CHAPTER 11 STRENGTHENING PLAN FOR PUBLIC ADMINISTRATION, LEGISLATION AND FINANCIAL ADMINISTRATION

11.1 Improvement in Public Administration

Basic Concepts

(1) The roles and responsibilities of MWR, NWCPC, MOLA and the LAs, and any other scheme operators, should be rationalised and clearly defined in terms of: policy formulation, sector strategy and planning, regulation, scheme planning and implementation, and scheme operation, based on the revision of responsibilities outlined in the National Water Policy.

(2) To achieve such a separation of roles and responsibilities, it will be necessary to:

1) Strengthen the management, systems and general resources of existing and potential water undertakers, and
2) Agree on the criteria and procedure for allocating schemes.

(3) A logical basis must be established and agreed for the allocation of water and sewage schemes among the main actors. Allocation criteria could include; financial viability; size of scheme; type of scheme; municipal/urban/rural scheme; location; the need to combine water supply and sewage disposal schemes under one water and sewerage manager, as in the water undertaking municipalities.

(4) A regulatory framework should be set up to monitor the operational, environmental and financial performance of undertakers and of schemes.

Proposed Restructuring of Institutions

(5) MWR should be responsible overall for policy making, strategy, planning, coordination and regulation of the water supply and sewerage sector and should retain its current functions, at least in the short term. Some changes of institution are, however, necessary (see proposed organisation in **Figure - 11.1**).

(6) First, to strengthen the management of the sewage subsector, improve its linkage with water supply, and to ensure MWR has final responsibility for and control over the subsector, the present functions in MWR related to sewerage should be consolidated in one MWR Division. It is therefore proposed to establish Sewerage Division (see **Figure - 11.1**). The proposed responsibilities of and relationships between the agencies concerned with sewerage provision are outlined in **Figure - 11.4**.

(7) Regulation of water abstraction, water pollution, and water quality should be grouped together with surface water and groundwater management in one MWR department by establishing Water Resources Management and Regulation Department, to detach

regulatory functions from the mainstream work of the Ministry, and be given a higher profile (see **Figure - 11.1**).

(8) In the longer term, MWR should relinquish most of its direct water undertaking activity, beginning with the handover of municipal and urban schemes to local authorities when these are ready for the task. In addition, suitable rural water supply schemes should continue to be handed over to selected communities under the SIDA-funded Community Management of Water Supplies Project. At the same time, MWR should intensify its role in rural areas, by advising community schemes and acting as undertaker for smaller loss-making schemes. **Figure - 11.3** outlines proposed responsibilities of the agencies involved.

(9) Water supply schemes run by communities' face many problems. Actions recommended to improve the present situation include:

1) Undertake a national survey of all community schemes.
2) MWR water quality test at all community water supplies, including those MWR schemes already handed over to community groups.
3) Where new or extended MWR schemes are being considered near community schemes, three options for development should be assessed and the most appropriate one selected.

(10) NWCPC, now a major resource in water supply, should undertake water supply scheme development, operation and maintenance, mainly in bulk water supply and should have no responsibility for policy formulation, sector strategy and planning (MWR) or regulation (MWR or agency), although it could advise on the first two areas. For NWCPC the following is recommended:

1) Scheme allocation criteria should be agreed and applied to current NWCPC and MWR water supply schemes to decide which should be transferred to NWCPC, and which to MWR. The majority of transfers should be from MWR to NWCPC to reduce MWR's responsibility for service delivery.
2) Where NWCPC is a water undertaker in a local authority which is ready to become water undertaker under the UWASAM local authority development project, its responsibilities should be handed over to the LA.
3) Major efforts must be made to improve NWCPC's operational and financial performance for commercial viability. More capacity building and reform is needed before commercial operation is possible.

(11) The commercialisation of water supply and sewage disposal currently being implemented by MOLA and municipalities (with GTZ technical assistance) should continue until all ten water undertaking municipalities (including Nairobi) have public water and sanitation companies operating commercially. In addition, non-water undertaking municipalities ultimately suitable for appointment as water undertakers (i.e. those will eventually meet certain criteria) should be upgraded (currently through the GTZ project) to allow them to be appointed as such.

Regulation

(12) A separate regulatory agency should be set up to regulate water undertakers and sewerage providers in order to monitor their operational, environmental and financial performance without managerial or political intervention. (A similar agency, also reporting to the relevant Minister, was recently set up for the power sector in Kenya.) **Figure - 11.2** outlines the proposed responsibilities and relationships of the regulator and other agencies involved in urban water supply.

Personnel Administration

(13) To help to remedy the current problems in recruiting, promoting and transferring senior officers, an assessment of the functions, methods and value of the Public Service Commission and the Directorate of Personnel Management is recommended, with a view to increasing the relative authority of Department heads, LAs and District offices in decisions affecting their staff.

(14) Of concern is the important issue of inadequate pay and conditions prevalent throughout the public sector. It is therefore recommended that a consulting assignment be undertaken to establish a pay policy for the Civil Service.

11.2 Proposed Amendment to Legislation

(1) Measures to address the current poor implementation and enforcement of the law as well as the need for amendments are proposed. It is recommended that both the Water Act revisions and the Environmental Management and Coordination Bill 1996 should be enacted without further delay.

(2) Recommendations to assist law enforcement include: i) strengthening top level support, ii) handling cases at District level, or iii) by Catchment Boards, Water Apportionment Board, or District Courts, iv) thorough training of officials responsible for enforcement through a national programme, v) and a public education campaign.

(3) Short term measure includes: i) amendment of Water Act and ii) changes to other water related legislation. Longer term recommendations include: i) the drafting of a single comprehensive Water Act, ii) consolidating all other water sector legislation, iii) enacting a single water and environmental law and establishing water and environmental law.

11.3 Improvement in Financial Administration

(1) The large disparity between budgeted recurrent expenditure and the funds allocated is observed frequently. It is recommended that the Ministries of Finance and Planning, and the Office of the President take urgent steps to ensure that budgets and available funds coincide to a greater extent than at present. If necessary, an external review of the planning, budgeting and funds management process should be undertaken. It is vital that the funds budgeted are made available at District level, so that management of District

operations may proceed rationally and the requisite quality and quantity of water supplied can be maintained.

(2) Investment in development projects should be guided by policy, e.g. on appropriate technology, and sectoral planing framework. It is essential that such policy guidelines and a planning framework are developed for both water supply and sewerage subsectors and used as a basis for determining investment priorities. The procedure for identifying projects should include the use of standard algorithms and selection criteria for water supply and sewage treatment and disposal. These criteria should be as far as possible identical for both subsectors.

(3) Water beneficiaries should share, according to National Water Policy, the entire capital and operating cost of the relevant public facilities. The same principle should apply to recovery of water supply and sewerage costs. From a previous study of international water tariffs, it is concluded that a progressive rising block tariff is best suited to Kenya's needs.

(4) Water and sewage tariff rates should be set to satisfy an attainable revenue target, such as to cover operation and maintenance (O&M) costs or to cover O&M costs plus depreciation plus a contribution to reserves at an agreed percentage rate (10% has been suggested) of the cost of new capital works. The decentralisation of tariff setting to provincial offices should be considered.

(5) Regarding sewage, it is recommended that actual sewerage O&M costs and water volume at each municipality should be used as a basis for calculating tariffs. The resulting tariff value (in terms of water volume) to generate the necessary funds to meet the desired target recovery could then be expressed as a percentage of the water tariff and collected by the same billing arrangements as are now used.

(6) The serious weaknesses in the revenue collection system are largely due to lack of meters and meter repair activity, and substandard water supply. However, other problems relating to ineffective and inefficient meter reading, billing, bill distribution and collection should be addressed. This should be done by training where needed, of meter readers, billing clerks and their supervisors, and, particularly, by providing management support and feedback to supervision, both from District management and from Head Office in Nairobi.

CHAPTER 12 IMPLEMENTATION PROGRAMME OF PROPOSED PLANS

12.1 Implementation Schedule of Strengthening Plan for Public Administration, Legislation and Financial Administration

(1) In the previous Chapter 11, an institutional strengthening plan was proposed aiming at sustainable development in water supply and sewerage sectors, which includes improvement in public administration, amendment to legislation and improvement in financial administration. The implementation schedules of the projects/actions proposed in the above strengthening plan is presented hereinafter:

Improvement in Public Administration

(2) The improvement in public administration include:

1) MWR

i) Establish Sewerage Division,
ii) Establish Water Resources Management and Regulation Department,
iii) Hand over water supply schemes to upgraded LAs,
iv) Select community groups to receive water supply schemes and hand over when ready,
v) Strengthen support for rural and community water supply schemes, and
vi) Set up independent central regulator for water undertakers and sewerage providers.

2) Community Water Supply Schemes

i) National survey of community schemes,
ii) Water quality test for community water supply schemes, and
iii) Assessment of development options for new and extension schemes and selection of optimum plan.

3) Local Authorities and MOLA

i) Commercialise the remaining seven municipal water and sewerage departments (6 under GTZ assistance and Nairobi City) and supervise pilot water and sewerage company
ii) Upgrade additional five municipalities which are non-water undertakers and appoint as water undertakers, and
iii) Commercialise five municipal water and sewerage departments.

4) NWCPC

i) Hand over water supply schemes to upgraded LAs,
ii) Apply scheme allocation criteria to receive/hand over water supply schemes from/to MWR, and
iii) Organisational, operational, and financial review of NWCPC's performance.

5) Personnel administration

i) Review of Public Service Commission, and
ii) Establish pay policy for Civil Services.

(3) The schedule for implementing the above proposals in the improvement in public administration is given in **Figure - 12.1.** According to the schedule, projects would be complete by the end of year 2002, except for those requiring on-going actions.

Amendment to Legislation

(4) The amendment to legislation include:

1) Short term measures

i) Amendment of Water Act,
ii) Changes to other water related legislation, and
iii) Enforce Environmental Management and Coordination Bill.

2) Long term measures

i) Draft comprehensive Water Act,
ii) Prepare single water and environment law, and
iii) Establish a single enforcement agency for water and environment law.

3) Enforcement of the Law

i) Train provincial and district staffs, and
ii) Conduct PR campaign regarding water legislation in districts.

(5) The schedule for implementing the proposals for amendment to legislation is given in **Figure - 12.1.** Projects of the short term measures should be complete by the end of year 2000. More comprehensive changes to the Water Act would require a further year to accomplish. The long term measures are scheduled for completion in the end of year 2005.

Improvement in Financial Administration

(6) For improvement in financial administration, the following is proposed.

1) Improve unbalance of budgeting and fund allocation,
2) Improve investment method,
3) Revise tariff structure and rates for water supply and sewerage schemes in NWR, NWCPC and MOLA, and
4) Improve enforcement of billing and collection.

(7) The schedule for implementing the proposals in the financial improvement plan is given in **Figure - 12.1**. Projects for improving budgeting and fund allocation, revising of tariff structure and rates, and improving enforcement of billing and collection should be complete by the end of year 2001. While, on-going action is required for improvement of investment method.

12.2 Implementation Schedule of Improvement Plans of Operation and Maintenance Systems for Water Supply and Sewerage

(1) Improvement of operation and maintenance of water supply and sewerage schemes is essential to secure sustainability of the schemes. The improvement plans for operation and maintenance of water supply and sewerage schemes are presented in Chapter 6 and 7, respectively. They are:

1) Water supply schemes

i) Establish functional metering system,
ii) Leakage control,
iii) Customer registration,
iv) Other O&M staff training,
v) Procure water tankers (2 vehicles per province), and
vi) Technical assistance at district level for implementing the proposed projects.

2) Sewerage schemes

i) Increase operating revenue in each scheme (obtain funds due from water undertakers),
ii) Upgrade staff levels and skills,
iii) Procure required facilities, equipment and tools in each scheme,
iv) Establish preventive maintenance and standard operating procedures
v) Implement industrial wastewater pre-treatment programme, and
vi) Technical assistance at each facilities for implementing the proposed projects.

(2) The schedule for implementing the proposals in the operation and maintenance (O&M) system strengthening plan is given in **Figure - 12.2**. The O&M strengthening plan for water supply scheme is scheduled for completion by the end of 2006, except for the

projects requiring on-going action. While, the O&M strengthening plan for sewerage scheme is scheduled for completion by the end of 2004.

12.3 Institutional Support

(1) To progress the programme properly, a high level Implementation Committee (IMCO) with executive powers should be set up with the specific remit to ensure implementation of the agreed projects according to the agreed timetable. IMCO would have the same remit at supervisory level for the agreed water supply and sewerage.

(2) A Project Implementation Unit (PIU) should be established in MWR to manage the implementation of the projects proposed. The PIU should work closely with, and probably draw staff from, the Special Water Programmes Division of MWR. MOLA staff should also be co-opted to the PIU, one at least to be at senior level.

12.4 Implementation Schedule of Urban Water Supply Development Plan

(1) In order to prepare implementation schedule of urban water supply development plan, 139 urban centres subject to urban water supply planning were evaluated for priority ranking of the urban centres applying the following socioeconomic and technical factors with scores.

Factors	Classification	Score
Percentage of Served Population	More than 50%	1
	50% or less	2
Water Supply Condition (Supply/Water Demand)	Less than 25%	4
	25% - 50%	3
	50% - 75%	2
	More than 75%	1
Health Condition (Case of vomit/diarrhoea, fever/malaria)	Less than 25%	4
	25% - 50%	3
	50% - 75%	2
	More than 75%	1
Contribution to Industry and Commerce	District Centre	2
	Other Urban Centres	1
Contribution to Tourism	Nairobi, Malindi, Mombasa, Lamu, Marsabit, Kericho, Nakuru	2
	Other Urban Centres	1
Willingness to Pay and Affordability of Household	More than 7,700 Kshs	2
	7,700 Kshs or less	1
Cost Effectiveness (Unit Production Cost)	More than 1,000 Kshs/m^3	1
	1,000 Kshs/m^3 or less	2

(2) Results of the numerical rating are given in **Table - 12.1**. Depending on total score gained, 139 urban centres evaluated are grouped into three priority groups as follows. The group with higher score should have higher priority.

Ranking Groups	Score Gained	Urban Centres
A	15 or more	Karuri, Msambweni, Lamu, Garsen, Hola, Kangundo/Tala, Marsabit, Mwingi Mitto Andei, Garissa, Elwak, Rhamu, Bute, Eldas, Wajir, Ahero, Kisumu, Homabay, Migori, Nyamira, Narok, Lemok, Simat, Kilgoris, Cheptais, Malakisi, Luanda, Mbale, Vihiga (29 UC)
B	13 - 14	Githunguri, Kiambu, Ndumberi, Ruiru, Kerugoya/Kutus, Muranga, Nyahururu, Ol Kalou, Majengo, Malindi, Watamu, Kwale, Lunga Lunga, Modo Gashe, Kitui, Machakos, Matuu, Kargi, Korr, Moyale, North Horr, Meru, Nkubu, Maua, Kibwezi, Liboi, Mandera, Kisii, Muhoroni, Asiro, Siaya, Kendu Bay, Mbita, Oyugis, Awendo, Kenhacha, Nyabikaye, Keroka, Kericho, Kipkelion, Londiani, Sotik, Nyanyuki, Rumuruti, Kitale, Eldoret, Moi's Bridge, Kabarnet, Wamba, Kakuma T.C., Kalokol, Lodwar, Lokitaung, Kepenguria, Makutano, Bungoma, Kimilili, Webuye, Busia, Malaba Town, Butere, Kakamega, Mumias (63 UC)
C	12 or less	Kikuyu, Thika, Wanguru, Mukuyu, Maragua, Endarasha, Karatina, Nyeri, Othaya, Kilifi, Mambrui, Mariakani, Makowe, Taveta, Voi, Wundayani, Embu, Runyenjes, Isiolo, Merti, Athi River, Sololo, Chuka, Maseno, Rongo, Kajiado, Magadi, Namanga, Ngong, Loitokitok, Ongata-Longai, Elburgon, Gilgil, Molo, Naivasha, Nakuru, Njoro, Burnt Forest, Turbo, Elda Ravine, Mazi Mazuri, Marigat, Mogotio, Iten, Kapsabet, Maralal, Nambale (47 UC)

Source: The Aftercare Study Team

(3) On the basis of the assumed construction period presented in Chapter 8 and the results of the priority ranking among the urban centres, implementation schedule is worked out for the respective urban centres. **Figure - 12.3** shows the summarised implementation schedule of the urban water supply development plan.

12.5 Implementation Schedule of Rural Water Supply Development Plan

(1) As for rural water supply plan, 50 districts subject to rural water supply planning were evaluated by the following seven factors with scores for priority ranking of the districts in the same way as the urban water supply plan.

Evaluation Item	Classification	Score
Percentage of Served Population (Pop. Served/District Pop.)	Less than 25%	4
	25% - 50%	3
	51% - 75%	2
	More than 75%	1
Water Shortage during Dry Season (Time Spent/Maximum Time)	Less than 25%	4
	25% - 50%	3
	51% - 75%	2
	More than 75%	1
Health Condition	Less than 25%	2
	25% or more	1
Contribution to Industry and Commerce	District Centre	2
	Other Urban Centres	1
Contribution to Tourism	Nairobi, Malindi, Mombasa, Lamu, Marsabit, Kericho, Nakuru	2
	Other Urban Centres	1
Willingness to Pay and Affordability	More than 7,700 Kshs	2
	7,700 Kshs or less	1
Cost Effectiveness (Unit Production Cost	More than 1,000 Kshs/m^3	1
	1,000 Kshs/m^3 or less	2

(2) Results of the numerical rating are given in **Table - 12.2**. As the same as the urban centres, 50 districts evaluated are grouped into three priority groups depending on the total score gained summarised in the table below. The group with higher score should have higher priority.

Ranking Groups	Score Gained	District
A	14 and 15	Kilifi, Kwale, Taoa River, Kitui, Makueni, Mandera, Wajir, Migori, Kipsigis, Narok, Transmara (11 districts)
B	12 and 13	Lamu, Masaku, Marsabit, Mwingi, Garissa, Gusii, Siaya, Homa Bay, Nyamira, Kajiago, Laikipia, Trans Nzoia, Uasin Gishu, Baringo, Elgeyo, Marakwet, Nandi, West Pokot, Bungoma, Kakamega, Vihiga (20 districts)
C	11 and less	Kiambu, Kirinyaga, Muranga, Nyandarua, Nyeri, Mombasa, Taita, Embu, Isiolo, Meru, Nyambene, Tharaka Nith, Kisumu, Nakuru, Bomet, Samburu, Turkana, Busia (18 districts)

Source: The Aftercare Study Team

(3) The implementation schedule of rural water supply development is worked out on a basis of district in due consideration of the assumed construction period presented in Chapter 9 and priority ranking of the district as shown in **Figure - 12.4**.

12.6 Implementation Schedule of Livestock Water Supply Development Plan

(1) The livestock water supply schemes are planned to be realised on the basis of district unit and the priority order is evaluated to be simply based on the number of livestock units and the amount of annual rainfall in the district concerned with the following scores.

Evaluation Item	Classification	Score
Number of Livestock Unit	More than 300,000 heads	2
	300,000 heads or less	1
Annual Rainfall	Less than 500 mm	4
	500 - 900 mm	3
	900 - 1,500 mm	2
	More than 1,500 mm	1

Source: The Aftercare Study Team

(2) **Table - 12.3** presents the results of evaluation and scores allocated to the respective district. As an overall evaluation, 50 districts are classified into three groups depending on the score gained as summarised in the table below. The group with higher score should have higher priority.

Group	Score Gained	District
A	6 and 5	Makueni, Garissa, Mandera, Wajir, Narok, Baringo (6 districts)
B	4	Taita, Tana River, Isiolo, Kitui, Marsabit, Kajiado, Laikipia, Nakuru, Uasin Gishu, Turkana, West Pokot (11 districts)
C	3 and less	Nairobi, Kiambu, Kirinyaga, Muranga, Nyandaura, Nyeri, Kilifi, Kwale, Lamu, Mombasa, Embu, Masaku, Meru, Nyambene, Tharaka Nithi, Mwingi, Gusii, Kisumu, Siaya, Homa Bay, Migori, Nyamira, Kipsigis, Trans Nzoia, Bomet, Transmara, Elgeyo Marakwet, Nandi, Samburu, Bungoma, Busia, Kakamega, Vihiga (33 districts)

Source: The Aftercare Study Team

(3) The proposed implementation schedule of livestock water supply development based on the above ranking is shown in **Figure - 12.5.**

12.7 Implementation Schedule of Sewerage Development Plan

(1) In the same way as water supply development plan, 40 urban centres subject to sewerage development planning are evaluated for priority ranking by the following five factors with scores.

Ratio of Population with Piped Water Supply but No Sewer Connection	Population Requiring Services by 2010	Potential Health & Environmental Impact	Industrial Growth Potential	Tourism Potential	Score
Less than 25%	Less than 20,000	Nil	Nil	Nil	0
25 to 50%	20,000 to 100,000	Minor impact on water environment	Low	Low	1
50 to 75%	100,000 to 300,000	Serious impact on sensitive ecosystem	Medium	Medium	2
More than 75%	More than 300,000	Contamination of drinking water source	High	High	3

(2) Results of numerical rating are given in **Table - 12.4.** Forty urban centres evaluated are ranked depending on the total score gained as presented below.

Ranking	Urban Centre	Score Gained
1	Mombasa	14
2	Nairobi	13
3	Kisumu	12
4	Machakos, Meru, Nakuru	11
5	Narok, Malindi, Kitale	10
6	Kisii, Naivasha	9
7	Maragua, Ruiru, Wajir, Thika, Kericho, Nanyuki	8
8	Garissa, Ongata, Kilifi, Nyahururu, Webuye, Voi, Eldoret, Nyeri	7
9	Mandera, Kabarnet, Muranga, Bungoma, Busia, Isiolo	6
10	Kapsabet, Homa Bay, Karatina, Embu, Kakamega	5
11	Ngong, Athi River	4
12	Kiambu	3
13	Limuru	2

Source: The Aftercare Study team

(3) Based on the assumed construction period in Chapter 10 and above ranking, the proposed implementation schedule for the proposed sewerage development plan was worked out as shown in **Figure - 12.6.**

12.8 Investment Cost and Development Fund

(1) The investment costs for implementing the long term plans of urban water supply, rural water supply, livestock water supply and sewerage development are summarised as follows:

(Unit: US$ million)

Long Term Plan	Investment Cost
Urban Water Supply	1,322
Rural Water Supply	357
Livestock Water Supply	18
Sub-total of Water Supply	1,697
Sewerage	483
Total	2,180

(2) On the other hand, the future development funds, estimated based on historical development expenditure, are given below.

(Unit: US$ million)

Sector	Estimated Future Development Fund (1997/1998 – 2011/2012)	Government Portion	Foreign Assistance Portion
Water Supply Sector	1,965	714	1,251 (64 %)
Sewerage Sector	426	103	326 (76 %)
Total	2,391	817	1,577 (66 %)

As seen in the above table, the ratio of expected foreign assistance amount to the future development fund is more than 60%.

(3) Comparing the required investment cost to the future development fund expected, the long term plans toward 2010 proposed in the present Study may be implementable provided foreign assistance continues as expected. However, as the ratio of foreign assistance is high, the continued foreign assistance is essential for the successful development of water supply and sewerage sectors to meet the planned objectives for 2010.

(4) Considering those financial constraints, the following three scenarios were studied.

Scenario A : Full development
Scenario B : Development with Kenyan own fund only
Scenario C : Development with Kenyan own fund and 50% of the expected foreign assistance amount.

The development fund amounts of respective scenarios are given below:

(Unit: million US$)

Scenario	Sector	Government Fund	Foreign Assistance	Total Fund
A	Water Supply	714	983	1,697
	Sewerage	103	380	483
	Total	817	1,363	2,180
B	Water Supply	714	0	714
	Sewerage	103	0	103
	Total	817	0	817
C	Water Supply	714	627	1,341
	Sewerage	103	161	264
	Total	817	788	1,605

For the above expected funds, the scale of implementation programme is reviewed by scenario based on the following criteria.

1) Allocation of the fund between water supply and sewerage sectors is to be unchanged.

2) Priority of implementation is given as follows:

   i) Urban centres and districts ranked A (or high) have a priority and are followed by those ranked B (or medium) and C (or low) in order.
   ii) In the same ranking group, the urban centres and districts with larger requirement have a priority.
   iii) Among the urban, rural and livestock water supplies, the rural water supply has a priority and is followed by the urban water supply and livestock water supply in order.

As a result, the numbers of urban centres and districts of each scenario are summarised as given below.

Scenario	Urban Water Supply (nos. of U.C.)	Rural Water Supply (nos. of districts)	Livestock Water Supply (nos. of districts)	Sewerage (nos. of U.C.)
A	139 (A29, B63, C47)	50 (A11, B21, C18)	50 (A6, B11, C33)	40
B	34 (A29, B5)	32 (A11, B21)	6 (A6)	3
C	93 (A29, B63, C1)	50 (A11, B21, C18)	17 (A6, B11)	27

Note: U.C. - Urban Centre.
A29 - 29 U.C. ranked A, B63 - 63 U.C. ranked B, C47 - 47 U.C. ranked C

Besides the above analysis from financial constraint, it should be noted that the social, institutional and legislative constraints also affect the implementation programme although it is difficult to reflect those constraints to the implementation schedule.

CHAPTER 13 PRELIMINARY STUDY ON PRIORITY PROJECTS

13.1 Priority Urban Water Supply Projects

(1) As described in Chapter 12, it is evident that the development fund of the Kenyan Government is not sufficient to implement the proposed long-term plan targeting the year 2010 and foreign assistance is required. In order to effectively use the limited funds, the selection of priority projects is made examining the natures, urgency and need of the projects among the 29 urban centres ranked A in the Chapter 12.

(2) The long-term development plan comprises such structural measures as rehabilitation of existing facilities, completion of on-going projects, and implementation of planned/designed and newly proposed projects. Thus, they are simply grouped into the rehabilitation works and the expansion works (on-going, planned/designed and newly proposed projects) and their ranking will be determined accordingly.

(3) The evaluation factors applied for selection of priority rehabilitation works are as follows:

1) Metered connection (related to accounted-for water ratio)
2) Operational hour (related to production efficiency)
3) Chlorine dosage (related to quality control)

On the other hand, the evaluation factors applied for selection of the priority expansion works are as follows:

1) Development status of the scheme
2) Water production to be expanded
3) Impacts on environment

(4) The evaluation for selection of the priority rehabilitation works is made for 25 urban centres excluding 4 urban centres that have no existing water supply schemes from the nominated 29 urban centres. Results of the evaluation are presented in **Table - 13.1.** As a result, the rehabilitation works of the following 20 urban centres are selected as priority rehabilitation works. The preliminary scopes of the priority rehabilitation works are given in **Table - 13.2.** Their locations are shown in **Figure – 13.1.**

1) Karuri	6) Kangundo	11) Eldas	16) Kilgoris
2) Msambweni	7) Mwingi	12) Wajir	17) Cheptais
3) Lamu	8) Garissa	13) Ahero	18) Maseno/Luanda
4) Garsen	9) Rhamu	14) Migori	19) Mbale
5) Hola	10) Bute	15) Kajiado	20) Vihiga/Majengo

(5) The evaluation for selection of priority expansion works is made for 25 urban centres excluding 4 urban centres having on-going projects with enough design capacity to meet water demand in 2010 from the nominated 29 urban centres. Two urban centres have no existing facilities. Twenty one urban centres have no on-going projects and insufficient water supply capacity against the water demand in 2010. The remaining two urban centres have on-going projects, but their design capacities are less than 50% of the required capacity. The result of evaluation is presented in **Table - 13.3.** As a result, the expansion works of the following eight urban centres are selected as priority expansion works. Their locations are shown in **Figure – 13.1.**

1) Msambweni	2) Tala & Kangundo	3) Wajir
4) Kisumu	5) Homa Bay	6) Narok
7) Luanda	8) Mbale	

The preliminary scopes of the expansion works are given in **Table - 13.4.** Six planned/designed projects and 18 newly proposed projects are included.

(6) The economic evaluation for urban water supply is made for the priority expansion works by urban centre unit. The major qualitative benefits of the urban water supply projects are identified as follows:

1) Alleviation of water shortage and water rationing,
2) Cost saving for water vendor, and
3) Prevention of the people from water-borne diseases.

Also, the priority urban water supply projects are evaluated quantitatively taking into account benefit by increased water and cost saving as given below.

Item	Msanbweni	Tala+ Kangundo	Wajir	Kisumu	Homa Bay	Narok	Luanda	Mbale
EIRR (%)	16.6	16.5	12.4	9.8	17.4	1.2	18.6	24.7
B/C	1.6	1.6	1.2	1.0	1.7	0.5	1.9	2.0

Note: EIRR Economic rate of return, B/C Benefit-cost ratio

13.2 Priority Rural Water Supply Projects

(1) In the same manner as the urban water supply, 11 districts with Rank A in Chapter 12 are subject to further evaluation to select the priority rural water supply projects. The following two factors are applied for evaluation to select priority projects.

1) Non-served population in 1995
2) Production deficit in 2010

(2) Result of evaluation is given in **Table - 13.5.** Consequently, the projects in the following five districts are selected as priority rural water supply projects. Their locations are shown in **Figure – 13.2.**

1) Kilifi District	2) Kwale District	3) Migori District
4) Kipsigis District	5) Narok District	6) Transmara District

The preliminary scopes of the priority rural water supply projects are given in **Table - 13.6.** Three planned/designed projects of large scale water supply and 13 planned/designed projects are included, outlines of newly proposed projects are not presented since no location is identified in the current study.

(3) The quantitative evaluation is not made because the area subject to evaluation is so broad and various water undertakers exist in the area. The major qualitative benefits of the rural water supply projects are as follows:

1) Alleviation of water shortage
2) Improvement of public health
3) Contribution to poverty alleviation
4) Alleviation of water-carrying burden for women and children
5) Contribution of ASAL development

13.3 Priority Livestock Water Supply Projects

Based on the evaluation result presented in the previous Chapter 12 (refer to **Table - 12.3**), the projects of the following 6 districts with high priority were selected as priority livestock water supply projects.

1) Makueni District	2) Garissa District	3) Mandera District
4) Wajir District	5) Narok District	6) Baringo District

The preliminary scopes of the priority projects are given in **Table - 13.7.** Their locations are shown in **Figure – 13.2.** No economic evaluation is made for priority livestock water supply project.

13.4 Priority Sewerage Projects

(1) The selection of priority sewerage development projects was made from the short list of the 9 urban centres that obtained a score of 10 or more in the evaluation in the previous Chapter 12. Each urban centre was evaluated against the following factors.

1) Studies to date
2) Sanitation conditions
3) Status of on-going projects
4) Health and environment benefits
5) Importance to viability of tourism

(2) The results of the evaluation are presented in **Table - 13.8.** Consequently, the projects of the following five urban centres are selected as priority sewerage development projects.

1) Mombasa 2) Kisumu 3) Machakos 4) Malindi 5) Narok

The preliminary scopes of the priority projects are given in **Table - 13.9.** Their locations are shown in **Figure – 13.1.**

(3) The economic evaluation for sewerage development is made for the priority sewerage projects. The major qualitative benefits of the sewerage projects are as follows:

1) Resources costs saving
2) Realisation of willingness-to-pay for improvement of sewerage service
3) Improvement of hygiene, health and environmental conditions

The quantitative evaluation of the sewerage projects are made as follows taking into account benefits by reduction of wastewater treatment cost and willingness to pay.

Item	Mombasa	Kisumu	Machakos	Malindi	Narok
EIRR (%)	14.5	11.8	22.1	11.6	13.1
B/C	1.23	1.08	1.82	1.09	1.21

CHAPTER 14 CONCLUSION AND RECOMMENDATIONS

14.1 Conclusion

The Study Team reviewed the development plans for water supply and sewerage sectors in the National Water Master Plan prepared in 1992 and established new implementation programmes for the target year 2010. Also, the Study Team made recommendations on strengthening of law, organisation and institution for project implementation and improvement of management, operation and maintenance of the projects.

Water Supply Development

(1) The target for water supply development is to increase the present 90% service coverage in urban centre to 95% and the present 35% service coverage in the rural area to 70% by the year 2010 and also to attain an accounted-for-water ratio of over 70% by each scheme by the year 2010.

For the above target, water demand is forecasted as $2,010 \times 10^3$ m^3/day for urban water supply and $1,660 \times 10^3$/day for rural water supply in 2010. While, the present water supply capacity is estimated at 710×10^3 m^3/day for urban water supply and 750×10^3 m^3/day for rural water supply. This big gap between water demand and supply capacity indicates the need for further development of both urban and rural water supplies.

(2) To meet the water demand in 2010, a lot of water supply projects have to be completed and require huge amount of investment.

Projects	Urban Water Supply Projects		Rural Water Supply Projects	
	Nos. of projects	Cost (1,000 US$)	Nos. of projects	Cost (1,000 US$)
Rehabilitation Works	120	44,400	295	95,100
On-going Projects	21	7,400	552	67,700
Planned/designed Projects	21	27,400	217	8,800
Newly Proposed Projects	108	1,243,000	51,183	185,400
Total	270	1,322,200	52,247	357,000

The above investment costs may be obtainable provided that foreign assistance continues as expected. However, as the percentage of foreign assistance is more than 60%, it is essential to increase the percentage of own fund and get the continuous foreign assistance for the successful development of water supply and sewerage sectors to meet the planned objectives for 2010.

(3) A review of MWR project status reports suggests that a large percent of the on-going projects are stalled due mainly to a lack of funds. According to the questionnaire surveys, many existing schemes are inoperable due to financial, technical, and managerial problems. Priority should be given to the on-going projects under construction, planning and design. Concurrently with these projects, rehabilitation of the existing schemes shall be undertaken.

Augmentation or expansion projects shall be kept to a minimum level and limited to schemes which were evaluated very urgent before completion of on-going projects and rehabilitation works.

(4) However, in the rural areas, much of the population has no access to safe water. In such areas, small scale community water supply schemes which are most cost-effective method to supply safe water should be undertaken. Those schemes may greatly help alleviate the heavy tasks by women and children to fetch water and will improve rural living conditions.

(5) The long-term development plan of water supply was formulated targeting the year 2010. However, considering financial constraints of the GOK priority projects were selected to utilise the limited funds effectively. The priority projects were selected among the projects in the proposed long-term water supply development plan which are ranked as high priority from social and technical viewpoints. However, the priority projects are selected by urban centre unit for urban water supply and district unit for rural water supply. As a result, rehabilitation projects of 20 urban centres and expansion projects of 8 urban centres listed in Section 13.1 were selected as priority project in the urban water supply sector. On the other hand, rehabilitation/expansion projects of 6 districts listed in Section 13.2 were selected as priority project in the rural water supply sector.

Sewerage Development

(6) The service coverage of water supply in the urban centres in Kenya is more than 90% at present, while that of sewerage is 28%. This situation is affecting environment and health conditions; therefore, further sewerage development is required. In the Study, target service ratio of the sewerage development was set as follows:

Urban Population	Target Service Coverage
300,000 or more	50%
300,000 - 100,000	40%
100,000 - 20,000	25%
20,000 or less	15%

The overall service ratio comes to 38%. For this target, wastewater flow in 2010 is estimated at 750×10^3 m^3/day against the present treatment capacity of 240×10^3 m^3/day. The treatment capacity has to be increased by 510×10^3 m^3/day.

(7) To increase the treatment capacity by 510×10^3 m^3/day, the following number of projects have to be implemented:

Projects	Nos. of Projects	Cost (1,000 US$)
Rehabilitation Works	52 (34)	52,100
On-going Projects	18	89,600
Planned/designed Projects	2	31
Newly Proposed Projects	64 (40)	341,400
Total	136 (74)	483,131

Source: Aftercare Survey Group

Funding for these projects may be obtainable by assuming that the past growth rate of budget for the sewerage sector is maintained in the future. However, this is a very ambitious assumption since the appropriation-in-aid occupy more than 70% of the budget for sewerage sector.

(8) Existing old sewer and treatment works are hydraulically and organically overloaded and require urgent rehabilitation. Therefore, in the sewerage development plan rehabilitation of the existing sewerage facilities should have priority in order to recover the original function of sewerage system. Also, extension of sewer reticulation and expansion of treatment works should be implemented and the progress of water supply monitored.

(9) Priority projects were selected by evaluating the projects of 10 urban centres with high priority in the long term sewerage development plan from social and technical viewpoints. As a result, projects of five urban centres listed in Section 13.4 were selected as having the highest priority.

(10) In the evaluation for ranking of sewerage development projects, impact to environment and potential of tourism are adopted as one of the evaluation factors. The tourism is a major industry in Kenya and it depends heavily on the natural environment. The sewerage system can contribute to conservation of the national environment. In the further stage of sewerage development, needs of sewerage development should be confirmed paying attention to the above point.

14.2 Recommendations

(1) The water supply and sewerage development plans were prepared to cope with water demand and wastewater treatment demand in 2010. On the other hand, most existing water supply and sewerage schemes are facing many problems and constraints and are not sustainable. To get out of this situation, it is of vital importance to strengthen the public administration, legislation, and financial administration and also improve the operation and maintenance system. Otherwise, the proposed development plans will not be effective.

(2) To strengthen public administration the following should be done:

1) Restructure organizations related to water supply and sewerage sectors,
2) Improve personnel administration,
3) Regulate water undertakers and sewerage providers,
4) Amend legislation related to water supply and sewerage sectors,

5) Improve law enforcement,
6) Improve disparity between budget and fund available,
7) Improve investment method,
8) Revise tariff structures and rates in water supply and sewerage sectors,
9) Improve tariff billing and collection.

(3) To improve the operation and maintenance system the following should be done:

1) Water supply sector

i) Establish a functional metering system
ii) Implement leakage control
iii) Register all customers
iv) Train operation and maintenance staff
v) Provide water tankers (2 vehicles per province)

2) Sewerage sector

i) Increase operating revenue in each schemes (obtain fund due for operation),
ii) Upgrade staff levels and skills (Recruitment, raining and transfer),
iii) Procure facilities, equipment and tools,
iv) Establish preventive maintenance program and standard operating procedures, and
v) Implement an industrial wastewater pre-treatment program.

(4) The detailed measures for institutional strengthening plan and operation and maintenance improvement plan will be different among the schemes or projects depending on their own problems and constraints. Therefore, the problems and constraints of each scheme or project should be clarified before their implementation. Since some of the measures will require the action at a national level, all the ministries and organizations concerned should implement them cooperatively under the strong leadership of the ministries in-charge.

(5) The financial capability of the Kenyan government is one of the most important factors to achieve the proposed development plans. The estimated government development fund is much too short to accomplish them. Therefore, continuous foreign assistance will be required. However, most donors are recently paying more attention to institutional and operational aspects of the schemes rather than the investment required for the physical facilities. To get the foreign assistance for investment on physical facilities against the recent donor's trend, sustainability of the existing schemes has to be recovered in both water supply and sewerage sectors as precondition for further development by implementing the proposed institutional strengthening plan and operation and maintenance improvement plan immediately and successively.

TABLES

Table - 6.1(1/4) Water Balance for Urban Water Supply

(Unit: m³/day)

Province	Code	District	Code	Urban Centre Name	Water Demand		Step 1 : Existing Projects		Step 2 : Ongoing Projects			Step 3 : Planned / Design Projects			Step 4 : Rehabilitation of Existing Facilities	
					1995	2010	Supply Capacity	Deficit 2010	Project Name	Supply Capacity	Deficit 2010	Project Name	Supply Capacity	Deficit 2010	Augmented Capacity	Deficit 2010
Nairobi	110	Nairobi	U - 1	Nairobi	331,823	721,687	319,000	402,687			402,687	Sunshine Sec. School	0	402,687	0	402,687
Central	210	Kiambu	U - 2	Githunguri	1,205	2,480	360	2,120			2,120	Githunguri Cia Gichambu	180	1,940	0	1,940
			U - 3	Karuri	2,259	4,649	624	4,025			4,025	Karuri	N/E	0	0	0
			U - 4	Kiambu	1,213	2,498	490	2,008	Thuku Borehole (Kiambu Water Supply), Kiambu Rural	2,666	0			0	0	0
			U - 5	Kikuyu	1,443	2,971	1,278	1,693			1,693	Kikuyu Div. W/S (Muguga)	300	1,393	0	1,393
			U - 7	Ndumberi	0	3,393	0	3,393			3,393			3,393	0	3,393
			U - 8	Ruiru	9,035	18,598	792	17,805	Kuiru	3,669	14,137			14,137	0	14,137
			U - 9	Thika	18,070	37,196	36,660	536			536			536	0	536
		Sub-total			33,225	71,784	40,204	31,580		6,335	25,904		480	21,398	0	21,398
	220	Kirinyaga	U - 12	Kerugoya/Kutus	1,320	7,175	1,446	5,729			5,729	Kutus/Kimbibi		5,729	482	5,247
			U - 16	Wanguru	93	506	1,512	0	Wanguru	450	0	Wanguru Major	16,000	0	1,512	0
		Sub-total			1,413	7,681	2,958	5,729		450	5,729		16,000	5,729	1,994	5,247
	230	Murang'a	U - 19	Makuyu	82	422	360	62			62			62	285	0
			U - 20	Maragua	849	4,366	96	4,270			4,270	Maragua Ridge, Maragua W/S	2,295	1,975	48	1,927
			U - 21	Muranga	3,288	16,900	2,000	14,900	Muranga	3,488	11,412			11,412	0	11,412
		Sub-total			4,220	21,688	2,456	19,232		3,488	15,744		2,295	13,449	333	13,339
	240	Nyandarua	U - 28	Nyahururu	6,834	22,906	3,000	19,906			19,906			19,906	1,500	18,406
			U - 30	Ol kalou	1,230	4,123	220	3,903	Ol Kalau	3,309	594	Olkalau Rural		594	55	539
		Sub-total			8,064	27,029	3,220	23,809		3,309	20,499		0	20,499	1,555	18,944
	250	Nyeri	U - 32	Endarasha	0	1,150	0	1,150	Endarasha Settlement	2,400	0			0	0	0
			U - 33	Karatina	2,045	6,203	1,300	4,903			4,903			4,903	0	4,903
			U - 36	Nyeri	5,629	34,738	5,940	28,798			28,798			28,798	0	28,798
			U - 37	Othaya	1,970	5,963	11,000	0			0			0	0	0
		Sub-total			9,644	48,053	18,240	34,850		2,400	33,700		0	33,700	0	33,700
Total in Central Province					56,565	176,234	67,078	115,200		15,982	101,576		18,775	94,776	3,982	92,628
Coast	310	Kilifi	U - 38	Kilifi	4,105	6,314	4,300	2,014			2,014			2,014	0	2,014
			U - 39	Majengo	0	805	0	805			805			805	0	805
			U - 40	Malindi	19,224	29,569	15,985	13,584			13,584			13,584	0	13,584
			U - 41	Mambrui	272	419	432	0			0			0	0	0
			U - 42	Mariakani	1,714	2,637	1,200	1,437	Mariakani	650	787	Mariakani Pelakumui	201	586	0	586
			U - 43	Watamu	867	1,334	0	1,334			1,334			1,334	0	1,334
		Sub-total			26,183	41,078	21,917	19,174		650	18,524		201	18,323	0	18,323
	320	Kwale	U - 44	Kwale	427	1,404	7,000	0			0			0	0	0
			U - 45	Lunga Lunga	260	893	220	673			673			673	37	637
			U - 46	Msambweni	1,704	5,847	624	5,223			5,223			5,223	286	4,937
		Sub-total			2,391	8,204	7,844	5,896		0	5,896		0	5,896	323	5,574
	330	Lamu	U - 47	Lamu	691	4,043	575	3,468	Lamu/Mkowe Augumentation	2,684	784	Tana/Lamu Water Supply		784	216	568
			U - 49	Mokowe T.C	290	1,698	120	1,578	Mkowe Roof Catchment	2	1,576			1,576	60	1,516
		Sub-total			981	5,741	695	5,046		2,686	2,360		0	2,360	276	2,084
	340	Mombasa	U - 52	Mombasa	69,374	111,951	70,000	41,951			41,951	Distribution Network Improvement and Extensions (Mombasa and Coastal Area)	344,400	0	0	0
	350	Taita	U - 54	Taveta	577	1,594	2,981	0			0			0	0	0
			U - 55	Voi	2,661	7,353	2,700	4,653			4,653			4,653	0	4,653
			U - 56	Wundanyani	1,049	2,898	1,488	1,410			1,410			1,410	744	666
		Sub-total			4,286	11,845	7,169	6,063		0	6,063		0	6,063	744	5,319

Table - 6.1(2/4) Water Balance for Urban Water Supply

(Unit: m³/day)

Province	Code	District	Code	Urban Centre Name	Water Demand		Step 1 : Existing Projects		Step 2 : Ongoing Projects			Step 3 : Planned / Design Projects			Step 4 : Rehabilitation of Existing Facilities	
					1995	2010	Supply Capacity	Deficit 2010	Project Name	Supply Capacity	Deficit 2010	Project Name	Supply Capacity	Deficit 2010	Augmented Capacity	Deficit 2010
Coast	360	Tana River	U - 58	Garsen	1,513	4,429	100	4,329			4,329	Garsen	1,300	3,029	33	2,996
			U - 59	Hola	1,361	3,986	228	3,758			3,758	Hola	1,300	2,458	152	2,306
		Sub-total			2,874	8,415	328	8,087		0	8,087		2,600	5,487	185	5,302
Total in Coast Province					106,089	187,235	107,953	86,218		3,336	82,882		347,201	38,130	1,529	36,603
Eastern	410	Embu	U - 60	Embu	4,823	14,031	4,058	9,973			9,973	Embu Water Supply		9,973	676	9,297
			U - 61	Runyenjes	590	1,717	135	1,582			1,582			1,582	22	1,560
		Sub-total			5,413	15,748	4,193	11,555		0	11,555		0	11,555	699	10,856
	420	Isiolo	U - 63	Isiolo	5,341	13,882	4,356	9,526			9,526			9,526	0	9,526
			U - 64	Modo Gashe	0	1,015	0	1,015	Madogashe W/P	1,050	0			0	0	0
			U - 65	Merti	174	452	69	383			383			383	0	383
		Sub-total			5,515	15,350	4,425	10,925		1,050	9,910		0	9,910	0	9,910
	430	Kitui	U - 68	Kitui	1,553	5,166	3,000	2,166	Masinga Kitui Water Supply	5,619	0			0	0	0
	440	Masaku	U - 69	Athi River	1,783	6,458	2,000	4,458			4,458	Athi River Water Supply	3,300	1,158	0	1,158
			U - 71	Machakos	11,411	41,329	5,800	35,529			35,529	Machakos Urban Water Supply	8,300	27,229	0	27,229
			U - 74	Matuu	1,426	5,166	480	4,686			4,686			4,686	180	4,506
			U - 77	Kangundo/Tala	2,068	7,491	441	7,050			7,050			7,050	165	6,885
		Sub-total			16,689	60,444	8,721	51,723		0	51,723		12,600	40,123	345	39,777
	450	Marsabit	U - 79	Kargi	1,046	2,654	160	2,494	Kargi	645	1,849			1,849	60	1,789
			U - 80	Korr	1,046	2,654	0	2,654	Korr	825	1,829			1,829	0	1,829
			U - 82	Marsabit	2,582	6,552	300	6,252	Marsabit	3,750	2,502	Marsabit	400	2,102	75	2,027
			U - 83	Moyale	1,307	3,317	61	3,256	Moyale Lami	1,275	1,981			1,981	15	1,966
			U - 84	North Horr	327	829	21	808			808			808	5	803
			U - 85	Sololo	850	2,156	21	2,135	Sololo	1,290	845			845	5	840
		Sub-total			7,157	18,162	563	17,599		7,785	9,814		400	9,414	161	9,253
	460	Meru	U - 86	Meru	2,203	17,398	4,730	12,668			12,668			12,668	0	12,668
			U - 87	Nkubu	674	5,327	329	4,998			4,998			4,998	192	4,806
		Sub-total			2,877	22,725	5,059	17,666		0	17,666		0	17,666	192	17,474
	470	Nyambene	U - 89	Maua	326	1,725	400	1,325			1,325			1,325	0	1,325
	480	Tharaka Nithi	U - 90	Chuka	1,103	2,577	355	2,222			2,222	Chuka	1,000	1,222	0	1,222
	490	Mwingi	U - 91	Mwingi	1,900	5,129	300	4,829			4,829			4,829	300	4,529
	4A0	Makueni	U - 93	Kibwezi	0	1,052	0	1,052			1,052			1,052	0	1,052
			U - 98	Mtito Andei	2,383	6,748	3,000	3,748			3,748			3,748	0	3,748
		Sub-total			2,383	7,800	3,000	4,800		0	4,800		0	4,800	0	4,800
Total in Eastern Province					44,916	154,826	30,016	124,810		14,454	113,844		13,000	100,844	1,697	99,147
North Eastern	510	Garissa	U - 104	Garissa	4,587	12,257	1,440	10,817	Garissa	12,000	0			0	480	0
			U - 105	Liboi	816	2,179	123	2,056			2,056			2,056	41	2,015
		Sub-total			5,403	14,436	1,563	12,873		12,000	2,056		0	2,056	521	2,015
	520	Mandera	U - 108	Elwak	0	2,169	0	2,169	Elwak	300	1,869			1,869	0	1,869
			U - 109	Mandera	1,099	4,604	500	4,104	Mandera	300	3,804	Mandera	3,000	804	167	637
			U - 110	Rhamu	1,077	4,513	140	4,373	Rhamu	300	4,073			4,073	47	4,027
		Sub-total			2,177	11,286	640	10,646		900	9,746		3,000	6,746	213	6,533
	530	Wajir	U - 113	Bute	0	775	202	573			573			573	51	522
			U - 114	Eldas	652	1,717	65	1,652			1,652			1,652	16	1,636
			U - 116	Wajir	196	9,152	48	9,104			9,104			9,104	16	9,088
		Sub-total			848	11,644	315	11,329		0	11,329		0	11,329	83	11,246
Total in North Eastern Province					8,427	37,367	2,518	34,849		12,900	23,132		3,000	20,132	817	19,294

Table - 6.1(3/4) Water Balance for Urban Water Supply

(Unit: m^3/day)

Province	Code	District	Code	Urban Centre Name	Water Demand		Step 1 : Existing Projects		Step 2 : Ongoing Projects			Step 3 : Planned / Design Projects			Step 4 : Rehabilitation of Existing Facilities	
					1995	2010	Supply Capacity	Deficit 2010	Project Name	Supply Capacity	Deficit 2010	Project Name	Supply Capacity	Deficit 2010	Augmented Capacity	Deficit 2010
Nyanza	610	Gusii	U - 117	Kisii	6,475	16,960	6,000	10,960			10,960			10,960	2,000	8,960
	620	Kisumu	U - 119	Ahero	68	124	23	102			102			102	8	94
			U - 120	Kisumu	41,244	75,315	14,565	60,750			60,750			60,750	0	60,750
			U - 121	Maseno	4,406	8,045	0	8,045			8,045			8,045	0	8,045
			U - 122	Muhoroni	734	1,341	720	621			621	Songhor/Muhoroni W/P	1,400	0	0	0
		Sub-total			46,452	84,826	15,308	69,518		0	69,518		1,400	68,897	8	68,889
	630	Siaya	U - 123	Asiro	0	1,334	0	1,334			1,334			1,334	0	1,334
			U - 125	Siaya	1,655	8,132	770	7,362			7,362	Rehabilitation and Augmentation of Siaya Water Project	2,695	4,667	257	4,410
		Sub-total			1,655	9,467	770	8,697		0	8,697		2,695	6,002	257	5,745
	640	Homa Bay	U - 129	Homa Bay	6,482	13,524	1,500	12,024			12,024			12,024	500	11,524
			U - 130	Kendu Bay	1,508	3,145	720	2,425			2,425			2,425	240	2,185
			U - 131	Mbita	0	1,639	0	1,639			1,639			1,639	0	1,639
			U - 133	Oyugis	4,523	9,435	5,760	3,675			3,675			3,675	1,920	1,755
		Sub-total			12,512	27,743	7,980	19,763		0	19,763		0	19,763	2,660	17,103
	650	Migori	U - 134	Awendo	0	2,274	0	2,274			2,274	Awendo	20,000	0	0	0
			U - 135	Kenhacha	814	2,083	44	2,039			2,039	Migori/Kehancha, Kehancha	150,250	0	15	0
			U - 136	Migori	907	2,321	960	1,361			1,361	Migori/Ndhiwa	2,250	0	320	0
			U - 137	Nyabikaye	0	1,167	0	1,167			1,167			1,167	0	1,167
			U - 138	Rongo	887	2,271	497	1,774			1,774			1,774	166	1,608
		Sub-total			2,609	10,116	1,501	8,615		0	8,615		172,500	2,941	500	2,775
	660	Nyamira	U - 139	Keroka	0	762	0	762			762			762	0	762
			U - 140	Nyamira	2,396	5,229	466	4,763			4,763	Nyamira UWS & Sewerage	2,064	2,699	0	2,699
		Sub-total			2,396	5,991	466	5,525		0	5,525		2,064	3,461	0	3,461
Total in Nyanza Province					72,098	155,102	32,025	123,077		0	123,077		178,659	112,022	5,425	106,933
Rift Valley	710	Kajiado	U - 141	Kajiado	701	3,294	2,000	1,294			1,294			1,294	667	628
			U - 142	Magadi	1,403	6,589	1,364	5,225			5,225			5,225	455	4,770
			U - 143	Namanga	631	2,965	780	2,185			2,185	Namanga	450	1,735	0	1,735
			U - 144	Ngong	842	3,953	1,260	2,693	Ngong	450	2,243	Ngong	8,460	0	210	0
			U - 145	Loitokitok	2,805	13,177	0	13,177			13,177	Ronga (Loitoktok)		13,177	480	12,697
			U - 146	Ongata Longai	1,010	4,744	3,600	1,144			1,144			1,144	2,700	0
		Sub-total			7,392	34,722	9,004	25,718		450	25,268		8,910	22,575	4,511	19,830
	720	Kipsigis	U - 148	Kericho	8,197	22,167	8,460	13,707			13,707			13,707	0	13,707
			U - 149	Kipkelion	209	566	48	518	Kipkelion	1,425	0			0	16	0
			U - 151	Londiani	558	1,510	756	754	Londiani	1,737	0			0	252	0
			U - 152	Sotik	0	1,450	0	1,453			1,453			1,453	0	1,453
		Sub-total			8,965	25,693	9,264	16,433		3,162	15,161		0	15,161	268	15,161
	730	Laikipia	U - 153	Nanyuki	5,936	19,187	6,800	12,387			12,387			12,387	2,267	10,120
			U - 154	Rumuruti	441	1,425	0	1,425			1,425	Rumuruti Rural, Urban	1,378	47	0	47
		Sub-total			6,377	20,612	6,800	13,812		0	13,812		1,378	12,434	2,267	10,167
	740	Nakuru	U - 155	Elburgon	853	2,297	391	1,906			1,906			1,906	130	1,776
			U - 156	Gilgil	1,137	3,063	760	2,303			2,303			2,303	253	2,050
			U - 157	Molo	1,421	3,829	775	3,054			3,054			3,054	258	2,796
			U - 158	Naivasha	6,537	17,614	762	16,852			16,852			16,852	254	16,598
			U - 159	Nakuru	43,284	116,618	28,969	87,649			87,649			87,649	12,070	75,578
			U - 160	Njoro	711	1,915	224	1,691			1,691			1,691	75	1,616
		Sub-total			53,942	145,336	31,881	113,455		0	113,455		0	113,455	13,041	100,414
	750	Narok	U - 163	Narok	1,641	10,873	1,315	9,558			9,558			9,558	0	9,558
	760	Trans Nzoia	U - 164	Kitale	8,732	33,317	12,749	20,568			20,568			20,568	4,250	16,318

Table - 6.1(4/4) Water Balance for Urban Water Supply

(Unit: m³/day)

Province	Code	District	Code	Urban Centre Name	Water Demand		Step 1 : Existing Projects		Step 2 : Ongoing Projects			Step 3 : Planned / Design Projects			Step 4 : Rehabilitation of Existing Facilities	
					1995	2010	Supply Capacity	Deficit 2010	Project Name	Supply Capacity	Deficit 2010	Project Name	Supply Capacity	Deficit 2010	Augmented Capacity	Deficit 2010
Rift Valley	770	Uasin Gishu	U - 165	Burnt Forest	249	1,105	600	505	Burnt Forest	600	0			0	200	0
			U - 166	Eldoret	12,393	54,928	37,400	17,528			17,528	Eldoret Polytechnic	10	17,518	0	17,518
			U - 167	Lenuk	0	1,627	0	1,627			1,627			1,627	0	1,627
			U - 169	Moi's Bridge	139	616	600	16	Moi's Bridge	1,500	0			0	400	0
			U - 170	Simat	0	3,015	0	3,015			3,015			3,015	0	3,015
			U - 172	Turbo	337	1,495	300	1,195			1,195			1,195	200	995
		Sub-total			13,119	62,787	38,900	23,887		2,100	23,366		10	23,356	800	23,156
	790	Transmara	U - 174	Kilgoris	1,476	3,886	864	3,022			3,022			3,022	288	2,734
	810	Baringo	U - 178	Eldo Ruvine	2,675	4,501	6,700	0			0			0	2,233	0
			U - 179	Karbarnet	17,050	28,696	2,042	26,654			26,654			26,654	681	25,974
			U - 180	Maji Mazuri	267	450	260	190			190			190	87	103
			U - 181	Marigat	163	274	366	0			0			0	244	0
			U - 182	Mogotio	669	1,125	686	439			439			439	0	439
		Sub-total			20,824	35,047	10,054	27,284		0	27,284		0	27,284	3,245	26,516
	820	Elgeyo Marakwet	U - 183	Iten	279	2,110	460	1,650			1,650	Iten Yogot Dam	2,850	0	153	0
	830	Nandi	U - 185	Kapsabet	992	6,303	624	5,679			5,679	Kapsabet/Kipsigak Water Supply	4,011	1,668	208	1,460
	840	Samburu	U - 188	Maralal	294	1,200	529	671			671			671	309	362
			U - 189	Wamba	1,354	5,523	181	5,341	Wamba	600	4,741			4,741	144	4,597
		Sub-total			1,649	6,722	710	6,012		600	5,412		0	5,412	452	4,960
	850	Turkana	U - 190	Kakuma T.C	2,966	4,597	1,080	3,517			3,517	Kakuma	200	3,317	360	2,957
			U - 191	Kalokol	297	460	72	388	Kalokol	1,350	0	Kalokol Community W/S	1,200	0	54	0
			U - 194	Lodwar	4,449	6,896	1,506	5,390	Lodwar	5,250	140			140	0	140
			U - 195	Lokitaung	593	919	240	679	Lokitaung	815	0			0	180	0
		Sub-total			8,305	12,872	2,898	9,974		7,415	3,657		1,400	3,457	594	3,097
	860	West pokot	U - 197	Kapenguria	749	3,752	360	3,392			3,392			3,392	210	3,182
			U - 198	Makutano	708	3,547	262	3,285			3,285			3,285	98	3,187
		Sub-total			1,457	7,299	622	6,677		0	6,677		0	6,677	308	6,369
Total in Rift Valley Province					135,149	407,583	126,145	283,728		13,728	274,567		18,559	264,625	30,385	239,739
Western	910	Bungoma	U - 199	Bungoma	4,895	15,066	3,000	12,066			12,066	Bungoma Rural I & II	1,586	10,480	1,000	9,480
			U - 200	Cheptais	0	1,142	2,400	0			0			0	800	0
			U - 202	Kimilili	12,755	39,255	2,200	37,055			37,055			37,055	733	36,321
			U - 203	Malakisi	0	1,215	0	1,215			1,215			1,215	0	1,215
			U - 205	Webuye	5,439	16,740	1,800	14,940			14,940			14,940	0	14,940
		Sub-total			23,090	73,417	9,400	65,275		0	65,275		1,586	63,689	2,533	61,956
	920	Busia	U - 206	Busia	2,325	14,794	2,072	12,722	Busia /mundika	7,500	5,222	Busia hills	300	4,922	691	4,231
			U - 207	Malaba Town	0	1,252	0	1,252	Malaba /Kocholia	13,256	0	Malaba H.C W/P		0	0	0
			U - 208	Nambale	178	1,135	159	976			976			976	0	976
		Sub-total			2,504	17,181	2,231	14,950		20,756	6,198		300	5,898	691	5,207
	930	Kakamega	U - 209	Butere	682	4,300	264	4,036	Butere W/S	251	3,785			3,785	132	3,653
			U - 210	Kakamega	3,796	23,929	7,000	16,929			16,929			16,929	2,333	14,596
			U - 211	Mumias	1,697	10,698	1,498	9,200	Mumias W/S	2,250	6,950			6,950	0	6,950
		Sub-total			6,175	38,927	8,762	30,165		2,501	27,664		0	27,664	2,465	25,198
	940	Vihiga	U - 213	Maseno/Luanda	9,326	24,763	1,192	23,571			23,571			23,571	397	23,174
			U - 214	Mbale	2,727	7,241	960	6,281			6,281	Mbale III	22,501	0	240	0
			U - 215	Vihiga/Majengo	1,636	4,344	63	4,281			4,281	Vihiga-Maralal	156,000	0	32	0
		Sub-total			13,689	36,349	2,215	34,134		0	34,134		178,501	23,571	669	23,174
Total in Western Province					45,458	165,874	22,608	144,524		23,257	133,270		180,387	120,822	6,458	115,535
TOTAL IN KENYA					800,525	2,005,907	707,343	1,315,092		83,656	1,255,035		759,581	1,154,038	50,091	1,113,066

Source: The Aftercare Study Team

Table - 6.2 Water Balance for Large Scale Rural Water Supply

(Unit : m^3 / day)

Province	Code	District	Water Demand for LSRWS		Step 1 : Existing Projects		Step 2 : Ongoing Projects		Step 3 : Planned Designed Projects		Step 4 : Rehabilitation	
			1995	2010	Supply Capacity	Deficit 2010	Supply Capacity	Deficit 2010	Supply Capacity	Deficit 2010	Augmented Capacity	Deficit 2010
Central	210	Kiambu	26,631	47,825	139,931	0	15,016	0	10,912	0	4,800	0
	220	Kirinyaga	20,998	25,817	32,969	0	4,127	0	7,161	0	9,633	0
	230	Muranga	18,897	22,055	35,875	0	80,856	0	0	0	9,240	0
	240	Nyandarua	4,699	5,832	11,145	0	31,566	0	2,426	0	3,715	0
	250	Nyeri	7,013	6,775	9,808	0	24,638	0	19,143	0	261	0
Sub-total			78,237	108,306	232,727	0	157,232	0	39,642	0	27,709	0
Coast	310	Kilifi	1,866	3,161	2,415	745	21,300	0	4,024	0	805	0
	320	Kwale	1,102	2,166	2,160	6	0	6	2,350	0	528	0
	330	Lamu	441	472	1,085	0	3,967	0	400	0	362	0
	340	Mombasa	5,800	9,300	1,053	8,307	2,250	6,057	2,600	3,457	351	3,100
	350	Taita	3,410	4,649	4,620	29	4,354	0	173	0	3,603	0
	360	Tana River	1,103	5,364	6,400	0	3,875	0	1,300	0	2,633	0
Sub-total			13,724	25,172	17,733	9,088	33,746	6,063	10,847	3,457	6,582	3,100
Eastern	410	Embu	7,768	13,564	32,020	0	5,625	0	1,248	0	586	0
	420	Isiolo	799	799	256	543	12,164	0	0	0	85	0
	430	Kitui	1,957	10,135	645	9,490	12,712	0	1,751	0	310	0
	440	Masaku	6,929	13,639	31,451	0	23,283	0	3,978	0	9,972	0
	450	Marsabit	3,433	2,872	783	2,088	16,328	0	1,275	0	261	0
	460	Meru	7,762	8,472	4,080	4,392	16,939	0	0	0	0	0
	470	Nyambene	12,445	24,922	13,086	11,836	11,312	524	0	524	3,286	0
	480	Tharaka Nithi	6,642	18,292	8,896	9,305	9,133	262	2,300	0	965	0
	490	Mwingi	2,412	10,674	243	10,432	3,113	7,319	90	7,229	414	6,815
	4A0	Makueni	2,989	11,488	3,675	7,813	22,840	0	31,779	0	105	0
Sub-total			53,137	114,856	95,136	55,958	133,447	8,106	42,321	7,753	15,985	6,815
North Eastern	510	Garissa	1,973	3,070	667	2,403	7,275	0	800	0	264	0
	520	Mandera	1,637	5,653	494	5,159	0	5,159	2,400	2,759	165	2,594
	530	Wajir	7,243	6,314	1,805	4,509	2,925	1,584	248	1,336	671	665
Sub-total			10,852	15,037	2,966	12,070	10,200	6,742	3,448	4,095	1,100	3,258
Nyanza	610	Gusii	2,061	6,918	4,428	1,590	13,508	0	22,008	0	1,476	0
	620	Kisumu	18,573	27,261	16,042	11,219	4,050	7,169	4,288	2,881	12,297	0
	630	Siaya	15,584	34,045	12,554	21,491	66,375	0	21,353	0	3,624	0
	640	Homa Bay	9,976	39,544	2,117	37,427	54,086	0	3,000	0	472	0
	650	Migori	904	7,513	409	7,104	19,125	0	1,782	0	136	0
	660	Nyamira	2,301	5,215	1,347	3,867	5,400	0	53,367	0	370	0
Sub-total			49,399	119,596	36,897	82,699	162,545	7,169	105,798	2,881	18,375	0
Rift Valley	710	Kajiado	3,586	4,710	5,380	0	3,225	0	0	0	2,457	0
	720	Kipsigis	322	780	887	0	1,581	0	29,178	0	33	0
	730	Laikipia	313	1,644	21	1,623	28,194	0	8,766	0	7	0
	740	Nakuru	5,670	6,339	1,754	4,585	1,883	2,703	4,044	0	301	0
	750	Narok	2,289	11,486	2,049	9,437	2,436	7,001	340	6,661	686	5,975
	760	Trans Nzoia	0	0	0	0	4,402	0	11,240	0	0	0
	770	Uasin Gishu	7,074	8,379	8,367	12	9,339	0	18,471	0	3,548	0
	780	Bomet	1,329	4,319	2,873	1,445	2,469	0	3,403	0	958	0
	790	Transmara	8,520	8,281	25	8,255	1,125	7,130	0	7,130	8	7,122
	810	Baringo	2,342	1,715	1,411	303	7,713	0	2,753	0	681	0
	820	Elgeyo Marakwet	1,895	5,737	3,223	2,514	11,085	0	35,830	0	180	0
	830	Nandi	1,931	5,069	1,092	3,977	6,113	0	35,300	0	364	0
	840	Samburu	3,796	4,580	3,872	708	465	243	553	0	2,581	0
	850	Turkana	2,976	5,919	1,076	4,843	1,718	3,125	0	3,125	582	2,543
	860	West Pokot	2,687	9,061	3,114	5,946	49,163	0	750	0	1,115	0
Sub-total			37,030	78,017	35,146	43,649	130,910	20,202	150,528	16,916	13,301	15,641
Western	910	Bungoma	21,594	30,685	10,883	19,802	9,077	10,726	10,291	435	1	433
	920	Busia	5,477	6,892	3,532	3,360	20,306	0	1,243	0	472	0
	930	Kakamega	6,492	10,648	11,072	0	465	0	11,776	0	2,771	0
	940	Vihiga	5,782	9,224	2,509	6,715	0	6,715	0	6,715	116	6,598
Sub-total			39,345	57,449	27,997	29,877	29,847	17,440	23,310	7,150	3,361	7,032
Total			281,725	518,433	448,602	233,371	657,926	65,722	375,894	42,252	86,412	35,852
Number of Districts Facing Water Deficits						36		15		11		9

Source : The Aftercare Study Team

Note: Deficits above imply balance between designed production capacity and estimated water requirements by planned population served.

Table - 6.3 Water Balance for Small Scale Rural Water Supply

(Unit : m^3 / day)

Province	Code	District	Water Demand for SSRWS		Step 1 : Existing Projects		Step 2 : Ongoing Projects		Step 3 : Planned Designed Projects		Step 4 : Rehabilitation	
			1995	2010	Supply Capacity	Deficit 2010	Supply Capacity	Deficit 2010	Supply Capacity	Deficit 2010	Augmented Capacity	Defocot 2010
Central	210	Kiambu	6,073	14,786	6,073	8,713	0	8,713	1,983	6,730	0	6,730
	220	Kirinyaga	431	2,168	431	1,737	865	872	3,123	0	0	0
	230	Murang'a	16,616	28,936	16,616	12,321	0	12,321	1,843	10,478	0	10,478
	240	Nyandarua	4,189	7,654	4,189	3,466	975	2,491	2,952	0	0	0
	250	Nyeri	10,542	14,625	10,542	4,084	1,551	2,532	11,877	0	0	0
Sub-total			37,850	68,170	37,850	30,320	3,391	26,929	21,777	17,208	0	17,208
Coast	310	Kilifi	9,592	24,135	9,592	14,543	525	14,018	214	13,804	0	13,804
	320	Kwale	7,727	21,254	7,727	13,527	1,200	12,327	444	11,883	0	11,883
	330	Lamu	1,144	1,772	1,144	628	122	507	300	207	0	207
	340	Mombasa	12,700	6,976	12,700	0	0	0	0	0	0	0
	350	Taita	1,603	1,929	1,603	326	1,462	0	922	0	0	0
	360	Tana River	265	1,239	265	974	0	974	280	694	0	694
Sub-total			33,032	57,306	33,032	29,998	3,309	27,826	2,160	26,588	0	26,588
Eastern	410	Embu	2,119	7,355	2,119	5,236	180	5,056	1,362	3,694	0	3,694
	420	Isiolo	919	915	919	0	291	0	986	0	0	0
	430	Kitui	1,415	7,050	1,415	5,634	522	5,112	0	5,112	0	5,112
	440	Machakos	3,231	11,556	3,231	8,325	540	7,785	0	7,785	0	7,785
	450	Marsabit	1,043	1,395	1,043	351	2,986	0	863	0	0	0
	460	Meru	5,106	11,294	5,106	6,189	6,716	0	0	0	0	0
	470	Nyambene	2,745	7,962	2,745	5,217	855	4,362	0	4,362	0	4,362
	480	Tharaka Nithi	247	913	247	666	41	626	0	626	0	626
	490	Mwingi	1,038	5,670	1,038	4,633	1,332	3,301	316	2,985	0	2,985
	4A0	Makueni	6,375	15,617	6,375	9,242	1,351	7,892	221	7,671	0	7,671
Sub-total			24,238	69,727	24,238	45,493	14,813	34,333	3,748	32,234	0	32,234
North Eastern	510	Garissa	1,661	2,255	1,661	594	330	264	113	151	0	151
	520	Mandera	632	2,432	632	1,799	600	1,199	0	1,199	0	1,199
	530	Wajir	279	331	279	51	0	51	0	51	0	51
Sub total			2,573	5,017	2,573	2,444	930	1,514	113	1,402	0	1,402
Nyanza	610	Gusii	11,560	59,729	11,560	48,170	959	47,211	175	47,036	0	47,036
	620	Kisumu	1,222	4,919	1,222	3,697	188	3,509	26	3,483	0	3,483
	630	Siaya	153	868	153	716	150	566	3,200	0	0	0
	640	Homa Bay	869	4,463	869	3,594	0	3,594	750	2,844	0	2,844
	650	Migori	2,539	22,110	2,539	19,571	0	19,571	85	19,486	0	19,486
	660	Nyamira	3,010	9,565	3,010	6,555	225	6,330	170	6,160	0	6,160
Sub-total			19,352	101,655	19,352	82,302	1,521	80,781	4,406	79,008	0	79,009
Rift Valley	710	Kajiado	5,529	6,907	5,529	1,379	518	861	300	561	0	561
	720	Kipsigis	5,943	27,486	5,943	21,543	392	21,151	953	20,199	0	20,199
	730	Laikipia	1,269	5,176	1,269	3,908	451	3,457	78	3,379	0	3,379
	740	Nakuru	11,491	15,428	11,491	3,937	0	3,937	1,559	2,378	0	2,378
	750	Narok	1,443	10,550	1,443	9,107	166	8,941	5,954	2,987	0	2,987
	760	Trans Nzoia	5,058	21,873	5,058	16,815	457	16,358	0	16,358	0	16,358
	770	Uasin Gishu	4,973	5,343	4,973	370	1,199	0	3,768	0	0	0
	780	Bomet	5,463	30,816	5,463	25,353	297	25,056	729	24,327	0	24,327
	790	Transmara	400	4,511	400	4,111	600	3,511	4,550	0	0	0
	810	Baringo	1,310	4,366	1,310	3,056	555	2,501	4,963	0	0	0
	820	Elgeyo Marakwet	1,825	9,362	1,825	7,537	2,672	4,865	210	4,655	0	4,655
	830	Nandi	7,071	25,705	7,071	18,635	533	18,102	280	17,822	0	17,822
	840	Samburu	638	638	638	0	1,665	0	967	0	0	0
	850	Turkana	1,078	2,992	1,078	1,914	1,838	77	120	0	0	0
	860	West Pokot	592	2,158	592	1,566	450	1,116	3,444	0	0	0
Sub-total			54,081	173,311	54,081	119,230	11,792	109,933	27,873	92,666	0	92,666
Western	910	Bungoma	2,521	7,420	2,521	4,899	519	4,381	0	4,381	0	4,381
	920	Busia	7,168	13,537	7,168	6,369	720	5,649	400	5,249	0	5,249
	930	Kakamega	17,796	42,811	17,796	25,015	0	25,015	473	24,543	0	24,543
	940	Vihiga	6,608	15,537	6,608	8,930	240	8,690	0	8,690	0	8,690
Sub total			34,093	79,305	34,093	45,213	1,479	43,734	873	42,862	0	42,862
Total			205,218	554,491	205,218	355,001	37,234	324,850	60,948	291,969	0	291,969
Number of Districts Facing Water Deficit						46		42		34		34

Source : The Aftercare Study Team

Note: Deficits above imply balance between designed production capacity and estimated water requirements by planned population served.

Table - 6.4 Water Balance for Livestock Water Supply

(Unit : m^3 / day)

Province	Code	District	Production Capacity for Livestock	Livestock Water Demand				Deficit			
				1995	2000	2005	2010	1995	2000	2005	2010
Nairobi	110	Nairobi	978	1,223	1,275	1,326	1,378	245	296	348	400
Central	210	Kiambu	2,907	3,633	3,787	3,941	4,095	727	880	1,034	1,188
	220	Kirinyaga	1,723	2,154	2,245	2,337	2,428	431	522	613	704
	230	Murang'a	3,098	3,872	4,036	4,200	4,364	774	938	1,102	1,266
	240	Nyandarua	5,110	6,388	6,658	6,929	7,199	1,278	1,548	1,818	2,089
	250	Nyeri	3,116	3,895	4,060	4,225	4,390	779	944	1,109	1,274
Coast	310	Kilifi	1,943	2,428	2,531	2,634	2,737	486	588	691	794
	320	Kwale	4,468	5,585	5,821	6,057	6,294	1,117	1,353	1,590	1,826
	330	Lamu	735	918	957	996	1,035	184	223	261	300
	340	Mombasa	140	176	183	190	198	35	43	50	57
	350	Taita	944	1,180	1,230	1,280	1,330	236	286	336	386
	360	Tana River	9,413	11,767	12,265	12,763	13,261	2,353	2,851	3,349	3,847
Eastern	410	Embu	3,298	4,123	4,297	4,472	4,646	825	999	1,174	1,348
	420	Isiolo	751	939	979	1,018	1,058	188	228	267	307
	430	Kitui	8,995	11,244	11,719	12,195	12,671	2,249	2,725	3,200	3,676
	440	Masaku	6,881	8,601	8,965	9,329	9,693	1,720	2,084	2,448	2,812
	450	Marsabit	6,603	8,253	8,603	8,952	9,301	1,651	2,000	2,349	2,698
	460	Meru	3,406	4,257	4,437	4,617	4,797	851	1,032	1,212	1,392
	470	Nyambene	2,943	3,679	3,835	3,991	4,146	736	892	1,047	1,203
	480	Tharaka Nithi	3,550	4,437	4,625	4,813	5,000	887	1,075	1,263	1,451
	490	Mwingi	4,337	5,421	5,650	5,880	6,109	1,084	1,314	1,543	1,772
	4A0	Makueni	53,214	66,518	69,333	72,148	74,963	13,304	16,119	18,934	21,749
North-Eastern	510	Garissa	44,381	55,476	57,824	60,172	62,520	11,095	13,443	15,791	18,138
	520	Mandera	10,132	12,665	13,200	13,736	14,272	2,533	3,069	3,605	4,141
	530	Wajir	17,413	21,766	22,688	23,609	24,530	4,353	5,274	6,196	7,117
Nyanza	610	Gusii	5,469	6,837	7,126	7,415	7,705	1,367	1,657	1,946	2,235
	620	Kisumu	7,270	9,087	9,472	9,856	10,241	1,817	2,202	2,587	2,971
	630	Siaya	7,826	9,783	10,197	10,611	11,025	1,957	2,371	2,785	3,199
	640	Homa Bay	4,392	5,490	5,722	5,955	6,187	1,098	1,330	1,563	1,795
	650	Migori	2,644	3,305	3,445	3,585	3,725	661	801	941	1,081
	660	Nyamira	4,890	6,112	6,371	6,629	6,888	1,222	1,481	1,740	1,998
Rift Valley	710	Kajiado	18,467	23,084	24,061	25,038	26,015	4,617	5,594	6,571	7,548
	720	Kipsigis	4,198	5,248	5,470	5,692	5,914	1,050	1,272	1,494	1,716
	730	Laikipia	4,923	6,153	6,414	6,674	6,935	1,231	1,491	1,751	2,012
	740	Nakuru	44,364	55,455	57,802	60,148	62,495	11,091	13,438	15,785	18,131
	750	Narok	10,476	13,095	13,649	14,204	14,758	2,619	3,173	3,727	4,282
	760	Trans Nzoia	2,364	2,955	3,080	3,205	3,330	591	716	841	966
	770	Uasin Gishu	6,552	8,190	8,537	8,883	9,230	1,638	1,985	2,331	2,678
	780	Bomet	7,440	9,300	9,694	10,087	10,481	1,860	2,254	2,647	3,041
	790	Transmara	3,939	4,924	5,133	5,341	5,549	985	1,193	1,402	1,610
	810	Baringo	29,367	36,709	38,263	39,816	41,370	7,342	8,895	10,449	12,002
	820	Elgeyo Marakwet	1,565	1,956	2,039	2,122	2,205	391	474	557	640
	830	Nandi	6,528	8,160	8,505	8,850	9,195	1,632	1,977	2,323	2,668
	840	Samburu	7,841	9,801	10,216	10,630	11,045	1,960	2,375	2,790	3,205
	850	Turkana	5,417	6,771	7,057	7,344	7,631	1,354	1,641	1,927	2,214
	860	West Pokot	7,652	9,565	9,970	10,375	10,780	1,913	2,318	2,723	3,127
Western	910	Bungoma	5,377	6,721	7,006	7,290	7,575	1,344	1,629	1,913	2,198
	920	Busia	3,323	4,153	4,329	4,505	4,680	831	1,006	1,182	1,358
	930	Kakamega	7,567	9,833	10,249	10,665	11,082	1,967	2,383	2,799	3,215
	940	Vihiga	3,376	4,220	4,398	4,577	4,755	844	1,022	1,201	1,380
TOTAL			414,006	517,508	539,408	561,309	583,210	103,502	125,402	147,303	169,204

Source: The Aftercare Study Team

Note: The present situation is assumed that 80% of the 1995 demand is being fed from the existing facilities.

Table - 7.1(1/2) Sewerage Development Targets

Province		District		Urban Center		Water & Sanitation Developement in 1998					Water & Sanitation Developement in 2010				Incremental population requiring sewerage by 2010
						Urban Population [1]	Population connected to water supply [3]	Population connected to sewer [1]	Population with water but no sewerage		% of urban population connected to sewer	Urban Population	Population connected to water supply	Population connected to sewer	% of urban population connected to sewer	
1	Nairobi	110	Nairobi	U-1	Nairobi	2,240,000	1,784,577	1,000,000	784,577	44%	45%	3,023,000	2,932,310	1,511,500	50	511,500
2	Central	210	Kiambu	U-4	Kiambu	7,500	8,058	2,250	5,808	72%	30%	21,356	14,241	6,407	30	4,157
3	Central	210	Kiambu	U-6	Limuru	3,000	1,958	2,100	0	0%	70%	4,347	4,129	3,043	70	943
4	Central	210	Kiambu	U-8	Ruiru	32,302	6,000	0	6,000	100%	0%	70,142	106,041	17,500	25	17,500
5	Central	210	Kiambu	U-9	Thika	155,770	120,000	87,230	32,770	27%	56%	190,350	212,082	95,175	50	7,945
6	Central	230	Muranga	U-20	Maragua	39,411	6,200	0	6,200	100%	0%	79,924	27,266	20,021	25	20,021
7	Central	230	Muranga	U-21	Muranga	30,000	24,000	10,500	13,500	56%	35%	62,635	105,547	21,980	35	11,480
8	Rift Valley	240	Nyandarua	U-28	Nyahururu	60,000	50,000	18,000	32,000	64%	30%	60,186	150,583	18,056	30	56
9	Central	250	Nyeri	U-33	Karatina	7,299	14,533	5,109	9,424	65%	70%	19,471	38,767	13,630	70	8,521
10	Central	250	Nyeri	U-36	Nyeri	142,000	40,000	37,100	2,900	7%	26%	331,393	217,108	165,697	50	128,597
11	Coast	310	Kilifi	U-38	Kilifi	20,555	30,170	0	30,170	100%	0%	57,082	41,335	14,300	25	14,300
12	Coast	310	Kilifi	U-40	Malindi	48,227[2]	141,293	0	141,293	100%	0%	134,152	193,580	53,661	40	53,661
13	Coast	340	Mombasa	U-52	Mombasa	580,000	370,764	69,600	301,164	81%	12%	736,000	476,234	368,000	50	298,400
14	Coast	350	Taita Taveta	U-55	Voi	15,772[2]	20,300	700	19,600	97%	4%	35,159	46,991	8,800	25	8,100
15	Eastern	410	Embu	U-60	Embu	45,000	35,000	9,000	26,000	74%	20%	92,214	93,054	23,100	25	14,100
16	Eastern	420	Isiolo	U-63	Isiolo	26,968	36,000	1,700	34,300	95%	6%	83,440	78,896	20,902	25	19,202
17	Eastern	440	Masaku	U-69	Athi River	18,300	12,500	1,300	11,200	90%	7%	48,441	42,911	12,110	25	10,810
18	Eastern	440	Masaku	U-71	Machakos	154,006	80,000	8,000	72,000	90%	5%	407,822	274,630	203,911	50	195,911
19	Eastern	460	Meru	U-86	Meru	124,412[2]	16,330	800	15,530	95%	1%	337,437	218,467	168,718	50	167,918
20	North Eastern	510	Garissa	U-104	Garissa	40,000[2]	34,758	0	34,758	100%	0%	115,126	82,350	46,051	40	46,051

Table - 7.1(2/2) Sewerage Development Targets

Province		District		Urban Center		Water & Sanitation Developement in 1998					Water & Sanitation Developement in 2010				Incremental population requiring sewerage by 2010
						Urban Population (1)	Population connected to water supply (3)	Population connected to sewer (1)	Population with water but no sewerage		Urban Population	Population connected to water supply	Population connected to sewer	% of urban population connected to sewer	
21	North Eastern	520	Mandera	U-109	Mandera	22,856	8,160	0	8,160	100%	51,680	29,603	12,900	25	12,900
22	North Eastern	530	Wajir	U-116	Wajir	26,239	1,500	0	1,500	100%	66,062	61,637	16,500	25	16,500
23	Nyanza	610	Kisii	U-117	Kisii	65,000	45,000	13,000	32,000	71%	120,615	114,584	48,246	40	35,246
24	Nyanza	620	Kisumu	U-120	Kisumu	231,327(2)	280,845	130,000	150,845	54%	561,029	441,418	280,514	50	150,514
25	Nyanza	640	Homa Bay	U-129	Homa Bay	75,000	43,000	15,000	28,000	65%	71,860	90,372	18,000	25	3,000
26	Rift Valley	710	Kajiado	U-144	Ngong	15,000	6,000	750	5,250	88%	41,207	24,471	10,300	25	9,550
27	Rift Valley	710	Kajiado	U-146	Ongata Longai	25,050	7,200	0	7,200	100%	81,185	29,365	20,337	25	20,337
28	Rift Valley	720	Kipsigis	U-148	Kericho	80,000	58,723	41,600	17,123	29%	152,522	148,636	76,261	50	34,661
29	Rift Valley	730	Laikipia	U-153	Nanyuki	55,000	43,100	24,750	18,350	43%	97,975	131,804	44,089	45	19,339
30	Rift Valley	740	Nakuru	U-158	Naivasha	60,000	46,000	30,000	16,000	35%	168,905	110,824	84,452	50	54,452
31	Rift Valley	740	Nakuru	U-159	Nakuru	231,687	304,561	123,500	181,061	59%	760,237	733,756	380,119	50	256,619
32	Rift Valley	750	Narok	U-163	Narok	19,859	12,000	0	12,000	100%	77,231	73,369	19,347	25	19,347
33	Rift Valley	760	Trans Nzoia	U-164	Kitale	75,000	60,000	37,500	22,500	38%	229,328	217,362	114,664	50	77,164
34	Rift Valley	770	Uasin Gishu	U-166	Eldoret	220,000	90,000	70,400	19,600	22%	450,629	354,259	225,314	50	154,914
35	Rift Valley	810	Baringo	U-179	Kabarnet	11,804	127,500	0	127,500	100%	32,363	159,666	8,100	25	8,100
36	Rift Valley	830	Nandi	U-185	Kapsabet + Baraton	20,000	7,000	4,000	3,000	43%	44,693	42,458	11,200	25	7,200
37	Western	910	Bungoma	U-199	Bungoma	70,000	36,000	12,600	23,400	65%	114,086	99,395	45,634	40	33,034
38	Western	910	Bungoma	U-205	Webuye	60,000	40,000	12,000	28,000	70%	120,647	110,439	48,259	40	36,259
39	Western	920	Busia	U-206	Busia	43,000	17,267	9,600	7,667	44%	103,635	98,433	41,454	40	31,854
40	Western	930	Kakamega	U-210	Kakamega	77,306(2)	27,826	5,445	22,381	80%	202,516	160,123	81,006	40	75,561

	1998						2010			
Urban population connected to sewers			1,783,534						4,379,257	
Population living in urban centers where sewerage is available	3,986,236		45%				9,453,078		46%	
Total population in all urban centers.	6,576,000		27%				11,500,000		38%	

Note: (1) - Populations reported by municipal and town councils during JICA study team survey.
(2) - Information not reported in survey or incorrect therefore population shown is for 1995 as estimated by JICA study team.
(3) - from various sources gathered by the Aftercare Study Team

Table - 12.1(1/2) Ranking of Urban Centres for Implementation of Urban Water Supply Development

Code	District	Code	Name of Urban Scheme	1) Service Ratio		2) Supply Conditions		3) Health Condition		4) Industry & Commerce	5) Tourism	6) Afford-ability	7) Cost Efficiency	Overall Ranking	
				%	Rank	Production/ Demand	Rank	%	Rank					Total Score	Rank
210	Kiambu	U-2	Githunguri	138.9	1	24.9	4	56.3	3	1	1	2	1	13	B
		U-3	Karuri	50.0	2	23.0	4	56.3	3	1	1	2	2	15	A
		U-4	Kiambu	79.9	1	40.4	3	56.3	3	2	1	2	1	13	B
		U-5	Kikuyu	49.1	2	58.5	2	56.3	3	1	1	2	1	12	C
		U-7	Ndumberi	-	2	0.0	4	56.3	3	1	1	2	1	11	B
		U-8	Ruiru	60.0	1	8.6	4	56.3	3	1	1	2	2	14	B
		U-9	Thika	80.3	1	132.8	1	56.3	3	1	1	2	1	10	C
220	Kirinyaga	U-12	Kerugoya	23.2	2	90.9	2	64.3	3	2	1	1	2	13	B
		U-13	Kutus	12.9	2	0.0	4	64.3	3	1	1	1	2	14	B
		U-16	Wanguru	13.8	2	85.9	2	64.3	3	1	1	1	2	12	C
230	Murang'a	U-19	Makuyu	2.5	2	437.9	1	48.1	2	1	1	2	1	10	C
		U-20	Maragua	51.7	1	1.8	4	48.1	2	1	1	2	1	12	C
		U-21	Murang'a	42.9	2	60.8	2	48.1	2	2	1	2	2	13	B
240	Nyandarua	U-28	Nyahururu	33.3	2	43.9	3	41.7	2	2	1	2	2	14	B
		U-30	Ol Kalou	90.0	1	17.9	4	41.7	2	1	1	2	2	13	B
250	Nyeri	U-32	Endarasha	-	2	0.0	4	35.4	2	1	1	1	1	12	C
		U-33	Karatina	162.7	1	63.6	2	35.4	2	2	1	1	2	13	C
		U-36	Nyeri	49.0	2	205.5	1	35.4	2	1	1	1	2	10	C
		U-37	Othaya	80.0	1	35.5	3	35.4	2	1	1	1	2	11	C
310	Kilifi	U-38	Kilifi	41.3	2	104.8	1	80.5	4	2	1	1	1	12	C
		U-39	Majengo	-	2	0.0	4	80.5	4	1	1	1	1	14	B
		U-40	Mafinda	239.5	1	83.2	2	80.5	4	1	2	1	2	13	B
		U-41	Mambrui	66.7	1	76.1	2	80.5	4	1	1	1	2	12	C
		U-42	Mariakani	65.9	1	70.0	2	80.5	4	1	1	1	1	11	C
		U-43	Watamu	193.1	1	0.0	4	80.5	4	1	1	1	1	13	B
320	Kwale	U-44	Kwale	69.9	1	121.9	1	100.0	4	2	1	2	2	13	B
		U-45	Lunga Lunga	16.1	2	84.5	2	100.0	4	1	1	2	1	13	B
		U-46	Msambweni	48.0	2	30.5	3	100.0	4	1	1	2	2	15	A
330	Lamu	U-47	Lamu	25.0	2	83.2	2	79.5	4	2	2	2	1	15	A
		U-49	Mokowe T.C	70.0	1	89.7	2	79.5	4	1	1	2	1	12	C
350	Taita	U-54	Taveta	30.0	2	277.4	1	55.6	3	1	1	1	2	11	C
		U-55	Voi	422.9	1	101.5	1	55.6	3	1	1	1	2	10	C
		U-56	Wundanyani	125.2	1	117.5	1	55.6	3	2	1	1	1	10	C
360	Tana River	U-58	Garsen	100.0	1	0.0	4	78.2	4	1	1	2	2	15	A
		U-59	Hola	60.0	1	15.7	4	78.2	4	2	1	2	2	16	A
410	Embu	U-60	Embu	63.6	1	84.1	2	70.1	3	2	1	2	1	12	C
		U-61	Runyenjes	95.2	1	22.9	4	70.1	3	1	1	2	1	13	C
420	Isiolo	U-63	Kiuko	90.0	1	81.6	2	69.4	3	2	1	1	2	12	C
		U-64	Modo Gashe	-	2	0.0	4	69.4	3	1	1	1	1	13	B
		U-65	Merti	18.8	2	39.8	3	69.4	3	1	1	1	1	12	C
430	Kitui	U-68	Kitui	44.0	2	51.5	2	65.3	3	2	1	2	2	14	B
440	Machakos	U-69	Athi River	25.0	2	112.2	1	85.4	4	1	1	1	1	11	C
		U-71	Machakos	66.7	1	23.3	4	85.4	4	2	1	1	1	14	B
		U-74	Matuu	193.3	1	19.7	4	85.4	4	1	1	1	2	13	B
		U-77	Kangundo	47.4	2	16.5	4	85.4	4	1	1	1	2	15	A
		U-77	Tala	76.9	1	0.0	4	85.4	4	1	1	1	2	14	B
450	Marsabit	U-79	Kargi	105.2	1	15.3	4	62.1	3	1	1	1	2	13	B
		U-80	Korr	85.6	1	0.0	4	62.1	3	1	1	1	2	13	B
		U-82	Marsabit	70.5	1	5.3	4	62.1	3	2	2	1	2	15	A
		U-83	Moyale	50.0	2	4.7	4	62.1	3	1	1	1	1	13	B
		U-84	North Horr	25.8	2	6.4	4	62.1	3	1	1	1	1	13	B
		U-55	Sololo	65.8	1	2.5	4	62.1	3	1	1	1	1	12	C
460	Meru	U-86	Meru	19.2	2	214.7	1	54.9	3	2	1	2	2	13	B
		U-87	Nkubu	33.3	2	48.8	3	54.9	3	1	1	2	2	14	B
470	Nyambene	U-89	Maua	29.6	2	50.3	2	54.9	3	2	1	2	1	13	B
480	Tharaka Nithi	U-90	Chuka	94.5	1	32.2	3	71.1	3	2	1	1	1	12	C
490	Mwingi	U-91	Mwingi	80.0	1	15.8	4	65.3	3	2	1	2	2	15	A
4A0	Makueni	U-93	Kibwezi	-	2	0.0	4	75.9	4	1	1	1	1	14	B
		U-98	Mtito Andei	42.9	2	14.0	4	75.9	4	1	1	1	2	15	A
510	Garissa	U-104	Garissa	60.0	1	31.4	3	75.4	4	2	1	2	2	15	A
		U-105	Liboi	166.0	1	15.1	4	75.4	4	1	1	2	1	14	B
520	Mandera	U-108	Elwak	-	2	0.0	4	60.6	3	1	1	2	2	15	A
		U-109	Mandera	29.2	2	65.5	3	60.6	3	2	1	2	1	14	B
		U-110	Rhamu	50.0	2	33.0	4	60.6	3	1	1	2	2	15	A
530	Wajir	U-113	Bute	-	2	0.0	4	86.6	4	1	1	2	1	15	A
		U-114	Eldas	83.3	1	10.5	4	86.6	4	1	1	2	2	15	A
		U-116	Wajir	4.7	2	13.2	4	86.6	4	2	1	2	2	17	A
610	Gusii	U-117	Kisii	60.8	1	54.4	2	99.4	4	2	1	2	1	13	B
620	Kisumu	U-119	Ahero	3.3	2	0.0	4	81.3	4	1	1	2	1	15	A
		U-120	Kisumu	100.0	1	35.3	3	81.3	4	2	1	2	2	15	A
		U-121	Maseno	630.4	1	100.0	1	81.3	4	1	1	2	2	12	C
		U-122	Muhoroni	50.0	2	81.7	2	81.3	4	1	1	2	1	13	B
630	Siaya	U-123	Asembo	-	2	0.0	4	82.7	4	1	1	1	1	14	B
		U-125	Siaya	55.7	1	46.5	3	82.7	4	2	1	1	2	14	B

Table - 12.1(2/2) Ranking of Urban Centres for Implementation of Urban Water Supply Development

Code	District	Code	Name of Urban Scheme	1) Service Ratio		2) Supply Conditions		3) Health Condition		4) Industry & Commerce	5) Tourism	6) Affordability	7) Cost Efficiency	Overall Ranking	
				%	Rank	Production/ Demand	Rank	%	Rank					Total Score	Rank
640	Homa Bay	U-129	Homa Bay	113.4	1	19.0	4	87.9	4	2	1	1	2	15	A
		U-130	Kendu Bay	250.6	1	1.1	4	87.9	4	1	1	1	2	14	B
		U-131	Mbita	-	2	0.0	4	87.9	4	1	1	1	1	14	B
		U-133	Oyugis	397.6	1	1.8	4	87.9	4	1	1	1	2	15	B
650	Migori	U-134	Awendo	-	2	0.0	4	72.5	3	1	1	2	1	14	B
		U-135	Kehancha	42.2	2	5.4	4	72.5	3	1	1	2	1	14	B
		U-136	Migori	23.2	2	24.3	4	72.5	3	2	1	2	1	15	A
		U-137	Nyabikaye	-	2	0.0	4	72.5	3	1	1	2	1	14	B
		U-138	Rongo	85.0	1	56.0	2	72.5	3	1	1	2	1	13	C
660	Nyamira	U-139	Keroka	-	2		4	93.2	4	1	1	1	1	14	B
		U-140	Nyamira	42.5	2	19.5	4	93.2	4	2	1	1	2	16	A
710	Kajiado	U-141	Kajiado	55.6	1	64.2	2	72.3	3	2	1	2	1	12	C
		U-142	Magadi	100.0	1	97.2	2	72.3	3	1	1	2	2	12	C
		U-143	Namanga	33.5	2	54.0	2	72.3	3	1	1	2	1	12	C
		U-144	Ngong	13.3	2	149.7	1	72.3	3	1	1	2	1	13	C
		U-145	Loitokitok	152.6	1	51.3	2	72.3	3	1	1	2	2	12	C
		U-146	Ongata Rongai	45.0	2	96.8	2	72.3	3	1	1	2	1	12	C
720	Kipsigis	U-148	Kericho	100.0	1	65.0	2	68.7	3	2	2	2	2	14	B
		U-149	Kipkelion	7.5	2	22.9	4	68.7	3	1	1	2	1	14	B
		U-151	Londiani	22.2	2	30.3	3	68.7	3	1	1	2	1	13	B
		U-152	Sotik	-	2	0.0	4	68.7	3	1	1	2	1	14	B
730	Laikipia	U-153	Nanyuki	81.2	1	45.8	3	59.0	3	1	1	2	2	13	B
		U-154	Rumuruti	88.9	1	0.0	4	59.0	3	1	1	2	1	13	B
749	Nakuru	U-155	Elburgon	20.0	2	45.9	3	47.4	2	1	1	1	1	11	C
		U-156	Gilgil	100.0	1	66.8	2	47.4	2	1	1	1	1	9	C
		U-157	Molo	33.3	2	54.5	2	47.4	2	1	1	1	1	10	C
		U-158	Naivasha	95.8	1	11.7	4	47.4	2	1	1	1	2	12	C
		U-159	Nakuru	64.1	1	95.0	2	47.4	2	2	2	1	2	12	C
		U-160	Njoro	25.0	2	31.5	3	47.4	2	1	1	1	1	11	C
750	Narok	U-163	Narok	90.0	1	80.2	2	99.0	4	2	1	2	2	15	A
760	Trans Nzoia	U-164	Kitale	85.7	1	103.1	1	90.0	4	2	1	2	2	13	B
770	Uasin Gishu	U-165	Burnt Forest	36.2	2	200.6	1	86.6	4	1	1	2	1	12	C
		U-166	Eldoret	80.9	2	232.8	1	86.6	4	2	1	2	1	13	B
		U-167	Lemok	-	2	0.0	4	86.6	4	1	1	2	1	15	A
		U-169	Moi's Bridge	24.0	2	75.5	2	86.6	4	1	1	2	1	13	B
		U-170	Simat	-	2	0.0	4	86.6	4	1	1	2	1	15	A
		U-172	Turbo	53.3	1	88.9	2	86.6	4	1	1	2	1	12	C
790	Transmara	U-174	Kilgoris	80.0	1	1.7	4	99.0	4	2	1	2	1	15	A
810	Baringo	U-178	Elda Ravine	197.6	1	92.0	2	47.6	2	1	1	2	2	11	C
		U-179	Kabarnet	53.0	1	12.0	4	47.6	2	2	1	2	2	14	B
		U-180	Maji Mazuri	20.0	2	35.9	3	47.6	2	1	1	2	1	12	C
		U-181	Marigat	21.2	2	94.5	2	47.6	2	1	1	2	2	12	C
		U-182	Mogotio	33.3	2	102.6	1	47.6	2	1	1	2	1	10	C
820	Elgeyo Marakwet	U-183	Iten	14.6	2	164.7	1	47.0	2	2	1	2	1	11	C
830	Nandi	U-185	Kapsabet	35.0	2	110.8	1	84.6	4	2	1	1	1	12	C
840	Samburu	U-188	Maralal	15.2	2	179.8	1	89.1	4	2	3	1	1	12	C
		U-189	Wamba	100.0	1	13.4	4	89.1	4	1	1	1	2	14	B
850	Turkana	U-190	Kakuma T C	66.7	1	8.8	4	76.1	4	1	1	1	2	14	B
		U-191	Kalokol	40.0	2	2.7	4	76.1	4	1	1	1	1	14	B
		U-194	Lodwar	75.0	1	33.9	3	76.1	4	2	1	1	1	13	B
		U-195	Lokitaung	40.0	2	4.0	4	76.1	4	1	1	1	1	14	B
860	West pokot	U-197	Kapenguria	84.6	1	35.0	3	92.3	4	2	1	2	1	14	B
		U-198	Makutano	80.0	1	37.0	3	92.3	4	1	1	2	1	13	B
910	Bungoma	U-199	Bungoma	82.5	1	53.5	2	89.6	4	2	1	2	2	14	B
		U-200	Cheptais	-	2	0.0	4	89.6	4	1	1	2	2	16	A
		U-202	Kimilili	82.9	1	32.3	3	89.6	4	1	1	2	2	14	B
		U-203	Malakisi	-	2	0.0	4	89.6	4	1	1	2	1	15	A
		U-205	Webuye	76.9	1	31.3	3	89.6	4	1	1	2	2	14	B
920	Busia	U-206	Busia	34.5	2	89.1	2	74.1	3	2	1	1	2	13	B
		U-207	Malaba Town	-	2	0.0	4	74.1	3	1	1	1	1	13	B
		U-208	Nambale	35.2	2	89.1	2	74.1	3	1	1	1	1	11	C
930	Kakamega	U-209	Butere	138.7	1	38.7	3	80.0	4	1	1	2	2	14	B
		U-210	Kakamega	29.4	2	134.4	1	80.0	4	2	1	2	1	13	B
		U-211	Mumias	62.2	1	88.3	2	80.0	4	1	1	2	2	13	B
949	Vihiga	U-213	Maseno/Tavanda	95.8	1	12.8	4	93.2	4	1	1	2	2	15	A
		U-214	Mbale	4.4	2	32.6	3	93.2	4	1	1	2	2	15	A
		U-215	Vihiga Majengo	80.0	1	3.9	4	93.2	4	2	1	2	2	15	A

Note: (1) Nairobi and Mombasa are excluded from the above evaluation.

(2) "-" implies urban centers which have sufficient production capacity. Therefore, they are excluded from evaluatio

Table - 12.2 Ranking of Districts for Implementation of Rural Water Supply Development

Province	Code	District	1) Served Ratio		2) Water Shortage		3) Health Condition		4) Tourism	5) Affordability	6) Cost Efficiency	Overall Ranking	
			%	Rank	Time Spent	Rank	%	Rank	Rank	Rank	Rank	Total Score	Rank
Nairobi	110	Nairobi	96.1	1	5.4	1	67.4	3	2	2	-	-	-
Central	210	Kiambu	60.1	2	23.5	1	56.3	3	1	2	2	11	C
	220	Kirinyaga	74.1	2	20.5	1	64.3	3	1	1	2	10	C
	230	Muranga	79.8	1	18.6	1	48.1	2	1	2	2	9	C
	240	Nyandarua	63.0	2	21.7	1	41.7	2	1	2	2	10	C
	250	Nyeri	61.1	2	17.2	1	35.4	2	1	1	2	9	C
Coast	310	Kilifi	67.2	2	52.7	3	80.5	4	2	1	2	14	A
	320	Kwale	46.5	3	60.5	3	100	4	1	2	2	15	A
	330	Lamu	60.7	2	19.7	1	9.5	4	2	2	1	12	B
	340	Mombasa	95.4	1	16.5	1	96.8	4	2	2	1	11	C
	350	Taita	62.1	2	21.5	1	55.6	3	1	1	2	10	C
	360	Tana River	24.1	4	52.3	3	78.2	4	1	2	2	16	A
Eastern	410	Embu	53.8	2	35.3	2	70.1	3	1	2	1	11	C
	420	Isiolo	73.9	2	20.6	1	69.4	3	1	1	1	9	C
	430	Kitui	47.8	4	74.4	3	66.3	3	1	2	2	15	A
	440	Masaku	38.9	3	35.3	2	85.4	4	1	1	1	12	B
	450	Marsait	96.1	1	100.0	4	62.1	3	2	1	2	13	B
	460	Meru	62.5	2	46.1	2	54.9	3	1	2	1	11	C
	470	Nyambene	36.8	3	0.0	1	54.9	3	1	2	1	11	C
	480	Tharaka Nith	33.7	3	29.0	2	71.1	3	1	1	1	11	C
	490	Nwingi	18.9	4	0.0	1	65.3	3	1	2	2	13	B
	4A0	Makueni	17.9	4	56.3	3	75.9	4	1	1	1	14	A
North-Eastern	510	Garissa	58.3	2	37.6	2	75.4	4	1	2	1	12	B
	520	Mandera	31.3	3	85.3	4	60.6	3	1	2	1	14	A
	530	Wajir	64.3	2	90.2	4	86.6	4	1	2	2	15	A
Nyanza	610	Gusii	31.3	3	34.1	2	99.4	4	1	2	1	13	B
	620	Kisumu	65.5	2	18.7	1	81.3	4	1	2	1	11	C
	630	Siaya	31.1	3	46.3	2	82.7	4	1	1	1	12	B
	640	Homa Bay	26.0	3	43.7	2	87.9	4	1	1	2	13	B
	650	Migori	66.0	4	4.8	2	72.5	3	1	2	2	14	A
	660	Nyamira	43.0	3	38.8	2	93.2	4	1	1	2	13	B
Rift Valley	710	Kajiado	72.9	2	34.2	2	72.3	3	1	2	2	12	B
	720	Kipsigis	44.0	3	30.4	2	68.7	3	2	2	2	14	A
	730	Laikipia	29.3	3	25.2	2	59	3	1	2	1	12	B
	740	Nakuru	74.5	2	41.4	2	47.4	2	2	1	2	11	C
	750	Narok	26.0	3	47.4	2	99	4	1	2	2	14	A
	760	Trans Nzoia	39.6	3	15.7	1	90	4	1	2	1	12	B
	770	Uasin Gishu	58.4	2	0.0	1	86.6	4	1	2	2	12	B
	780	Bomet	29.6	3	36.4	2	45.5	2	1	2	1	11	C
	790	Transmara	11.0	4	0.0	1	99	4	1	2	2	14	A
	810	Baringo	53.3	2	50.8	3	47.6	2	1	2	2	12	B
	820	Elgeyo Marak	29.0	3	28.6	2	47	2	1	2	2	12	B
	830	Nandi	36.8	3	16.6	1	84.6	4	1	2	1	12	B
	840	Samburu	53.4	2	43.8	2	89.1	4	1	1	1	11	C
	850	Turkana	59.3	2	37.8	2	76.1	4	1	1	1	11	C
	860	West Pokot	27.6	3	41.5	2	92.3	4	1	2	1	13	B
Western	910	Bungoma	65.6	2	29.9	2	89.6	4	1	2	2	13	B
	920	Busia	66.6	2	6.8	2	74.1	3	1	1	2	11	C
	930	Kakamega	55.5	2	18.9	1	80	4	1	2	2	12	B
	940	Vihiga	60.5	2	39.0	2	93.2	4	1	2	2	13	B

Note:1) Non-served ratio for each district is obtained from the 1996 Project Status Reprot and/or Welfare Monitoring Survey.

2) Water shortage is considered as a facor of total time spent to collect water by people. Data are obtained from WMS.

3)&4) Data on Health Condition and affordability of the househols are results obtained from the Ousehold Survey condition in the course of current Study.

5) Ranking is made according to 100% - 75% : 4 75% - 50% : 3
50% - 25% : 2 25% - 0% : 1

Table - 12.3 Ranking of Districts for Implementation of Livestock Water Supply Development

Province	Code	District	Livestock Unit	Score by Rainfall	Score by Livestock Unit	Total Score	Overall Ranking
Nairobi	110	Nairobi	24,458	2	1	3	C
Central	210	Kiambu	72,665	2	1	3	C
	220	Kirinyaga	43,086	2	1	3	C
	230	Muranga	77,446	2	1	3	C
	240	Nyandarua	127,762	2	1	3	C
	250	Nyeri	77,907	2	1	3	C
Coastal	310	Kilifi	48,567	2	1	3	C
	320	Kwale	111,693	2	1	3	C
	330	Lamu	18,367	2	1	3	C
	340	Mombasa	3,511	2	1	3	C
	350	Taita	23,603	3	1	4	B
	360	Tana River	235,333	3	1	4	B
Eastern	410	Embu	82,456	2	1	3	C
	420	Isiolo	18,780	3	1	4	B
	430	Kitui	224,872	3	1	4	B
	440	Masaku	172,023	2	1	3	C
	450	Marsabit	165,067	3	1	4	B
	460	Meru	85,138	2	1	3	C
	470	Nyambene	73,585	2	1	3	C
	480	Tharaka Nithi	88,740	2	1	3	C
	490	Mwingi	108,421	2	1	3	C
	4A0	Makueni	1,330,357	3	2	5	A
North-Eastern	510	Garissa	1,109,528	4	2	6	A
	520	Mandera	253,290	4	1	5	A
	530	Wajir	435,328	4	2	6	A
Nyanza	610	Gusii	136,732	1	1	2	C
	620	Kisumu	181,744	2	1	3	C
	630	Siaya	195,656	2	1	3	C
	640	Homa Bay	109,801	2	1	3	C
	650	Migori	66,101	2	1	3	C
	660	Nyamira	122,243	2	1	3	C
Rift Valleey	710	Kajiado	461,684	2	2	4	B
	720	Kipsigis	104,957	1	1	2	C
	730	Laikipia	123,066	3	1	4	B
	740	Nakuru	1,109,094	2	2	4	B
	750	Narok	261,903	4	1	5	A
	760	Trans Nzoia	59,100	2	1	3	C
	770	Uasin Gishu	163,801	3	1	4	B
	780	Bomet	186,004	2	1	3	C
	790	Transmara	98,484	2	1	3	C
	810	Baringo	734,187	3	2	5	A
	820	Elgeyo Marakwet	39,128	2	1	3	C
	830	Nandi	163,190	2	1	3	C
	840	Samburu	196,019	2	1	3	C
	850	Turkana	135,419	3	1	4	B
	860	West Pokot	191,305	3	1	4	B
Western	910	Bungoma	134,429	2	1	3	C
	920	Busia	83,064	2	1	3	C
	930	Kakamega	196,664	1	1	2	C
	940	Vihiga	84,390	1	1	2	C
TOTAL			10,350,151				

Source: The Aftercare Study Team

Table - 12.4(1/2) Ranking of Sewerage Development Priorities among Urban Centres

	Province	Code	District	Code	Urban Centre	Water & Sanitation Developement in 1998			Water & Sanitation Developement in 2010			Incremental population requiring sewerage	Evaluation					
						Urban Population	Population connected to sewer	% of urban population connected to sewer	Urban Population	Population connected to sewer	% of urban population connected to sewer		Population with water supply connection not served by sewer	Incremental population requiring sewer services	Potential Health & Environmental Impact	Industrial potential	Tourism Potential	Total score
1	Coast	340	Mombasa	U-52	Mombasa	580,000	69,600	12%	736,000	368,000	50	298,400	3	3	2	3	3	14
2	Nairobi	110	Nairobi	U-1	Nairobi	2,240,000	1,000,000	45%	3,023,000	1,511,500	50	511,500	1	3	3	3	3	13
3	Nyanza	620	Kisumu	U-120	Kisumu	231,327	130,000	56%	561,029	280,514	50	150,514	2	2	2	3	3	12
4	Eastern	440	Masaku	U-71	Machakos	154,000	8,000	5%	407,822	203,911	50	195,911	3	2	3	2	1	11
5	Eastern	460	Meru	U-86	Meru	124,412	800	1%	337,437	168,718	50	167,918	3	2	3	2	1	11
6	Rift Valley	740	Nakuru	U-159	Nakuru	231,687	123,500	53%	760,237	380,119	50	256,619	2	2	2	2	3	11
7	Rift Valley	750	Narok	U-163	Narok	19,859	0	0%	77,231	19,347	25	19,347	3	1	3	0	3	10
8	Coast	310	Kilifi	U-40	Malindi	48,227	0	0%	134,152	53,661	40	53,661	3	1	2	1	3	10
9	Rift Valley	760	Trans Nzoia	U-164	Kitale	75,000	37,500	50%	229,328	114,664	50	77,164	1	1	3	3	2	10
10	Nyanza	610	Kisii	U-117	Kisii	65,000	13,000	20%	120,615	48,246	40	35,246	2	1	3	2	1	9
11	Rift Valley	740	Nakuru	U-158	Naivasha	60,000	30,000	50%	168,905	84,452	50	54,452	1	1	2	2	3	9
12	Central	230	Muranga	U-20	Maragua	39,411	0	0%	79,924	20,021	25	20,021	3	1	3	1	0	8
13	Central	210	Kiambu	U-8	Ruiru	32,302	0	0%	70,142	17,500	25	17,500	3	0	3	2	0	8
14	North Eastern	530	Wajir	U-116	Wajir	26,239	0	0%	66,062	16,500	25	16,500	3	0	3	0	2	8
15	Central	210	Kiambu	U-9	Thika	155,770	5,445	3%	190,350	95,175	50	89,730	3	1	1	3	0	8
16	Rift Valley	720	Kipsigis	U-148	Kericho	80,000	41,600	52%	152,522	76,261	50	34,661	1	1	3	2	1	8
17	Rift Valley	730	Laikipia	U-153	Nanyuki	55,000	24,750	45%	97,975	44,089	45	19,339	1	1	3	3	0	8
18	North Eastern	510	Garissa	U-1-4	Garissa	40,000	0	0%	115,126	46,051	40	46,051	3	1	3	0	0	7
19	Rift Valley	710	Kajiado	U-146	Ongata Longai	25,080	0	0%	81,185	20,337	25	20,337	3	1	3	0	0	7
20	Coast	310	Kilifi	U-38	Kilifi	20,555	0	0%	57,082	14,300	25	14,300	3	0	2	0	2	7
21	Rift Valley	240	Nyandarua	U-28	Nyahururu	60,000	18,000	30%	60,186	18,056	30	56	2	0	3	1	1	7
22	Western	910	Bungoma	U-205	Webuyo	60,000	12,000	20%	120,647	48,259	40	36,259	2	1	2	2	0	7
23	Coast	350	Taita Taveta	U-55	Voi	15,772	700	4%	35,159	8,800	25	8,100	3	0	1	1	2	7
24	Rift Valley	770	Uasin Gishu	U-166	Eldoret	220,000	70,400	32%	450,629	225,314	50	154,914	0	2	1	3	1	7
25	Central	250	Nyeri	U-36	Nyeri	142,000	37,100	26%	331,393	165,697	50	128,597	0	2	1	2	2	7
26	North Eastern	520	Mandera	U-109	Mandera	22,856	0	0%	51,680	12,900	25	12,900	3	0	3	0	0	6
27	Rift Valley	810	Baringo	U-179	Kabarnet	11,804	0	0%	32,363	8,100	25	8,100	3	0	3	0	0	6
28	Central	230	Muranga	U-21	Muranga	30,000	10,500	35%	62,635	21,980	35	11,480	2	0	3	1	0	6

Table - 12.4(2/2) Ranking of Sewerage Development Priorities among Urban Centres

	Province	Code	District	Code	Urban Centre	Water & Sanitation Developement in 1998			Water & Sanitation Developement in 2010			Incremental population requiring sewerage
						Urban Population	Population connected to sewer	% of urban population connected to sewer	Urban Population	Population connected to sewer	% of urban population connected to sewer	
29	Western	910	Bungoma	U-199	Bungoma	70,000	12,600	18%	114,086	45,634	40	33,034
30	Western	920	Busia	U-206	Busia	48,000	9,600	20%	103,635	41,454	40	31,854
31	Eastern	420	Isiolo	U-63	Isiolo	26,968	1,700	6%	83,440	20,902	25	19,202
32	Rift Valley	830	Nandi	U-185	Kapsabet + Baraton	20,000	4,000	20%	44,693	11,200	25	7,200
33	Nyanza	640	Homa Bay	U-129	Homa Bay	75,000	15,000	20%	71,860	18,000	25	3,000
34	Central	250	Nyeri	U-33	Karatina	7,299	5,109	70%	19,471	13,630	70	8,521
35	Eastern	410	Embu	U-60	Embu	45,000	9,000	20%	92,214	23,100	25	14,100
36	Western	930	Kakamega	U-210	Kakamega	110,000	27,826	25%	202,516	101,258	50	73,432
37	Rift Valley	710	Kajiado	U-144	Ngong	15,000	750	5%	41,207	10,300	25	9,550
38	Eastern	440	Masaku	U-69	Athi River	50,000	12,500	25%	48,441	12,110	25	-390
39	Central	210	Kiambu	U-4	Kiambu	7,500	2,250	30%	21,356	6,407	30	4,157
40	Central	210	Kiambu	U-6	Limuru	3,000	2,100	70%	4,347	3,043	70	943

Evaluation					
population with water supply connection not served by sewer	Incremental population requiring sewer services	Potential Health & Environmental Impact	Industrial potential	Tourism Potential	Total score
2	1	2	1	0	6
1	1	3	1	0	6
3	1	1	0	1	6
2	0	3	0	0	5
2	0	3	0	0	5
2	0	2	1	0	5
2	0	1	2	0	5
0	1	1	2	1	5
3	0	1	0	0	4
1	0	3	0	0	4
2	0	1	0	0	3
0	0	0	2	0	2

Evaluation Factors					
% of population with water supply connection not served by sewer	Population requiring sewer services	Potential Health & Environmental Impact	Industrial potential	Tourism Potential	Rating
<25%	P<20,000	nil	nil	nil	0
25 to 50%	20,000< P <100,000	Minor impact on water environment	low	low	1
50 to 75%	100,000< P <300,000	Serious impact on sensitive ecosystem	medium	medium	2
>75%	P>300,000	Contamination of drinking water source	high	high	3

Table - 13.1 Selection of Priority Urban Water Supply Rehabilitation Works

Code	District	Code	Name of Urban Schemes	Water Undertaker	Metered Connection		Operation		Chlorine Dosage		Overall
					%	Evaluation	Operation Hour (h)	Evaluation	Daily or not	Evaluation	Evaluation
210	Kiambu	U-3	Karuri	Municipal Council of Karuri		3	24	1		2	6
320	Kwale	U-46	Msambweni	MWR		3	13	3	Daily	1	7
330	Lamu	U-47	Lamu	MWR		3	15	3		2	8
360	Tana River	U-58	Garsen	MWR		3		3	Daily	1	7
		U-59	Hola	MWR		3	8	3	Daily	1	7
440	Masaku	U-77	Kangundo	Kangundo-Tala Town Council	72%	2	15	3	Daily	1	6
450	Marsabit	U-82	Marsabit	MWR	95%	1	18	2	Daily	1	4
490	Mwingi	U-91	Mwingi	MWR	6%	3		3	Twice a week	2	8
500	Makueni	U-98	Mtito Andei	MWR	94%	1	24	1		2	4
510	Garissa	U-104	Garissa	MWR	33%	3		3	Daily	1	7
520	Mandera	U-110	Rhamu	Local Community		3		3	Daily	1	7
530	Wajir	U-113	Bute	MWR		3	18	2		2	7
		U-114	Eldas	MWR		3	18	2		2	7
		U-116	Wajir	MWR		3		3	Daily	1	7
620	Kisumu	U-119	Ahero	Ahero Catholic Church		3		3		2	8
		U-120	Kisumu	Kisumu Municipal Council	97%	1	24	1	Daily	1	3
640	Homa Bay	U-129	Homa Bay	MWR	99%	1	16	2	Daily	1	4
650	Migori	U-136	Migori	MWR	54%	3		3	Daily	1	7
710	Kajiado	U-141	Kajiado	NWCPC	32%	3		3	Daily	1	7
750	Narok	U-163	Narok	Narok Municipal Council	89%	1	24	1	Daily	1	3
790	Transmara	U-174	Kilgoris	MWR		3	16	2	Daily	1	6
910	Bungoma	U-200	Cheptais	MWR		3		3	0	2	8
940	Vihiga	U-213	Maseno/Luanda	MWR	43%	3		3	0	2	8
		U-214	Mbale			3	18	2		2	7
		U-215	Vihiga/Majenge	MWR	76%	1	12	3	0	2	6

Note: (1) Nairobi and Mombasa are excluded from the above evaluation.
Source: The Aftercare Study Team, 1998

Table – 13.2 Preliminary Scope of Priority Rehabilitation Works for Urban Water Supply Projects

Code	Name of Urban Scheme	Production Capacity (m^3/day)	Scope of Rehabilitation Works						Estimated Rehabilitation Cost (US$1,000)
			(1)	(2)	(3)	(4)	(5)	(6)	
U-3	Karuri	624			X		X	X	88
U-46	Msambweni	624			X	X	X	X	142
U-47	Lamu	575			X	X	X	X	117
U-58	Garsen	100	X	X	X	X	X		57
U-59	Hola	228	X	X	X	X	X	X	105
U-77	Kangundo	441			X	X	X	X	95
U-91	Mwingi	300	X	X	X	X	X	X	145
U-104	Garissa	1,440	X	X	X	X	X	X	353
U-110	Rhamu	140			X	X	X	X	46
U-113	Bute	202			X	X	X		54
U-114	Eldas	65			X	X	X		36
U-116	Wajiri	48			X	X	X		38
U-119	Ahero	23				X	X		33
U-136	Migori	960			X	X	X	X	184
U-141	Kajiado	2,000		X	X	X	X	X	533
U-174	Kilgoris	864	X	X	X	X	X	X	249
U-200	Cheptais	2,400	X	X	X	X	X	X	505
U-213	Maseno/Luanda	1,192	X	X	X	X	X	X	309
U-214	Mbale	960			X	X	X	X	114
U-215	Vihiga/Majengo	63			X	X	X	X	41
Total		10,080							3,244

Note: (1) Intake facilities, (2) Treatment works, (3) Storage tanks, (4) Pipeline, (5) Master meters, and (6) Chlorine dosing equipment.

Source: The Aftercare Study Team

Table - 13.3 Priority Project Assessment for Urban Water Supply Development

Code	District	Code	Urban Centre	1995 Population	Studies to Date	Operational Body	Status of On-going Project	Production Capacity of the Existing Schemes	Production Capacity to be Expanded	Proposed Water Source	Environ. Impact	Overall Assessment
210	Kiambu	U - 3	Kiruri	18,716	design	Municipal Council	No funding identified for expansion	624	4,025	-	none	B
320	Kwale	U - 4	Msambweni	7,247	none	MWR	No funding identified for expansion	624	5,223	Msambweni Dam	none	A
360	Tana River	U - 5	Garsen	4,232	design	MWR	No funding identified for expansion	100	4,329	Tana River	none	B
		U - 5	Hola	12,853	design	MWR	No funding identified for expansion	228	3,756	Tana River	none	B
440	Masaku	U - 7	Tala+Kangundo	14,656	none	Town Council	No funding identified for expansion	441	7,050	Borehole	none	A
490	Mwingi	U - 9	Mwingi	5,469	none	MWR	Kiambere Water Supply by TARDA will serve in 1999	300	4,829	Tana River	none	C
4A0	Mikueni	U - 10	MiltoAndei	4,938	none	MWR	No funding identified for expansion	3,000	3,748	Borehole	none	B
520	Mandera	U - 10	Elwak	8,087	under construction	Community	ongoing	0	1,869	Borehole	none	B
		U - 11	Rhamu	5,144	under construction	Community	ongoing	140	4,027	Borehole	none	B
530	Wajir	U - 11	Bute	2,543	none	MWR	No funding identified for expansion	202	573	Borehole	none	C
		U - 11	Eldas	2,242	none	MWR	No funding identified for expansion	65	1,652	Borehole	none	B
		U - 11	Wajir	26,239	none	MWR	No funding identified for expansion	48	9,104	Borehole	none	A
620	Kisumu	U - 11	Ahero	11,661	none	MWR	No funding identified for expansion	23	102	Borehole	none	C
		U - 12	Kisumu	231,327	F/S by JICA	Municipal Council	JICA study completed F/S. No funding identified for next stage	14,565	60,750	Victoria Lake, Awach river, Sondu & Kibos river	none	A
640	Homa Bay	U - 12	Homa Bay	30,995	none	MWR	No funding identified for expansion	1,500	12,024	Boreholes	none	A
650	Migori	U - 13	Migori	14,913	design	MWR	No funding identified for expansion	960	1,361	River /Borehole	none	B
660	Nyamira	U - 14	Nyamira+Kebirigo	7,130	design	MWR	No funding identified for expansion	466	4,763	Boreholes	none	B
750	Narok	U - 16	Narok	19,859	none	Municipal Council	No funding identified for expansion	1,315	9,558	Boreholes	none	A
770	Uasin Gishu	U - 16	Lemok	4,405	none	none	No funding identified for expansion	0	1,627	-	none	B
		U - 17	Simat	7,717	none	none	No funding identified for expansion	0	3,015	-	none	B
790	Transmara	U - 17	Kolgoris	7,665	none	MWR	No funding identified for expansion	864	3,022	-	none	B
910	Bungoma	U - 20	Mawalie Malakisi	3,119	none	MWR	No funding identified for expansion	0	1,215	River	none	B
940	Vihiga	U - 21	Luanda	4,246	none	MWR	No funding identified for expansion	1,192	23,571	-	none	A
		U - 21	Mbale	3,672	design	MWR	No funding identified for expansion	950	6,281	-	none	A
		U - 21	Vihiga/Majengo	5,274	design	MWR	No funding identified for expansion	63	4,281	-	none	B

Note: "Production capacity to be expanded" implies water deficit to be expected in 2010 after completion of the ongoing project (under construction). It is assumed that the urban center with the required capacity more than 5,000m3/day considered urgent.

Source: The Aftercare Study Team

Table - 13.4 Preliminary Scope of Priority Expansion Urban Water Supply Projects

Code	Urban Centre Name	Planned/Designed Project							Newly Proposed Project									Rehabilitation Works		
		Name	Source of Water	Design Population	Supply Capacity (m^3/day)	Source of Funds	Management Agency	Cost (US10^3)	Name	Planned Population Served	Production Capacity (m^3/day)	Production of Capacity to be Expanded (m^3/day)	Water Source	Treatment Process	Storage Tank Capacity (m^3)	Length of Distribution Pipes (km)	Cost (US10^3)	Water Undertaker	Augmented Capacity (m^3/day)	Cost (US10^3)
U-46	Masambweni								Mkurumuji R.	20,800	5,900	4,937	S	F	2,600	37	3,796	MOWR	286	142
U-77	Kangundo/Tala								Athi R. pipe	37,800	7,500	6,885	S	F	3,500	51	5,309	Kangundo-Tala Town Council	165	95
U-116	Wajir								B/H	66,100	9,200	9,088	G	C	4,700	68	9,608	MOWR	10	38
U-120	Kisumu								Kibos D.	561,000	75,100	60,750	D	F	30,200	436	77,257	Kisumu Municipal Council	0	1,172
U-129	Homa Bay								L. Victoria	71,900	13,500	11,524	S	F	6,000	87	8,257	MOWR	500	363
U-163	Narok								U. Narok D.	77,200	10,900	9,558	D	F	4,700	69	27,242	Narok Municipal Council	0	249
U-213	Maseno/Lunnda								Edzawa R.	11,100	25	23,174	S	F	11,700	170	15,331	MOWR	397	309
U-214	Mbale	Mbale III	River	106,000	22,501	GOK	MLRRWD	982.0											240	114
Total				106,000	22,501			982.0		845,900	122,125	125,916			63,400	918	146,800		1,604	2,482

Note: S ... Surface Water, G ... Groundwater, D ... Impounded Dam, F ... Full Treatment, C ... Chlorination

Source: The Aftercare Study Team

Table - 13.5 Project Assessment for Rural Water Supply

Province	Code	District	1995 Population Served by RWS	1995 Non-served	Production Deficit in 2010 (m^3/day)	Overall Assessment
Coastal	310	Kilifi	300	240	14,018	A
	320	Kwale	203	252	12,333	A
	360	Tana River	22	126	974	B
Eastern	430	Kitui	76	401	5,112	B
	4A0	Makueni	145	732	7,892	B
North-eastern	520	Mandera	54	153	6,358	B
	530	Wajir	145	63	1,635	B
Nyanza	650	Migori	29	580	19,571	A
Rift Valley	720	Kipsigis	209	348	21,151	A
	750	Narok	77	253	15,941	A
	790	Transmara	13	164	10,641	A

Note: Nonserved popualtion more than 100,000 and production deficit more than 10,000 m^3/day are considered to have higher prority.

Table - 13.6 Preliminary Scope of Priority Rural Water Supply Projects

Code	District	Large Scale Water Supply														
		Planned/Designed									Newly Proposed Project				Rehabilitation	
		Name	Supply Capacity (m^3/day)	Source of Funds	Management Agency	Design Population	Source of Water	COST (Kshs)		Cost (US$10^3)	Name	Nos	Supply Capacity (m^3/day)	Cost (US$10^3)	Augmented Capacity (m^3/day)	Cost (US$10^3)
310	Kilifi	Mariani/Palakumi	201			5,500				38					805	1,290
		Magarini Settlement	3,823			98,600	River Water			982						
320	Kwale	Coast ASAL Prog.	1,300	IFRD	C.ASAL	65,000	Rain Water	367,390	120,259	120					828	645
		Matumbi	400		MLRRWD			500,000	163,666	164						
		Samburu Vigurungani	300		MLRRWD			500,000	163,666	164						
		Vyongwani wp	150		MLRRWD			150,000	49,100	49						
		Aga Khan Prim Health Care	200		A.Khan/MLRRWD			N/E								
650	Migori	Muhuru	1,422		MLRRWD			500,000	163,666	164					136	322
		Isabenia W/P	300		GOK			500,000	163,666	164						
		Kegonga W/P	60		Instit.			420,000	137,480	137						
720	Kipsigis	Kotabmat	3,183		P/C			400,000	130,933	131					33	645
		Kipsitet	2,652		P/C			750,000	245,499	245						
		Soin	10,017		NWCPC			14,282,750	4,675,205	4,675						
		Litein Phase II	2,652		MLRRWD			475,000	155,483	155						
		Nyakach Ext.	5,644		MLRRWD			357,500	117,021	117						
		Lelu/Kimologit	5,029		MLRRWD											
750	Narok	Naroosura Irr. Prj.	340		Community			268,800	87,987	88	LS-1	6	5,975	9,395	686	1,935
											LS-2	1		2,801		
790	Transmara										LS-1	8	7122	12,526	3,519	645,003
											LS-2	1		2,801		

Code	District	Small Scale Rural Water Supply												
		Planned/Designed									Newly Proposed Project			
		Name	Supply Capacity (m^3/day)	Source of Funds	Management Agency	Design Population	Source of Water	COST (Kshs)		Cost (US$10^3)	Name	Nos	Supply Capacity (m^3/day)	Cost (US$10^3)
310	Kilifi	Nyari	74		MLRRWD	4,382		31,000	10,147	10	SS-1	1,726	13,804	3,417
		Ng'ombeni	140		MLRRWD	1,600		35,000	11,457	11	SS-2	690		1,366
320	Kwale	Kanango Dam	64	GOK/RDF	MLRRWD	1,000	Run-off River	105,000	34,370	34	SS-1	1,486	11,883	2,942
		Gulanze Dam	300	GOK/RDF	MLRRWD	100	Rain Water	1,000,000	327,332	327	SS-2	594		1,176
		Mwaluphesa Rock Catch.	80	RDF	MLRRWD	2,000	Rain Water	130,000	42,553	43				
650	Migori	Ongo Health Centre	5	GOK/COMM	MOH/Community	500	Borehole	100,000	32,733	33	SS-1	2437	19,486	4,825
		Nyaroba W/P	25		Instit.	500	Springs	20,000	6,547	7	SS-2	974		1,929
		Kegunga II/S	25		Instit.	300	Springs	10,000	3,273	3				
		Masaba W/P	30		P/C	300	Dam	20,000	6,547	7				
720	Kipsigis	Tugunon	285	P/C	P/C	3,800	Spring/Dam	N/A			SS-2	1,009	20,199	1,998
		Teldet	188	P/C	P/C	2,500	River	N/A						
750	Narok	Mosiro Pans	320		MLRRWD			140,000	45,827	46	SS-1	375	2,987	743
		Leshuta W/P	95		Community			12,500	4,092	4	SS-2	149		295
		Nkinyeni W/P	113		Community			27,900	9,133	9				
		Iltumutum Pan	5,000		Community			21,786	7,131	7				
		Kijijirijit	96		Community			18,000	5,892	6				
790	Transmara	Oldonyo Rasha	500		P/C			100,000	32,733	33				
		Nakuiyana W/P	400		P/C			80,000	26,187	26				
		Poroko W/P	300		P/C			750,000	245,499	245				
		Murkan W/P	500		P/C			7,500	2,455	2				
		Soget W/P	400		P/C			70,000	22,913	23				
		Shankoe W/P	450		P/C			100,000	32,733	33				
		Lolgorien W/S	200		MLRRWD			125,000	40,917	41				
		Angata Baragoi w/s	150		MLRRWD			150,000	49,100	49				

NOTE: LS-1 : Large Scale Rural Water Supply (5,000 Population Scale)
LS-2 : Large Scale Rural Water Supply (20,000 Population Scale)
SS-1 : Small Scale Rural Water Supply (200 Population Scale)
SS-2 : Small Scale Rural Water Supply (500 Population Scale)

Table - 13.7 Preliminary Scope of Priority Livestock Water Supply Projects

Province	Code	District	Supply Capacity for Livestock (m^3/day)	Livestock Water Demand in 2010 (m^3/day)	Required New Water Supply for Livestock by 2010 (m^3/day)	Number of Water Pans Required by 2010 (Nos)	Required Water Supply Period by Water Pans	Construction Cost (1,000US$)
Eastern	4A0	Makueni	53,214	74,963	21,749	79	6 months	2,410
North-Eastern	510	Garissa	44,381	62,520	18,138	98	9 months	2,989
	520	Mandera	10,132	14,272	4,141	23	9 months	702
	530	Wajir	17,413	24,530	7,117	39	9 months	1,190
Rift Valley	750	Narok	10,476	14,758	4,282	16	6 months	488
	810	Baringo	29,367	41,370	12,002	44	6 months	1,342
Total			164,984	232,412	67,429	299		9,121

Source: Calculated by the Aftercare Study Team

Table – 13.8 Priority Project Assessment for Sewerage Development

Code	Urban Center	Studies to Date	Sanitation Conditions	Status of On-going Project	Health & Environment Benefits	Importance to viability of tourism	Overall Assess-ment
U - 52	Mombasa	F/S	Contamination of drinking water supply, impact on reef and beaches	No funding commitment for design and construction	High	High	A
U - 1	Nairobi	M/P	Good coverage except in slum areas, treatment plants performing well despite overload	World Bank actively involved	Medium	Low	C
U - 120	Kisumu	F/S	Treatment works polluting Lake Victoria, high level of industrial pollutant.	JICA completing F/S, no funding identified for next phase	High	Medium	A
U - 71	Machakos	M/P	Treatment works overloaded, polluting surface waters used for drinking.	No funding identified for next stage	High	Low	A
U - 86	Meru	F/S	Adequate on-site sanitation is available. Existing sewage works is overloaded but capacity can be restored by removing sludge.	On-going water supply project will probably include sanitation improvements	Medium	Low	B
U - 159	Nakuru	M/P and F/S	Treatment works are operating under design capacity	New treatment works recently completed but sewer reticulation required	High	Medium	C
U - 163	Narok	nil	Wastewater drainage is affecting surface water used for drinking. On-site sanitation is inadequate.	No funding identified for sewerage development	High	High	A
U - 164	Kitale	nil	Treatment works are operating under design capacity	GTZ is strengthening water management	Medium	Low	C
U - 40	Malindi	M/P	On-site sanitation is inadequate.	No funding identified for sewerage development	High	High	A

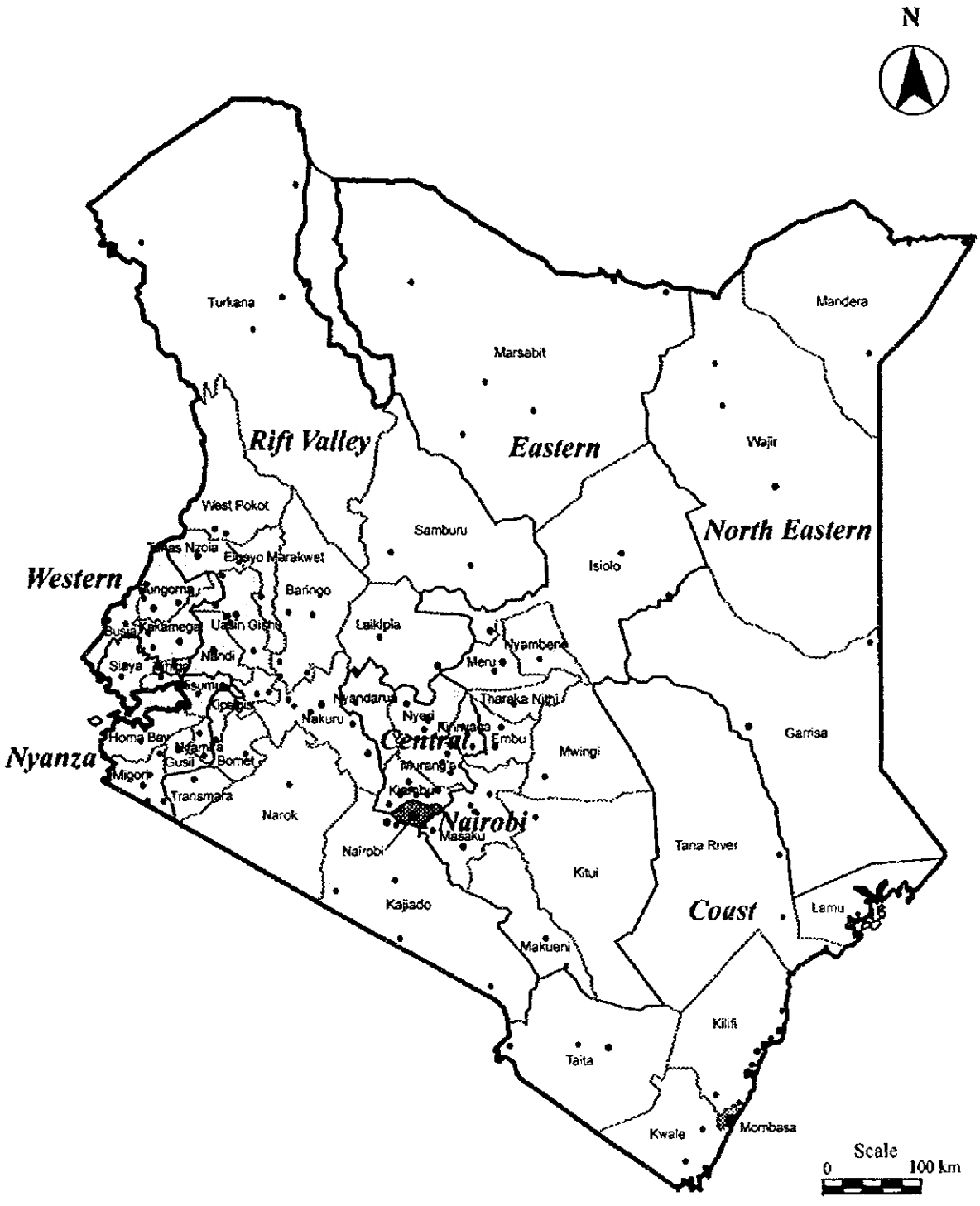
Note: A = Highest priority, B = intermediate priority, C = lower priority

Table - 13.9 Preliminary Scope of Priority Sewerage Projects

Code	Urban Name	Name of Treatment Works	Population Connected to Sewer in 1998	Target Population Connected to Sewer in 2010	Existing Treatment Works Capacity (m^3/day)	Dry Weather Flow 2010 (m^3/day)	Previously Proposed or On-going Projects			New Projects - Treatment Works				New Projects - Sewer Reticulation		
							Scope	Treatment Capacity (m^3/day)	Cost (US$)	Build New Facility	Expand Existing Facility	Rehabilitation	Cost (US$)	New construction or Expand	Rehabilitation	Cost (US$)
U-52	Mombasa	Chengamwe	69,600	368,000	0	95,827	New treatment works under construction	17,100	unavailable	-	Increase treatment capacity for future requirement	none	48,225,000	Incremental population connected to sewer =298,400 (person); extend sewer network up to full treatment capacity at Chengamwe	Replacements Existing 25% small Dai. pipe. Cleaning=All main trunk	5,884,000
		Kizingo			0		Abandon existing facility and provide primary treatment facility on North Mainland	18,848	57,000,000		none	none	0			11,936,000
U-120	Kisumu	Conventional serving central WTD	130,000	280,514	6,800	52,176	JICA Feasibility Study Phase 1 project	14,600	14,234,000	none	none	none	0	none	none	0
		Nyalenda Ponds serving eastern WTD			10,855			18,000		JICA Master Plan Phase 2 Project New Otongolo Ponds in Western District 29,400 m^3/day	JICA Master Plan Phase 2 Project increase capacity by 12,500 m^3/day	none	3,939,000	JICA Master Plan Phase 2 Project New Western District	none	19,000,000
U-72	Machakos	Ponds	8,000	203,911	2,000	37,927	Master plan proposed in 1985	35,927	3,750,000 (1985 prices)	Provide new treatment facilities in accordance with existing wastewater master plan	none	none	3,372,000	Incremental population connection to sewer =195,911 (person); extend sewer network after more treatment capacity is available	Replacemmennt= Existing 25% small dia. pipe. Cleaning=All main trunk Pumping satation	904,000
U-163	Narok	None	0	19,345	0	3,598	none	0	0	Provide new waste stabilisation ponds	none	none	1,044,000	Provide sewer reticulation	none	1,708,000
U-40	Malindi	None	0	53,661	0	9,981	Master plan proposed in 1994	12,580	9,700,000 (1994 prices)	Provide new treatment facilities in accordance with existing wastewater master plan.	none	none	4,000,000	Provide sewer reticulation in accordance with existing wastewater master plan	none	6,000,000
Total Cost of On-going Projects(US$)[1]									71,234,000	Total Cost (US$)			60,580,000	Total Cost (US$)		45,432,000
										Total Cost of New Projects (US$) [1]						106,012,000

Notes: (1) Donor/GOK funding not yet committed

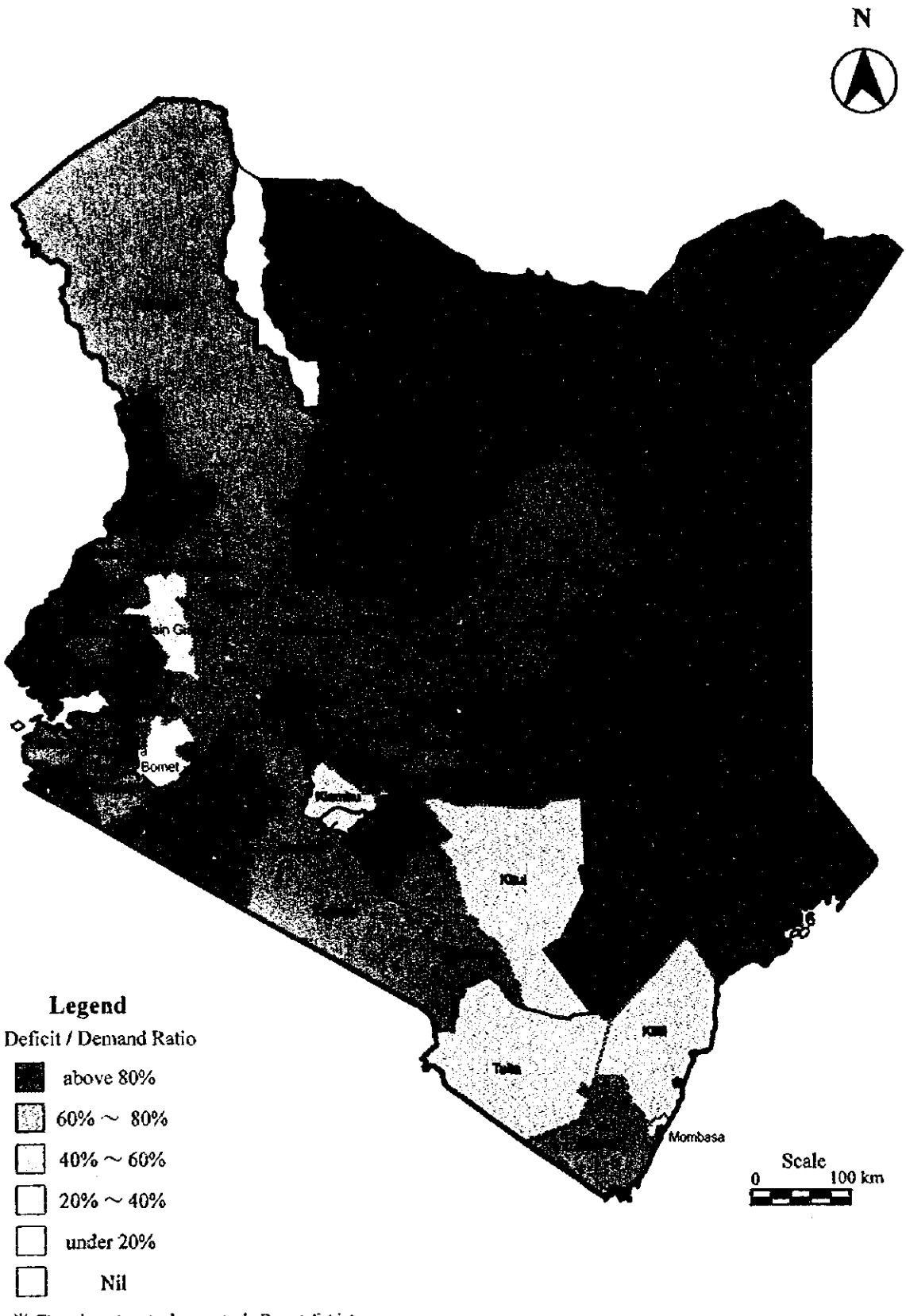
FIGURES



Legend

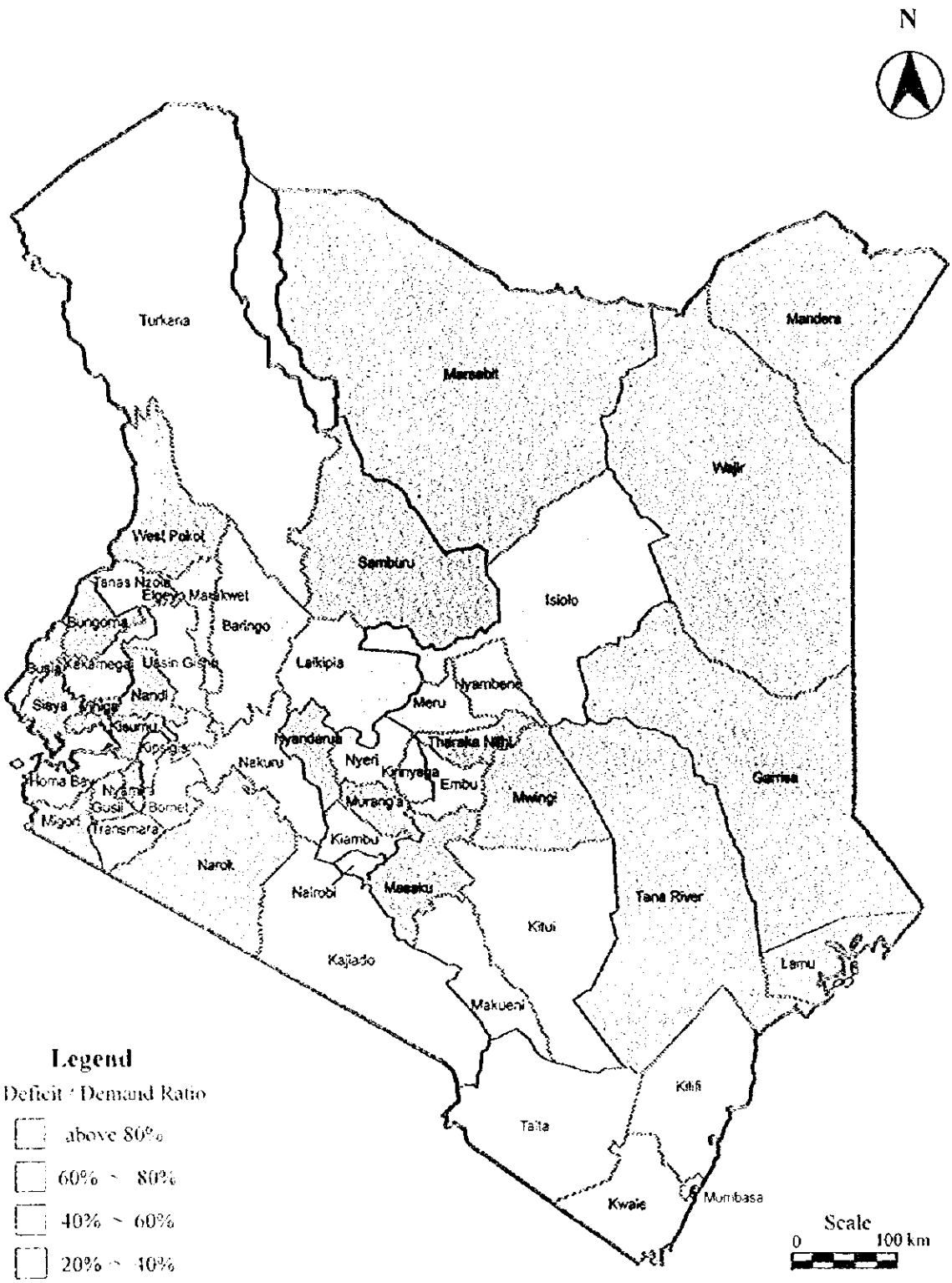
- • : Urban centres (112 nos.) subject to urban water supply development planning
- • : Urban centers (29 nos.) subject to urban water supply and sewerage development planning
- • : Urban center (1 no.) subject to sewerage development planning
- Turkana : District (50 nos.) subject to rural water supply planning

THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN	**Figure - 1.1** **Objective Areas for the Aftercare Study**
JAPAN INTERNATIONAL COOPERATION AGENCY	

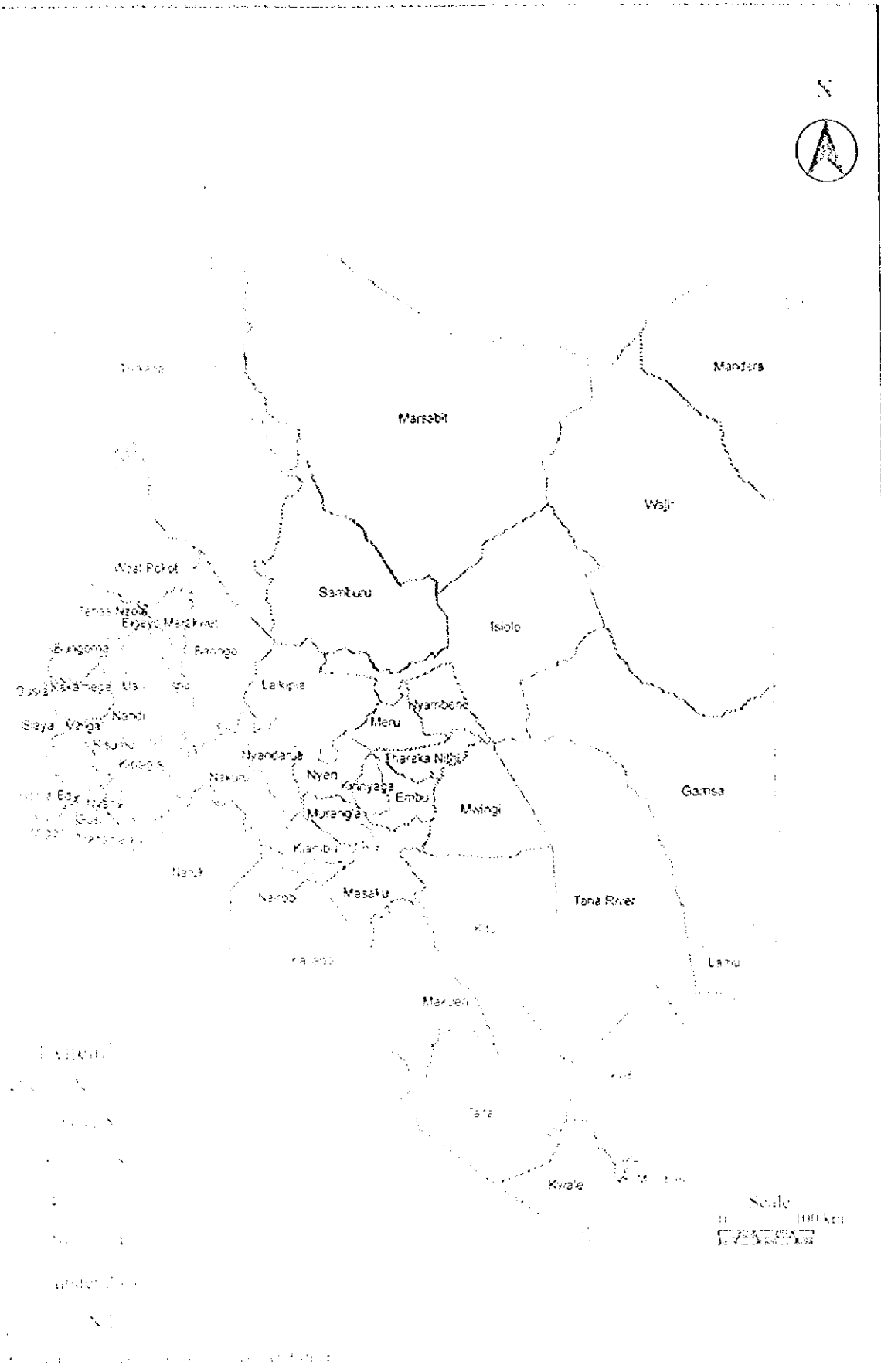


※ There is no target urban center in Bomet district.

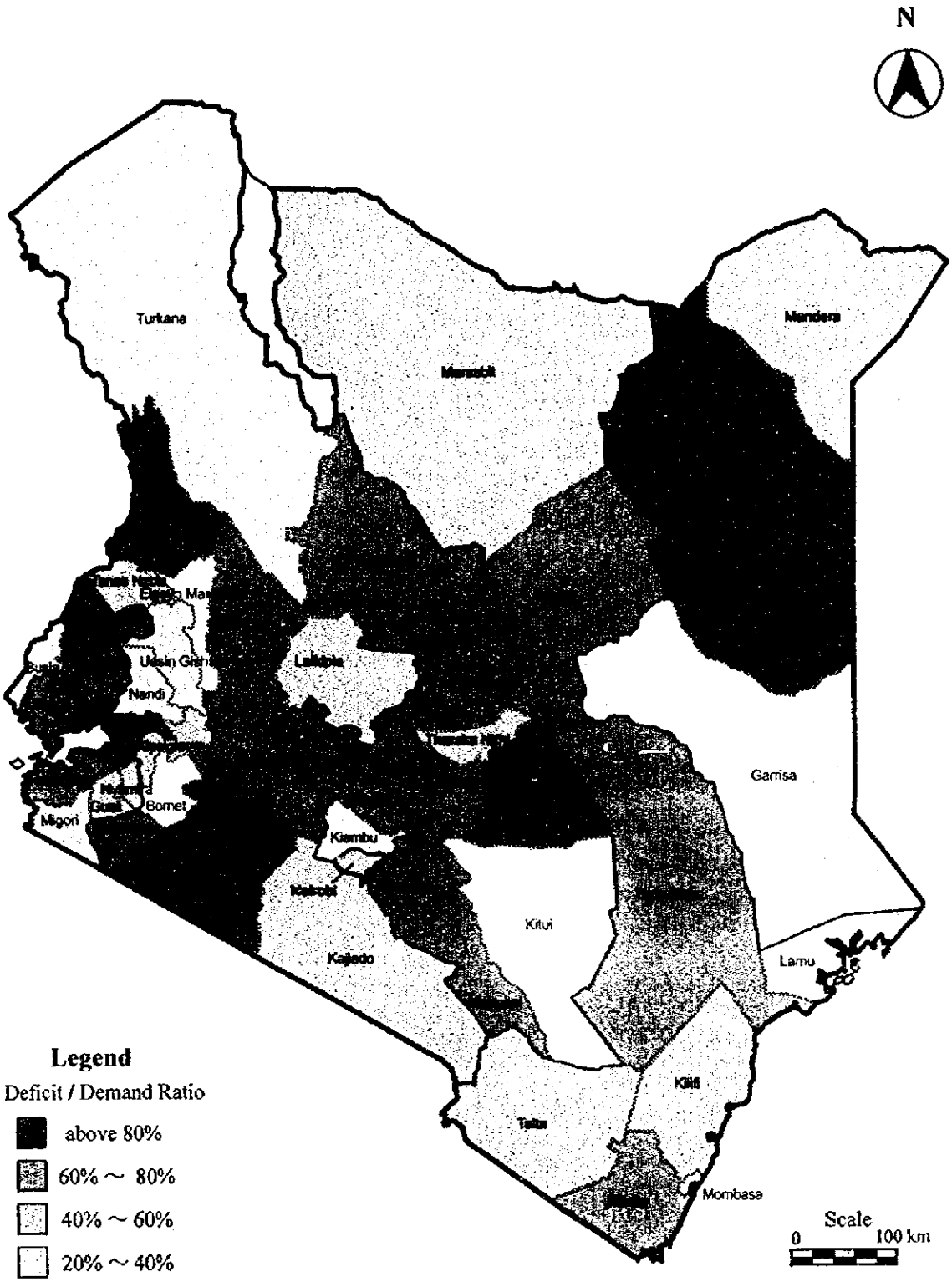
THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN	**Figure - 6.1 Urban Water Supply Water Deficit in 2010 Under Step 1**
JAPAN INTERNATIONAL COOPERATION AGENCY	



THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN	**Figure - 6.1**
JAPAN INTERNATIONAL COOPERATION AGENCY	**Urban Water Supply** **Water Deficit in 2010 Under Step 1**

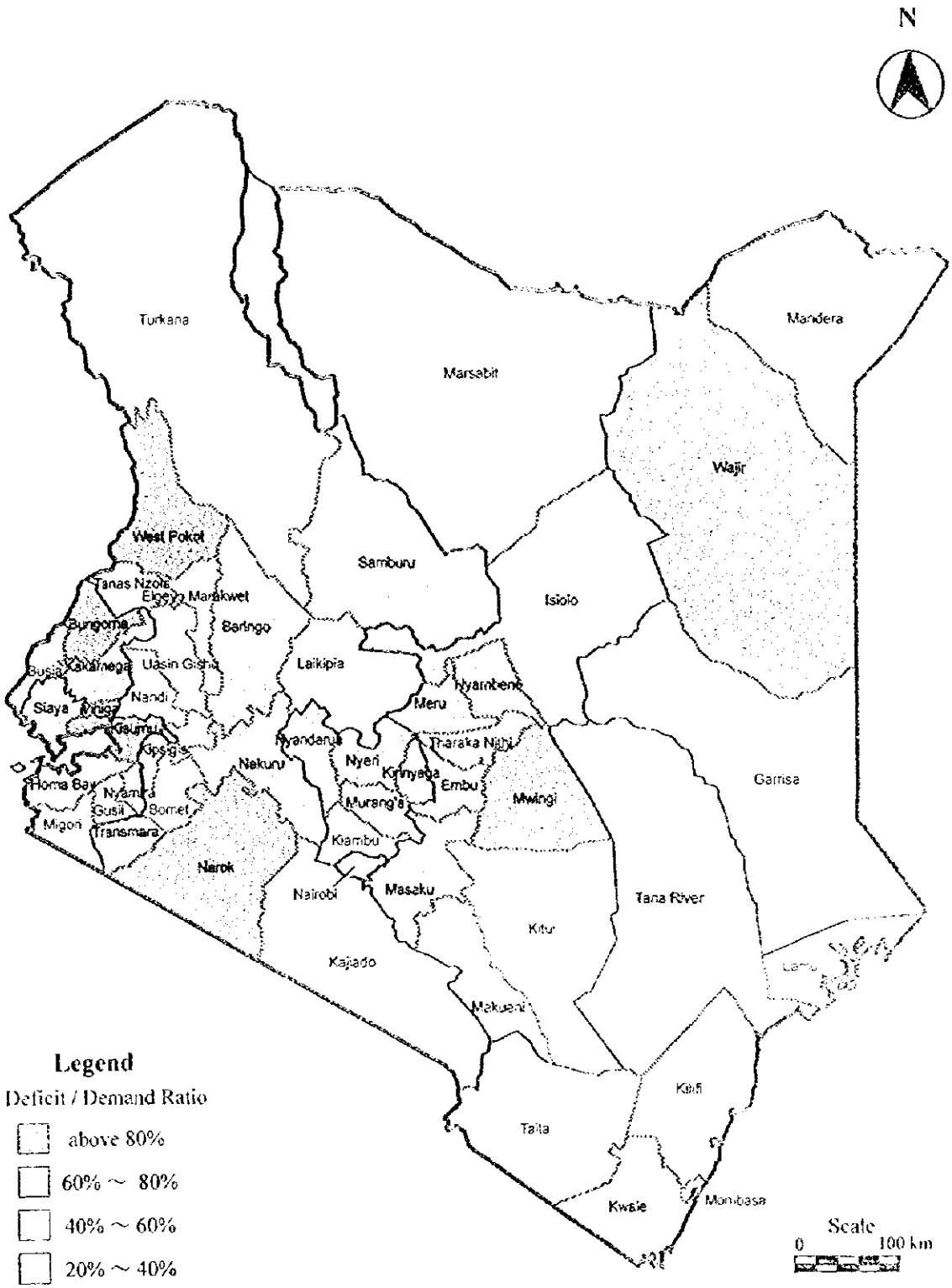


THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure - 6.1** **Urban Water Supply** **Water Deficit in 2010 Under Step 1**



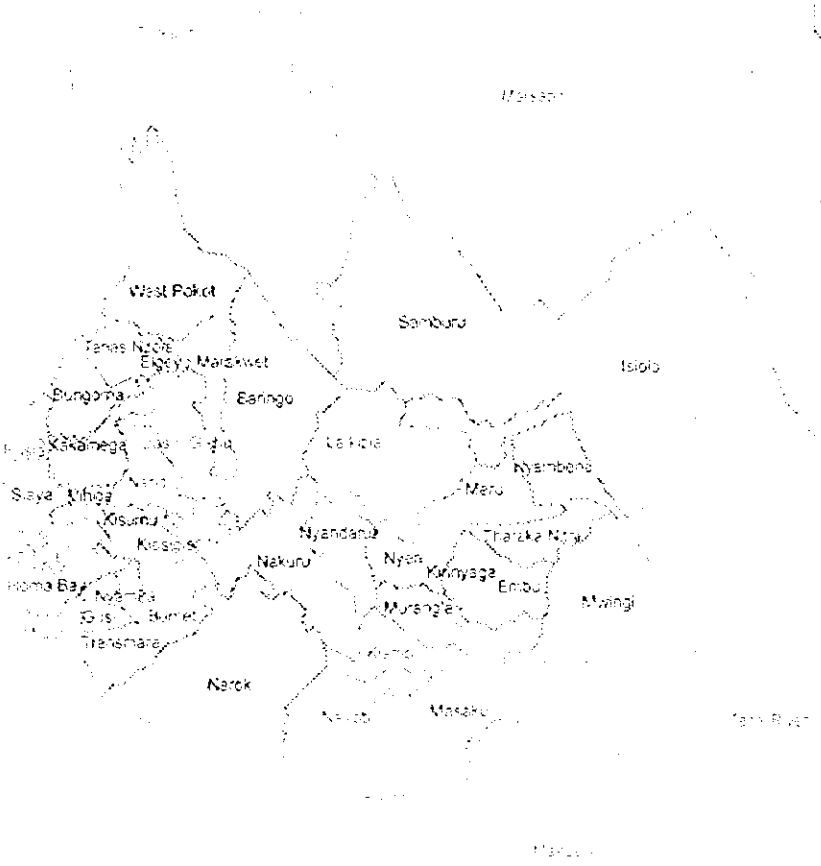
※1 There is no target urban center in Bomet district.
※2 With completion of the on-going projects, the planned/designed projects and the proposed rehabilitation works

THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure - 6.2** **Urban Water Supply** **Water Deficit in 2010 Under Step 4**



※1 There is no target urban center in Bomet district.
※2 With completion of the on-going projects, the planned/designed projects and the proposed rehabilitation works

THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure - 6.2** **Urban Water Supply** **Water Deficit in 2010 Under Step 4**



Legend

Deficit / Demand Ratio

above 80%

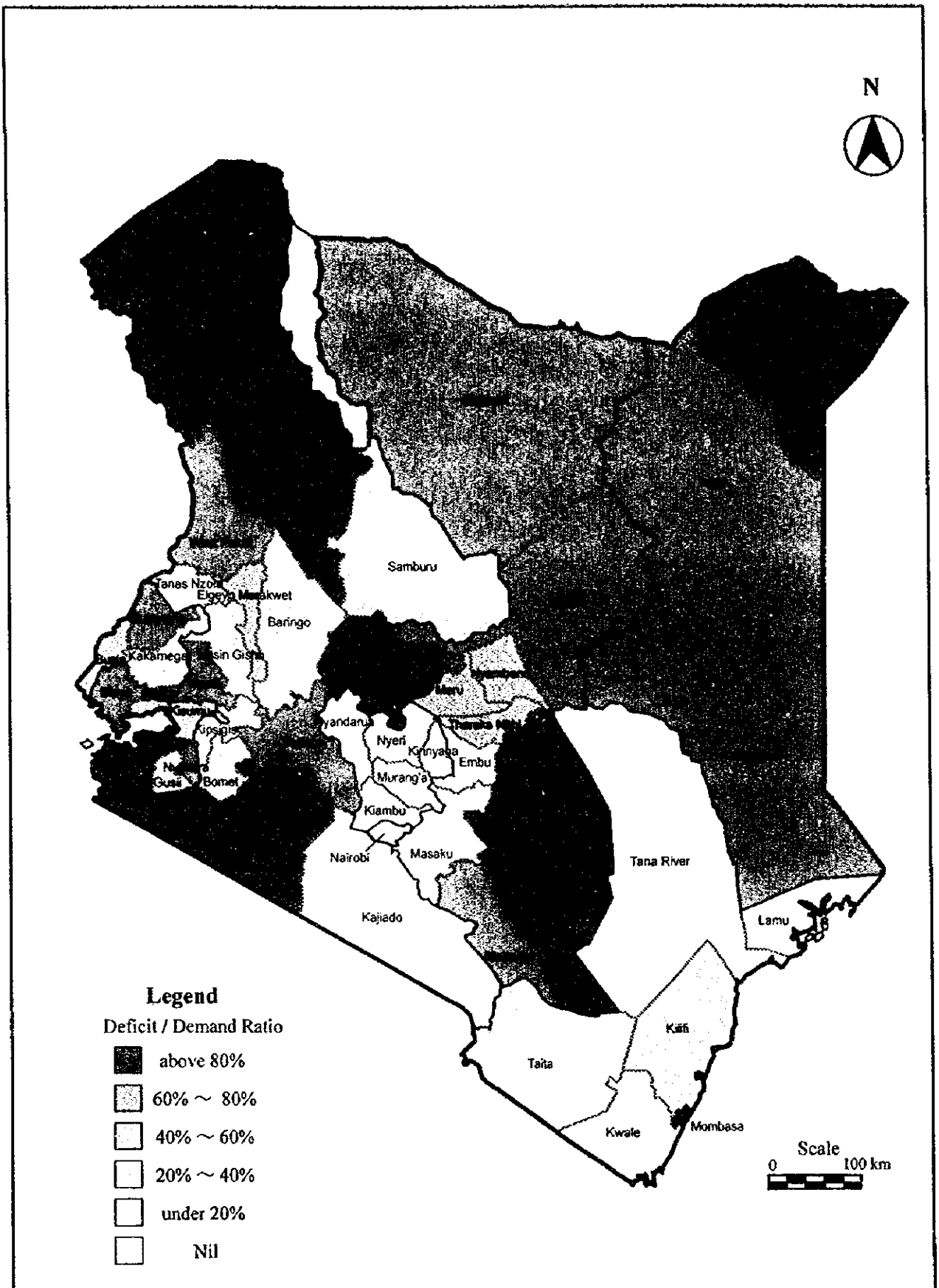
40% ~ 80%

20% ~ 40%

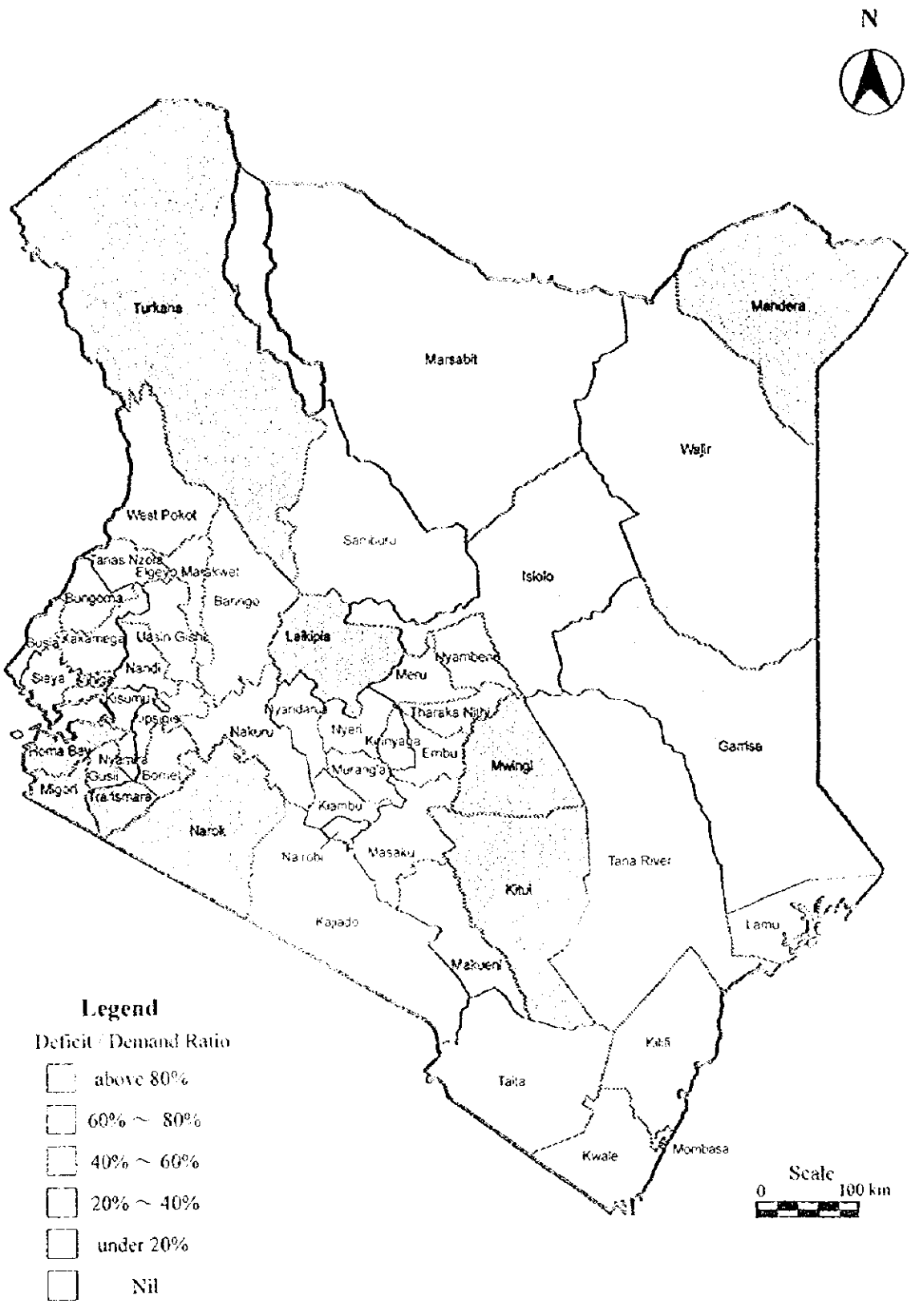
under 20%

Nil

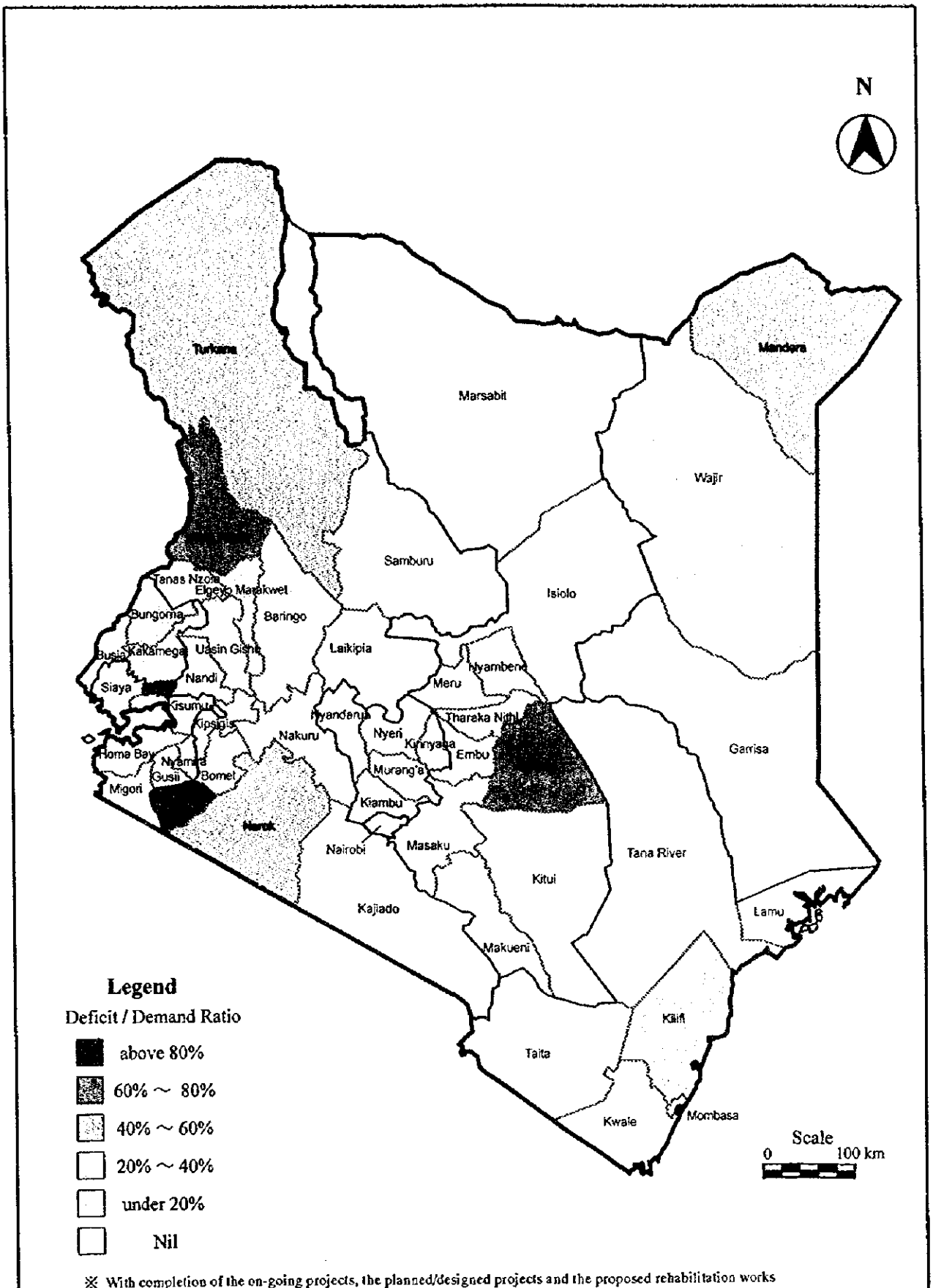
THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN JAPAN INTERNATIONAL COOPERATION AGENCY	Figure - 6.2 Urban Water Supply Water Deficit in 2010 Under Step 4



THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN	**Figure - 6.3 Large Scale Rural Water Supply Water Deficit in 2010 Under Step 1**
JAPAN INTERNATIONAL COOPERATION AGENCY	

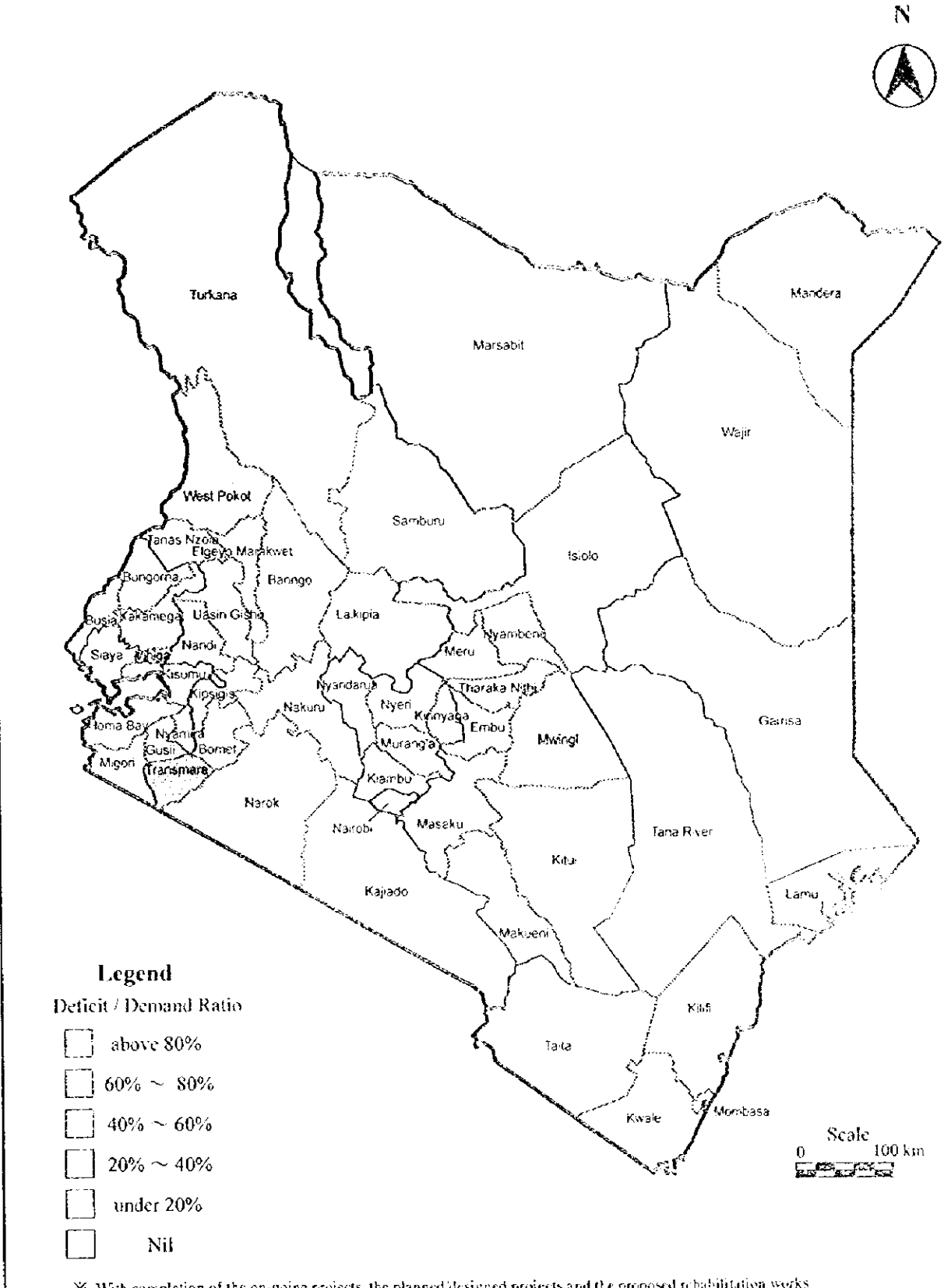


THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure - 6.3** **Large Scale Rural Water Supply** **Water Deficit in 2010 Under Step 1**



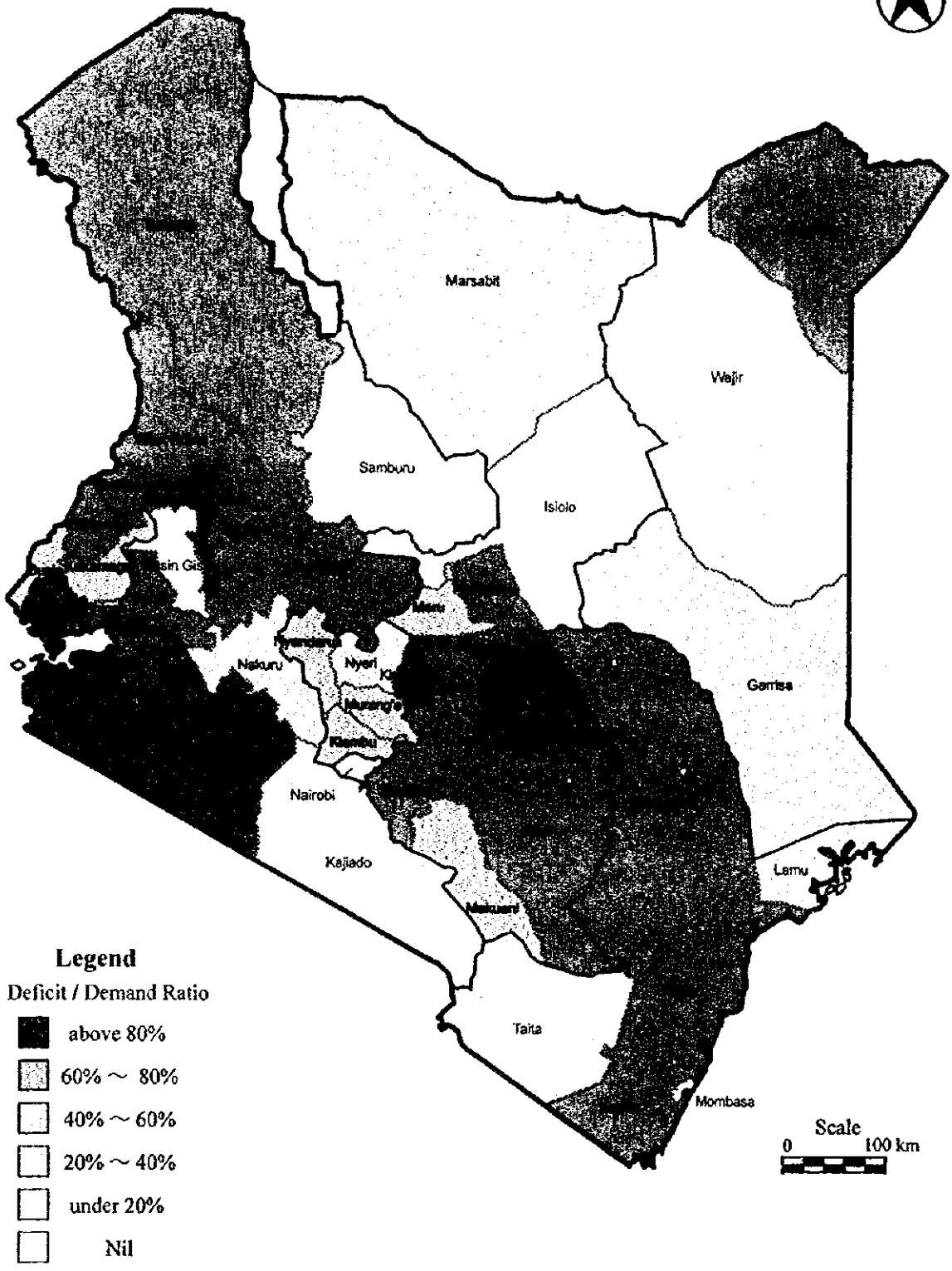
※ With completion of the on-going projects, the planned/designed projects and the proposed rehabilitation works

THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN	**Figure - 6.4 Large Scale Rural Water Supply Water Deficit in 2010 Under Step 4**
JAPAN INTERNATIONAL COOPERATION AGENCY	

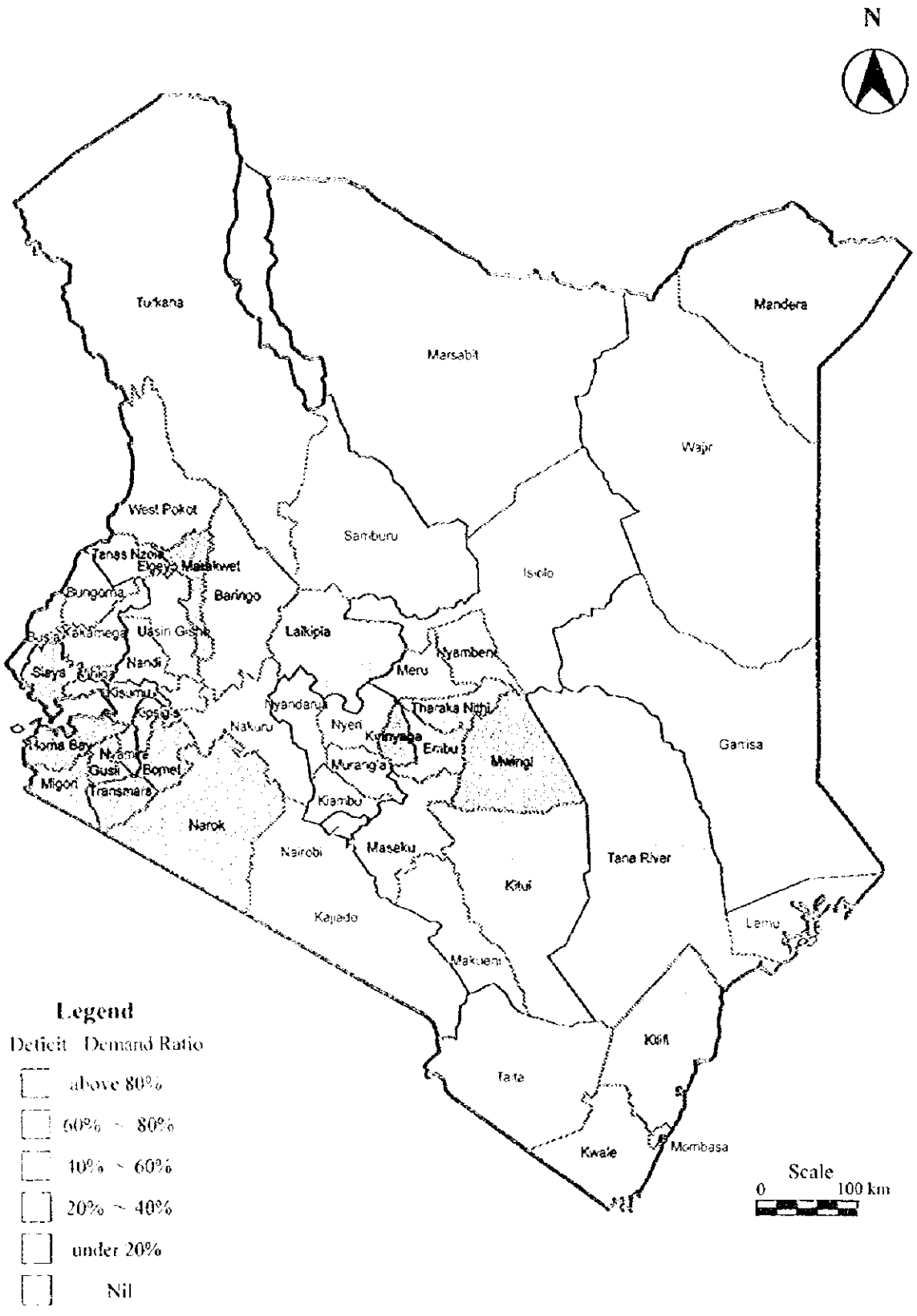


※ With completion of the on-going projects, the planned/designed projects and the proposed rehabilitation works

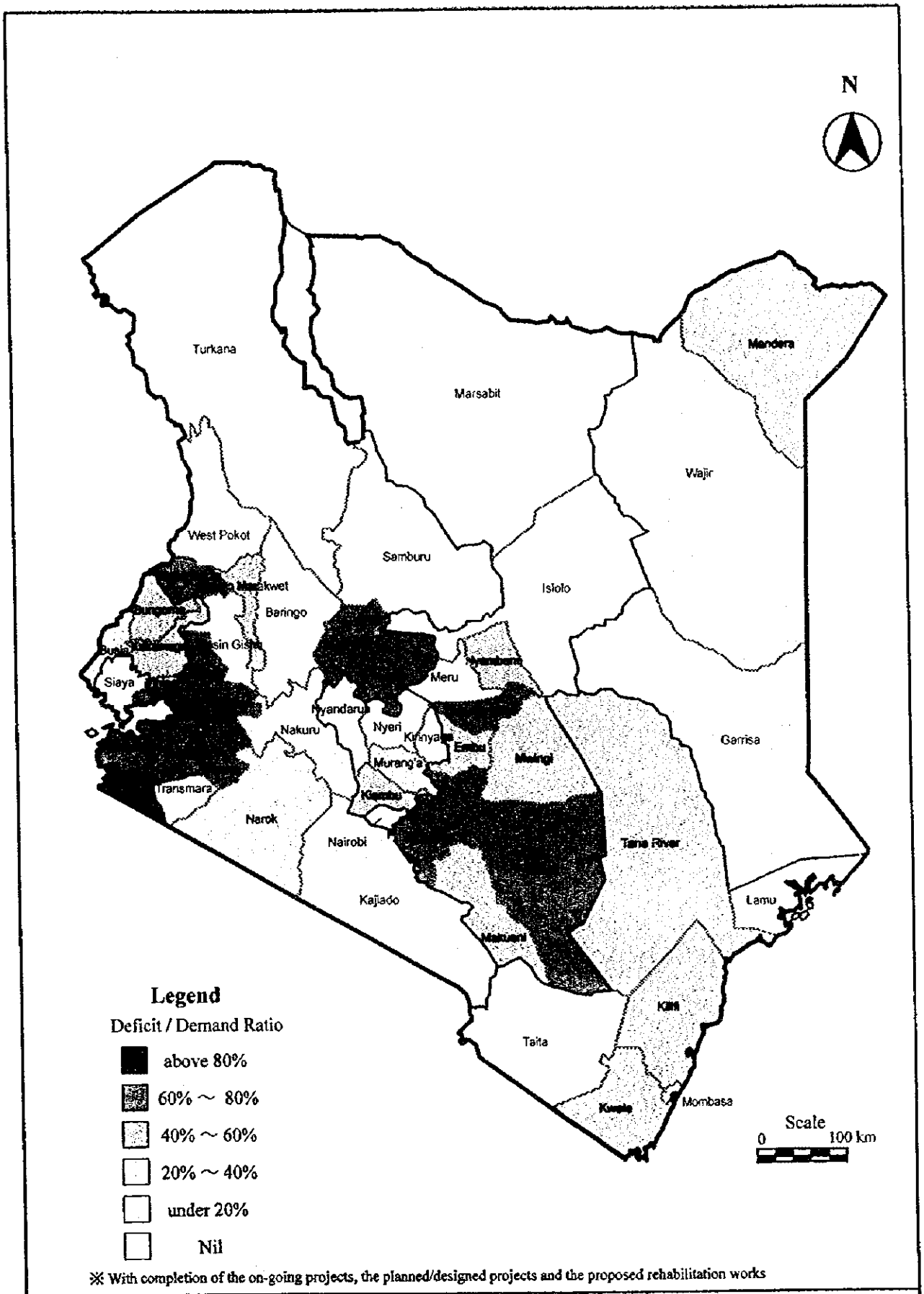
THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure - 6.4** **Large Scale Rural Water Supply** **Water Deficit in 2010 Under Step 4**



THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN	**Figure - 6.5 Small Scale Rural Water Supply Water Deficit in 2010 Under Step 1**
JAPAN INTERNATIONAL COOPERATION AGENCY	

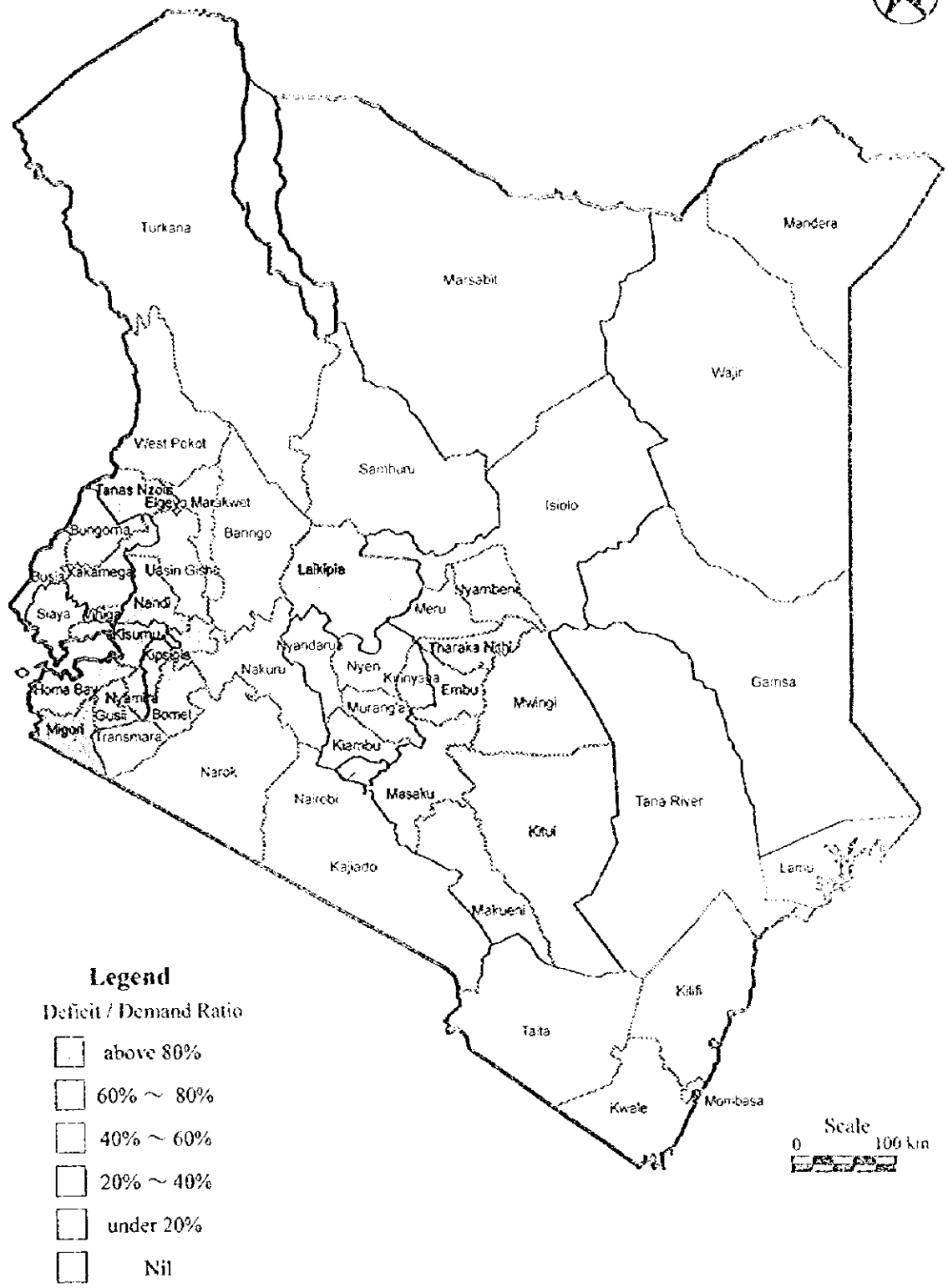


THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure - 6.5** **Small Scale Rural Water Supply** **Water Deficit in 2010 Under Step 1**



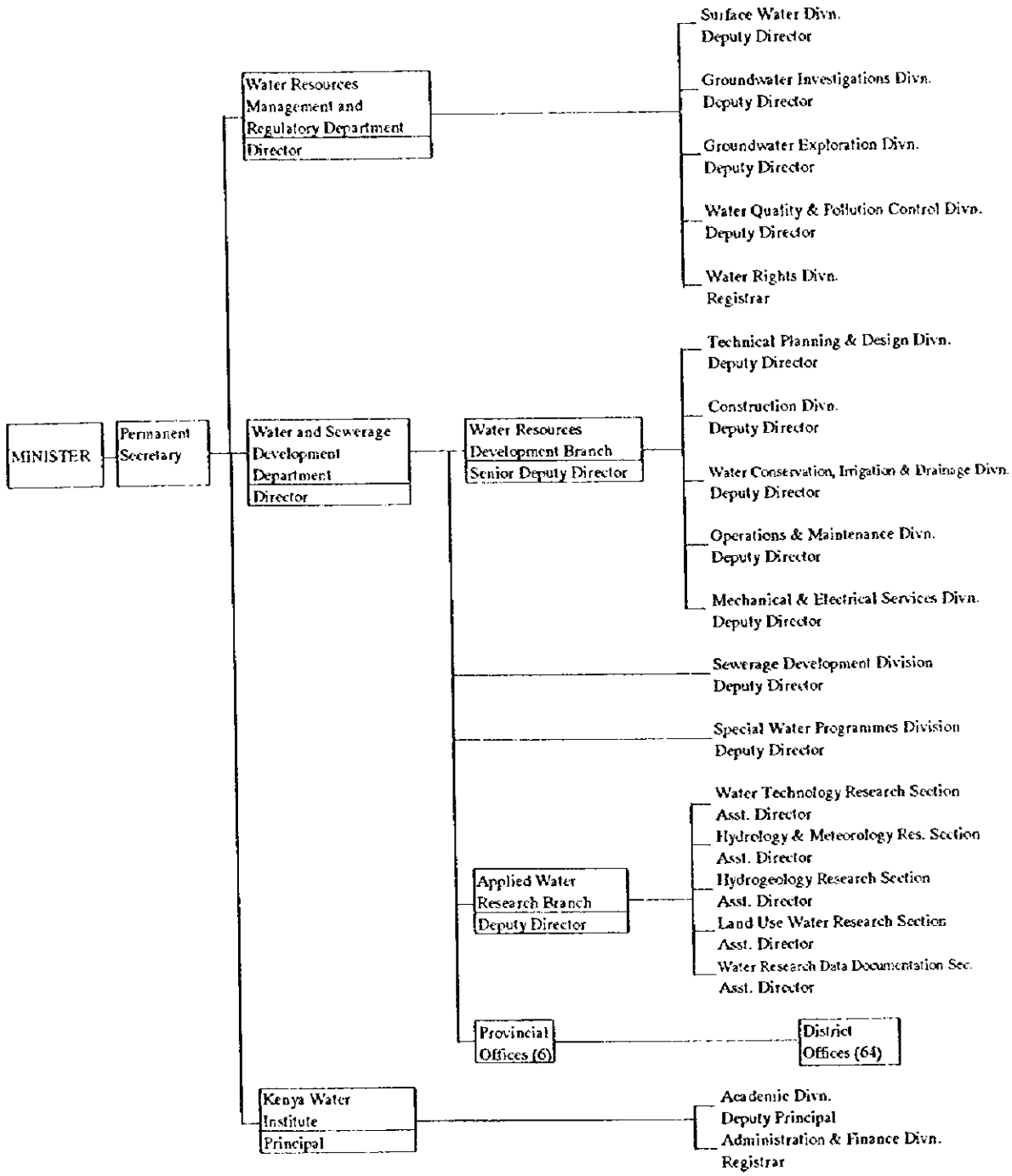
※ With completion of the on-going projects, the planned/designed projects and the proposed rehabilitation works

THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure - 6.6** **Small Scale Rural Water Supply** **Water Deficit in 2010 Under Step 4**



※ With completion of the on-going projects, the planned/designed projects and the proposed rehabilitation works

THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN	**Figure - 6.6** **Small Scale Rural Water Supply** **Water Deficit in 2010 Under Step 4**
JAPAN INTERNATIONAL COOPERATION AGENCY	



THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN

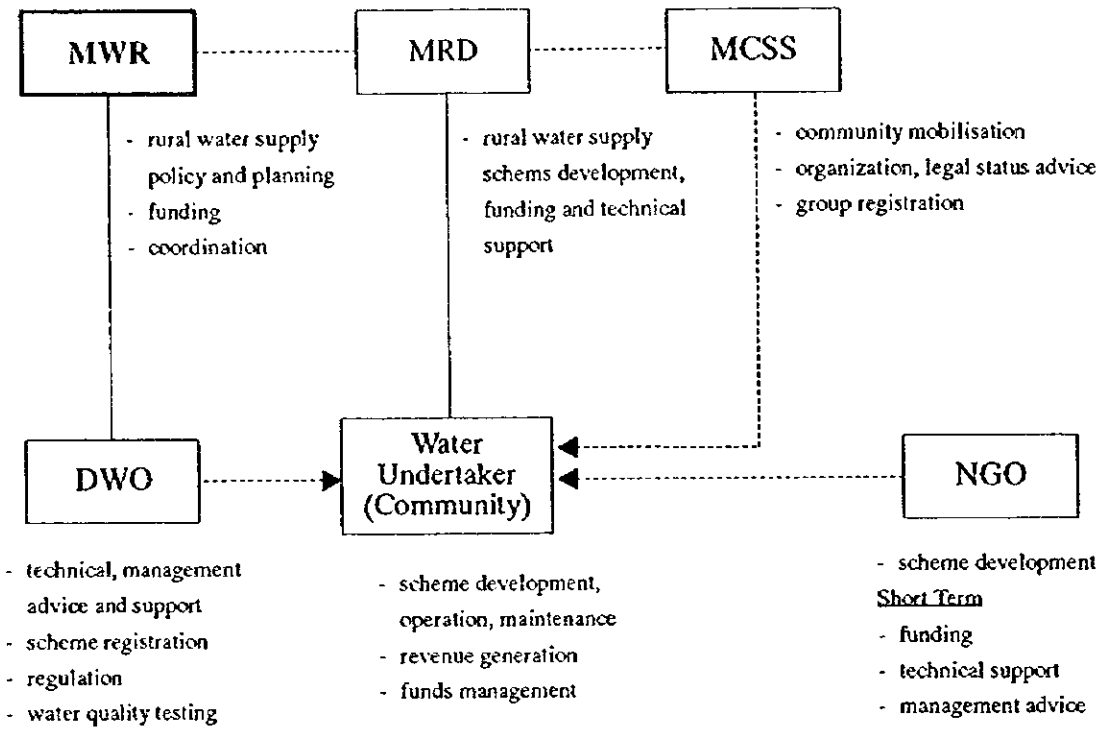
JAPAN INTERNATIONAL COOPERATION AGENCY

Figure - 11.1
Ministry of Water Resources

THE AFTERCARE STUDY ON
THE NATIONAL WATER MASTER PLAN

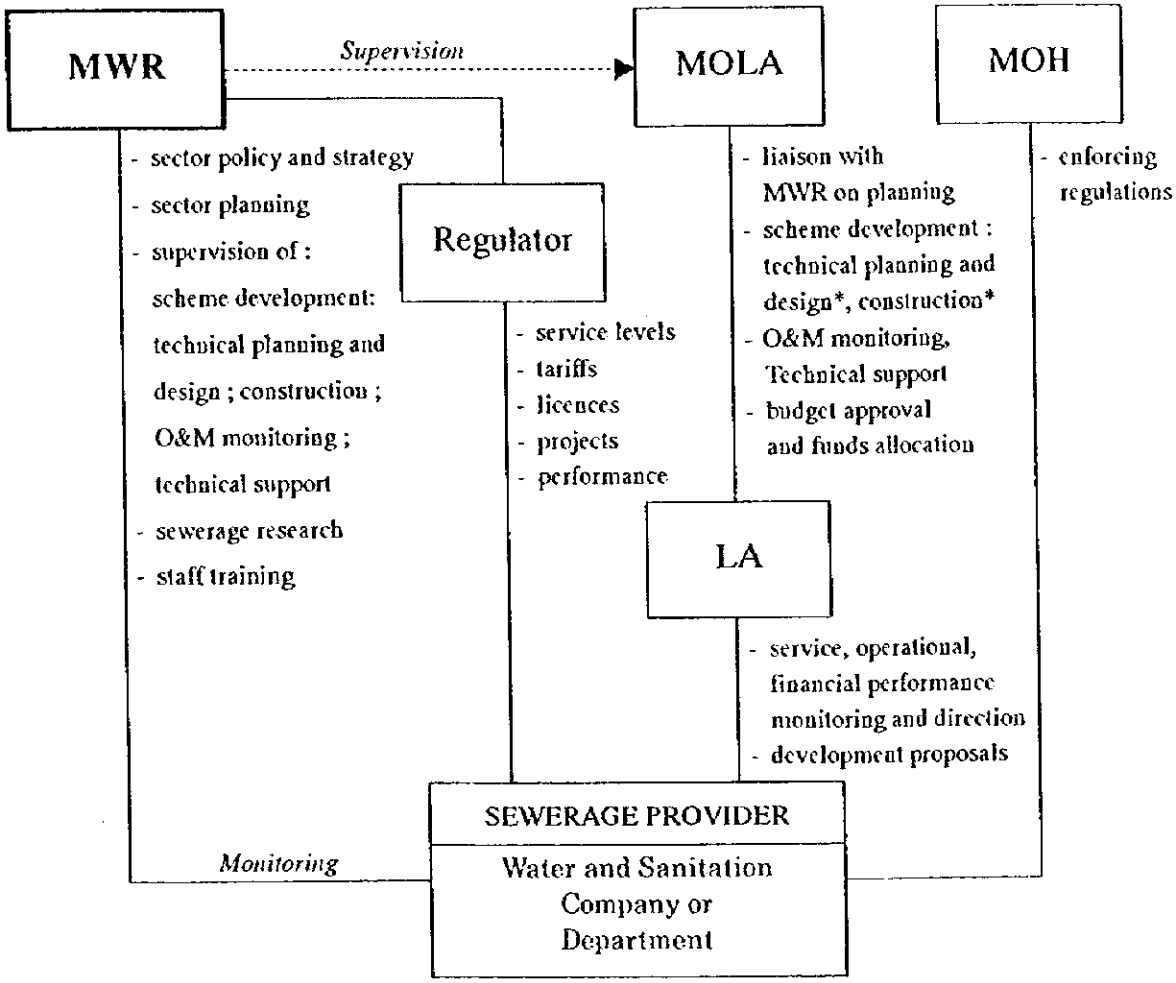
JAPAN INTERNATIONAL COOPERATION AGENCY

Figure – 11.2
Urban Water Supply: Proposed Organization and Responsibilities



Note : MWR : Ministry of Water Resources
MCSS : Ministry of Culture and Social Services
DWO : District Water Office
NGO : Non Governmental Organization
MRD : Ministry of Regional Development

THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure – 11.3** **Rural Water Supply : Proposed Organization and Responsibilities**



Note : * : outsourced
MWR : Ministry of Water Resources
MOLA : Ministry of Local Authorities
LA : Local Authorities
MOH : Ministry of Health

THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure – 11.4 Sewerage Provision : Proposed Organization and Responsibilities**