Med	Beds															-
class: Low	Beds															-
Bars																-
Shops																-

Service Levels

Projection assumptions — Assume varying growth rates as follows:

	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	2.0%	2.0%	2.0%

Projection constraints

Pupil/pop ratio...		30%
%of schools:	with WC.	0%
	no WC...	100%
	Boarding	0%
% of Hospital Beds	Regional...	0%
	District...	0%
	Other. ...	0%
% of Hotel Beds.	High.....	
	Medium..	
	Low	

28/06/97

			Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs	Rural	High	20%	40%	80%	60	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
	Urban	High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs	Rural unconnected supplies					10	3
	Urban unconnected supplies					20	3
Livestock							1.5
	Total Livestock Ur		15%	15%	15%	50	
Industry	ha			20%		20000	1.8
Institutions							2
	Day pupils with WC			100%		25	
	Day pupils without WC			100%		5	
	Boarding pupils			100%		50	
	Admin office staff			100%		25	
Hlth	Centre Nr			100%		5000	2
	Region Beds			100%		400	
	District Beds			100%		200	
	Other H Beds			100%		100	
	Outpati Nr			100%		20	
Commerc	High	Beds		100%		500	1.8
	Med	Beds		100%		300	
	Low	Beds		100%		50	
	Bars			100%		500	
	Shops			100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Ind-ustry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels: Total beds	Bars	Shops
1997	6,744	-	-	-	-	-	6,744	1,918	-	2,023	-	0	0	0	0	0	0
1998	6,935	-	-	-	-	-	6,935	1,956	-	2,081	-	0	0	0	0	0	0
1999	7,120	-	-	-	-	-	7,120	1,995	-	2,136	-	0	0	0	0	0	0
2000	7,298	-	-	-	-	-	7,298	2,035	-	2,189	-	0	0	0	0	0	0
2001	7,477	-	-	-	-	-	7,477	2,076	-	2,243	-	0	0	0	0	0	0
2002	7,657	-	-	-	-	-	7,657	2,118	-	2,297	-	0	0	0	0	0	0
2003	7,837	-	-	-	-	-	7,837	2,160	-	2,351	-	0	0	0	0	0	0
2004	8,017	-	-	-	-	-	8,017	2,203	-	2,405	-	0	0	0	0	0	0
2005	8,197	-	-	-	-	-	8,197	2,247	-	2,459	-	0	0	0	0	0	0
2006	8,377	-	-	-	-	-	8,377	2,292	-	2,513	-	0	0	0	0	0	0
2007	8,558	-	-	-	-	-	8,558	2,338	-	2,567	-	0	0	0	0	0	0
2008	8,737	-	-	-	-	-	8,737	2,385	-	2,621	-	0	0	0	0	0	0
2009	8,916	-	-	-	-	-	8,916	2,432	-	2,675	-	0	0	0	0	0	0
2010	9,095	-	-	-	-	-	9,095	2,481	-	2,728	-	0	0	0	0	0	0

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	81	54	0	0	135	14	-	20	-	-	169	2.28
1998	111	51	0	0	162	15	-	20	-	-	197	2.22
1999	142	47	0	0	190	15	-	21	-	-	225	2.18
2000	175	44	0	0	219	15	-	21	-	-	255	2.14
2001	197	42	0	0	239	16	-	22	-	-	276	2.12
2002	221	40	0	0	260	16	-	22	-	-	298	2.11
2003	244	38	0	0	282	16	-	23	-	-	321	2.09
2004	269	35	0	0	305	17	-	23	-	-	344	2.08
2005	295	33	0	0	328	17	-	24	-	-	368	2.07
2006	322	30	0	0	352	17	-	24	-	-	393	2.05
2007	349	27	0	0	377	18	-	25	-	-	419	2.04
2008	377	24	0	0	402	18	-	25	-	-	445	2.03
2009	407	21	0	0	428	18	-	26	-	-	472	2.03
2010	437	18	0	0	455	19	-	26	-	-	500	2.02

MERU WATER SUPPLY — Baseline data for area to be fed from combined intake and treatment works

Baseline Data			Baseline data														Total Base-line
Locations			Town	Ntima U.Igoki	Ntima Ntakira	Ntima L.Igoki	Ntima Ntembiri	Ntima Mpuri	Ntima Ngonyi	Nyika Mulathanka	Nyika Thuura	Nyika Chungu	Nyika Munithu	Nyika Nkabune	U.Abothuguchi Kathen	U.Abothuguchi Githongo	Kithirune	
Sub-Locations																	
1989 Census figures								6									
1989 population								4492									4,492
Population distribution & growth (WRAP 1988 estimates)																	
Rural areas		High						100%									100.0%
Land potential		Med															0.0%
		Low															0.0%
Urban area		High															0.0%
housing class:		Med															0.0%
		Low															0.0%
Livestock numbers:		Grade						674									874
		Indig															-
		Shoats						729									729
Total Livestock Units.								923									923
Note: The following are assumed to increase in proportion with the population, within the limits specified:																	
Industry		ha															-
Institutions																	50%
Day pupils with WC																	-
Day pupils without WC								2123									2,123
Boarding pupils								143									143
Admin office staff																	-
Hlth Health Cntr/Disp'ry		Nr															-
Regional Hospitals		Beds															-
District Hospitals		Beds															-
Other Hospitals		Beds															-
Outpatients per day		Nr															-
Commercial	High	Beds															-
Hotel	Med	Beds															-
class:	Low	Beds															-
	Bars																-
	Shops																-

Service Levels

Projection assumptions — Assume varying growth rates as follows:

	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%

Projection constraints

Pupil/pop ratio...			30%
%of	with WC.		0%
schools:	no WC....		94%
	Boarding		6%

% of	Regional.		0%
Hospital	District...		0%
Beds	Other.....		0%

% of	High.....		
Hotel	Medium..		
Beds	Low.....		

28/05/97

				Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand								
ICs	Rural	High		20%	40%	80%	60	2
		Med		10%	20%	40%	50	
		Low		5%	10%	20%	40	
	Urban	High		100%	100%	100%	250	2
		Med		100%	100%	100%	150	
		Low		10%	30%	50%	75	
WKs	Rural unconnected supplies						10	3
	Urban unconnected supplies						20	3
Livestock								1.5
	Total Livestock Un			15%	15%	15%	50	
Industry	ha				20%		20000	1.8
Institutions								2
	Day pupils with WC				100%		25	
	Day pupils without WC				100%		5	
	Boarding pupils				100%		50	
	Admin office staff				100%		25	
Hlth	Centre Nr				100%		5000	2
	Region Beds				100%		400	
	District Beds				100%		200	
	Other H Beds				100%		100	
	Outpati Nr				100%		20	
Commerc	High	Beds			100%		600	1.8
	Med	Beds			100%		300	
	Low	Beds			100%		50	
	Bars				100%		500	
	Shops				100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Industry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	5,690	-	-	-	-	-	5,690	1,103	-	1,707	-	0	0	0	0	0	0
1998	5,852	-	-	-	-	-	5,852	1,125	-	1,755	-	0	0	0	0	0	0
1999	6,008	-	-	-	-	-	6,008	1,147	-	1,802	-	0	0	0	0	0	0
2000	6,158	-	-	-	-	-	6,158	1,170	-	1,847	-	0	0	0	0	0	0
2001	6,309	-	-	-	-	-	6,309	1,193	-	1,893	-	0	0	0	0	0	0
2002	6,460	-	-	-	-	-	6,460	1,217	-	1,938	-	0	0	0	0	0	0
2003	6,612	-	-	-	-	-	6,612	1,242	-	1,984	-	0	0	0	0	0	0
2004	6,764	-	-	-	-	-	6,764	1,267	-	2,029	-	0	0	0	0	0	0
2005	6,916	-	-	-	-	-	6,916	1,292	-	2,075	-	0	0	0	0	0	0
2006	7,068	-	-	-	-	-	7,066	1,318	-	2,120	-	0	0	0	0	0	0
2007	7,220	-	-	-	-	-	7,220	1,344	-	2,166	-	0	0	0	0	0	0
2008	7,372	-	-	-	-	-	7,372	1,371	-	2,212	-	0	0	0	0	0	0
2009	7,523	-	-	-	-	-	7,523	1,398	-	2,257	-	0	0	0	0	0	0
2010	7,673	-	-	-	-	-	7,673	1,426	-	2,302	-	0	0	0	0	0	0

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	68	46	0	0	114	8	-	16	-	-	139	2.30
1998	94	43	0	0	137	8	-	17	-	-	162	2.24
1999	120	40	0	0	160	9	-	17	-	-	186	2.19
2000	148	37	0	0	185	9	-	18	-	-	211	2.15
2001	167	35	0	0	202	9	-	18	-	-	229	2.13
2002	186	34	0	0	220	9	-	19	-	-	247	2.12
2003	206	32	0	0	238	9	-	19	-	-	266	2.10
2004	227	30	0	0	257	9	-	20	-	-	286	2.09
2005	249	28	0	0	277	10	-	20	-	-	306	2.07
2006	271	25	0	0	297	10	-	20	-	-	327	2.06
2007	295	23	0	0	318	10	-	21	-	-	349	2.05
2008	318	21	0	0	339	10	-	21	-	-	371	2.04
2009	343	18	0	0	361	10	-	22	-	-	393	2.03
2010	368	15	0	0	384	11	-	22	-	-	417	2.02

MERU WATER SUPPLY — Baseline data for area to be fed from combined intake and treatment works

Baseline Data		Baseline data														Total Base-line
Locations			Ntima	Ntima	Ntima	Ntima	Ntima	Ntima	Nyika	Nyika	Nyika	Nyika	Nyika	U Abothoguchi		
Sub-Locations		Town	U.Igoki	Ntakiru	L.Igoki	Nthimbin	Mpuri	Ngonyi	Mulathanka	Thuura	Chungu	Muunthu	Nkabune	Kathen	Githongo	Kahrune	
1989 Census figures								9								
1989 population								5227								5,227
Population distribution & growth (WRAP 1988 estimates)																
Rural areas	High							100%								100.0%
Land potential.....	Med															0.0%
	Low															0.0%
Urban area	High															0.0%
housing class	Med															0.0%
	Low															0.0%
Livestock numbers:	Grade							633								633
	Indig															-
	Shoats							675								675
Total Livestock Units.....								678								678
Note. The following are assumed to increase in proportion with the population, within the limits specified:																-
Industry	ha															31%
Institutions																-
Day pupils with WC								1600								1,600
Day pupils without WC																-
Boarding pupils																-
Admin office staff																-
Hlth Health Cntr/Disp'ry	Nr															-
Regional Hospitals	Beds															-
District Hospitals	Beds															-
Other Hospitals	Beds															-
Outpatients per day	Nr															-
Commercial	High	Beds														-
Hotel	Med	Beds														-
class:	Low	Beds														-
	Bars															-
	Shops															-

Service Levels

28/06/97

Projection assumptions

Assume varying growth rates as follows:

	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	2.0%	2.0%	2.0%

Projection constraints

Pupil/pop ratio... 30%

% of schools: with WC 0%; no WC ... 100%; Boarding 0%

% of Hospital Beds: Regional 0%; District.... 0%; Other..... 0%

% of Hotel Beds: High..... ; Medium.. ; Low. ....

			Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs	Rural	High	20%	40%	80%	60	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
	Urban	High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs	Rural unconnected supplies					10	3
	Urban unconnected supplies					20	3
Livestock							1.5
	Total Livestock Ur		15%	15%	15%	50	
Industry	ha			20%		20000	1.8
Institutions							2
	Day pupils with WC			100%		25	
	Day pupils without WC			100%		5	
	Boarding pupils			100%		50	
	Admin office staff			100%		25	
Hlth	Centre Nr			100%		5000	2
	Region Beds			100%		400	
	District Beds			100%		200	
	Other H Beds			100%		100	
	Outpati Nr			100%		20	
Commerc	High	Beds		100%		600	1.8
	Med	Beds		100%		300	
	Low	Beds		100%		50	
	Bars			100%		500	
	Shops			100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification High	Medium	Low	Total Population	Livestock Pop'n LU	Ind-ustry ha	Pupil Pop'n	Admin staff	Health Facilities Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	6,621	-	-	-	-	-	6,621	810	-	1,986	-	0	0	0	0	0	0
1998	6,809	-	-	-	-	-	6,809	826	-	2,043	-	0	0	0	0	0	0
1999	6,991	-	-	-	-	-	6,991	843	-	2,097	-	0	0	0	0	0	0
2000	7,165	-	-	-	-	-	7,165	860	-	2,150	-	0	0	0	0	0	0
2001	7,341	-	-	-	-	-	7,341	877	-	2,202	-	0	0	0	0	0	0
2002	7,517	-	-	-	-	-	7,517	895	-	2,255	-	0	0	0	0	0	0
2003	7,694	-	-	-	-	-	7,694	912	-	2,308	-	0	0	0	0	0	0
2004	7,871	-	-	-	-	-	7,871	931	-	2,361	-	0	0	0	0	0	0
2005	8,048	-	-	-	-	-	8,048	949	-	2,414	-	0	0	0	0	0	0
2006	8,225	-	-	-	-	-	8,225	968	-	2,467	-	0	0	0	0	0	0
2007	8,402	-	-	-	-	-	8,402	988	-	2,521	-	0	0	0	0	0	0
2008	8,578	-	-	-	-	-	8,578	1,007	-	2,573	-	0	0	0	0	0	0
2009	8,754	-	-	-	-	-	8,754	1,028	-	2,626	-	0	0	0	0	0	0
2010	8,929	-	-	-	-	-	8,929	1,048	-	2,679	-	0	0	0	0	0	0

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-ercial m3/d	Total Avg m3/d	Overall Peak Factor
1997	79	53	0	0	132	6	-	19	-	-	158	2.32
1998	109	50	0	0	159	6	-	20	-	-	185	2.25
1999	140	47	0	0	186	6	-	20	-	-	213	2.20
2000	172	43	0	0	215	6	-	21	-	-	242	2.16
2001	194	41	0	0	235	7	-	21	-	-	263	2.14
2002	216	39	0	0	256	7	-	22	-	-	284	2.13
2003	240	37	0	0	277	7	-	22	-	-	306	2.11
2004	264	35	0	0	299	7	-	23	-	-	329	2.09
2005	290	32	0	0	322	7	-	23	-	-	352	2.08
2006	316	30	0	0	345	7	-	24	-	-	376	2.07
2007	343	27	0	0	370	7	-	24	-	-	401	2.06
2008	371	24	0	0	395	8	-	25	-	-	427	2.05
2009	399	21	0	0	420	8	-	25	-	-	453	2.04
2010	429	18	0	0	446	8	-	26	-	-	480	2.03

MERU WATER SUPPLY — Baseline data for area to be fed from combined intake and treatment works

Baseline Data		Baseline data														Total Base-line
Locations			Ntima	Ntima	Ntima	Ntima	Ntima	Ntima	Nyika	Nyika	Nyika	Nyika	Nyika	U.Abothoguchi		
Sub-Locations		Town	U.Igoki	Mtakira	L.Igoki	Nthimbiri	Mpuri	Ngonyi	Mulathank	Thuura	Chungu	Munithu	Nkabune	Katheri	Githongo	Kithirune	
1989 Census figures									5							
1989 population									5054							5,054
Population distribution & growth (WRAP 1988 estimates)																
Rural areas	High								0%							0.0%
Land potential:..... ..	Med								0%							0.0%
	Low								0%							0.0%
Urban area	High								10%							10.0%
housing class:	Med								30%							30.0%
	Low								60%							60.0%
Livestock numbers:	Grade								614							614
	Indig								153							153
	Shoats								330							330
Total Livestock Units.....									687							687
Note: The following are assumed to increase in proportion with the population, within the limits specified:																
Industry	ha															-
Institutions																19%
Day pupils with WC																-
Day pupils without WC									981							981
Boarding pupils																-
Admin office staff									10							10
Hlth Health Cntr/Disp'ry	Nr															-
Regional Hospitals	Beds															-
District Hospitals	Beds															-
Other Hospitals	Beds															-
Outpatients per day	Nr															-
Commercial	High Beds															-
Hotel	Med Beds															-
class:	Low Beds															-
	Bars								3							3
	Shops								12							12

Service Levels

28/06/97

Projection assumptions — Assume varying growth rates as follows:

	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	2.0%	2.0%	2.0%

Projection constraints

Pupil/pop ratio...		30%
%of schools:	with WC..	0%
	no WC ..	100%
	Boarding	0%
% of Hospital Beds	Regional..	0%
	Distnct....	0%
	Other.....	0%
% of Hotel Beds	High.....	
	Medium..	
	Low	

			Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs	Rural	High	20%	40%	80%	60	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
	Urban	High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs	Rural unconnected supplies					10	3
	Urban unconnected supplies					20	3
Livestock							1.5
	Total Livestock Un		15%	15%	15%	50	
Industry	ha			20%		20000	1.8
Institutions							2
	Day pupils with WC			100%		25	
	Day pupils without WC			100%		5	
	Boarding pupils			100%		50	
	Admin office staff			100%		25	
Hlth	Centre Nr			100%		5000	2
	Region Beds			100%		400	
	District Beds			100%		200	
	Other h Beds			100%		100	
	Outpati Nr			100%		20	
Commerc	High	Beds		100%		600	1.8
	Med	Beds		100%		300	
	Low	Beds		100%		50	
	Bars			100%		500	
	Shops			100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Industry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	-	-	-	747	2,240	4,480	7,467	821	-	2,240	13	0	0	0	0	4	16
1998	-	-	-	784	2,352	4,704	7,840	837	-	2,352	14	0	0	0	0	4	16
1999	-	-	-	823	2,470	4,939	8,232	854	-	2,470	14	0	0	0	0	4	17
2000	-	-	-	864	2,593	5,186	8,644	871	-	2,593	15	0	0	0	0	4	18
2001	-	-	-	908	2,723	5,446	9,076	889	-	2,723	15	0	0	0	0	5	18
2002	-	-	-	953	2,859	5,718	9,530	906	-	2,859	16	0	0	0	0	5	19
2003	-	-	-	1,001	3,002	6,004	10,007	925	-	3,002	16	0	0	0	0	5	19
2004	-	-	-	1,051	3,152	6,304	10,507	943	-	3,152	17	0	0	0	0	5	20
2005	-	-	-	1,103	3,310	6,619	11,032	962	-	3,310	17	0	0	0	0	5	21
2006	-	-	-	1,158	3,475	6,950	11,584	981	-	3,475	18	0	0	0	0	5	21
2007	-	-	-	1,216	3,649	7,298	12,163	1,001	-	3,649	18	0	0	0	0	5	22
2008	-	-	-	1,277	3,831	7,663	12,771	1,021	-	3,831	19	0	0	0	0	6	23
2009	-	-	-	1,341	4,023	8,046	13,410	1,041	-	4,023	19	0	0	0	0	5	23
2010	-	-	-	1,408	4,224	8,448	14,080	1,062	-	4,224	20	0	0	0	0	5	24

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Commer-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	-	0	556	81	637	6	-	22	-	4	669	2.11
1998	-	0	608	78	686	6	-	23	-	4	719	2.10
1999	-	0	663	76	738	6	-	24	-	4	773	2.09
2000	-	0	722	73	794	7	-	25	-	4	830	2.08
2001	-	0	766	74	840	7	-	27	-	4	877	2.08
2002	-	0	813	75	888	7	-	28	-	4	927	2.08
2003	-	0	863	77	939	7	-	29	-	4	980	2.07
2004	-	0	915	78	993	7	-	31	-	4	1,036	2.07
2005	-	0	971	79	1,050	7	-	32	-	5	1,094	2.07
2006	-	0	1030	81	1,110	7	-	34	-	5	1,157	2.07
2007	-	0	1092	82	1,174	8	-	36	-	5	1,222	2.06
2008	-	0	1158	83	1,241	8	-	37	-	5	1,291	2.06
2009	-	0	1228	84	1,312	8	-	39	-	5	1,364	2.06
2010	-	0	1302	84	1,387	8	-	41	-	5	1,442	2.06

MERU WATER SUPPLY — Baseline data for area to be fed from combined intake and treatment works

Baseline Data		Baseline data														Total Baseline
Locations		Ntima		Ntima	Ntima	Ntima	Ntima	Ntima	Nyika	Nyika	Nyika	Nyika	Nyika	U.Abothoguchi		
Sub-Locations		Town	U.Igoki	Ntakora	L.Igoki	Nthimbiri	Mpuri	Ngonyi	Mulathank	Thuuru	Chungu	Munithu	Nkabune	Kathen	Githongo	Kithrune	
1989 Census figures										45						
1989 population										8879						8,879
Population distribution & growth (WRAP 1988 estimates)										100%						100.0%
Rural areas	High															0.0%
Land potential:.....	Med															0.0%
	Low															0.0%
Urban area	High															0.0%
housing class:.....	Med															0.0%
	Low															0.0%
Livestock numbers:	Grade									2196						2,196
	Indig									549						549
	Shoats									2770						2,770
Total Livestock Units.....										2564						2,564
Note: The following are assumed to increase in proportion with the population, within the limits specified:																-
Industry	ha															28%
Institutions																-
Day pupils with WC																2,446
Day pupils without WC										2446						-
Boarding pupils																5
Admin office staff										5						5
Hlth Health Cntr/Disp'ry	Nr															-
Regional Hospitals	Beds															-
District Hospitals	Beds															-
Other Hospitals	Beds															-
Outpatients per day	Nr															-
Commercial Hotel	High	Beds														-
Hotel	Med	Beds														-
class:	Low	Beds														-
	Bars									10						10
	Shops									49						49

Service Levels

28/06/97

Projection assumptions

Assume varying growth rates as follows:

	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
Livestock	2.0%	2.0%	2.0%

Projection constraints

Pupil/pop ratio			30%
% of schools:	with WC		0%
	no WC		100%
	Boarding		0%
% of Hospital Beds:	Regional		0%
	Distrct		0%
	Other		0%
% of Hotel Beds:	High		
	Medium		
	Low		

			Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs	Rural	High	20%	40%	80%	60	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
	Urban	High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs	Rural unconnected supplies					10	3
	Urban unconnected supplies					20	3
Livestock							1.5
	Total Livestock Un		15%	15%	15%	50	
Industry	ha			20%		20000	1.5
Institutions							2
	Day pupils with WC			100%		25	
	Day pupils without WC			100%		5	
	Boarding pupils			100%		50	
	Admin office staff			100%		25	
Hlth	Centre Nr			100%		5000	2
	Region Beds			100%		400	
	District Beds			100%		200	
	Other H Beds			100%		100	
	Outpati Nr			100%		20	
Commerc	High	Beds		100%		600	1.8
	Med	Beds		100%		300	
	Low	Beds		100%		50	
	Bars			100%		500	
	Shops			100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Industry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels: Total beds	Bars	Shops
1997	11,246	-	-	-	-	-	11,248	3,064	-	3,374	7	0	0	0	0	13	65
1998	11,586	-	-	-	-	-	11,586	3,125	-	3,470	7	0	0	0	0	14	67
1999	11,875	-	-	-	-	-	11,875	3,186	-	3,562	7	0	0	0	0	14	69
2000	12,172	-	-	-	-	-	12,172	3,251	-	3,651	7	0	0	0	0	15	72
2001	12,470	-	-	-	-	-	12,470	3,316	-	3,741	8	0	0	0	0	15	74
2002	12,769	-	-	-	-	-	12,769	3,383	-	3,831	8	0	0	0	0	16	77
2003	13,069	-	-	-	-	-	13,069	3,450	-	3,921	8	0	0	0	0	16	79
2004	13,370	-	-	-	-	-	13,370	3,519	-	4,011	8	0	0	0	0	17	82
2005	13,671	-	-	-	-	-	13,671	3,590	-	4,101	9	0	0	0	0	17	84
2006	13,971	-	-	-	-	-	13,971	3,662	-	4,191	9	0	0	0	0	18	87
2007	14,272	-	-	-	-	-	14,272	3,735	-	4,282	9	0	0	0	0	18	90
2008	14,571	-	-	-	-	-	14,571	3,809	-	4,371	9	0	0	0	0	19	92
2009	14,870	-	-	-	-	-	14,870	3,886	-	4,461	10	0	0	0	0	19	95
2010	15,168	-	-	-	-	-	15,168	3,963	-	4,550	10	0	0	0	0	20	99

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	135	90	0	0	225	23	-	33	-	13	294	2.26
1998	185	85	0	0	270	23	-	34	-	14	341	2.21
1999	237	79	0	0	317	24	-	35	-	14	389	2.17
2000	292	73	0	0	365	24	-	35	-	15	439	2.13
2001	329	70	0	0	399	25	-	36	-	15	475	2.11
2002	368	66	0	0	434	25	-	37	-	15	512	2.10
2003	408	63	0	0	470	26	-	38	-	16	550	2.08
2004	449	59	0	0	508	26	-	39	-	16	590	2.07
2005	492	55	0	0	547	27	-	40	-	17	630	2.06
2006	537	50	0	0	587	27	-	41	-	18	672	2.05
2007	582	46	0	0	628	28	-	42	-	18	716	2.04
2008	629	41	0	0	670	29	-	42	-	19	760	2.03
2009	678	36	0	0	714	29	-	43	-	19	805	2.02
2010	728	30	0	0	758	30	-	44	-	20	852	2.01

MERU WATER SUPPLY — *Baseline data for area to be fed from combined intake and treatment works*

Baseline Data		Baseline data														Total Base-line
Locations			Ntima	Ntima	Ntima	Ntima	Ntima	Ntima	Nyika	Nyika	Nyika	Nyika	Nyika	U.Abothoguchi		
Sub-Locations		Town	U.Igoki	Ntakira	L.Igoki	Nthimbiri	Mpuri	Nconyi	Mutathariki	Thuura	Chungu	Mumithu	Nkubune	Katheri	Githongo	Kithrune	
1989 Census figures											48					
1989 population											13499					13,499
Population distribution & growth (WRAP 1988 estimates)																
Rural areas	High										100%					100.0%
Land potential:	Med															0.0%
	Low															0.0%
Urban area	High															0.0%
housing class	Med															0.0%
	Low															0.0%
Livestock numbers:	Grade										333					333
	Indig										83					83
	Shoats										420					420
Total Livestock Units											389					389
Note: The following are assumed to increase in proportion with the population, within the limits specified:																
Industry	ha															23%
Institutions																-
Day pupils with WC											2772					2,772
Day pupils without WC																298
Boarding pupils											298					-
Admin office staff																-
Hlth Health Cntr/Disp'ry	Nr															-
Regional Hospitals	Beds															-
District Hospitals	Beds															-
Other Hospitals	Beds															-
Outpatients per day	Nr															-
Commercial	High Beds															-
Hotel	Med Beds															-
class:	Low Beds															-
	Bars															-
	Shops															-

Service Levels

28/06/97

Projection assumptions — Assume varying growth rates as follows:

	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	2.0%	2.0%	2.0%

Projection constraints

Pupil/pop ratio ...			30%
%of	with WC		0%
schools:	no WC...		90%
	Boarding		10%
% of	Regional		0%
Hospital	District ...		0%
Beds	Other.....		0%
% of	High.....		
Hotel	Medium..		
Beds:	Low ...		

			Service Levels: Percentage connection			Rate l/c/d	Peak Factor
			1997	2000	2010		
Domestic Demand							
ICs	Rural	High	20%	40%	80%	60	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
	Urban	High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs	Rural unconnected supplies					10	3
	Urban unconnected supplies					20	3
Livestock							1.5
	Total Livestock Un		15%	15%	15%	50	
Industry	ha			20%		20000	1.8
Institutions							2
	Day pupils with WC			100%		25	
	Day pupils without WC			100%		5	
	Boarding pupils			100%		50	
	Admin office staff			100%		25	
Hlth	Centre Nr			100%		5000	2
	Region Beds			100%		400	
	District Beds			100%		200	
	Other H Beds			100%		100	
	Outpati Nr			100%		20	
Commerc	High	Beds		100%		600	1.8
	Med	Beds		100%		300	
	Low	Beds		100%		50	
	Bars			100%		500	
	Shops			100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Ind-ustry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	17,100	-	-	-	-	-	17,100	464	-	5,130	-	0	0	0	0	0	0
1998	17,585	-	-	-	-	-	17,585	474	-	5,275	-	0	0	0	0	0	0
1999	18,054	-	-	-	-	-	18,054	483	-	5,416	-	0	0	0	0	0	0
2000	18,505	-	-	-	-	-	18,505	493	-	5,551	-	0	0	0	0	0	0
2001	18,958	-	-	-	-	-	18,958	503	-	5,687	-	0	0	0	0	0	0
2002	19,413	-	-	-	-	-	19,413	513	-	5,824	-	0	0	0	0	0	0
2003	19,869	-	-	-	-	-	19,869	523	-	5,961	-	0	0	0	0	0	0
2004	20,326	-	-	-	-	-	20,326	534	-	6,098	-	0	0	0	0	0	0
2005	20,784	-	-	-	-	-	20,784	544	-	6,235	-	0	0	0	0	0	0
2006	21,241	-	-	-	-	-	21,241	555	-	6,372	-	0	0	0	0	0	0
2007	21,698	-	-	-	-	-	21,698	566	-	6,509	-	0	0	0	0	0	0
2008	22,153	-	-	-	-	-	22,153	578	-	6,646	-	0	0	0	0	0	0
2009	22,608	-	-	-	-	-	22,608	589	-	6,782	-	0	0	0	0	0	0
2010	23,060	-	-	-	-	-	23,060	601	-	6,918	-	0	0	0	0	0	0

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	205	137	0	0	342	3	-	49	-	-	395	2.34
1998	281	129	0	0	410	4	-	51	-	-	465	2.27
1999	361	120	0	0	481	4	-	52	-	-	537	2.22
2000	444	111	0	0	555	4	-	54	-	-	612	2.18
2001	500	106	0	0	607	4	-	55	-	-	665	2.16
2002	559	101	0	0	660	4	-	56	-	-	720	2.14
2003	620	95	0	0	715	4	-	57	-	-	777	2.12
2004	683	89	0	0	772	4	-	59	-	-	835	2.10
2005	748	83	0	0	831	4	-	60	-	-	896	2.09
2006	816	76	0	0	892	4	-	61	-	-	958	2.08
2007	885	69	0	0	955	4	-	63	-	-	1,022	2.07
2008	957	62	0	0	1,019	4	-	64	-	-	1,087	2.06
2009	1,031	54	0	0	1,085	4	-	65	-	-	1,155	2.05
2010	1,107	46	0	0	1,153	5	-	67	-	-	1,224	2.04

MERU WATER SUPPLY — Baseline data for area to be fed from combined intake and treatment works

Baseline Data		Baseline data														Total Base-line
Locations			Ntima	Ntima	Ntima	Ntima	Ntima	Ntima	Nyika	Nyika	Nyika	Nyika	Nyika	U Abothuguchi		
Sub-Locations		Town	U Igoki	Ntakira	L Igoki	Nthimbiri	Mpuri	Ngonyi	Mulathankı	Thuura	Chungu	Munthu	Nkabune	Kathieri	Githongo	Kathrune	
												16				
1989 Census figures												8021				8,021
1989 population																
Population distribution & growth (WRAP 1988 estimates)												100%				100.0%
Rural areas	High															0.0%
Land potential:.....	Med															0.0%
	Low															0.0%
Urban area	High															0.0%
housing class.....	Med															0.0%
	Low															0.0%
Livestock numbers:	Grade											3547				3,547
	Indig											549				549
	Shoats											4566				4,566
Total Livestock Units.....												4034				4,034
Note: The following are assumed to increase in proportion with the population, within the limits specified																
Industry	ha											1				1
Institutions																33%
Day pupils with WC																-
Day pupils without WC												2650				2,650
Boarding pupils																-
Admin office staff												3				3
Hlth Health Cntr/Disp'ry	Nr											1				1
Regional Hospitals	Beds															-
District Hospitals	Beds															-
Other Hospitals	Beds															-
Outpatients per day	Nr											170				170
Commercial	High	Beds														-
Hotel	Med	Beds														-
class:	Low	Beds														-
	Bars											9				9
	Shops											40				40

Service Levels

Projection assumptions — Assume varying growth rates as follows

	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	2.0%	2.0%	2.0%

Projection constraints

Pupil/pop ratio...		30%
%of schools:	with WC..	0%
	no WC...	100%
	Boarding	0%
% of Hospital Beds	Regional..	0%
	District ..	0%
	Other.....	0%
% of Hotel Beds	High.....	
	Medium.	
	Low.....	

28/06/97

			Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs	Rural	High	20%	40%	80%	60	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
	Urban	High	100%	100%	100%	250	2
		Mec	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs	Rural unconnected supplies					10	3
	Urban unconnected supplies					20	3
Livestock							1.5
	Total Livestock Ur		15%	15%	15%	50	
Industry	ha			20%		20000	1.8
Institutions							2
	Day pupils with WC			100%		25	
	Day pupils without WC			100%		5	
	Boarding pupils			100%		50	
	Admin office staff			100%		25	
Hlth	Centre Nr			100%		5000	2
	Region Beds			100%		400	
	District Beds			100%		200	
	Other H Beds			100%		100	
	Outpati Nr			100%		20	
Commerc	High	Beds		100%		600	1.8
	Med	Beds		100%		300	
	Low	Beds		100%		50	
	Bars			100%		500	
	Shops			100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Industry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	10,161	-	-	-	-	-	10,161	4,621	1.3	3,048	4	1	0	225	0	12	53
1998	10,449	-	-	-	-	-	10,449	4,916	1.4	3,135	4	1	0	233	0	12	55
1999	10,727	-	-	-	-	-	10,727	5,016	1.4	3,218	4	1	0	241	0	13	57
2000	10,995	-	-	-	-	-	10,995	5,117	1.5	3,299	4	1	0	249	0	13	59
2001	11,265	-	-	-	-	-	11,265	5,219	1.5	3,379	5	2	0	257	0	14	61
2002	11,535	-	-	-	-	-	11,535	5,323	1.6	3,461	5	2	0	265	0	14	62
2003	11,806	-	-	-	-	-	11,806	5,430	1.6	3,542	5	2	0	274	0	15	64
2004	12,078	-	-	-	-	-	12,078	5,538	1.7	3,623	5	2	0	283	0	15	67
2005	12,350	-	-	-	-	-	12,350	5,649	1.7	3,705	5	2	0	292	0	15	69
2006	12,621	-	-	-	-	-	12,621	5,762	1.8	3,786	5	2	0	301	0	16	71
2007	12,893	-	-	-	-	-	12,893	5,877	1.8	3,868	5	2	0	311	0	16	73
2008	13,163	-	-	-	-	-	13,163	5,995	1.9	3,949	6	2	0	321	0	17	75
2009	13,433	-	-	-	-	-	13,433	6,115	1.9	4,030	6	2	0	331	0	18	78
2010	13,702	-	-	-	-	-	13,702	6,237	2.0	4,111	6	2	0	342	0	18	80

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-ercial m3/d	Total Avg m3/d	Overall Peak Factor
1997	122	81	0	0	203	36	5	29	7	11	292	2.21
1998	167	77	0	0	244	37	5	30	7	12	335	2.16
1999	215	72	0	0	286	38	6	31	7	12	380	2.13
2000	264	66	0	0	330	38	6	32	7	12	426	2.10
2001	297	63	0	0	360	39	6	33	8	13	459	2.09
2002	332	60	0	0	392	40	6	33	8	13	493	2.07
2003	368	57	0	0	425	41	6	34	8	14	528	2.06
2004	406	53	0	0	459	42	7	35	8	14	565	2.05
2005	445	49	0	0	494	42	7	36	9	15	602	2.04
2006	485	45	0	0	530	43	7	37	9	15	641	2.03
2007	526	41	0	0	567	44	7	37	9	16	681	2.02
2008	569	37	0	0	606	45	8	38	9	16	722	2.01
2009	613	32	0	0	645	46	8	39	10	17	764	2.01
2010	658	27	0	0	685	47	8	40	10	17	807	2.00

MERU WATER SUPPLY — Baseline data for area to be fed from combined intake and treatment works

Baseline Data

Locations / Sub-Locations		Baseline data: Town	Ntima U.Igoki	Ntima Ntakira	Ntima L.Igoki	Ntima Nthimbiri	Ntima Mpuri	Ntima Ngenya	Nyika Mulathenka	Nyika Thuura	Nyika Chungu	Nyika Murithu	Nyika Nkabune	U.Abothoguchi Katheri	U.Abothoguchi Githongo	U.Abothoguchi Kathrune	Total Base-line
1989 Census figures													6				
1989 population													3645				3,645
Population distribution & growth (WRAP 1988 estimates)																	
Rural areas	High												100%				100.0%
Land potential	Med																0.0%
	Low																0.0%
Urban area	High																0.0%
housing class:..... ..	Med																0.0%
	Low																0.0%
Livestock numbers:	Grade												932				932
	Indig												233				233
	Shoats												1175				1,175
Total Livestock Units.													1088				1,088
Note: The following are assumed to increase in proportion with the population, within the limits specified																	
Industry	ha																-
Institutions																	0%
Day pupils with WC																	-
Day pupils without WC													0				-
Boarding pupils																	-
Admin office staff																	-
Hlth Health Cntr/Disp'ry	Nr												1				1
Regional Hospitals	Beds																-
District Hospitals	Beds																-
Other Hospitals	Beds																-
Outpatients per day	Nr												13				13
Commercial High	Beds																-
Hotel Med	Beds																-
class: Low	Beds																-
Bars																	-
Shops																	-

Service Levels

Projection assumptions — Assume varying growth rates as follows:

	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	2.0%	2.0%	2.0%

Projection constraints

Pupil/pop ratio....		30%
%of schools:	with WC..	0%
	no WC....	0%
	Boarding	0%
% of Hospital Beds	Regional	0%
	District..	0%
	Other....	0%
% of Hotel Beds.	High.....	
	Medium ..	
	Low.....	

25/08/97

			Service Levels: Percentage connections 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs	Rural	High	20%	40%	80%	80	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
	Urban	High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs	Rural unconnected supplies					10	3
	Urban unconnected supplies					20	3
Livestock							1.5
	Total Livestock Uni		15%	15%	15%	50	
Industry	ha			20%		20000	1.8
Institutions							2
Day pupils with WC				100%		25	
Day pupils without WC				100%		5	
Boarding pupils				100%		50	
Admin office staff				100%		25	
Hlth Centre	Nr			100%		5000	2
Region.	Beds			100%		400	
District	Beds			100%		200	
Other H	Beds			100%		100	
Outpati	Nr			100%		20	
Commerc High	Beds			100%		600	1.8
Med	Beds			100%		300	
Low	Beds			100%		50	
Bars				100%		500	
Shops				100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Ind-ustry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	4,617	-	-	-	-	-	4,617	1,300	-	1,385	-	1	0	17	0	0	0
1998	4,748	-	-	-	-	-	4,748	1,326	-	1,424	-	1	0	18	0	0	0
1999	4,875	-	-	-	-	-	4,875	1,353	-	1,462	-	1	0	18	0	0	0
2000	4,997	-	-	-	-	-	4,997	1,380	-	1,499	-	1	0	19	0	0	0
2001	5,119	-	-	-	-	-	5,119	1,407	-	1,536	-	2	0	20	0	0	0
2002	5,242	-	-	-	-	-	5,242	1,436	-	1,573	-	2	0	20	0	0	0
2003	5,365	-	-	-	-	-	5,365	1,464	-	1,610	-	2	0	21	0	0	0
2004	5,489	-	-	-	-	-	5,489	1,494	-	1,647	-	2	0	22	0	0	0
2005	5,612	-	-	-	-	-	5,612	1,523	-	1,684	-	2	0	22	0	0	0
2006	5,736	-	-	-	-	-	5,736	1,554	-	1,721	-	2	0	23	0	0	0
2007	5,859	-	-	-	-	-	5,859	1,585	-	1,758	-	2	0	24	0	0	0
2008	5,982	-	-	-	-	-	5,982	1,617	-	1,795	-	2	0	25	0	0	0
2009	6,104	-	-	-	-	-	6,104	1,649	-	1,831	-	2	0	25	0	0	0
2010	6,227	-	-	-	-	-	6,227	1,682	-	1,868	-	2	0	26	0	0	0

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	55	37	0	0	92	10	-	13	7	-	122	2.26
1998	76	35	0	0	111	10	-	14	7	-	141	2.21
1999	97	32	0	0	130	10	-	14	7	-	161	2.17
2000	120	30	0	0	150	10	-	14	7	-	182	2.14
2001	135	29	0	0	164	11	-	15	8	-	197	2.12
2002	151	27	0	0	178	11	-	15	8	-	212	2.10
2003	167	26	0	0	193	11	-	16	8	-	228	2.09
2004	184	24	0	0	209	11	-	16	8	-	244	2.08
2005	202	22	0	0	224	11	-	16	9	-	261	2.06
2006	220	21	0	0	241	12	-	17	9	-	278	2.05
2007	239	19	0	0	258	12	-	17	9	-	296	2.04
2008	258	17	0	0	275	12	-	17	9	-	314	2.03
2009	278	15	0	0	293	12	-	18	10	-	333	2.03
2010	299	12	0	0	311	13	-	18	10	-	352	2.02

MERU WATER SUPPLY — *Baseline data for area to be fed from combined intake and treatment works*

Baseline Data

Locations / Sub-Locations		Baseline data: Town	Ntima U.Igoki	Ntima Ntakira	Ntima L.Igoki	Ntima Nthimbiri	Ntima Mpuri	Ntima Ngonyi	Nyika Mulathanki	Nyika Thuura	Nyika Chungu	Nyika Munithu	Nyika Nkabune	U.Abothoguchi Katheri	U.Abothoguchi Gitiongo	Kithirune	Total Baseline
1989 Census figures		5															0
1989 population																	
Population distribution & growth (WRAP 1988 estimates)																	
Rural areas	High																0.0%
Land potential:....	Med																0.0%
	Low																0.0%
Urban area	High																0.0%
housing class:...	Med																0.0%
	Low																0.0%
Livestock numbers:	Grade	1076															1,076
	Indig																-
	Shoats	703															703
Total Livestock Units.....		1123															1,123
Note: The following are assumed to increase in proportion with the population, within the limits specified:																	
Industry	ha	450															450
Institutions																	
Day pupils with WC																	-
Day pupils without WC		655															655
Boarding pupils																	-
Admin office staff		1000															1,000
Hlth Health Cntr/Disp'ry	Nr	2															2
Regional Hospitals	Beds	0															-
District Hospitals	Beds	311															311
Other Hospitals	Beds	57															57
Outpatients per day	Nr	1254															1,254
Commercial High	Beds	120															120
Hotel Med	Beds	100															100
class: Low	Beds	400															400
Bars		25															25
Shops		354															354

Service Levels

Projection assumptions — Assume varying growth rates as follows:

	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	2.0%	2.0%	2.0%

Projection constraints

Pupil/pop ratio....		30%
%of schools:	with WC.	0%
	no WC....	100%
	Boarding	0%
% of Hospital Beds	Regional.	0%
	District..	85%
	Other.....	15%
% of Hotel Beds	High.....	19%
	Medium..	16%
	Low.....	65%

28/05/97

			Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs	Rural	High	20%	40%	80%	60	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
	Urban	High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs	Rural unconnected supplies					10	3
	Urban unconnected supplies					20	3
Livestock							1.5
	Total Livestock Ur		15%	15%	15%	50	
Industry	ha			20%		20000	1.8
Institutions							2
	Day pupils with WC			100%		25	
	Day pupils without WC			100%		5	
	Boarding pupils			100%		50	
	Admin office staff			100%		25	
Hlth	Centre Nr			100%		5000	2
	Region Beds			100%		400	
	District Beds			100%		200	
	Other F Beds			100%		100	
	Outpati Nr			100%		20	
Commerc	High	Beds		100%		600	1.8
	Med	Beds		100%		300	
	Low	Beds		100%		50	
	Bars			100%		500	
	Shops			100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Industry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	-	-	-	-	-	-	-	1,342	596.6	-	1,326	3	488	1663	822	33	469
1998	-	-	-	-	-	-	-	1,369	616.9	-	1,371	3	505	1719	850	34	485
1999	-	-	-	-	-	-	-	1,396	638.0	-	1,418	3	522	1778	879	35	502
2000	-	-	-	-	-	-	-	1,424	659.7	-	1,466	3	539	1838	908.9	37	519
2001	-	-	-	-	-	-	-	1,453	680.9	-	1,513	3	557	1897	938.1	38	536
2002	-	-	-	-	-	-	-	1,482	702.7	-	1,562	3	575	1958	968.2	39	553
2003	-	-	-	-	-	-	-	1,511	725.2	-	1,612	3	593	2021	999.2	40	571
2004	-	-	-	-	-	-	-	1,541	748.5	-	1,663	3	612	2086	1031	42	589
2005	-	-	-	-	-	-	-	1,572	772.6	-	1,717	3	632	2153	1064	43	608
2006	-	-	-	-	-	-	-	1,604	797.3	-	1,772	4	652	2222	1098	44	627
2007	-	-	-	-	-	-	-	1,636	822.9	-	1,829	4	673	2293	1134	46	647
2008	-	-	-	-	-	-	-	1,669	849.3	-	1,887	4	695	2367	1170	47	668
2009	-	-	-	-	-	-	-	1,702	876.5	-	1,948	4	717	2443	1208	49	690
2010	-	-	-	-	-	-	-	1,736	904.6	-	2,010	4	740	2521	1248	50	712

Water Demand Projections

Year	Rural Demand ICs m3/d	Rural Demand Kiosks m3/d	Urban demand ICs m3/d	Urban demand Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	-	0	0	0	-	10	2,366	33	103	225	2,758	1.81
1998	-	0	0	0	-	10	2,466	34	107	233	2,852	1.81
1999	-	0	0	0	-	10	2,552	35	110	241	2,949	1.81
2000	-	0	0	0	-	11	2,639	37	114	249	3,049	1.81
2001	-	0	0	0	-	11	2,723	38	118	257	3,147	1.81
2002	-	0	0	0	-	11	2,811	39	122	265	3,248	1.81
2003	-	0	0	0	-	11	2,901	40	126	274	3,352	1.81
2004	-	0	0	0	-	12	2,994	42	130	283	3,459	1.81
2005	-	0	0	0	-	12	3,090	43	134	292	3,570	1.81
2006	-	0	0	0	-	12	3,189	44	138	301	3,685	1.81
2007	-	0	0	0	-	12	3,291	46	142	311	3,803	1.81
2008	-	0	0	0	-	13	3,397	47	147	321	3,924	1.81
2009	-	0	0	0	-	13	3,506	49	152	331	4,050	1.81
2010	-	0	0	0	-	13	3,618	50	157	342	4,180	1.81

MERU WATER SUPPLY — Baseline data for area to be fed from combined intake and treatment works

Baseline Data

Locations / Sub-Locations		Baseline data: Town	Ntima U.Igoki	Ntima Ntakira	Ntima L.Igoki	Ntima Nthimoin	Ntima Mpuri	Ntima Ngonyi	Nyika Mulathanka	Nyika Thuura	Nyika Chungu	Nyika Muruthu	Nyika Nkabune	U.Abothuguchi Kathera	U.Abothuguchi Githongo	Kithirune	Total Base-line
1989 Census figures														28			
1989 population														14172			14,172
Population distribution & growth (WRAP 1988 estimates)																	
Rural areas	High													100%			100.0%
Land potential:	Med																0.0%
	Low																0.0%
Urban area	High																0.0%
housing class:...	Med																0.0%
	Low																0.0%
Livestock numbers:	Grade													5000			5,000
	Indig																-
	Shoats													325			325
Total Livestock Units.....														5022			5,022
Note: The following are assumed to increase in proportion with the population, within the limits specified.																	-
Industry	ha																29%
Institutions																	-
Day pupils with WC														3318			3,318
Day pupils without WC														723			723
Boarding pupils																	-
Admin office staff																	-
Hlth Health Cntr/Disp'ry	Nr																-
Regional Hospitals	Beds																-
District Hospitals	Beds																-
Other Hospitals	Beds																-
Outpatients per day	Nr																-
Commercial	High Beds																-
Hotel	Med Beds																-
class:	Low Beds																-
	Bars													15			15
	Shops													52			52

Service Levels

28/06/97

Projection assumptions — Assume varying growth rates as follows:

		1997	2000	2010
Industry	ha		20%	
Institutions				
Pupil/pop ratio...				30%
%of schools:	with WC			0%
	no WC...			82%
	Boarding			18%
Hlth	Centre Nr			
	Region Beds			
	District Beds			
	Other H Beds			
	Outpati Nr			
Commerc	High Beds			
	Med Beds			
	Low Beds			
	Bars			
	Shops			
Livestock	Total Livestock Un	2.0%	2.0%	2.0%

Projection constraints

% of Hospital Beds	Regional		0%
	District...		0%
	Other...		0%
% of Hotel Beds:	High.....		
	Medium..		
	Low.....		

		Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand						
ICs	Rural High	20%	40%	80%	60	2
	Med	10%	20%	40%	50	
	Low	5%	10%	20%	40	
	Urban High	100%	100%	100%	250	2
	Med	100%	100%	100%	150	
	Low	10%	30%	50%	75	
WKs	Rural unconnected supplies				10	3
	Urban unconnected supplies				20	3
Livestock						1.5
	Total Livestock Un	15%	15%	15%	50	
Industry	ha		20%		20000	1.8
Institutions						2
	Day pupils with WC		100%		25	
	Day pupils without WC		100%		5	
	Boarding pupils		100%		50	
	Admin office staff		100%		25	
Hlth	Centre Nr		100%		5000	2
	Region Beds		100%		400	
	District Beds		100%		200	
	Other H Beds		100%		100	
	Outpati Nr		100%		20	
Commerc	High Beds		100%		600	1.8
	Med Beds		100%		300	
	Low Beds		100%		50	
	Bars		100%		500	
	Shops		100%		100	

Annual projections

Year	Rural Population: Land potential: High	Medium	Low	Urban Population: Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Industry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels: Total beds	Bars	Shops
1997	17,953	-	-	-	-	-	17,953	6,001	-	5,386	-	0	0	0	0	20	69
1998	18,461	-	-	-	-	-	18,461	6,121	-	5,538	-	0	0	0	0	21	71
1999	18,954	-	-	-	-	-	18,954	6,244	-	5,686	-	0	0	0	0	21	74
2000	19,427	-	-	-	-	-	19,427	6,369	-	5,828	-	0	0	0	0	22	76
2001	19,903	-	-	-	-	-	19,903	6,496	-	5,971	-	0	0	0	0	23	79
2002	20,381	-	-	-	-	-	20,381	6,626	-	6,114	-	0	0	0	0	23	81
2003	20,860	-	-	-	-	-	20,860	6,759	-	6,258	-	0	0	0	0	24	84
2004	21,340	-	-	-	-	-	21,340	6,894	-	6,402	-	0	0	0	0	25	86
2005	21,820	-	-	-	-	-	21,820	7,032	-	6,546	-	0	0	0	0	28	89
2006	22,300	-	-	-	-	-	22,300	7,172	-	6,690	-	0	0	0	0	27	92
2007	22,779	-	-	-	-	-	22,779	7,316	-	6,834	-	0	0	0	0	27	95
2008	23,258	-	-	-	-	-	23,258	7,462	-	6,977	-	0	0	0	0	28	98
2009	23,735	-	-	-	-	-	23,735	7,611	-	7,120	-	0	0	0	0	29	101
2010	24,209	-	-	-	-	-	24,209	7,763	-	7,263	-	0	0	0	0	30	105

Water Demand Projections

Year	Rural Demand: ICs m3/d	Kiosks m3/d	Urban demand: ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	215	144	0	0	359	45	-	52	-	17	473	2.25
1998	295	135	0	0	431	46	-	53	-	17	547	2.20
1999	379	126	0	0	505	47	-	55	-	18	625	2.16
2000	466	117	0	0	583	48	-	58	-	19	705	2.13
2001	525	111	0	0	637	49	-	58	-	19	762	2.11
2002	587	106	0	0	693	50	-	59	-	20	821	2.09
2003	651	100	0	0	751	51	-	60	-	20	882	2.08
2004	717	94	0	0	811	52	-	62	-	21	945	2.07
2005	786	87	0	0	873	53	-	63	-	22	1,010	2.06
2006	856	80	0	0	937	54	-	64	-	23	1,077	2.05
2007	929	73	0	0	1,002	55	-	66	-	23	1,146	2.04
2008	1,005	65	0	0	1,070	56	-	67	-	24	1,217	2.03
2009	1,082	57	0	0	1,139	57	-	69	-	25	1,290	2.02
2010	1,162	48	0	0	1,210	58	-	70	-	26	1,364	2.01

MERU WATER SUPPLY — Baseline data for area to be fed from combined intake and treatment works

Baseline Data		Baseline data: Town	Ntima U.Igoki	Ntima Ntakira	Ntima L.Igoki	Ntima Nthimbiri	Ntima Mpuri	Ntima Ngonyi	Nyika Mutathanki	Nyika Thaura	Nyika Chuniqu	Nyika Murithu	Nyika Nkabune	U.Abothuguchi Kathen	Githongo	Kithirune	Total Baseline
	Locations																
	Sub-Locations																
																15	
1989 Census figures															7094		7,094
1989 population																	
Population distribution & growth (WRAP 1988 estimates)															100%		100.0%
Rural areas	High																0.0%
Land potential:	Med																0.0%
	Low																0.0%
Urban area	High																0.0%
housing class	Med																0.0%
	Low																0.0%
Livestock numbers:	Grade														1440		1,440
	Indig														360		360
	Shoats														504		504
Total Livestock Units															1594		1,594
Note: The following are assumed to increase in proportion with the population, within the limits specified.																	-
Industry	ha																38%
Institutions																	-
Day pupils with WC															1460		1,460
Day pupils without WC															1247		1,247
Boarding pupils															5		5
Admin office staff															2		2
Hlth Health Cntr/Disp'ry	Nr																-
Regional Hospitals	Beds																-
District Hospitals	Beds																-
Other Hospitals	Beds														270		270
Outpatients per day	Nr																-
Commercial	High Beds																-
Hotel	Med Beds																-
class:	Low Beds																-
	Bars														20		20
	Shops														58		58

Service Levels

Projection assumptions
Assume varying growth rates as follows:

	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	2.0%	2.0%	2.0%

Projection constraints

Pupil/pop ratio...		30%
%of schools:	with WC	0%
	no WC...	54%
	Boarding	46%
% of Hospital Beds	Regional..	0%
	District..	0%
	Other.....	0%
% of Hotel Beds	High.....	
	Medium..	
	Low ...	

28/06/97

			Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs Rural	High		20%	40%	80%	60	2
	Med		10%	20%	40%	50	
	Low		5%	10%	20%	40	
Urban	High		100%	100%	100%	250	2
	Med		100%	100%	100%	150	
	Low		10%	30%	50%	75	
WKs Rural unconnected supplies						10	3
Urban unconnected supplies						20	3
Livestock							1.5
Total Livestock Un			15%	15%	15%	50	
Industry	ha			20%		20000	1.8
Institutions							2
Day pupils with WC				100%		25	
Day pupils without WC				100%		5	
Boarding pupils				100%		50	
Admin office staff				100%		25	
Hlth Centre Nr				100%		5000	2
Region Beds				100%		400	
District Beds				100%		200	
Other H Beds				100%		100	
Outpati Nr				100%		20	
Commerc High	Beds			100%		600	1.8
Med	Beds			100%		300	
Low	Beds			100%		50	
Bars				100%		500	
Shops				100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Industry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	8,986	-	-	-	-	-	8,986	1,904	-	2,696	7	3	0	358	0	27	77
1998	9,241	-	-	-	-	-	9,241	1,943	-	2,772	7	3	0	370	0	27	80
1999	9,488	-	-	-	-	-	9,488	1,981	-	2,846	7	3	0	383	0	28	82
2000	9,725	-	-	-	-	-	9,725	2,021	-	2,917	7	3	0	396	0	29	85
2001	9,963	-	-	-	-	-	9,963	2,061	-	2,989	8	3	0	409	0	30	88
2002	10,202	-	-	-	-	-	10,202	2,103	-	3,061	8	3	0	422	0	31	91
2003	10,442	-	-	-	-	-	10,442	2,145	-	3,133	8	3	0	435	0	32	93
2004	10,682	-	-	-	-	-	10,682	2,188	-	3,205	8	3	0	449	0	33	96
2005	10,922	-	-	-	-	-	10,922	2,231	-	3,277	9	3	0	464	0	34	100
2006	11,163	-	-	-	-	-	11,163	2,276	-	3,349	9	4	0	478	0	35	103
2007	11,403	-	-	-	-	-	11,403	2,322	-	3,421	9	4	0	494	0	37	106
2008	11,642	-	-	-	-	-	11,642	2,368	-	3,493	9	4	0	510	0	38	109
2009	11,881	-	-	-	-	-	11,881	2,415	-	3,564	10	4	0	526	0	39	113
2010	12,118	-	-	-	-	-	12,118	2,464	-	3,636	10	4	0	543	0	40	117

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-ercial m3/d	Total Avg m3/d	Overall Peak Factor
1997	108	72	0	0	180	14	-	26	13	21	254	2.24
1998	148	68	0	0	216	15	-	27	14	22	292	2.19
1999	190	63	0	0	253	15	-	28	14	22	332	2.15
2000	233	58	0	0	292	15	-	28	15	23	373	2.12
2001	263	56	0	0	319	15	-	29	15	24	402	2.11
2002	294	53	0	0	347	16	-	30	16	25	433	2.09
2003	326	50	0	0	376	16	-	30	16	25	464	2.08
2004	359	47	0	0	406	16	-	31	17	26	496	2.07
2005	393	44	0	0	437	17	-	32	17	27	530	2.06
2006	429	40	0	0	469	17	-	33	18	28	564	2.05
2007	465	36	0	0	502	17	-	33	18	29	600	2.04
2008	503	33	0	0	536	18	-	34	19	30	636	2.03
2009	542	29	0	0	570	18	-	35	19	31	673	2.02
2010	582	24	0	0	606	18	-	35	20	32	712	2.01

MERU WATER SUPPLY — *Baseline data for area to be fed from combined intake and treatment works*

Baseline Data		Baseline data														Total Base-line	Service Levels
Locations			Ntima	Ntima	Ntima	Ntima	Ntima	Ntima	Nyika	Nyika	Nyika	Nyika	Nyika	U.Abothoguchi			
Sub-Locations		Town	U.Igoki	Ntakira	L.Igoki	Nthimbiri	Mpuri	Ngonyi	Mulathanka	Thuura	Chungu	Mumthu	Nkabune	Kathieri	Githongo	Kithrune	
																18	
1989 Census figures																8698	8,698
1989 population																	
Population distribution & growth (WRAP 1988 estimates)																100%	100.0%
Rural areas	High																0.0%
Land potential:.	Med																0.0%
	Low																0.0%
Urban area	High																0.0%
housing class:.....	Med																0.0%
	Low																0.0%
Livestock numbers:	Grade															3500	3,500
	Indig																-
	Shoats															562	562
Total Livestock Units																3537	3,537
Note: The following are assumed to increase in proportion with the population, within the limits specified																	
Industry	ha																-
Institutions																	32%
Day pupils with WC																	-
Day pupils without WC																2421	2,421
Boarding pupils																329	329
Admin office staff																3	3
Hlth Health Cntr/Disp'ry	Nr																-
Regional Hospitals	Beds																-
District Hospitals	Beds																-
Other Hospitals	Beds																-
Outpatients per day	Nr																-
Commercial High	Beds																-
Hotel Med	Beds																-
class: Low	Beds																-
Bars																9	9
Shops																68	68

Service Levels

Projection assumptions — Assume varying growth rates as follows:

	1997	2000	2010
	3.0%	2.5%	2.0%
	2.5%	2.0%	1.0%
	2.0%	2.0%	1.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	5.0%	5.0%	5.0%
	2.0%	2.0%	2.0%

Projection constraints

Pupil/pop ratio...			30%
%of	with WC.		0%
schools:	no WC....		88%
	Boarding.		12%
% of	Regional.		0%
Hospital	District....		0%
Beds	Other.....		0%
% of	High... ...		
Hotel	Medium..		
Beds:	Low.....		

28/06/97

			Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs	Rural	High	20%	40%	80%	60	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
	Urban	High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs	Rural unconnected supplies					10	3
	Urban unconnected supplies					20	3
Livestock							1.5
	Total Livestock Un		15%	15%	15%	50	
Industry	ha			20%		20000	1.8
Institutions							2
	Day pupils with WC			100%		25	
	Day pupils without WC			100%		5	
	Boarding pupils			100%		50	
	Admin office staff			100%		25	
Hlth	Centre Nr			100%		5000	2
	Region Beds			100%		400	
	District Beds			100%		200	
	Other H Beds			100%		100	
	Outpati Nr			100%		20	
Commerc	High	Beds		100%		600	1.8
	Med	Beds		100%		300	
	Low	Beds		100%		50	
	Bars			100%		500	
	Shops			100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Ind-ustry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	11,018	-	-	-	-	-	11,018	4,228	-	3,306	4	0	0	0	0	12	90
1998	11,331	-	-	-	-	-	11,331	4,312	-	3,399	4	0	0	0	0	12	93
1999	11,633	-	-	-	-	-	11,633	4,398	-	3,490	4	0	0	0	0	13	96
2000	11,924	-	-	-	-	-	11,924	4,486	-	3,577	4	0	0	0	0	13	100
2001	12,216	-	-	-	-	-	12,216	4,576	-	3,665	5	0	0	0	0	14	103
2002	12,509	-	-	-	-	-	12,509	4,668	-	3,753	5	0	0	0	0	14	106
2003	12,803	-	-	-	-	-	12,803	4,761	-	3,841	5	0	0	0	0	15	110
2004	13,097	-	-	-	-	-	13,097	4,856	-	3,929	5	0	0	0	0	15	113
2005	13,392	-	-	-	-	-	13,392	4,953	-	4,018	5	0	0	0	0	15	117
2006	13,687	-	-	-	-	-	13,687	5,052	-	4,106	5	0	0	0	0	16	120
2007	13,981	-	-	-	-	-	13,981	5,153	-	4,194	5	0	0	0	0	16	124
2008	14,274	-	-	-	-	-	14,274	5,256	-	4,282	6	0	0	0	0	17	128
2009	14,567	-	-	-	-	-	14,567	5,362	-	4,370	6	0	0	0	0	18	132
2010	14,858	-	-	-	-	-	14,858	5,469	-	4,458	6	0	0	0	0	18	137

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	132	88	0	0	220	32	-	32	-	15	299	2.23
1998	181	83	0	0	264	32	-	33	-	15	345	2.18
1999	233	78	0	0	310	33	-	34	-	16	393	2.15
2000	286	72	0	0	358	34	-	35	-	17	443	2.12
2001	322	68	0	0	391	34	-	35	-	17	478	2.10
2002	360	65	0	0	425	35	-	36	-	18	514	2.09
2003	399	61	0	0	461	36	-	37	-	18	552	2.07
2004	440	58	0	0	498	36	-	38	-	19	591	2.06
2005	482	54	0	0	536	37	-	39	-	19	631	2.05
2006	526	49	0	0	575	38	-	40	-	20	672	2.04
2007	570	45	0	0	615	39	-	41	-	21	715	2.03
2008	617	40	0	0	657	39	-	41	-	21	759	2.02
2009	664	35	0	0	699	40	-	42	-	22	804	2.01
2010	713	30	0	0	743	41	-	43	-	23	850	2.01

MERU WATER SUPPLY — Baseline data for area to be fed from combined intake and treatment works

Baseline Data			Baseline data			Total Base-line	Projection assumptions: Assume varying growth rates as follows:	1997	2000	2010
Locations			Ntima							
Sub-Locations			U.Igoki							
1989 Census figures			56							
1989 population			26913			26,913				
Population distribution & growth (WRAP 1988 estimates)										
Rural areas		High	0%			0.0%		3.0%	2.5%	2.0%
Land potential:.....		Med	0%			0.0%		2.5%	2.0%	1.0%
		Low	0%			0.0%		2.0%	2.0%	1.0%
Urban area		High	10%			10.0%		5.0%	5.0%	5.0%
housing class:...		Med	30%			30.0%		5.0%	5.0%	5.0%
		Low	60%			60.0%		5.0%	5.0%	5.0%
Livestock numbers:		Grade	716			716				
		Indig				-				
		Shoats	704			704				
Total Livestock Units.....			763			763		2.0%	2.0%	2.0%
Note: The following are assumed to increase in proportion with the population, within the limits specified.						-	**Projection constraints**			
Industry		ha				-				
Institutions						15%	Pupil/pop ratio...			30%
Day pupils with WC						-	%of	with WC		0%
Day pupils without WC			3908			3,908	schools:	no WC....		98%
Boarding pupils			61			61		Boarding		2%
Admin office staff			0			-				
Hlth Health Cntr/Disp'ry		Nr	2			2				
Regional Hospitals		Beds	0			-	% of	Regional		0%
District Hospitals		Beds	0			-	Hospital	District...		0%
Other Hospitals		Beds	0			-	Beds	Other.....		0%
Outpatients per day		Nr	121			121				
Commercial	High	Beds	0			-	% of	High.....		
Hotel	Med	Beds	0			-	Hotel	Medium...		
class:	Low	Beds	0			-	Beds:	Low.....		
	Bars		0			-				
	Shops		0			-				

Service Levels

02/07/97

			Service Levels: Percentage connection 1997	2000	2010	Rate l/c/d	Peak Factor
Domestic Demand							
ICs	Rural	High	20%	40%	80%	60	2
		Med	10%	20%	40%	50	
		Low	5%	10%	20%	40	
	Urban	High	100%	100%	100%	250	2
		Med	100%	100%	100%	150	
		Low	10%	30%	50%	75	
WKs	Rural unconnected supplies					10	3
	Urban unconnected supplies					20	3
Livestock							1.5
	Total Livestock Ur		15%	15%	15%	50	
Industry	ha			20%		20000	1.8
Institutions							2
Day pupils with WC				100%		25	
Day pupils without WC				100%		5	
Boarding pupils				100%		50	
Admin office staff				100%		25	
Hlth	Centre	Nr		100%		5000	2
	Region	Beds		100%		400	
	District	Beds		100%		200	
	Other H	Beds		100%		100	
	Outpati	Nr		100%		20	
Commerc	High	Beds		100%		600	1.8
	Med	Beds		100%		300	
	Low	Beds		100%		50	
	Bars			100%		500	
	Shops			100%		100	

Annual projections

Year	Rural Population Land potential: High	Medium	Low	Urban Population Housing classification: High	Medium	Low	Total Population	Livestock Pop'n LU	Industry ha	Pupil Pop'n	Admin staff	Health Facilities: Cntrs	Hosp' Beds	Out-patients	Hotels Total beds	Bars	Shops
1997	-	-	-	3,976	11,929	23,856	39,763	912	-	11,929	-	3	0	160	0	0	0
1998	-	-	-	4,175	12,525	25,051	41,751	930	-	12,525	-	3	0	166	0	0	0
1999	-	-	-	4,384	13,152	26,303	43,838	949	-	13,152	-	3	0	172	0	0	0
2000	-	-	-	4,603	13,809	27,618	46,030	968	-	13,809	-	3	0	177	0	0	0
2001	-	-	-	4,833	14,500	28,999	48,332	987	-	14,500	-	3	0	183	0	0	0
2002	-	-	-	5,075	15,225	30,449	50,749	1,007	-	15,225	-	3	0	189	0	0	0
2003	-	-	-	5,329	15,986	31,972	53,286	1,027	-	15,963	-	3	0	195	0	0	0
2004	-	-	-	5,595	16,785	33,570	55,950	1,047	-	16,785	-	3	0	201	0	0	0
2005	-	-	-	5,875	17,624	35,249	58,748	1,066	-	17,624	-	3	0	208	0	0	0
2006	-	-	-	6,169	18,506	37,011	61,685	1,090	-	18,506	-	4	0	214	0	0	0
2007	-	-	-	6,477	19,431	38,862	64,769	1,111	-	19,431	-	4	0	221	0	0	0
2008	-	-	-	6,801	20,402	40,805	68,008	1,134	-	20,402	-	4	0	228	0	0	0
2009	-	-	-	7,141	21,422	42,845	71,408	1,156	-	21,422	-	4	0	236	0	0	0
2010	-	-	-	7,498	22,494	44,987	74,979	1,179	-	22,494	-	4	0	243	0	0	0

Water Demand Projections

Year	Rural Demand ICs m3/d	Kiosks m3/d	Urban demand ICs m3/d	Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d	Overall Peak Factor
1997	-	0	2962	429	3,392	7	-	115	13	-	3,527	2.12
1998	-	0	3236	416	3,653	7	-	121	14	-	3,795	2.11
1999	-	0	3529	403	3,932	7	-	127	14	-	4,080	2.10
2000	-	0	3844	387	4,230	7	-	133	15	-	4,385	2.09
2001	-	0	4079	394	4,474	7	-	140	15	-	4,636	2.08
2002	-	0	4329	402	4,731	8	-	147	16	-	4,901	2.08
2003	-	0	4593	409	5,002	8	-	154	16	-	5,180	2.08
2004	-	0	4873	416	5,290	8	-	162	17	-	5,478	2.08
2005	-	0	5170	423	5,593	8	-	170	17	-	5,788	2.07
2006	-	0	5484	429	5,913	8	-	178	18	-	6,117	2.07
2007	-	0	5816	435	6,252	8	-	187	18	-	6,465	2.07
2008	-	0	6168	441	6,609	9	-	197	19	-	6,833	2.06
2009	-	0	6541	446	6,987	9	-	207	19	-	7,221	2.06
2010	-	0	6936	450	7,385	9	-	217	20	-	7,631	2.06

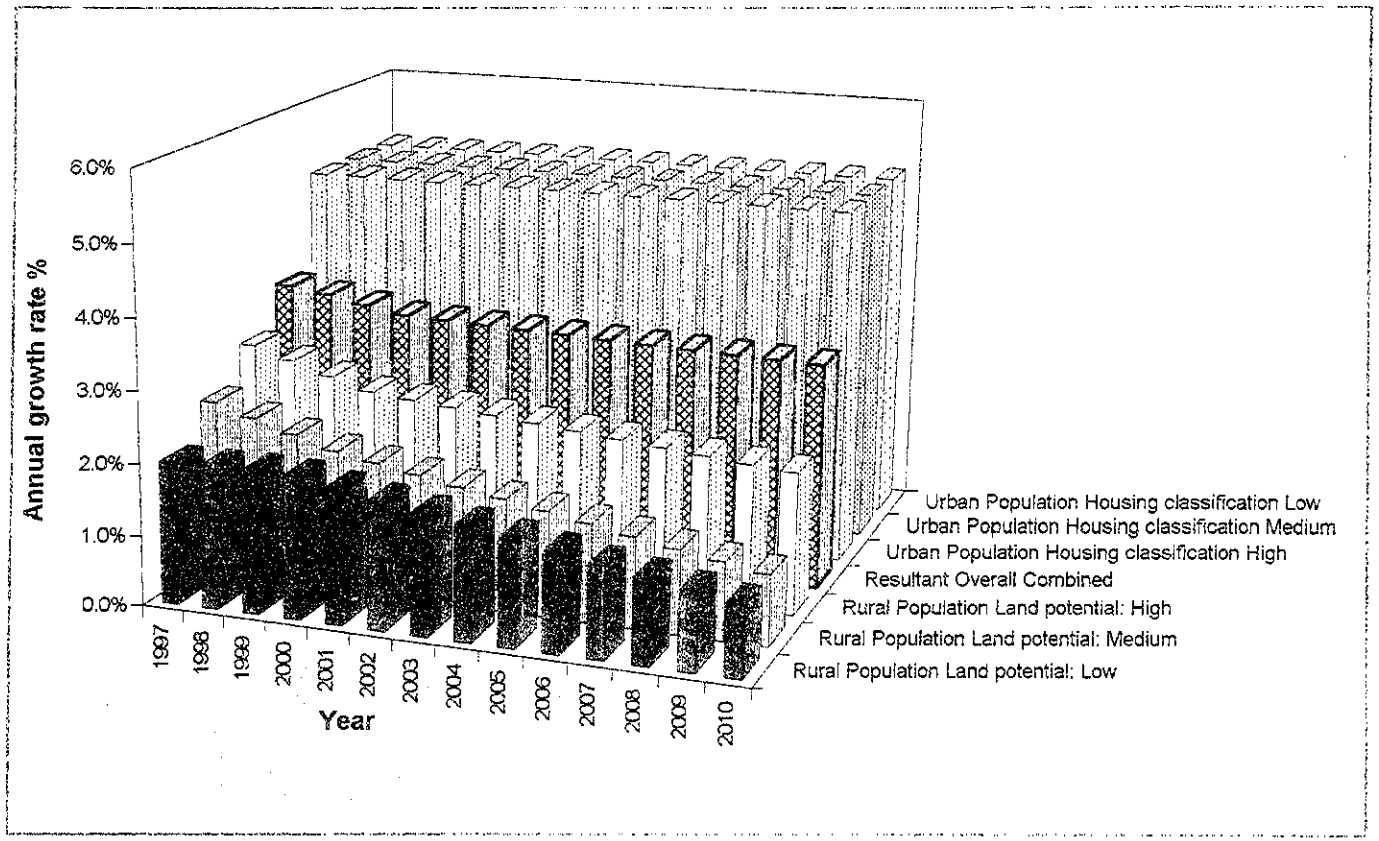
Water Demand Projection for..... Meru *For design Horizon of 2005*

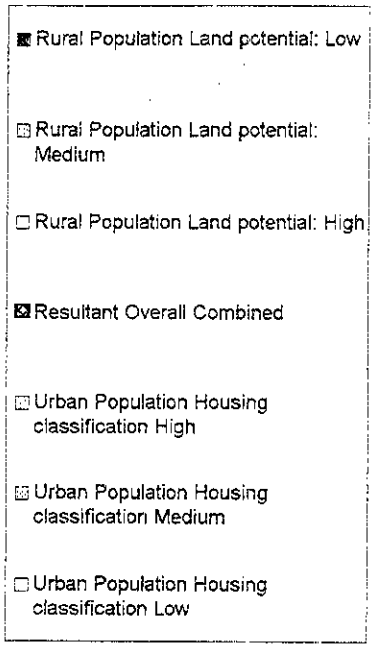
Sub Location	Rural ICs m3/d	Rural Kiosks m3/d	Urban ICs m3/d	Urban Kiosks m3/d	Total Domestic m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d
Town	-	-	-	-	-	12	3,090	43	134	292	3,570
Ntima											
U.Igoki	-	-	5,170	423	5,593	8	-	170	17	-	5,788
Ntakira	402	45	405	35	886	16	-	46	-	-	947
L.Igoki	211	23	183	15	432	10	-	23	-	18	483
Nthimbiri	295	33	-	-	328	17	-	24	-	-	368
Mpuri	249	28	-	-	277	10	-	20	-	-	306
Ngonyi	290	32	-	-	322	7	-	23	-	-	352
Total Ntima	1,447	161	5,757	472	7,837	67	-	306	17	18	8,245
Nyaki											
Mulathanka	-	-	971	79	1,050	7	-	32	-	5	1,094
Thuura	492	55	-	-	547	27	-	40	-	17	630
Chungu	748	83	-	-	831	4	-	60	-	-	896
Munthu	445	49	-	-	494	42	7	36	9	15	602
Nkabune	202	22	-	-	224	11	-	16	9	-	261
Total Muthambi	1,887	210	971	79	3,147	92	7	184	17	36	3,483
Upper Abothoguchi											
Katheri	786	87	-	-	873	53	-	63	-	22	1,010
Githongo	393	44	-	-	437	17	-	32	17	27	530
Kithrune	482	54	-	-	536	37	-	39	-	19	631
Total Mwonge	1,661	185	-	-	1,845	107	-	134	17	68	2,171
Total Scheme	4,994	555	6,728	552	12,830	277	3,097	667	185	414	17,470

Water Demand Projection for..... Meru *For design Horizon of 2010*

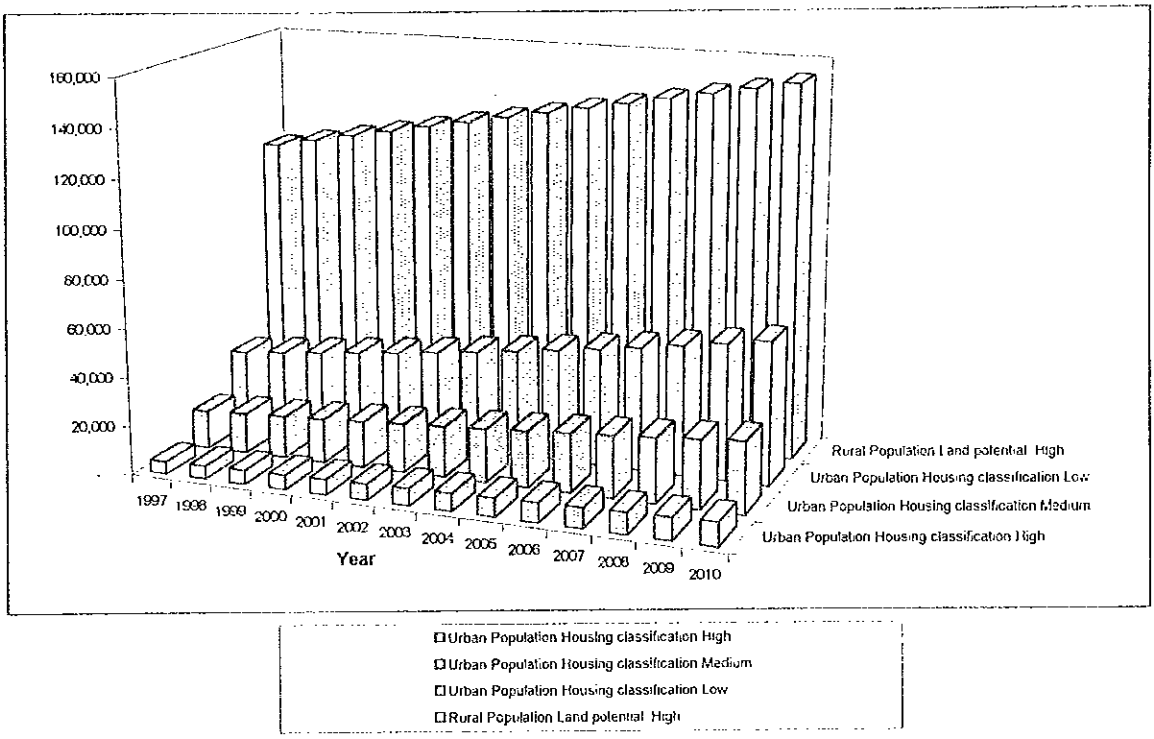
Sub Location	Rural ICs m3/d	Rural Kiosks m3/d	Urban ICs m3/d	Urban Kiosks m3/d	Total m3/d	Live-stock m3/d	Indu-stry m3/d	Instit-utional m3/d	Health m3/d	Comm-cial m3/d	Total Avg m3/d
Town	-	-	-	-	-	13	3,618	50	157	342	4,180
Ntima											
U.Igoki	-	-	6,936	450	7,385	9	-	217	20	-	7,631
Ntakira	594	25	544	37	1,200	17	-	53	-	-	1,271
L.Igoki	312	13	245	16	586	11	-	26	-	21	645
Nthimbiri	437	18	-	-	455	19	-	26	-	-	500
Mpuri	368	15	-	-	384	11	-	22	-	-	417
Ngonyi	429	18	-	-	446	8	-	26	-	-	480
Total Ntima	2,140	89	7,725	502	10,457	74	-	371	20	21	10,943
Nyaki											
Mulathanka	-	-	1,302	84	1,387	8	-	41	-	5	1,442
Thuura	728	30	-	-	758	30	-	44	-	20	852
Chungu	1,107	46	-	-	1,153	5	-	67	-	-	1,224
Munthu	658	27	-	-	685	47	8	40	10	17	807
Nkabune	299	12	-	-	311	13	-	18	10	-	352
Total Muthambi	2,791	116	1,302	84	4,295	102	8	210	20	42	4,677
Upper Abothoguchi											
Katheri	1,162	48	-	-	1,210	58	-	70	-	26	1,364
Githongo	582	24	-	-	606	18	-	35	20	32	712
Kithrune	713	30	-	-	743	41	-	43	-	23	850
Total Mwonge	2,457	102	-	-	2,559	118	-	148	20	80	2,926
Total Scheme	7,388	308	9,027	587	17,311	306	3,627	779	217	485	22,725

Population Growth Rate Variation with time

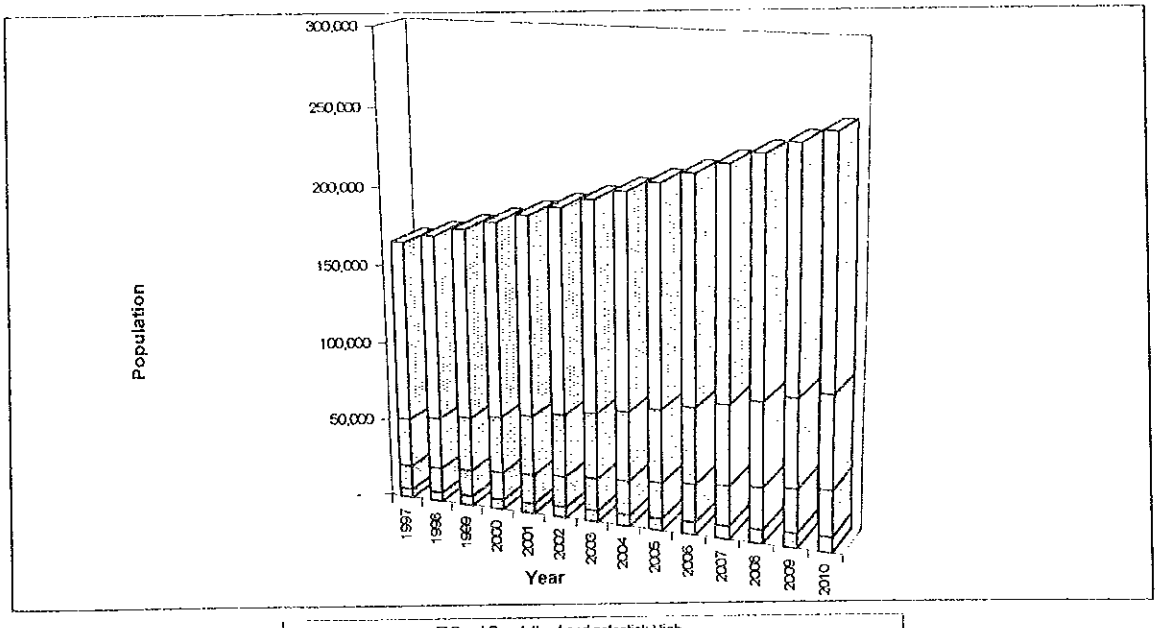


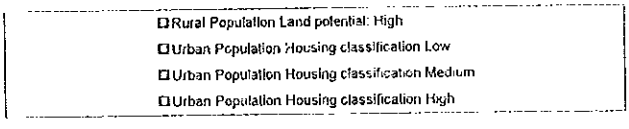


Population Projections

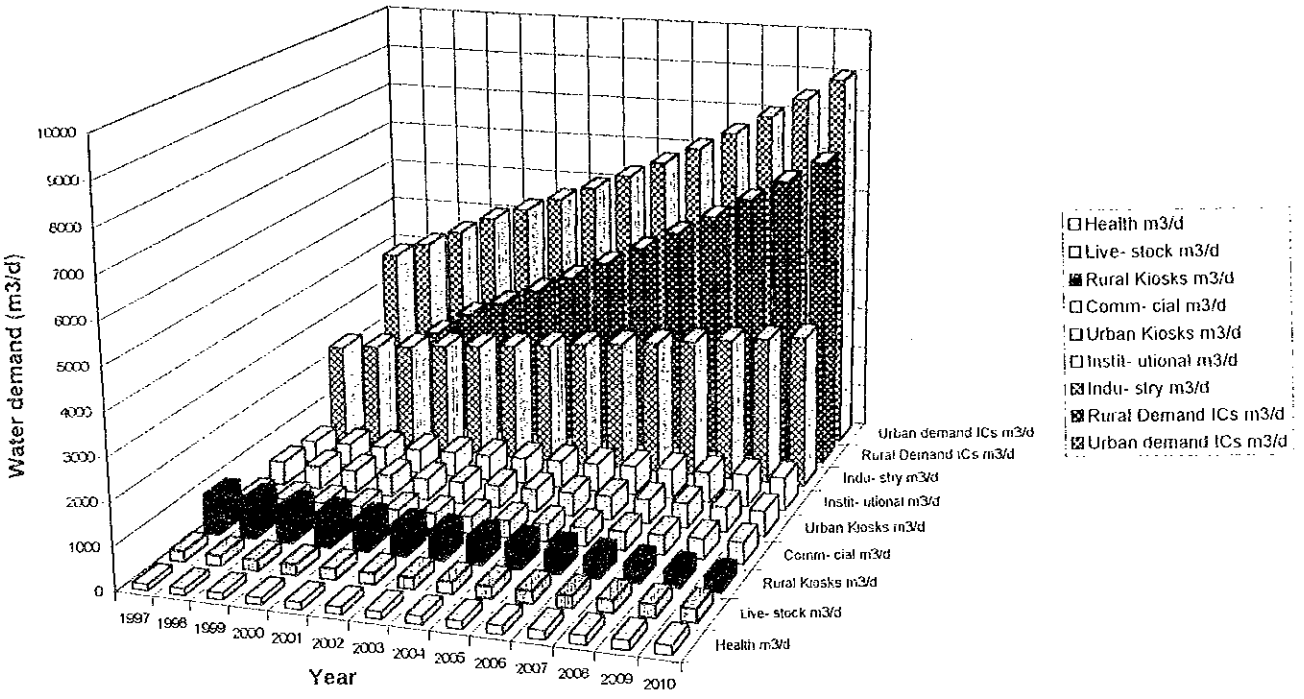
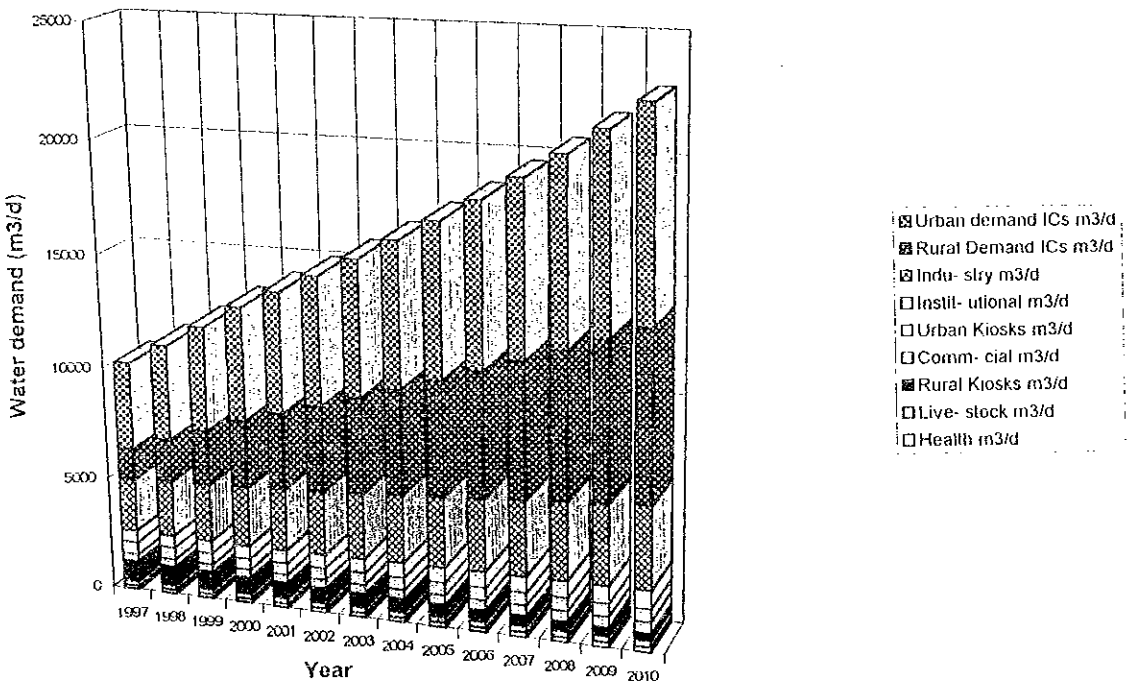


Population Projections





Meru Water Demand Projections



Meru Water Demand Projections