

CHAPTER 6 DEVELOPMENT GUIDELINES

Chapter 6 Development Guidelines

1. Physical Development Control

1.1. Land Use Zoning Strategy for Tourism Development

1.1.1. Zoning System for Tourism Development

The zoning system for tourism development aims at :

- Directing appropriate tourism development in accordance with the tourism development master plan,
- Restraining disordered tourism development and land speculation,
- Utilising the natural environment in a sustainable manner, and
- Minimising environmental negative impacts.

For this end, the following different zones regarding tourism development should be designated :

- Tourism Zone,
- Tourism Promotion Zone,
- Tourism Development Control Zone, and
- Local Reserve Zone.

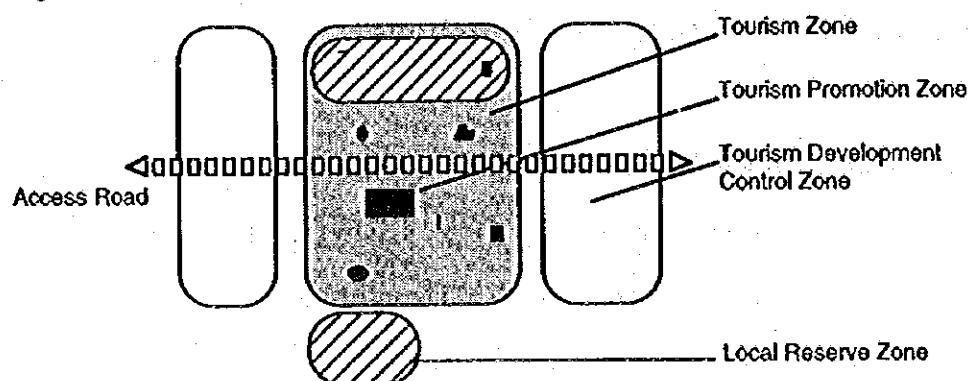
The concept of the zones and zoning system are indicated in Table 6.1 and Figure 6.1, respectively.

Table 6.1 Concept of Zones for Tourism Development

	Purpose of Designation	Necessary Functions
Tourism Zone	It is proposed to designate an area in which tourism facilities and accommodations are preferably located.	Preferential Taxation System Building Control Measures Land Transaction Supervision
Tourism Promotion Zone	It is proposed to designate an area in which tourism facilities and accommodations are accumulated as a tourism core.	Provision of Infrastructure Land Subdivision Public Services Preferential Taxation System Application of New Loan Arrangement Building Control Measures Effluent Control
Tourism Development Control Zone	It is proposed to designate an area in which tourism facilities and accommodations are prohibited to locate.	Prohibition of Tourism Development
Local Reserve Zone	It is proposed to designate an area in which tourism facilities and accommodations are preferably located.	Land Use Change Supervision Supporting System of Tourism Development Local Wildlife Management System with KWS

Source: JICA Study Team

Figure 6.1 Concept of Zoning System



Source: JICA Study Team

1.1.2. Definition of Zones

(1) Tourism Zone

a. Functions of Tourism Zone

To direct tourism development to appropriate areas, a tourism zone should be designated. The tourism zone aims at :

- Encouraging the establishment of tourism facilities and accommodation development,
- Controlling environmentally negative impacts by development control, and
- Providing public services effectively through the designation of tourism promotion zones.

The detailed development concept of the tourism zone is discussed in the following section.

b. Designation of the Tourism Zone

The tourism zone is designated for the following area :

- An area, which has a higher possibility to locate tourism facilities and accommodation,
- An area, which has to maintain natural landscape and the natural environment, and
- An area, which should be strategically developed as a tourism place in accordance with the tourism master plan.

(2) Tourism Promotion Zone

a. Functions of Tourism Promotion Zone

The tourism promotion zone, which is a designated tourism core area accumulating tourism facilities, aims at :

- Accumulating tourism facilities,
- Controlling environmentally negative impacts by providing public infrastructure,
- Providing effectively necessary public services,
- Effectively providing infrastructure, and
- Restraining land speculation.

Accordingly, the following functions should be attached :

- Tourist accommodation,
- Provision of food and drink,
- Transport services,
- Tourism information and supporting services,
- Public services, and
- Shopping.

Table 6.2 lists examples of possibly necessary facilities in accordance with the functions.

Table 6.2 Examples of Necessary Facilities in the Tourism Promotion Zone

Function	Examples of Facilities
Accommodation	Hotel, Lodge, Tent site, Camping Site
Food and Drink	Restaurant, Fast Food Shop, Bar, Entertainment
Transport Service	Car Parking, Bus Station, Gasoline Stand, Car Repair and Parts Shop, Rental Car Shop
Tourism Information and Supporting Service	Tourist Information Center, Travel Agent Office, Equipment, Tool, Machine Rental Shop, Tourist Guide, Pro Shop
Public Service	Post Office, Clinic, Police Box (Station), Bank, Fire Station
Shopping	Crio Shop, Glossary Store, Drug Store

Source: JICA Study Team

b. Designation of the Tourism Promotion Zone

The tourism promotion zone should be designated for the following area :

- An area, which should support the tourism zone as a core,

- An area, in which severe negative environmental impact is highly expected to occur, and
- An area, which had better accumulate tourism facilities and accommodations.

(3) Tourism Development Control Zone

a. Functions of the Tourism Development Control Zone

To restrain disordered tourism development and negative impact on the natural and social environment, tourism development control areas are recommended to be designated. In this zone, certain scales of physical developments are prohibited. However, small scale development is allowable.

b. Designation of the Tourism Development Control Zone

The area to be designated as the development control area is conceptually as follows :

- An area, which is identified as an environmentally important place and which has a high tourism potential,
- An area, which is environmentally important, but cannot be designated as national park, reserve and forest reserve,
- An area, which is expected to generate a severe negative impact on local communities caused by the tourism development, and
- An area, in which land speculation outside the tourism zones is expected.

(4) Local Reserve Zone

a. Functions of the Local Reserve Zone

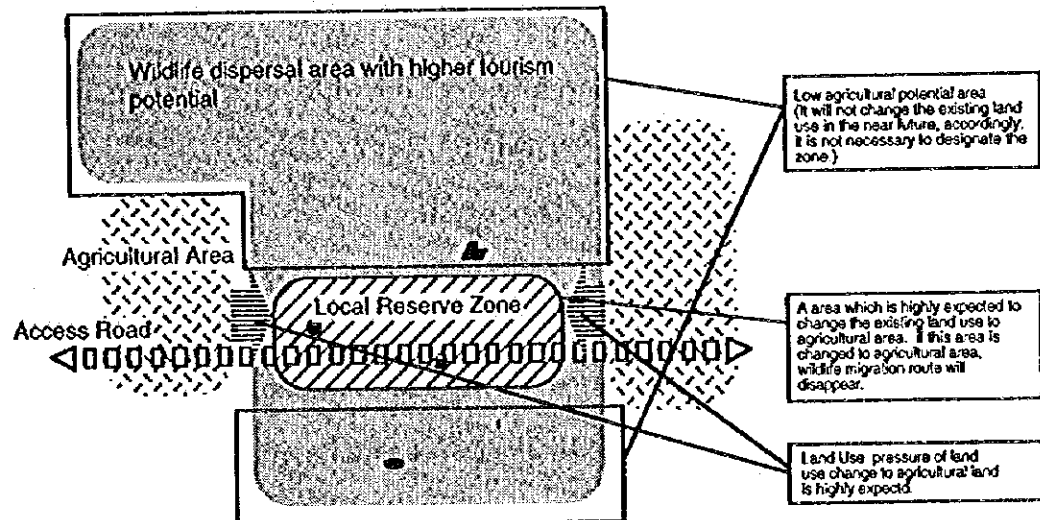
There are many places at present, which have tourism potential with wildlife, but the wildlife dispersal area is decreasing caused by a change in land use to intensive agriculture. Since as many benefits are expected from tourism as from agriculture, land use change might be discouraged. Accordingly, the local reserve zone aims at encouraging wildlife tourism at local level, while maintaining the wildlife dispersal area. The function of the zone is :

- KWS to entrust certain roles of wildlife management to local government,
- The local government to support the person, who has interest in being involved in tourism business,
- To restrain the establishment of large structures, such as fences, which may disturb wildlife migration, and

- To supervise land use change, land transaction and land subdivision by a notification system.

The concept of the local reserve zone is illustrated in Figure 6.2.

Figure 6.2 Concept of the Local Reserve Zone



Source: JICA Study Team

b. Designation of the Local Reserve Zone

The area, which satisfies the following conditions can be designated as a local reserve zone :

- A wildlife dispersal area with tourism development potential, but which is not a national park and reserve,
- An environmentally important area with wildlife habitation, but which is insufficient to be designated as national park and reserve,
- An area with high possibility to change the present land use to residential use or intensive agricultural land, and
- Existing land owner and local people are expected to participate in a tourism development project.

It is necessary to coordinate the existing "community reserve area" for designating a local reserve zone. One possibility would be to integrate the functions of the community reserve with those of the above proposed local reserve zone.

1.1.3. Institutional Arrangements for Tourism Zoning

(1) Establishment Gazettement System

There is no adequate act to designate the above proposed tourism zoning system. Therefore, it is necessary to establish an act to designate tourism zoning. For this end, the articles stipulating the

tourism zoning should be contained in the Basic Tourism Law, which is proposed in the previous section 3.1 of this chapter. The following points should be authorised in the proposed Basic Tourism Law:

- Authority of designating the zones,
- Restriction of land use and land transaction in the tourism zoning area, and
- Provision of incentives for the tourism zoning area.

(2) Authority for Designating the Zones

a. Related Public Organisation

For designating the zones, many factors, which fall under the responsibility of several ministries, must be considered. Table 6.3 shows the relationship between proposed functions of each of the zones and the responsibilities of the existing ministries.

Table 6.3 Related Organisation for Gazetting Zones

Related Public Organisation	Necessity to involve in designating the Zones
Ministry of Tourism and Wildlife	Responsible organisation for tourism development
Ministry of Finance	To coordinate economic incentives to the TPZ and TZ
Ministry of Environment and Natural Resources	To coordinate environmental standard of TPZ and TZ
Kenya Wildlife Service	To coordinate wildlife conservation around TPZ and TZ
Kenya Tourism Development Cooperation	Responsible organisation for implementing TPZ development
Ministry of Agriculture, Marketing and Livestock Production	To coordinate agricultural development around the TPZ and TZ
Ministry of Land and Settlements	To coordinate land title matters
Ministry of Local Government	To coordinate district development

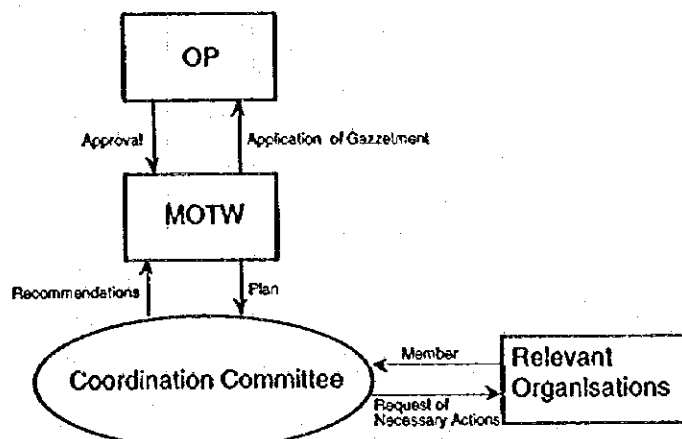
Source: JICA Study Team

b. Coordination Committee

In order to smoothly designate the zones, a simplified system to shortcut the decision making procedure is indispensable to be formally set up. For this end, the establishment of a Tourism Zoning Gazettement Committee should be stipulated in the law. The committee is chaired by the representative of MOTW and the members are representatives of the ministries which are indicated in the table. After agreement is reached in the committee, MOTW is responsible for requesting Gazettement to the Office of the President. Conceptual

Functions of the committee and relevant organisations are illustrated in Figure 6.3.

Figure 6.3 **Gazettement System of Tourism Zoning**



Source: JICA Study Team

(3) Restriction of Land Use and Land Transaction

The necessary restriction of land use and land transaction to be taken should be authorised in the law. The following is a preliminary recommendation on restricting certain kinds of human activities in the zones in accordance with the functions of the zones.

a. Concept of Allowable Activities in the Zones

Among these zones, allowable kinds of development and activities are conceptually defined. Table 6.4 shows the differences between them.

Table 6.4 Difference among the Zones

	Tourism Promotion Zone	Tourism Zone	Tourism Development Control Zone	Local Reserve Zone
Activity				
Lodging	○	○	x	○
Eat and Drink	○	○	○	○
Sports and Sightseeing	○	○	○	○
Facilities				
Accommodation Development.	○	○	x	○
Facility Development (Building)	○	○	x	○
Facility Development (non building)	○	○	△	○
Facility Development (small structure natural trail, view house, toilet)	○	○	○	○
Land Development				
Land Transaction Supervision	○	○	x	x
Land Use Control	x	x	○	○
Site Provision	○	x	x	x
Spatial Set-up				
Development Density	high	low	very low	low
Building Regulation	low	high	x	high
Sanitary Level	Centralised system	Own treatment	Prohibited	Own treatment

Note: ○- allowed, △- conditionally allowed, x - not allowed
 Source: JICA Study Team

b. Relationship with Other Kinds of Land Use

The tourism zone and tourism promotion zone are the zones, in which tourism facilities and accommodations should be developed preferably. It does, however, not mean that other land uses are prohibited in these zones. The relationship between these zones and the other land uses must be clearly coordinated. In this sense, Table 6.5 shows the relationship between these zones and the land use classification in terms of designation of the zone.

Table 6.5 Relationship between the Zones and the Other Land Use

	Tourism Promotion Zone	Tourism Zone	Tourism Development Control Zone	Local Reserve Zone
Urban Area	○	○	x	x
Agricultural Area	○	○	○	○
Ranch and Pastoral Area	○	○	○	○
Natural Conservation Area	○	○	○	-
National Reserve	x	x	-	-
National park	x	x	-	-

- possible to be designated
- x impossible to be designated
- not necessary to designate

Source: JICA Study Team

c. Supervision of Land Transaction and Land Use Change

In order to control land transaction and land use change in the designated zones, a notification and approval procedure should be introduced. The authority responsible for this procedure is the District Development Committee (DDC). Table 6.6 proposes the necessary procedure for each of the zones.

Table 6.6 Necessary Procedure for Each of the Zones

	Land Transaction	Land Use Change to Tourism Use
Tourism Promotion Zone	Notification to DDC	Notification to DDC
Tourism Zone	Notification to DDC	Notification to DDC
Tourism Development Control Zone	Appraisal from DDC	Prohibited to change to tourism use
Local Reserve	Appraisal from DDC	Prohibited to change existing land use except Tourism use DDC approves it.

Source: JICA Study Team

(4) Provision of Incentives

Instead of controlling the land use and land transaction, certain incentives should be available in the zone, especially for the tourism promotion zone (TPZ) and the tourism zone (TZ). Possible incentives to be provided should be rationalised by law. The incentives to be provided are divided into four types in terms of their characteristics such as:

- Economic incentives
- Provision of preferential development standards
- Provision of infrastructure, and
- Simplified administrative procedure

a. Economic Incentives

Type of Economic Incentives

An investor, who implements a tourism project in the zone should be granted certain preferential taxation. Although the contents and level of the preferential taxation must be determined through careful consideration and in balance with the taxation system for other industries, the following items are listed on a preliminary basis :

- Shortening of the depreciation period,
- Lightening custom tax for certain import goods, and
- Extension of the tax free period.

Preliminary Consideration on Preferential Taxation by Zone

The above taxation incentives must not be applied over the whole nation, but should be differentiated by kinds and level of preferences by region and zone in accordance with the development strategy. Table 6.7 indicates the preliminary concept of area differences reflected by the taxation incentives.

Table 6.7 Area Difference of Taxation Incentives

	Tourism Promotion Zone	Tourism Zone	Other Area
Nairobi	2	3	4
Coastal Tourism Region	2	4	No incentive
Priority Tourism Development Region (except Nairobi and Coast)	1	2	3
Other Area	No incentive	No incentive	No incentive

- 1 highest incentives apply
- 2 high incentives apply
- 3 medium incentives apply
- 4 low incentives apply

Source: JICA Study Team

Creation of Preferable Conditions for Local Medium and Small Firms

To encourage local medium and small scale tourism business, a new loan type with preferential conditions should be created by KTDC. A credit guarantee by the public sector might be another system to be adopted to lift the creditability of local medium and small firms.

b. Provision of Infrastructure

To support private tourism business, public support infrastructure and facilities are provided with higher priority, especially for TPZ.

Environment and Sanitary Infrastructure

To restrain pollution from TPZs, sanitary infrastructure such as drainage system and waste disposal system should be provided by the public sector. For this end, the public sector should prepare the following facilities and infrastructure with a centralised system :

- Waste water collection main route,
- Centralised waster water treatment facilities,
- Waster water discharging facilities,
- Garbage collection system, and
- Landfill site.

Others

To facilitate TPZ development, basic infrastructure is needed such as:

- Access road from the trunk roads, and
- Public services such as police, fire station, post office, clinic.

c. Preferential Development Standards

TPZs should be provided with environmental and sanitary facilities under a centralised system and in order to minimise a possible negative environmental impact. These facilities are available for tourism business in the TPZs. Hence, there will be no need to set efficient standards at the same level as for the facilities, which are located outside of the TPZs. Likewise, additional allowances should be granted under the building regulation code, since BPZs aim at establishing a concentrated type of tourism core. Such additional allowances are preferable for tourism facility developers, because they would enable them to utilise land more intensively.

d. Simplified Administrative Procedure

KTDC should provide a one-stop window service for investor which want to invest in the TPZ by obtaining all necessary permissions and licenses. This incentive is already available for export processing zones in Kenya. KTDC should be authorised to provide such service.

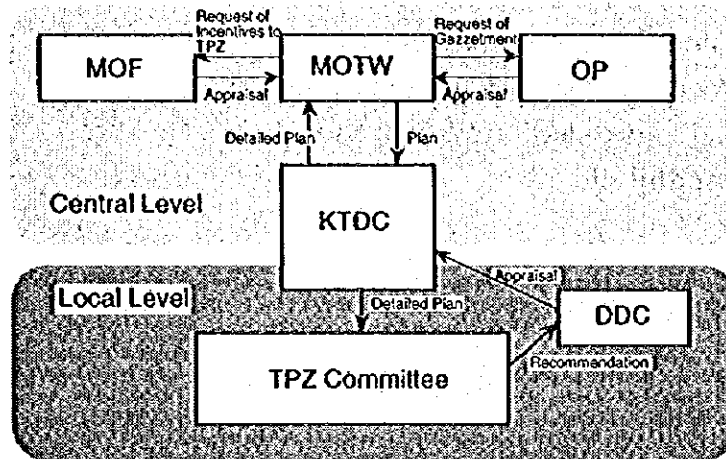
1.1.4. Management of Tourism Promotion Zone

(1) Devepment and Management System

Figure 6.4 shows the administrative system proposed for implementing the TPZ. MOTW is responsible for formulating a tourism master plan and coordinating and requesting gazetteement and economic incentives to the Office of the President and Ministry of Finance, respectively. KTDC is on the on the hand, responsible for

formulating a detailed TPZ development plan and implementing TPZ development. The TPZ development committee is responsible for evaluating and advising on the TPZ development project. The District Development Committee (DDC) is responsible for approving the project from the district development point of view.

Figure 6.4 Development and Management System of the TPZ



Source: JICA Study Team

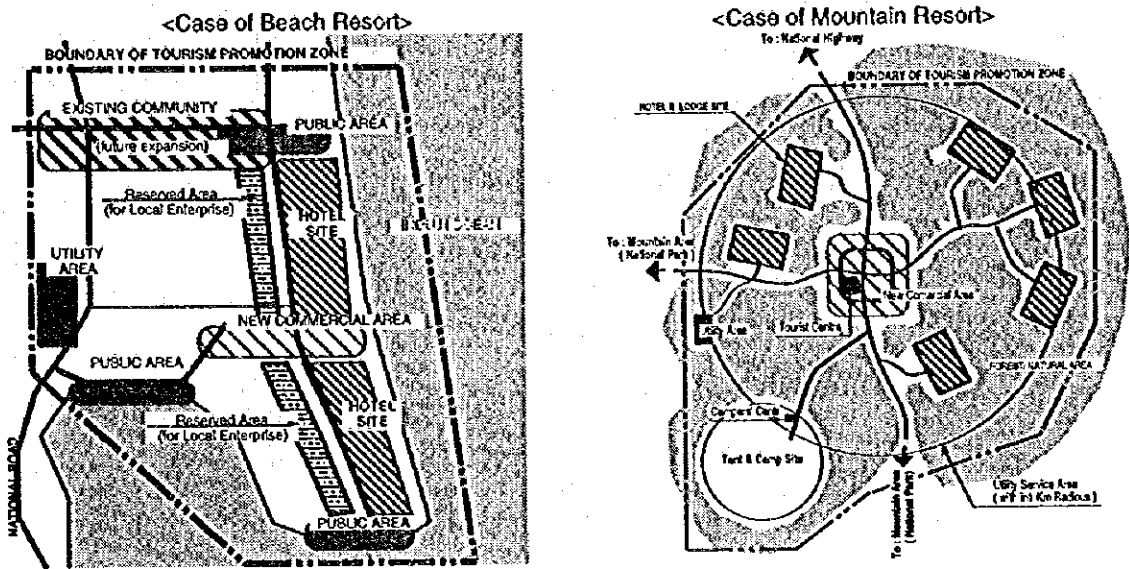
A detailed discussion of the organisation of the TPZ development committee is proposed in the previous Chapter 5 dealing with the Tourism Administration.

(2) Development Concept

The following sites are proposed to be introduced for the TPZs, as shown in Figure 6.5 and 6.6, in accordance with the proposed functions of TPZs as described in the previous section 1.1.2 of this chapter :

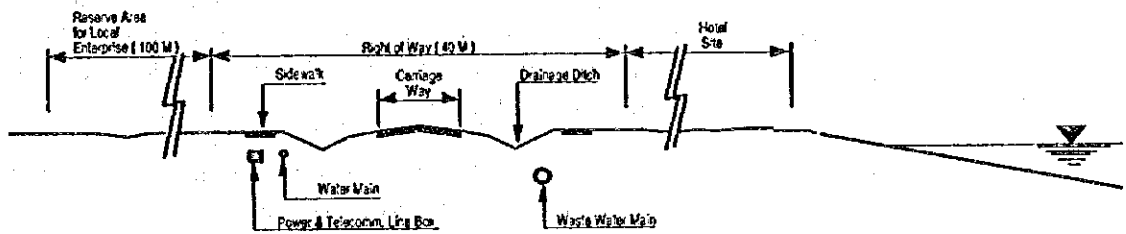
- Hotel site
- Commercial Area
- Utility area
- Public area including access road, public service facilities sites, and
- Reserved area to be utilised local tourism businesses.

Figure 6.5 Conceptual Layout of TPZ



Source: JICA Study Team

Figure 6.6 Conceptual Layout of Utility Corridor (Case of Beach Resort)



Source: JICA Study Team

a. Hotel Site

Hotel sites are for selling or leasing the sites to private investors. Accommodation facilities, such as hotel and lodge are located only here.

b. Utility Area

The utility area is for locating utilities such as waste disposal site, water treatment and power supply facilities. It should be kept at a proper distance from the other areas.

b. Public Area

Public sites are for locating public facilities, such as clinic, fire station, police, post office and tourist information centre and for providing access roads. KTDC prepares the sites and sells them to the public sector.

c. Reserved Area

These sites are prepared by KTDC for local people, which would like to be involved in tourism business in the TPZ. KTDC sells or leases the sites to such local small entrepreneurs at a lower price or rate.

(3) Land Preparation and Subdivision

Land acquisition is a key issue to develop TPZs, especially along the coast. For this end, a land purchasing and land consolidation method are recommendable.

a. Land Purchasing Method

KTDC purchases the whole necessary land area from the land owners carries out land preparation and subdivides it into appropriate lots for sell or lease. If some land owners do not want to sell their land, lease from the land owners is also possible.

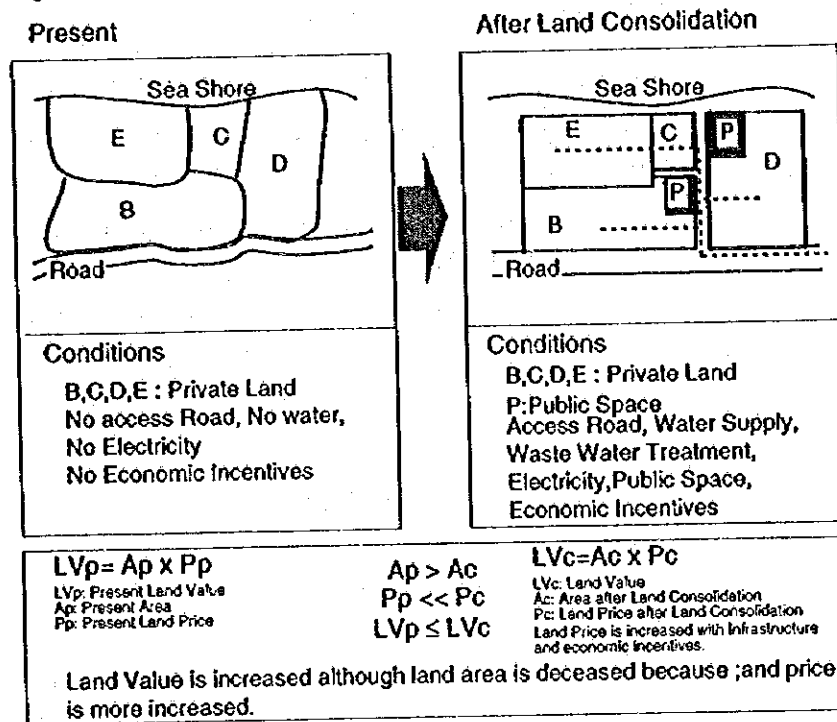
In order to secure private investment for commercial facilities and to provide public sites, the land price or lease price of the subdivided land will be included partly in the price of the accommodation sites. Further, to implement smoothly infrastructure provisions in TPZs, a certain portion of infrastructure projects should be included in the land or lease price of the sub-divided land.

Under this method, KTDC needs much initial investment. However, the time for land acquisition can be shortened.

b. Land Consolidation Method

It is popular to apply a land consolidation method for agricultural land consolidation and urban land subdivision. The basic concept of land consolidation is an equivalent exchange between the land belonging to the private owner and the cost needed for the provision of infrastructure. Based on the increase of land value with a proper provision of land, the land owner provide a certain portion of own land to the public sector and in return obtains the free provision of infrastructure by the public. A conceptual diagram of the land consolidation method is illustrated in Figure 6.7.

Figure 6.7 Conceptual Scheme of Land Consolidation



Source: JICA Study Team

It would be preferable for the public sector to obtain land ownership for the development of TPZs. For the private land owner, on the other hand, it is preferable to increase utilisation of his land with proper infrastructure, without having to pay for the infrastructure development cost. In addition, private owners could then obtain economic incentives by designing a TPZ on the land.

Under this method, landowners could either invest themselves into a tourism facility or they could lease the land to other private investors.

KTDC could buy the land from the public sector and use it for public sites, such as access roads and sites for locating medium and small tourism businesses.

Under this method, KTDC needs a minimum cost of investment funds. However, it may take a long time to obtain agreement from the private land owners. This method is useful for developing TPZs along the coast, since most of the land along the beach is already owned by private land holders.

(4) Management of TPZ

After completion of the development of the TPZ, the TPZ development committee should be transformed into a TPZ management committee. The committee consists of private firms, local residents and local government with the following purposes:

- **Monitoring the performance of local contribution by private firms in the TPZ,**
- **Formulating joint promotional activities for the TPZ,**
- **Organising, supervising and educating local tourism operators including beach operators in the TPZ, and**
- **Discussing miscellaneous matters in the TPZ to build close cooperation among private firms and local residents.**

2. Tourism Facilities' Development Concept

2.1. Overall Development Concept of Tourism Facilities

2.1.1. Type and Functions of Tourism Facilities

Tourism facilities are roughly classified into two types in accordance with their principal function, such as :

- Tourism Products, and
- Tourist Service Facilities.

The concept of the above classification, which is summarised in Table 6.8, aims at emphasising their own development direction based on their principal characteristics.

Table 6.8 Type of Tourism Facilities by Classification

Facilities	Definition	Examples
Tourism Product	Facilities which are/ could be utilised as a tourism attraction	NP & NR Museum Historical and Archaeological Site Old Town Old Building, etc.
Tourist service Facilities	Facilities, which could support tourist activities Facilities, which could improve an added value of a tourism attraction	Accommodation, Restaurant and Cafeteria, Public Service Facilities, Transport Facilities, Shop, Mechanical service facilities, Travel service facilities, Information facilities, etc.

Source: JICA Study Team

2.1.2. Development Concept of Tourism Facilities

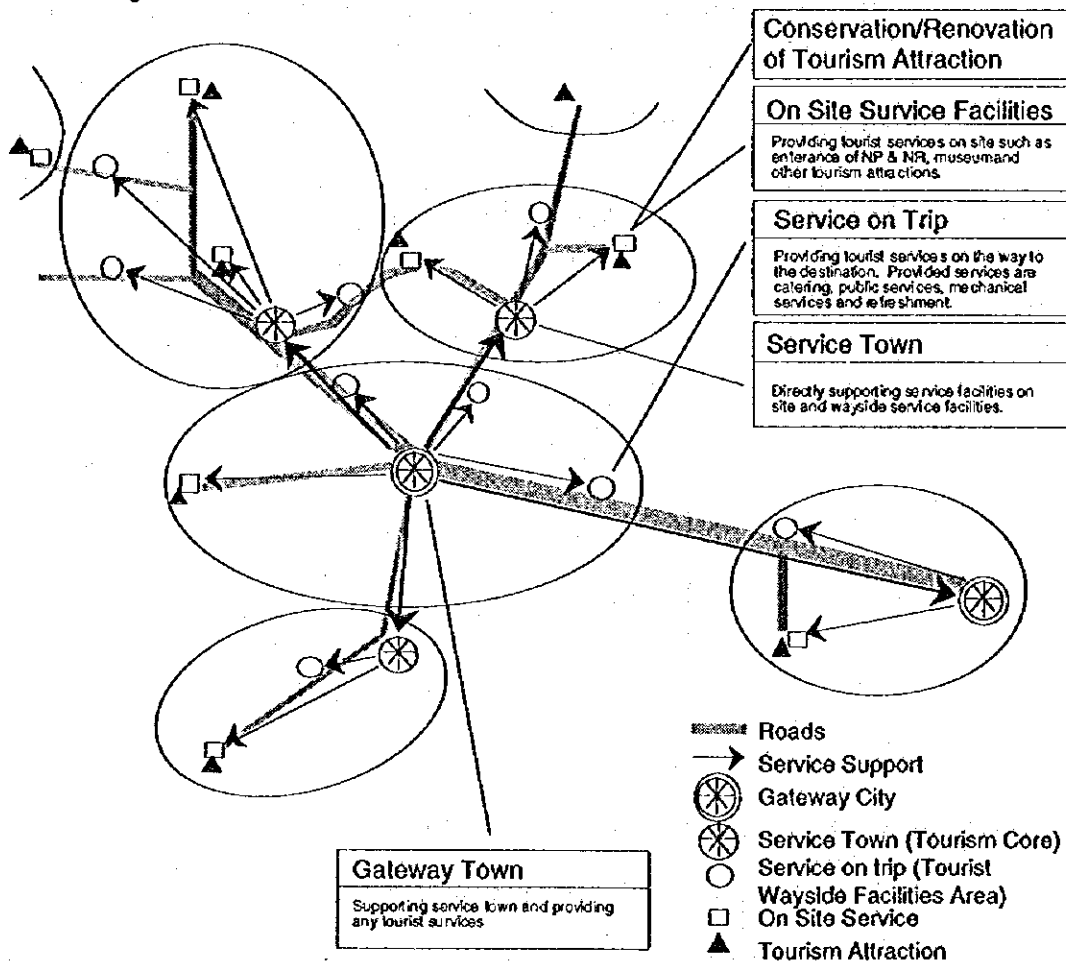
(1) Overall Development Concept

Tourism facility development aims at increasing the added value of the tourism attraction itself through properly providing the facilities in terms of location and functions. Tourism resources and existing attractions identified in this study should be properly developed or improved to avoid that they decline in their value. Various and appropriate tourist services should be available at

gateway cities and service facilities. Essential and immediate service should be available on site and on the way to the tourism attractions. In this sense, the following four concepts are proposed to guide tourism facilities' development. The concepts are illustrated in Figure 6.8:

- Tourism resources utilisation
- Improvement of tourist service on site
- Improvement of tourist comfort on the trip, and
- Hierarchical tourist service support.

Figure 6.8 Overall Development Concept of Tourism Facilities



Source: JICA Study Team

(2) Hierarchical Function of Tourism Facilities Required

Following the above concepts, facilities required are identified in accordance with their functional levels in national and regional tourism activities. Table 6.9 inventories the facilities required in i) gateway city, ii) service town and, iii) on site, such as national parks and reserves, other natural areas, and tourist spots. Notes on their proposed development bodies and level of requirement are also provided in the Table.

Table 6.9 Inventory of Tourism/Tourism Related Facilities

	Devt. Body	Gateway City	Service Town	National P. & R.	Other Natural Area	Tourist Spot
Tourism Industries						
1 Accommodation	pri	☐	☐	▲	▲	▲
2 Restaurant/Snack Stand	pri	☐	☐	▲	▲	▲
3 Amusement Facility	pri/pub	☐	☐			
4 Souvenir Shop	pri/pub	☐	☐	▲	▲	▲
5 Other Shops/Shopping Centre	pri/pub	☐	☐			
6 Travel Agency/Tour Operator	pri	☐	☐			
7 Land Transport Agency	pri	☐	☐			
8 Gas Stand/Repair Shop	pri	☐	☐		▲	
9 Bank/Exchange Office	pri	☐	☐	▲	▲	▲
Transportation & Communication						
10 Airport	pub	☐	▲			
11 Airfield/Airstrip	pri/pub	☐	☐	▲	▲	▲
12 Harbour	pub	☐	☐	▲	▲	
13 Train Station	pub	☐	▲			
14 Bus Terminal	pub	☐	☐			
15 Car Parking	pri/pub	☐	☐		☐	☐
16 Post Office	pub	☐	☐			
17 Telecomm System	pub	☐	☐	▲	▲	▲
Safety & Utility						
18 Fire Station	pub	☐	☐			
19 Police Station	pub	☐	☐			
20 Hospital	pri/pub	☐	☐			
21 Clinic/First Aid	pri/pub	☐	☐	▲	▲	▲
22 Water Supply System	pub	☐	☐			
23 Sewerage System	pub	☐	☐			
24 Refuse Disposal	pub	☐	☐			
25 Dustbin	pub			☐	☐	☐
26 Public Toilet	pub			☐	☐	☐
Information						
28 Information Office	pub	☐	☐	☐	▲	▲
29 Information Board	pub	☐	☐	☐	☐	☐
30 Road Sign	pub	☐	☐	☐	☐	☐

☐ : Required

▲ : Recommended

☐ : Public

☐ : Public or Private

☐ : Private

Source: JICA Study Team

a. Facilities in Gateway Cities and Service Towns

Gateway cities mentioned here are Nairobi and Mombasa, which receive the most international tourists coming from all over the world. These big hub cities require both, national and local functions of tourist services. To meet these requirements, gateway cities must have almost every kind of tourism/tourism related facilities as they are listed in the table.

Service towns, which function as the centres for each tourist region or area, are expected to provide services to tourists in limited local areas only. The variety of services is quite similar to those of gateway cities. However, the scale will be smaller and the service area can be limited. It must be emphasised that some of these services, for example agent service, transport and communications, should be linked by stable networks with the centre in gateway cities.

b. Service Facilities on Sites

In and around national parks, reserves, and other natural areas, construction and development activities should be limited not to disturb the natural environment and resources. Services in these areas will be limited to the minimum, which is indispensable, such as information and other essential tourist services. These service functions should be planned as complex facilities near the entrances to the areas. Where the environment has enough absorptive capacity, further development for accommodation and catering can be discussed.

Tourist spots require quite limited practical services for those visiting and spending some hours there. Thus, essential and immediate services for tourists will be provided within the capacity of the limited facilities.

(3) Proposed Tourism Facilities for On Site Services

Based on the above considerations, the following facilities are proposed to be developed on sites and along the travel route :

- Visitor facilities at museums, archaeological and historical sites
- Visitor amenity facilities for National Parks and Reserves
- Tourist Centre
- Tourist wayside facilities' area, and

- City beautification facilities for Gateway City and Tourism Core Towns.

2.2. Tourism Resources Utilisation and Conservation

The following resources are generally identified to be promoted in an appropriate development manner as tourism products as outlined in Chapter 2, 3 and 4 of Volume 2. It is obvious that these main attractions constitute wealth not only in terms of tourism use, but also under aspects, such as natural conservation, academic and so on. These resources are presently managed by various authorities, such as KWS and/or the National Museum. Utilisation of these resources should, therefore, be co-ordinated with the authority, which is responsible for managing these resources.

2.2.1. National Parks and Reserves

The existing national parks and reserves provide significant scenery and wildlife and are Kenya's main tourism product. KWS has recently started to develop a national park management plan for individual parks. This is based on the National Park Management Five Year Plan. KWS is also studying the overall pricing policy for the parks, in order to distribute the visitor properly to more unknown parks, since most of the visitors concentrate in certain parks. For further utilisation of the national parks, these management plans for each park and pricing policy should be followed and supported.

From the tourism development point of view, tourist amenity facilities, which support tourist activities in the park, should be established. Section 2.3 of this chapter discusses more details of the subject.

2.2.2. Museum, Historical and Archaeological Sites

National Museums of Kenya (NMK) possesses 20 museums, including site museums. They are aiming as their major tasks at i) research, ii) education, and iii) exhibits. The present condition of museums, however, is quite insufficient in each field. Even from the tourism point of view, most of them lack enough attractiveness to invite tourists and don't offer enough information on their area, which would add more value to the local tourism resources

For strengthening the museums' facility, activity and attractiveness, NMK has prepared in 1993 a plan titled "Integrating Culture, Environment and Development, 1995-2010". This plan identifies the development goals as follows :

- Exhibits' based education on the knowledge of the natural and cultural world
- Education of a wide variety of Kenyans, and
- Preservation and use of collections.

Museums in Kenya have enough potential to become major tourist attractions in addition to their main tasks pointed out above. The plan comprises 14 projects of museums and 7 projects of improvement of site museums. When these projects are implemented with enough attractiveness, they will contribute much to promote Kenyan tourism and diversify tourists to areas, where tourism is not yet well developed.

To attract tourists, museums should emphasise the local culture, ethnography and anthropology, nature, geography, flora and fauna in the area. Every museum should have its own strong character based on its locality and exhibits, which cannot be seen anywhere else.

A museum is also a centre, where updated local cultural and natural information is stored. Thus, the museum has the task to provide such kind of information to anyone, who wants to know, including tourists. A museum should be a powerful academic information centre of the area, which can serve those, who want vivid information.

Museums in Kenya work quite aggressively on the conservation and promotion of local traditional skills and techniques. Like is the case for some museums in Kenya, a museum should be a nursery of tradition. Their products will definitely be good marketable articles, which can support the museum's activities and moreover promote local industry, including tourism.

2.2.3. Old Swahili Town in Mombasa and Lamu

Kenya, in particular the Coastal Region, has precious hermitages, or historic towns and architecture, which are worth to be conserved and rehabilitated. The National Museums of Kenya (NMK) and KWS have long been working on their conservation. Their studies were carried out in Lamu and Mombasa, which brought excellent results. These two town's old traditional quarters with architectural features of high quality are gazetted national monuments of Kenya and the museums and related authorities are preparing early implementation of these conservation projects. Their conservation plans are targeting the following points :

- Determine the permitted use of land and buildings, which will be compatible with the special characters of old towns
- Indicate buildings, architectural features and other streetscape elements in the old town, which should be protected
- Regulate with a set of local by-laws building activities, in order to encourage orderly and structurally sound development and limit changes unsympathetic to the old towns' character, and
- Provide a planning framework for more detailed schemes to improve the infrastructure and public spaces in the old towns.

Both old towns are designated as larger conservation areas with different levels of conservation. In Lamu, 15.6 ha of the Old Town have been designated as a historical zone or area with strict conservation. In Mombasa the area's size is 31 ha. Major planned and permitted land use in these areas are residential, private garden, religious, educational, small scale commercial (max. 100 m²) and guest house (max. ten). In the outer conservation area, a rather tolerant regulation is applied, namely commercial (max. 450 m²) and hotel/lodges are allowed with the permission the from Local Planning Commissions.

From the tourism development point of view, these areas should be conserved and improved as soon as possible to create or improve new tourism resources, which have potentials to invite domestic and foreign tourists. Revenues from tourists would alleviate the financial difficulties, which the authorities face.

The following direction can be pointed out for further tourism development in the conservation areas mentioned above :

- Improve public owned spaces, such as squares, waterfront and some attractive public use buildings, such as old forts, museum, town centre and so on. These improvements will not only create lively recreation and breath-taking space, but also create a town and land scape, which conservation projects are targeting
- Existing buildings should be improved to become tourist attractions for creating an impression on and identification by tourists. Thus, the areas will establish their name and status as a tourist spot
- Tourists' walking network or circuits should be set and streets and alleys should be beautified in their environments. Hence, tourists will be attracted not only by the existing attractive buildings, but also by the old town as an area with a context

- Development of tourist facilities in the conservation area should make the area more attractive for tourists. Facilities recommended are, restaurants, cafeteria, souvenir shop and accommodations. As mentioned above, it is prohibited to change a building's use into larger restaurant and hotels. However, such restrictions may be handled flexibly and special permission for larger restaurants and hotels may be granted, if the planning will be done in collaboration with local authorities and experienced designers.

Any kind of tourism development brings considerable change to the area, both physically and mentally. Thus, the responsible authorities should watch developments all the time with a view to regulate and help tourism development by guiding it towards the best direction and with the best effects.

Many individual monumental architecture, such as colonial architecture, city hall court, market and churches in major cities over the country, require some conservation works. Besides the monumental, there is vernacular architecture and groups of buildings, which tend to vanish rapidly, because of social and economic changes in the country. This architecture and group of buildings should be listed immediately with collaboration of NMK and the society of national and local architects. After listing, they will be graded by their importance and characteristics and effective measures for their conservation should be planned and implemented. Historical monuments and vernacular group of buildings, villages or hamlets, remind domestic and foreign tourists of the country's long and stable footpath.

2.3. Development Strategy for Proposed On Site Service Facilities

2.3.1. Visitor Facilities at Museum, Archaeological and Historical Sites

(1) General Concept

Visitor facilities attached to museums aim at providing visitor service, such as refreshments, sale of informative and memorial materials and safe car parking. Visitor facilities at archaeological and historical sites aim at improving the site as a park by providing visitor service facilities similar to the facilities at museums.

(2) Conceptual Programme for Visitor Facilities

Following the above mentioned development concept, Table 6.10 shows the minimum of proposed facilities to be attached to museums, archaeological and historical sites. The detailed scale of services and facilities should be discussed for each individual practical case, based on the above typical case.

Table 6.10 Conceptual Programme for Visitor Facilities

Function	Floor Area (approx. sq.m)	Note
Car parking	150	5 cars
Cafeteria	200	
Souvenir Shop	30	
Benches		

Source: JICA Study Team

(3) Cost Estimates

The approximate cost of the visitor facilities at museums, archaeological and historical sites are estimated as follows. It is normal that the size of the visitor facilities depends on the number of visitors to each place. Hence, the size presented in the table is a minimum typical case. Accordingly, cost estimations for medium and large size visitor facilities are, 225,000 K£ and 300,000 K£, respectively.

Table 6.11 Cost Estimates of the Visitor Facilities

Function	Floor Area (approx. sq.m)	Unit Cost (K£/sq.m)	Total Cost (K£)
Car parking	150	75	11,250
Cafeteria	200	625	125,000
Souvenir Shop	30	625	18,750
Benches			
Total			155,000

Source: JICA Study Team

2.3.2. Visitor Amenity Facilities for National Parks and Reserves

(1) General Concept

Visitor amenity facilities in the national parks and reserves aim at providing more areas for refreshment, view points and picnic place in the parks and reserves.

(2) Conceptual Programme for Visitor Amenity Facilities

Following the above mentioned development concept, Table 6.12 shows the proposed facilities to be attached in the visitor amenity facilities area in the parks and reserves. Figure 6.9 shows the typical image of the area development. However, it is necessary to study more in detail the exact location, number of facilities' areas in the parks and reserves, taking environmental consideration full into account in each practical case.

Table 6.12 Conceptual Programme for Visitor Amenity Facilities

Function	Floor Area (approx. sq.m)	Note
Access Road	100 m	5 cars
Car parking	150	
Toilet	20	
View house	10	

Source: JICA Study Team

(3) Cost Estimates

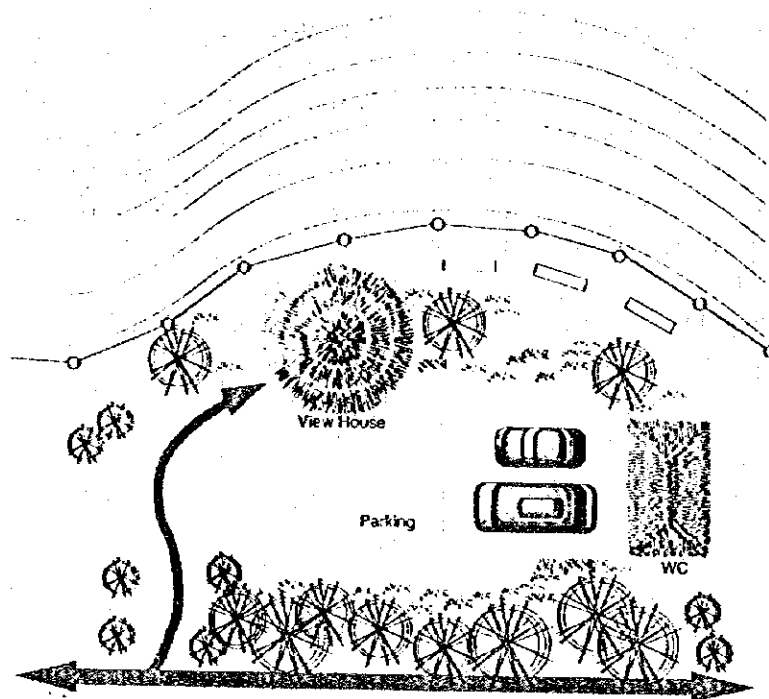
The approximate cost of the visitor amenity facilities in the national parks and reserves are estimated as shown in Table 6.13.

Table 6.13 Cost Estimates of the Visitor Facilities

Function	Floor Area (approx. sq.m)	Unit Cost (K£/sq.m)	Total Cost (K£)
Access Road	100 m	125	12,500
car parking	150	75	11,250
Toilet	20	625	12,500
View house	10	250	2,500
Total			38,750

Source: JICA Study Team

Figure 6.9 Typical Layout Plan of Visitor Amenity Facilities' Area



Source: JICA Study Team

2.3.3. Tourist Centre

(1) General Concept

A tourist centre aims at providing service and area information for tourists at sites. It is to be located at the main gates of major national parks and reserves and other big attractions. The facility will consist of two major functions. The first is that of usual tourist services with facilities of admission, refreshment, toilet, first aid, communications, sale of informative and memorial materials and guide services. The second function is as an information centre, not only a simple tourist information office, but also for the supply of information on natural and cultural matters, which can be seen in the area. In other words, a mini-museum. Naturally, the size and functions facilitated should be considered in detail taking into account fully the scale of the site or attraction.

(2) Conceptual Programme for Tourist Centre

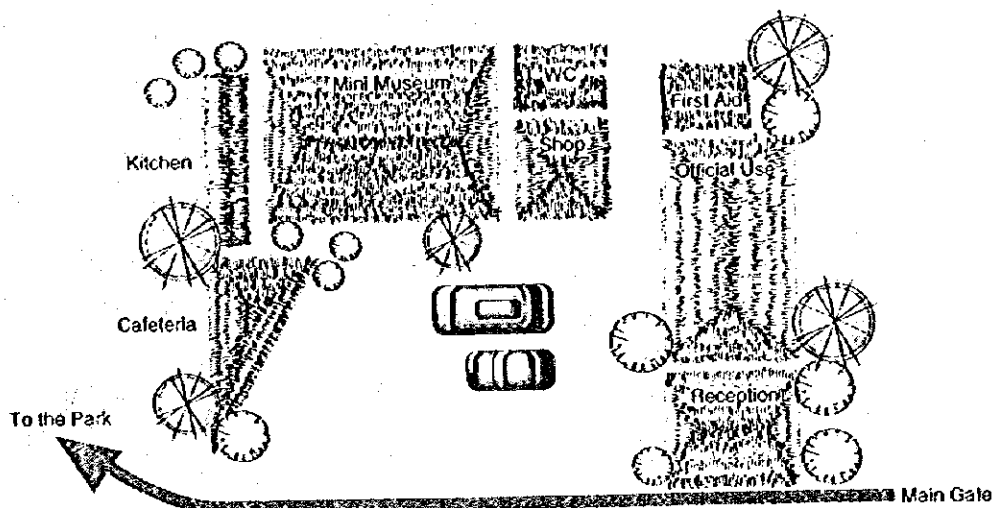
Functions facilitated in the tourist centre will be carefully planned so as to follow the above mentioned concept and considering the site's characteristics. It follows a conceptual programme for the development of this kind of facility at a larger scale. Table 6. 14 presents functions, which should be facilitated as a typical case and Figure 6. 10 shows a typical layout plan. The detailed scale of services should be discussed for each practical case.

Table 6. 14 Conceptual Programme for Tourist Centre

Function	Floor Area (approx. m ²)	Note
Reception/Information	30	
Mini-museum	60	
Cafeteria	60	30 seats
Kitchen	15	
Shop	15	
Toilet	20	8 persons
First aid room	10	
Official use	80	incl. telecom. room , store, etc.
Total	290	

Source: JICA Study Team

Figure 6. 10 Typical Layout Plan of Tourist Centre

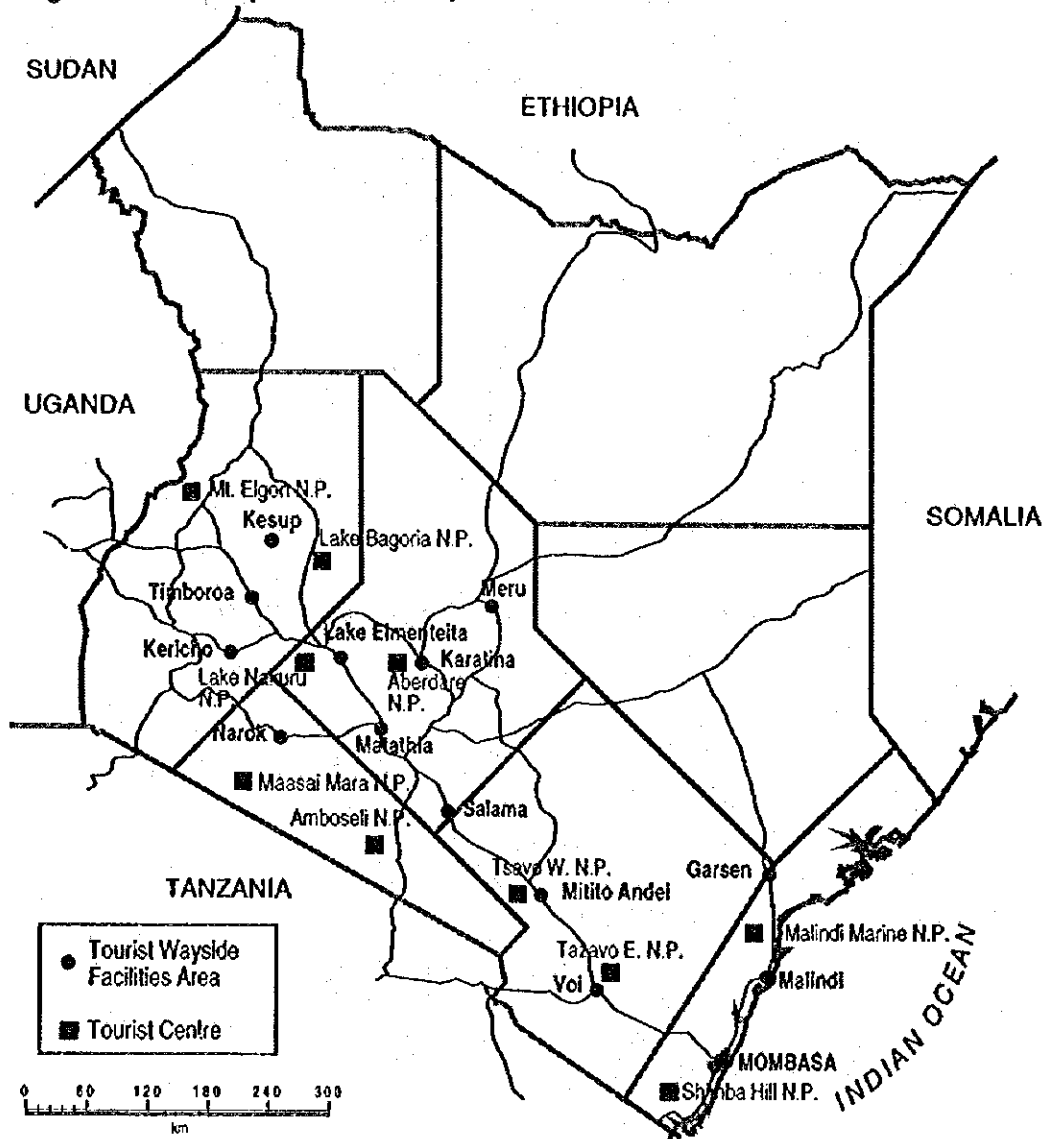


Source: JICA Study Team

(3) Location of Tourist Centre

The centres should be located at the main gates of major national parks/reserves, which are presented in Figure 6.11.

Figure 6.11 Proposed Site of Wayside Facilities Areas and Tourist Centre



(4) Cost Estimate of the Tourist Centre

The approximated cost of the tourist centre is estimated as shown in Table 6.15.

Table 6.15 Cost Estimates of the Tourist Centre

Function	Floor Area m ²	Unit Cost (K£/sq.m)	Total Cost (K£)
Reception/Information	30	750	22,500
Mini-museum	60	1,250	75,000
Cafeteria	75	625	46,875
Shop	15	500	7,500
Toilet	20	625	12,500
First aid room	10	750	7,500
Official use	80	750	66,000
Total	290		231,875

Source: JICA Study Team

2.3.4. Tourist Wayside Facilities Area

(1) General Concept

Tourists, both group and independent, requires facilities along highways or roadsides, for having a break, meals and other occasional services. These kind of facilities are important for tourists' convenience and comfort during overland trips. In present Kenya, these facilities are not well prepared, except in some rare cases, in which such facilities have been prepared by private petrol companies.

The overall aim of these facilities' area is to provide tourists immediate services, which are required while travelling on the highways. The service functions can be divided into those shown below:

- Catering
- Public Service/Utility
- Mechanical Service, and where possible/required
- Accommodation.

(2) Conceptual Programme for Tourist Wayside Facilities Area

Facilities are divided into two categories, that is major and minor facilities corresponding to a longer or shorter travel distance. The areas are to be prepared for long distance overland tourists' service should guarantee pleasant trips with facilities of all kinds required on long trips. The parking areas are to be prepared for occasional or emergency service with minimum facilities. These would be

located with distance of 180-240 km approximately or three hours drive, and parking areas with 60-80 km or one hour drive. Facilities recommended are presented in Table 6. 16. Figure 6. 12 shows a typical layout plan of the tourist wayside facilities area.

(3) Selection of the Sites of the Tourist Wayside Facilities Areas

Sites for the tourist wayside facilities areas are to be selected considering the following :

- On the major circuits of tourists
- Near junctions of the major tourists' circuit
- With some distance mentioned above, approximately 200 km, and
- At locations with good panoramic scenery.

The study team has selected appropriate locations of the tourist wayside facilities area on a preliminary basis.

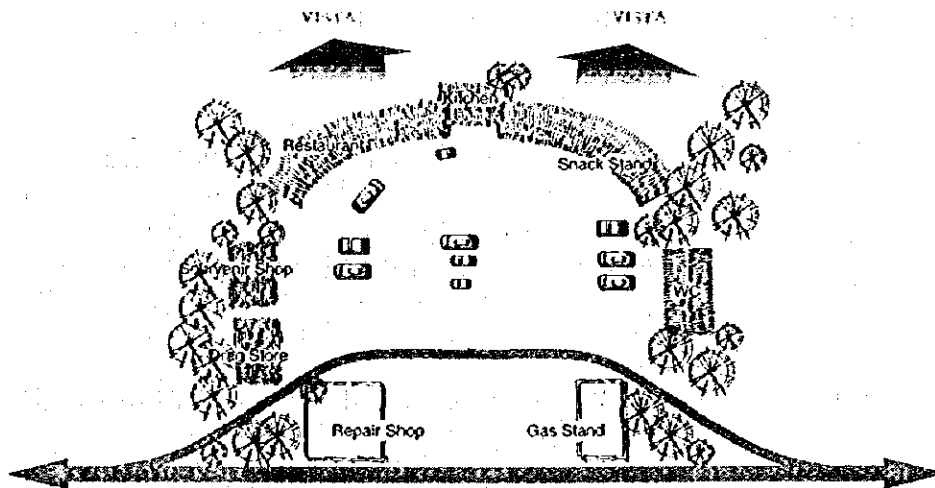
Table 6. 16 shows the locations.

Table 6. 16 Conceptual Programme for Tourist Wayside Facilities Area

Distance	Service Area		Parking Area	
	180-200km (3hrs)		60-80km (1hr)	
Facilities Included				
Inn	□	min. 20 beds of 2 stars		
Restaurant	■	min. 50 seat of 3 stars		
Snack Stand	■	min. 50 seats	■	min. 10 seats
Souvenir Shop	■	min. 20 sq.m	□	min. 10 sq.m
Drug Store	■	min. 10 sq.m		
Toilet	■	min. 6 booths each	■	min. 4 booths each
First Aid Kit	■		■	
Dustbin	■		■	
Information Board	■		■	
Telephone	■	min. 4 lines	■	min. 2 lines
Gas Station	■	4 pumps	■	2 pumps
Repair Shop	■		□	
Parking	■		■	

Note: A° - Necessary, A† - Prepare where possible
 Source: JICA Study Team

Figure 6. 12 Typical Layout Plan of Tourist Wayside Facilities Area



Source: JICA Study Team

(4) Cost Estimate of Tourist Wayside Facilities Area

The approximate cost of the area is estimated as shown in Table 6. 17.

Table 6. 17 Cost Estimation of the Tourist Service Areas

Function	Floor Area m ²	Unit Cost K€/m ²	Total Cost K€	Note
Service Area				
Restaurant	75	750	56,250	Include kitchen -ditto-
Snack	75	625	46,875	
Souvenir Shop	30	500	15,000	
Drug Store	30	500	15,000	
Toilet	40	625	25,000	
Gas Station	120	375	45,000	
Repair Shop	120	375	45,000	
Parking	300	250	75,000	
Total	790		323,125	
Parking Area				
Snack Stand	30	625	18,750	Include kitchen
Toilet	20	625	12,500	
Gas Station	60	375	22,500	
Parking	100	250	25,000	
Total	210		78,750	

Source: JICA Study Team

2.3.5. City Beautification Facilities in Gateway Cities and Tourism Core Towns

(1) General Concept

To improve the atmosphere of gateway cities and tourism core towns and create a "sense of arrival", beautification of these cities should be carried out. In this context, the proposed city beautification facilities development projects aims at providing tourist information facilities as well as amenity facilities in an appropriate manner.

(2) Conceptual Programme for City Beautification Facilities

Table 6. 18 shows facilities proposed under the city beautification programme. The main elements of the facilities development are to provide tourist information signs, such as guide signs, along the roads and interpretation boards at the sites, and to provide benches and rubbish bins at major tourism sites. Additional beautification projects, such as redevelopment of city centres, tourist pedestrian development and lighting are excluded here, because such projects strongly depend on the individual characteristics of each city/town.

Table 6. 18 Conceptual Programme for City Beautification Facilities

Function	Floor Area (approx. sq.m)	Note
Sign Board	50 places	Guide sign, Interpretation Board
Benches	100 places	
Rubbish Bin	50 places	

Source: JICA Study Team

(3) Cost Estimate

The approximate cost of the city beautification facilities development project is estimated in Table 6. 19. The cost estimate has been calculated for the case of Nairobi. Accordingly, a smaller size project and therefore lower cost may reasonably be assumed for the other cities and towns.

Table 6. 19 Cost Estimates of the City Beautification Facilities

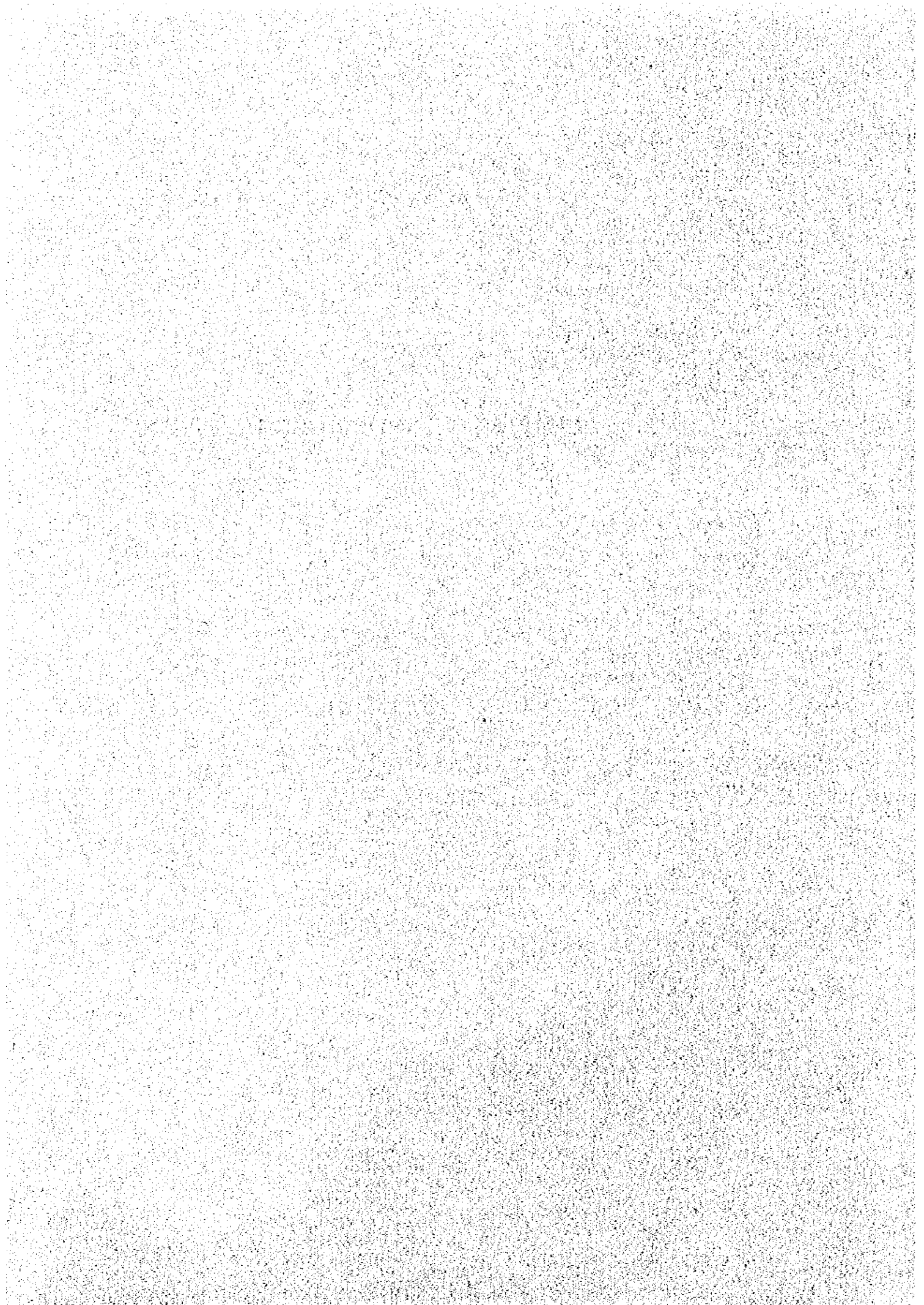
Function	Quantity (places)	Unit Cost (K£/sq.m)	Total Cost (K£)
Sign Board	50	750	375,000
Benches	100	250	25,000
Rubbish Bin	50	500	25,000
Total			425,000

Source: JICA Study Team

2.3.6. Health Facilities in the Tourism Area

As tourism is highly affected by reports on health conditions, clinics with international service level should be installed in tourism and tourism promotion zones. They should have a full kit for light diseases and injuries of secondary and tertiary level. For heavy and serious diseases and injuries (such as cholera or malaria), patients should be send to large scale hospitals in major cities (Nairobi and Mombasa), which can offer any kind of medical treatment. In such cases, urgent transfer of patients becomes the most important factor. Thus, transfer facilities such as ambulances and helicopters should be installed in Nairobi, Mombasa and other key cities of tourism zones for urgent use.

CHAPTER 7 INFRASTRUCTURE PLANS



Chapter 7 Infrastructure Plans

1. Transport

1.1. International Air Linkage

1.1.1. Present Situation

The majority of incoming passengers enter Kenya by air. There are 50 flights per week between Kenya and 14 cities in Europe, 28 per week between Kenya and 10 cities in Asia and 105 flights per week between Kenya and 26 cities in Africa. Table 7.1 shows the existing condition of international air passenger transportation to Kenya.

Table 7.1 Existing Conditions of International Air Passenger Transportation

		Tourism Arrivals (1993) ('000 persons)	No. of Flights (at April, 1994)	Estimated No. of Seats ('000 seats)	Occupancy Rate (%)
Europe & America	Scheduled	390.1	2,600	606	64.3
	Chartered	109.2	-	-	-
Africa	Scheduled	218.6	5,460	586	37.3
	Chartered	-	-	-	-
Asia & Oceania	Scheduled	59.5	1,456	178	33.5
	Chartered	-	-	-	-
Total	Scheduled	668.2	9,516	1,370	48.8
	Chartered	109.2	-	-	-

Note: 1. Tourist arrivals by the chartered flight assume only from Europe and America.
2. Tourist arrivals by the chartered flight are assumed on the basis of "National Transport Plan" (Aug. 1984, JICA).
3. No. of flights show the departure flights per year from Nairobi & Mombasa.

Source: JICA Study Team

Inbound air passengers to Kenya total around 777 thousand and some 109 thousand passengers (equivalent to 14% of the total) enter the country by chartered flights. Almost all chartered flights to Kenya originate from Europe and are handled at the Moi International Airport in Mombasa. The average occupancy rate of seats for scheduled flights of 48.8% is relatively low, but that of flights from Europe is with 64.3% comparatively high.

Presently, Jomo Kenyatta International Airport in Nairobi has the capacity to handle around 2.5 million passengers per year. And the rehabilitation works of Moi International Airport are in progress and will be finalised by summer 1995. The Airport would threaten be able to handle around 1.7 million passengers per year, up from the present capacity of about 0.9 million. Accordingly, the capacity to the present

air passengers including domestic passengers who are handled at both airport is sufficient.

1.1.2. Forecasted Occupancy Rate on International Flights

(1) Future Foreign Tourists

The target number for foreign tourist arrivals in the designated years is shown in Table 7. 2. It is targeted that incoming tourists to Kenya will increase at a composed rate of about 6.1 percent per annum from 1993 to 2000.

Table 7. 2 Target Number of Foreign Tourist Arrivals

	(Unit: '000 persons)				
	1993	2000	2005	2010	2010/1993
Europe	433	594	815	1,008	2.3
America	66	99	154	210	3.2
Africa	219	310	461	609	2.8
Asia	45	77	140	231	5.1
Océania	14	20	30	42	3.0
Total	777	1,100	1,600	2,100	2.7

Source: JICA Study Team

(2) Forecast of Number of Seats and Flights Required

The necessary number of seats and flights is estimated on basis of Table 7. 2. The results of this calculation are summarised in Table 7. 3. About 4.2 million seats should be provided on international flights in order to meet the future target of foreign visitors in the year 2010. Out of that number, around 2.4 million seats will be required from Europe and America and 0.5 million seats from Asia and Oceania in the year 2010. Taking into account the existing seat occupancy rate (about 65 %) on European air-routes, a considerable number of flights including chartered flights from/to Europe will be required in future. Accordingly, an appropriate share of the Nairobi and Mombasa international airports to accommodate the increasing number of international flights, including chartered flights, shall be established.

Table 7.3 Estimation of Number of Seats & Flights Required

	No. of Seats Required (thousand)				No. of International Flights Required (flights)			
	1993	2000	2005	2010	1994	2000	2005	2010
Europe & America	998.6	1,386.0	1,938.0	2,436.0	5,200	5,780	8,080	10,150
Africa	437.2	620.0	922.0	1,218.0	10,920	3,450	5,120	6,770
Asia & Oceania	119.0	194.0	340.0	546.0	2,912	1,090	1,890	3,040
Total	1,554.8	2,200.0	3,200.0	4,200.0	19,032	10,320	15,090	19,960

Note: 1 "Seats" indicates round trip.
 2. Load factor is assumed 80% for Europe/America and 60% for the others including scheduled flight and chartered flights. A wide body aircraft is assumed to be used for international flights. Accordingly, passengers per flight are assumed to be 300 passengers.
 3. No. of international flights in 1994 does not include the chartered flights.

Source: JICA Study Team

Moreover, if one takes into account the likely increase of domestic air passengers handled at both international airports, it is reasonable to estimate that passenger handling capacity will be short in 2010.

In order to secure the number of potentially available seats on international flights, the following items must be addressed :

- Introduction of direct flights, or improvement of connecting flights to/from Asia, Oceania and America, in order to enhance the opportunities of access to Kenya
- Development of human resources (crew, operators, ground staff) and airport facilities in order to efficiently handle the increasing number of air passengers
- Examination of the reception set-up for increased charter flights by foreign air carriers to/from Nairobi, Mombasa international airports during the high tourism season, and
- Examination of the need for developing other international airports according to the increase of international air passenger demand.

1.2. Domestic Transport

1.2.1. Issues of Future Traffic Flow

(1) Present Conditions

a. General

The transport system in Kenya consists of road, rail, air, water and pipeline transport facilities.

Adequate supply of efficient, safe, and affordable transport services is increasingly important to support increased productivity in all sectors of the economy and a sustainable development path.

The Kenyan Government, therefore, has given considerable attention to the development, expansion and modernisation of these transport facilities. However, further expansion of such infrastructure is constrained by a lack of sufficient financial resources.

b. Tourist Traffic Flow

The majority of tourist transport in Kenya depends presently on the road transport mode (vehicles).

The use of railways in the tourism sector is constrained, because of its limited routes and poor operation services.

The air services for access to tourism destinations are limited, because of small aircraft services, small airport facilities and expensive air fares.

According to the desire line chart of tourists by vehicles (See Volume 4), it is remarkable that the trips with tourism purposes concentrate on two areas, that is around Mombasa in the coastal area and connecting Nairobi with other Districts. This would indicate that Nairobi and Mombasa are presently the bases of tourism in Kenya.

The access conditions to the major tourism destinations by the field survey are shown on Table 7. 4.

Table 7.4 Access Conditions to Major Tourism Destinations

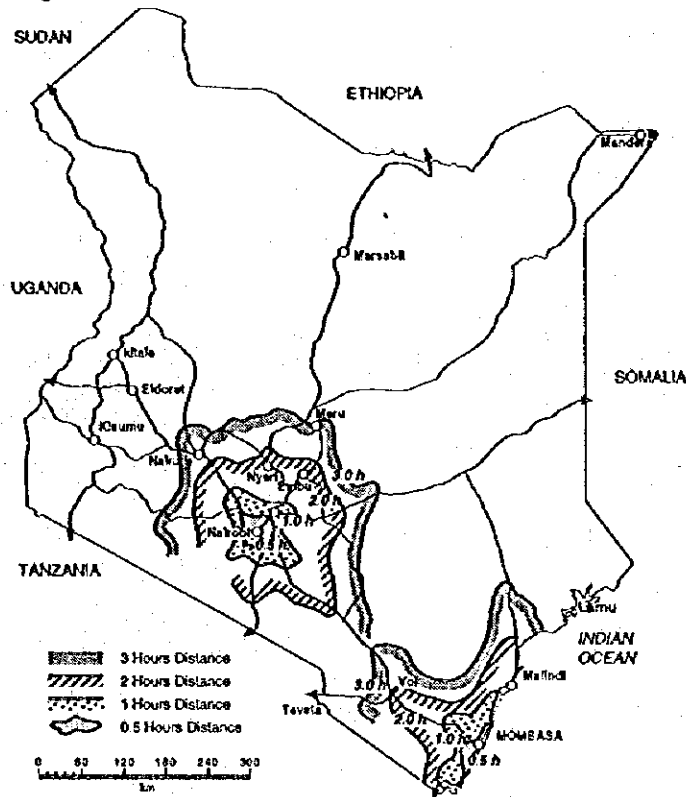
Origin	Destination	Route	Time	Road Conditions
Nairobi	Mombasa	A104-A109	6.6 hrs	Generally good in partial deterioration of pavement.
	Masai Mara N.R (Keekorok Lodge)	A104-B3-C12	5.5 hrs	Under construction of widening and pavement on B3. Route C12 is almost unpaved road.
	Naivasha(Lake Naivasha, Hell's Gate N.P)	A104	1.5 hrs	Generally good.
	Amboseli N.P	A104-C103	4.5 hrs	A104 is generally good. C103 is a narrow earth road.
Naivasha	Nakuru(Lake Nakuru N.P)	A104	1.5 hrs	Generally good. Climbing lane.
Nakuru	Nyahuru(Thompson's Falls)	B5	1.0 hrs	Good.
	Kisumu(Lake Victoria)	A104-B1	3.0 hrs	Generally good.
	Kitale(Mt. Elgon)	A104-B2	3.5 hrs	A104 is good. B2 is Narrow pavement (bad condition).
Nyahuru	Nyeri(Aberdare N.P)	B5	1.5 hrs	Good. (Bad access to N.P entrance)
Nyeri	Nanyuki(Mt. Kenya N.P)	A2	1.5 hrs	Good.
Nanyuki	Nairobi(via Meru, Embu and Thika)	A2-B6-A2	4.0 hrs	Generally good. Climbing lane. Under construction of bypass nearby Thika.
Kitale	Kaikoi(Lake Turkana)	A1- D348	5.0 hrs	A1 is good. D348 has many ups and downs(bad condition).
Nanyuki	Marsabit N.P	A2	7.5 hrs	Isiolo-Marsabit section is unpaved (bad condition).
Mombasa	Malindi Marine N.P	B8	1.5 hrs	Many sections of deterioration of pavement.
	Diani beach	A14	0.7 hrs	Ferry. Partly narrow pavement surface.

Source: JICA Study Team

The field survey has established that the conditions of arterial roads in the Central (including Nairobi), Western and Masailand Tourism Regions are partly satisfactory. However, arterial road development in Northern areas such as Turkana, Northern and Tana Basin Tourism Region lacks behind and the density of the road network is very low. In the Coastal Tourism Region, deterioration of paved roads is remarkable. On the whole, access from the arterial roads to the tourism destination entrances is inadequate.

Figure 7.1 shows the distribution of existing travel time from Nairobi and Mombasa, which are the gateways to Kenya.

Figure 7.1 Travel Time from Nairobi and Mombasa



Source: "A Road Network Development Master Plan Study", 1994 and field survey by JICA Study Team

(2) Review of Future Transport Network Plan

The future transport network in Kenya is reviewed on basis of "A Road Network Development Master Plan Study", which elaborates on a comprehensive road network development. In the study, the future arterial road network has been projected based on the results derived mainly from the future traffic demand analysis, industrial development prospect and the clarification of road functions.

To support tourism development, it is proposed that the road sections as identified in Table 7.5 should be improved in order to assure access to the potential as well as the existing tourism objectives.

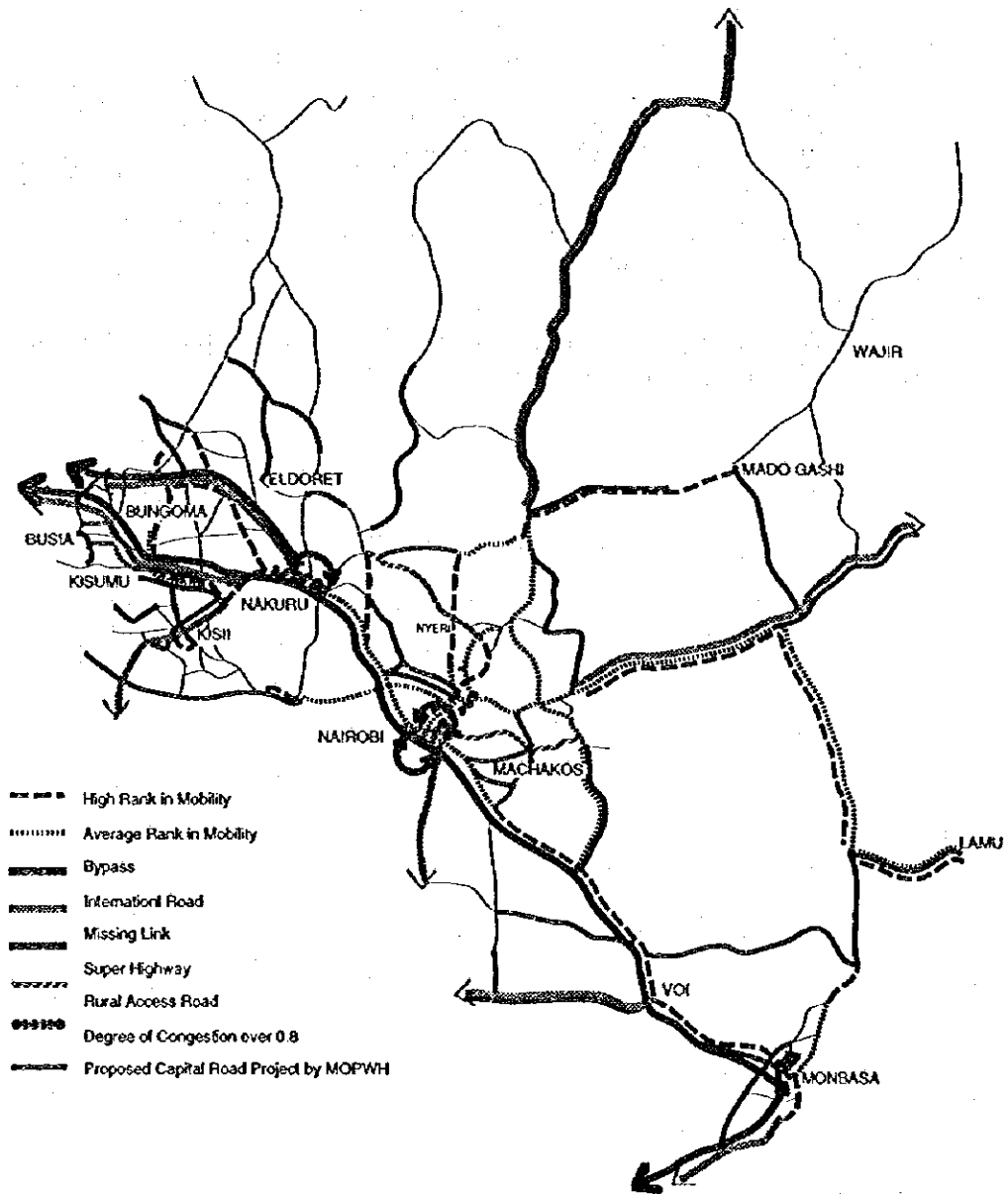
Table 7.5 Important Road Access for Tourism Development Promotion

Road Section	Route No.	Particulars
Lamu-Nairobi	C113, C112, B8, A3	Support to the tourism development in Lamu, and a formation of the tourist course.
Narok-MasaiMara	B3, C11, C12, C13	Assurance of the access to Masai Mara.
Tsavo-Amboseli -Namanga/Emali	C103, C102	Assurance of the access to Amboseli.
Vol - Taveta	A23	Formation of the international tourist course involving Tanzania.

Source: "A Road Network Development Master Plan Study" Draft Final Report (Summary), January, 1995

The proposed road network development plan in the above study is presented in Figure 7. 2.

Figure 7.2 Integrated Future Road Network Plan



Source: "A Road Network Development Master Plan Study" Draft Final Report (summary), January, 1995

(3) Issues

Considering the existing transport conditions and the prospects of future traffic flows, the major issues on the internal transport network plan for tourism development promotion are as follows :

a. Shortening of Time Distance

In accordance with the increasing prospects for tourists entering Kenya through the gateway cities of Nairobi and Mombasa, shortening the time distance between the gateway cities and major tourism towns/cores will be needed by developing the transport modes, thereby assuring the incoming tourist's short-travel time.

b. Improvement of Accessibility to Tourism Destinations

Access between the tourism towns/cores and between the tourism town/core and tourism promotion zone in each tourism region should be improved. In case of improvement of access roads to national parks and reserves, special attention should be paid to environmental conservation.

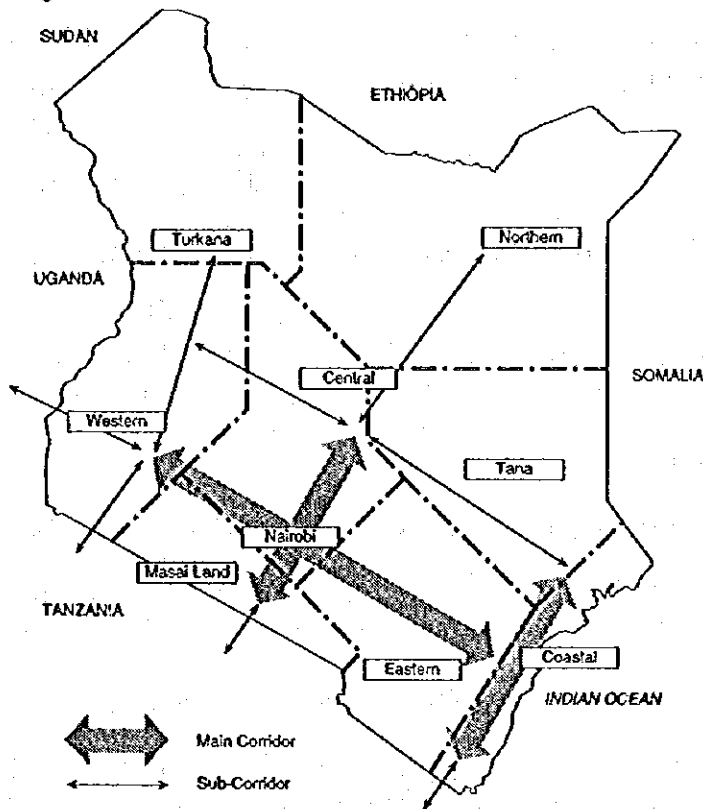
c. Utilisation of Transport Modes as Tourism Attractions

From the point of view of tourism development, railways and ports form a part of tourism attractions and they should be make utilised.

1.2.2. Basic Policy on Transport Development for Tourism Development

Taking the prospects of future traffic flows into account, the directions for the formation of tourism corridors, in which transport infrastructure should be developed in order to promote tourism development in Kenya, are shown in Figure 7. 3.

Figure 7.3 Directions of Tourism Corridor Formation



Source: JICA Study Team

Basic policies for transport network development corresponding to the above issues are as follows :

(1) Roads

Roads are the most fundamental transport infrastructure, not only for tourism development, but also Kenya's national development. Hence, road development should be hastened for:

- Safe and comfortable tourists' mobility.
- For shortening the time distance between the gateway cities and major tourism towns/cores. The targets for shortening of time distance are as follows :

Table 7.6 Targets for Shortening of Time Distance

Route	Distance	Future Time Distance	Present Time Distance
Nairobi-Mombasa	500 Km	6.0 hrs.	7.0-8.0 hrs
- Nakuru	158 Km	2.0 hrs.	2.5-3.0 hrs
- Kisumu	345 Km	5.0 hrs.	6.0-7.0 hrs
- Eldoret	311 km	4.0 hrs	5.0-6.0 hrs
- Nanyuki	200 km	2.5 hrs	3.0-3.5 hrs
Mombasa-Malindi	118 km	1.5 hrs	1.8-2.0 hrs
- Lamu	399 Km	5.5 hrs.	6.0-7.0 hrs
- Voi	158 Km	2.0 hrs.	2.5-3.0 hrs

Source : JICA Study Team.

- The improvement of accessibility between the tourism towns/cores and between the tourism towns/cores and tourism promotion zones in each tourism region.
- For the formation of circular tour routes.
- Appropriate road development and strengthening of road maintenance in the national parks and reserves.
- Development of the wayside rest areas at intervals of appropriate distance along the main tour routes.

(2) Railways

- Improvement of the railway tracks, strengthening of track maintenance and modernisation of the operation and signal system, in order to shorten time distance between main stations.
- Utilisation of the railway as a tourism attraction.

(3) Airways

- Development of airport facilities and human resources according to the increase in air tourists. Especially, expansion and development of local airport facilities, in order to make the take-off/landing of jets possible.

(4) Sea Transport

- Development of the ports/marinas, in order to meet the increasing demand for marine leisure.

1.2.3. Transport Development Plans for Tourism Development

(1) Roads

a. Road Network Development

The proposed arterial road network development plan, including the development sections for tourism promotion are based on the "A Road Network Development Master Plan Study", JICA, 1995.

Furthermore, taking the basic policy of the future road network development for the tourism development into account, the road sections, which should be developed additionally, are as follows :

Improvement of Accessibility

- Sibiloi National Park - North Horr (130 Km),
- Nasolot National Reserve - Route A1 intersection (30 Km),
- Lake Bogoria National Park - Solai - Route B5 intersection (40 Km),
- Nairobi - Magadi (98 Km),
- Rahole National Reserve - Garrissa (85 Km), and
- Other access routes to tourism destinations in each tourism region.

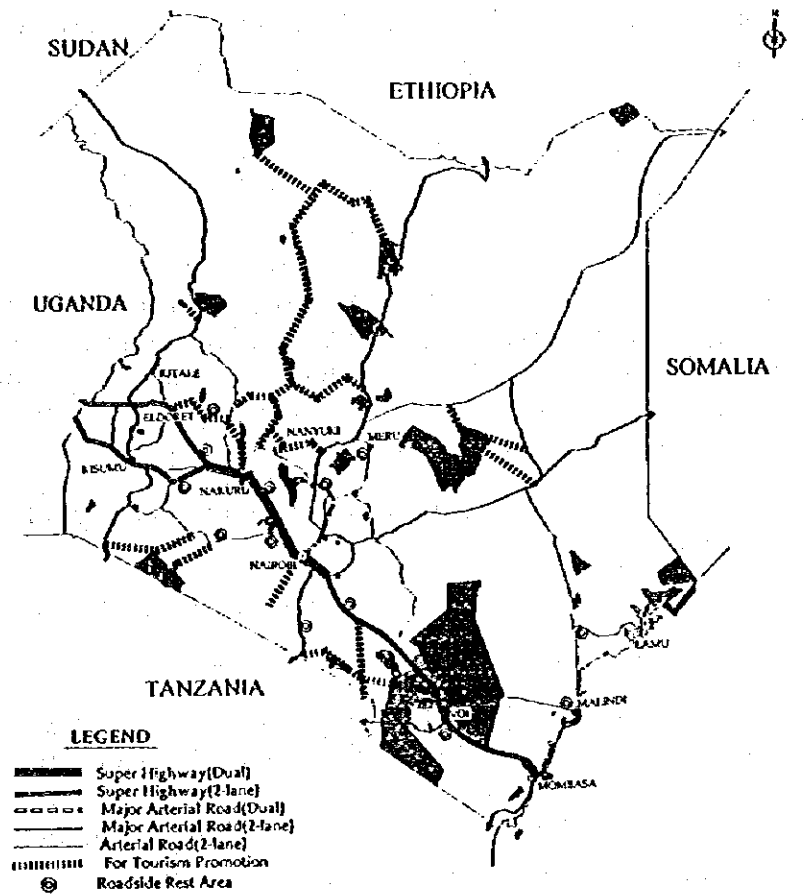
Formation of Circular Tour Route

- Garba Tula - Route C81 intersection (133 Km),
- Naltakikon - Route C79 - Route C78 - Kisima - Route C77 - Route D370 - Loruk (244 Km), and
- Marsabit - Route C82 - Route C77 - Rumuruti - Route D466 - Route C76 - Nanyuki (696 Km).

Moreover, for the formation of a Pan East African Safari circuit, it will be necessary to develop route C12, C102 and A23, which connect Kenya with Tanzania.

Figure 7. 4 shows the arterial road network for tourism development, including the additional routes mentioned above.

Figure 7. 4 Arterial Road Network for Tourism Development



Source: JICA Study Team and "A Road Network Development Master Plan Study"

b. Wayside Rest Area Development

It will be necessary to develop rest areas along the main long trip tour routes. Facilities, such as service station, rest house, parking lots, public lavatory and public telephone, should be constructed in the rest area. The rest areas should be established at intervals of 100 - 150 Km. Taking the future tourist traffic flow into account, tour routes, along which rest areas should be developed, are as follows :

- Nairobi-Voi-Mombasa route (500 Km) 3 places
- Nairobi-Nakuru-Eldoret-Kitale route (380 Km) 2 places
- Nakuru-Kericho-Kisumu route (227 Km) 1 place
- Eldoret-Kabarnet-Marigat route (128 Km) 1 place
- Nairobi-Narok-Masai Mara route (229 Km) 2 places

- Nairobi-Kajiado-Namanga-Amboseli route (269 Km) 1 place
- Nairobi-Murang'a-Nanyuki-Meru-Embu route (461 Km) 2places
- Mombasa-Malindi-Garsen-Lamu route (334 Km) 2places.

(2) Railways

a. General

Presently, Kenyan railways are not very reliable for passenger transport. Main reasons are the low train operating speed and railway capacity, mainly due to an old operating system; and sharp curvatures and severe gradients, such as the Rift Valley escarpment. The following improvement programs/projects are therefore indispensable, in order to ensure at least punctual train operations :

- Rehabilitation and reinforcement of the quality of the existing railroad tracks
- Modernisation of the operating and signal systems, and
- Enhancement of the quality of the railroad track maintenance.

It is estimated that the following time-distance reductions will be possible after implementation of the above improvement projects :

- Nairobi - Mombasa 11 hrs (13 hrs at present)
- Nairobi - Eldoret - Kitale 11 hrs (12 hrs), and
- Nairobi - Nanyuki 6 hrs (7 hrs).

b. Utilisation of the Railways as a Tourist Attraction

Basic Concept

The study team recommends the utilisation of the railway as "Rail Safari" to diversify and improve Kenyan tourism. Since the provision of a cheap and comfortable travel experience is indispensable for the utilisation, luxurious first class coaches and restaurants/buffet coaches should be introduced for the following route:

Mombasa~Nairobi~Nanyuki~Kitale.

Management

Since Rail Safari requires a distinguished atmosphere and services, it is necessary to introduce private sector's know-how to Kenya. Therefore, a joint venture between Kenya Railways (KR) and a private enterprise would be the best form of management. KR is responsible for

providing and operating the train, while the selected private firm is responsible for planing, marketing and servicing in the coaches.

Operation

The train should serve only for tourists with a special diagram and car formation. Since the service is for a limited market, the safari should start to operate only for peak season at the initial and trial stage. After confirmation of profitability, it should increase the number of operations and extend the operational period.

A detailed diagram of the train safari must be developed based on a discussion between KR and the private firm that has the know-how to operate luxurious train journeys.

A tariff should be set up to keep financial feasibility, so that a detailed cost-benefit analysis should be made prior to deciding the tariff. A public subsidy must not be considered, because this train safari is completely out of public transport.

Consideration

There is no packaged holiday which uses train as a mode of transport as insurance can not cover an accident during a train journey in Kenya. Because of frequent rail accidents in the past due to the poor maintenance of track, track rehabilitation projects must be completed prior to the introduction of Rail Safari.

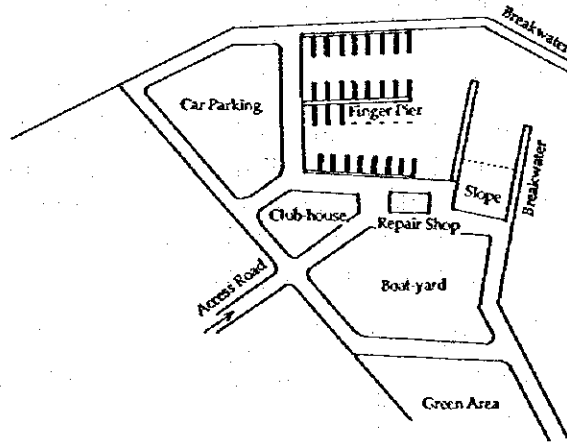
(3) Sea Transport

Marina development at the Indian Ocean coast will be necessary, because of the increase in marine leisure demand and marine tourism development, that is pleasure boats and cruise ship. The proposed sites for marina development will be at Mombasa's old port, Kilifi, Malindi, Lamu and Shimoni. Mombasa and Lamu have interesting historical townscapes along the old port. Accordingly, marina development as well as old town redevelopment should be taken into consideration.

Marinas should include the following facilities : mooring facilities (pier), slope for boat-lift, crane, boat-lifter, boat-yard, boat-house, club-house, information service facilities, training facilities, salvage boat, communication facilities, beacon, refuelling and water-supply facilities, repair shop, boat washing facilities, hotel and rest house. Figure 7. 5 shows an example of a marina plan.

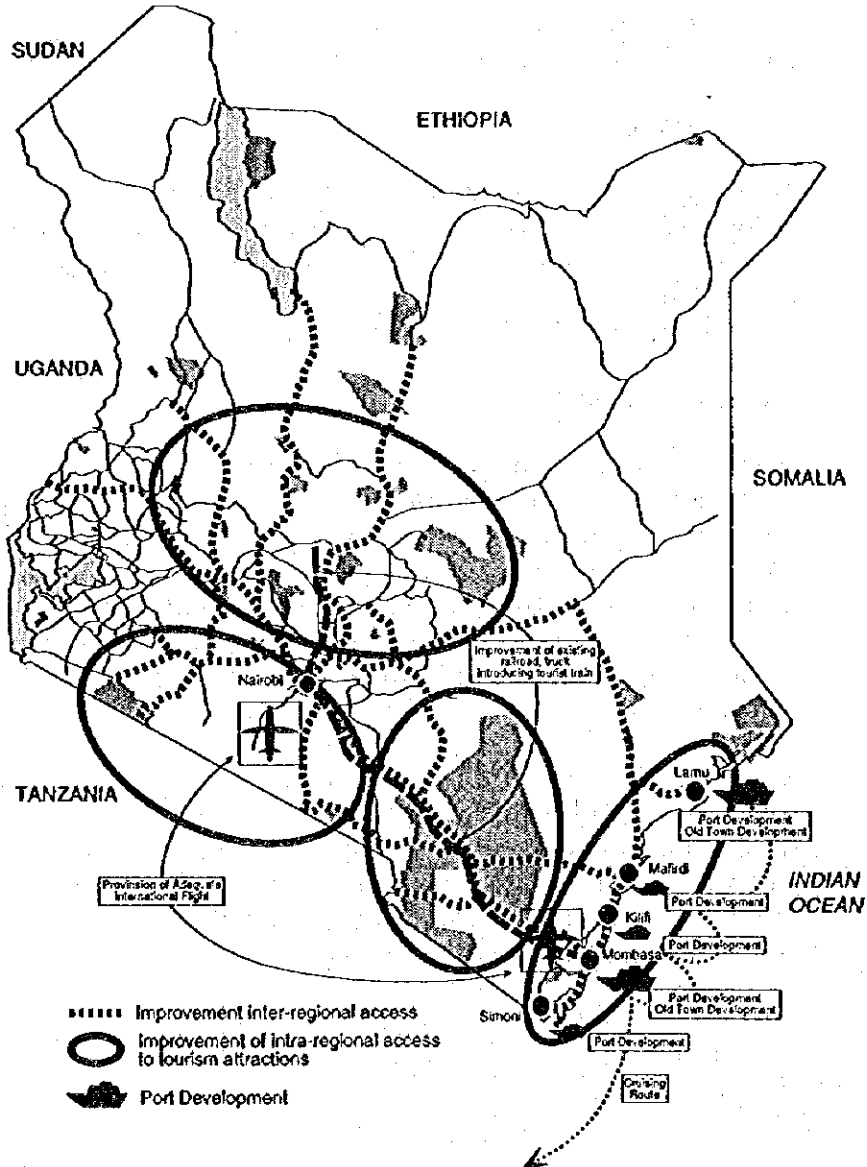
The future transport network development plan, including all transport modes, is illustrated in Figure 7. 6.

Figure 7.5 Example of Marina Plan



Source: JICA Study Team

Figure 7.6 Future Transport Development Direction



2. Water Supply

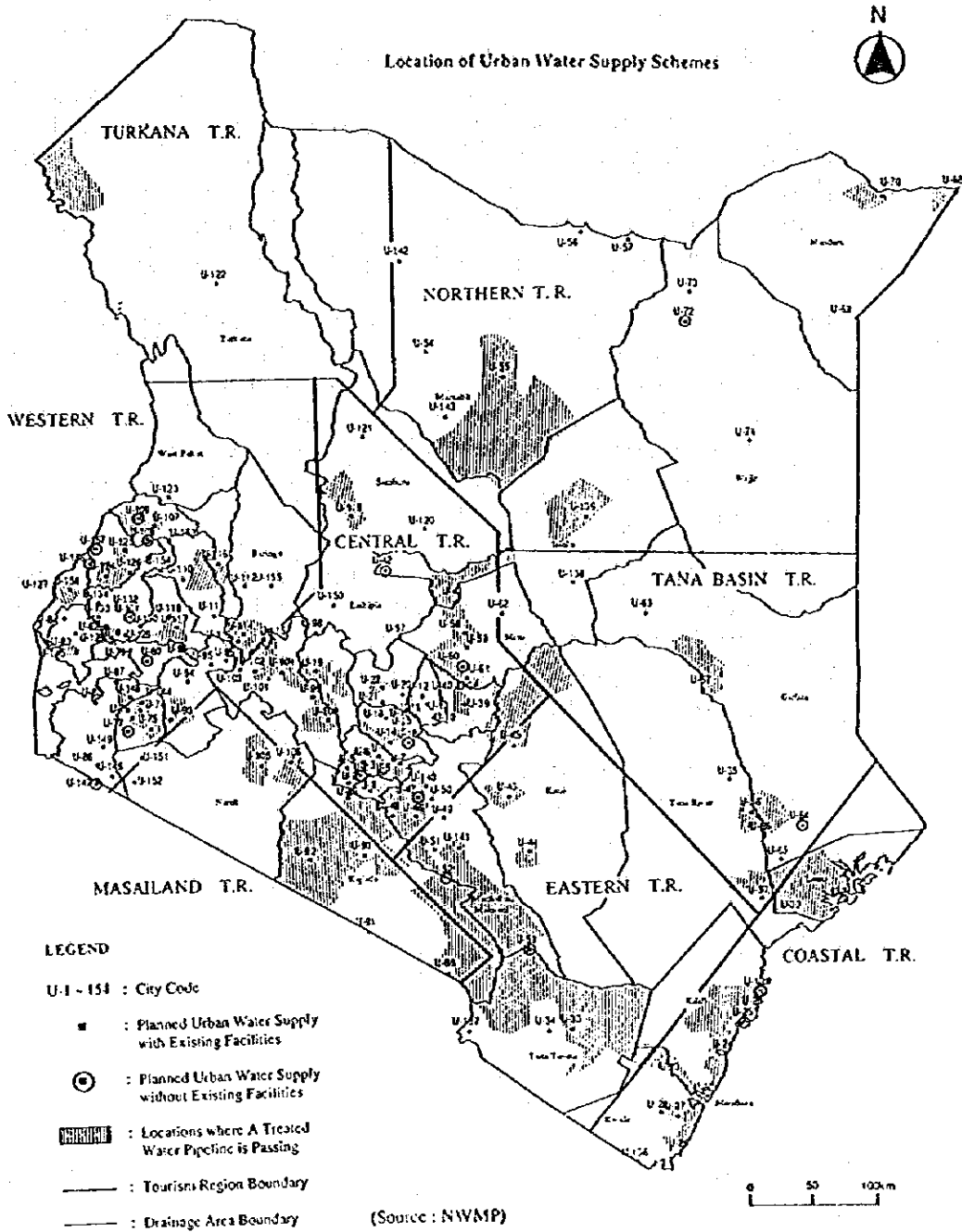
2.1. Present Conditions in Kenya

The water supply situation in Kenya has become increasingly critical, due to inadequately capacity of existing water supply systems and the increase in population and economic activities. Many water supply systems depend on unreliable water sources, and the systems have been affected by frequent supply failure over long periods. The water holding capacity of the river drainage areas is generally low and river flows reach their minimum flow almost every two years or so. As a result of this, a low level of supply reliability, for example 80 % dependability, cause supply failure almost every two years.

In the principal towns and urban centres, the water supply system has been prepared mainly for a treated water pipeline as shown in Figure 7. 7. This figure also shows the location of the existing urban water supply schemes. Bulk water for urban areas has been supplied from rivers in each region. Water supply systems in rural areas is obtained from various water sources and small scale projects, such as community unit and spot unit.

In terms of management, the existing water supply systems are classified into six categories : MOWD, NWCPC, Local Administration Authority (the City Council), Community, NGO, and donor systems. Many water supplies in urban centres in tourism regions are mainly managed by MOWD and the NWCPC, except in major towns. Water supplies in the major towns such as Nairobi, Mombasa, Nakuru and Kakamega are directly managed by each Municipal Council.

Figure 7.7 Location of Urban Supply Schemes



Source: National Water Master Plan, 1992

2.2. National Water Resources Development Master Plan

The National Water Resources Development Master Plan (NWMP) was formulated in 1992 with the assistance of Japan International Cooperation Agency (JICA) and with Kenyan counterpart personnel and a steering committee. The objective was to establish a high supply reliability by the target year 2010, not only for the benefit of water users but also for the sustainability of water resources development facilities themselves.

Water demand forecast and potential perennial water resources were roughly estimated by the NWMP as shown in Table 7.7 and Table 7.8.

Water demand for wildlife in the National Water Master Plan was assumed as constant because at the time of presentation of the Master Plan, there is insufficient data on the population of wildlife in the country.

Table 7.7 Projection of Water Demand

Items	1990	2000	2010	Increment to 1990
(a) Domestic and Industrial Water (1000m ³ /day)				
Urban	573	1,169	1,906	332 %
Rural	532	749	1,162	218 %
Industry	219	378	494	226 %
Sub-total	1,324	2,296	3,562	269 %
Per capita (l/d)	58	75	88	152 %
(b) Irrigation (1000 m ³ /d)	3,965	7,810	11,655	294 %
(c) Live Stock (1000 m ³ /d)	326	427	621	191 %
(d) Inland Fishery (1000m ³ /d)	44	61	78	
(e) Wildlife (1000m ³ /d)	21	21	21	
Total (1000m ³ /d)	5,680	10,615	15,937	
MCM per Year	2,073	3,874	5,817	

Source: National Water Resources Development Master Plan (NWPM), 1992

Note: Water demand for wildlife was assumed to remain constant from 1990-2010 due to lack of data and information on breeding behaviour of the wildlife.

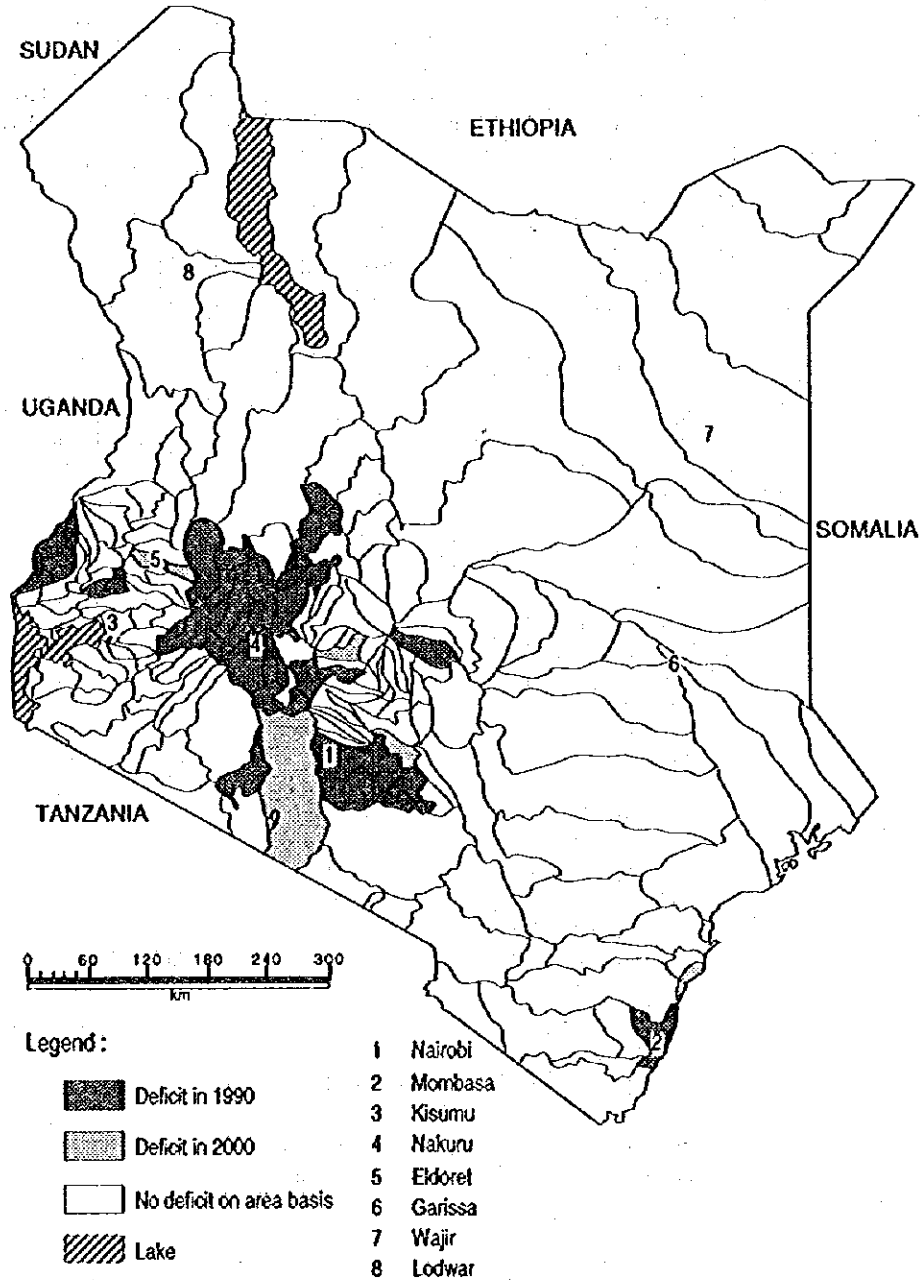
Table 7.8 Potential Perennial Water Resource

(a) Surface water	19,500	MCM/year
(b) Groundwater	619	MCM/year
-Boreholes	193	MCM/year
-Shallow wells	426	MCM/year
Total	20,209	MCM/year

Source: NWPM, 1992

The water balance between total demand and total available water sources (surface water & groundwater) was assessed on a regional basis for each drainage sub basin as shown in Figure 7.8. The figure shows the sub basins having a deficit in the years 1990, 2000, and 2010 and major demand centres in the respective areas.

Figure 7.8 Balance between Demand and Potential Available Water (Groundwater & Surface Water)



Note : This figure shows the balance between projected water demand and potential available water "on area basis". Even in the classified above as "no deficit", there may still be water shortage on local area basis

Source: NWPM, 1992

According to the NWMP, the principal towns and urban centres are considered for bulk water supply, and other centres are considered for area/rural water supply. In principle, rural water supply in high

potential areas and part of the medium potential areas, in which permanent surface water is available, will be covered by piped water supply from surface water sources. The remainder of the medium potential areas and low potential areas will be covered by spot supply from groundwater, water harvesting or other sources.

Targeted urban water supply schemes having high priority are as shown in Figure 7. 7. Almost all the tourism promotion zones in tourism regions are covered or related with the urban water supply schemes in the NWMP.

2.3. Formulation of Water Supply Plan for Tourism Development

2.3.1. Basic Concept

(1) Target Year

The target completion year of infrastructure is set at the year 2010, in co-ordinating with the National Tourism Master Plan.

(2) Adoption of the National Water Master Plan

The NWMP provides valuable information, data and preliminary plans for the urban infrastructure. Thus, the study on the water supply plan for tourism development is based to a large extent on the NWMP.

(3) Standards and Criteria

The Design Manual for Water Supply in Kenya stipulates standards and criteria for water demand projections. The water demand projections and water supply plan in the study area are, therefore, formulated based on this manual.

(4) Development Strategy for Water Supply

According to the classification of the Ministry of Land Reclamation, Regional and Water Development, the urban water supply programme is targeting urban areas with a population of more than 100,000 people, and the NWMP also follows this classification and plans urban water supply programmes. The water demand forecast of NWMP includes the demand from tourism activities, thus water demand in some tourism development areas, can be absorbed into the urban water supply capacity, which were compiled in the NWMP already. Under the above mentioned condition, the study team classified tourism development areas in the study into three categories as follows :

- Target tourism development areas, in which water demand from tourism can be absorbed into the capacity of the urban water supply programme. A public water supply system will be adopted for these areas.
- Target tourism development areas, in which the study plans new development on a large scale with new water demand, and in which the capacity of the urban water supply cannot absorb the demand originating from tourism. In these areas, another new programme including enlargement of the existing facilities should be planned with the relevant public enterprise.
- Target tourism development areas, which are located out of the area of the urban water supply programme, and in which the water supply system should be prepared by each tourism facility. Individual water supply system are proposed for these areas.

(5) Tourism Development Pattern

Tourism development is grouped into two patterns, one is the concentrated type and other is the scattered type. The concentrated type will be developed in the vicinity of the urban areas and so water supply for this type will be planned by the public water supply system, such as urban water supply schemes or community systems according to the NWMP. For the scattered type of development, it will not be economical to integrate their supply with the urban public infrastructure, owing to geographic and environmental constraints. Therefore, the scattered type will adopt the individual water supply system approach.

2.3.2. Planning Conditions

Characteristics of each tourism region are summarised in Table 7. 9.

(1) Forecast Water Demand

Water demand for the whole regions and accommodation are estimated respectively in Table 7. 9.

(2) Availability of Water Source for Tourism Region

Available water in each tourism region is identified as shown in Table 7. 10. The table shows that inadequate water supply is a major obstacle to tourism development at the coastal, Masailand, Northern and Torkana tourism regions respectively.

Table 7.9 Characteristics of Tourism Region

	Nairobi	Central	Masailand	Western	Turkana	Northern	Jana Basin	Coastal	Eastern	Total	
Population (1,000)	Present	1,806	7,832	853	10,621	210	408	280	1,739	1,753	25,501
	2000	2,456	9,004	1,084	12,204	232	432	302	1,976	2,011	29,701
	2005	3,117	9,970	1,291	13,516	250	451	313	2,188	2,210	33,305
	2010	3,855	10,905	1,509	14,597	266	469	321	2,399	2,397	36,718
Urbanisation ratio (%)	Present	100	16	9	10	0	16	19	39	4	
	2000	100	20	11	12	0	19	23	41	5	
	2005	100	24	12	14	0	20	28	49	6	
	2010	100	28	13	10	0	22	32	57	7	
Accommodation (Rooms)	Present	4,000	1,801	1,737	764	48	24	71	9,820	584	18,849
	2000	6,700	2,370	2,120	1,950	320	90	81	13,280	1,280	28,191
	2005	9,700	3,750	3,000	3,400	800	120	700	19,120	2,600	43,190
	2010	11,400	5,400	3,800	5,010	1,550	310	1,200	24,750	3,080	56,500
Domestic water demand (m ³ /d)	For the Whole Region										
	Present	270,854	516,151	50,150	637,232	10,482	27,072	19,194	154,080	94,330	1,779,545
	2000	368,354	632,098	65,880	759,114	11,618	29,565	22,028	180,193	110,404	2,179,257
	2005	467,499	735,765	80,068	867,701	12,502	31,636	24,257	215,752	123,527	2,558,706
	2010	578,296	849,493	95,218	871,465	13,310	33,693	26,440	255,925	136,637	2,860,477
	For Accommodation										
	Present	2,000	901	869	382	24	12	36	4,910	292	9,425
	2000	3,350	1,185	1,060	975	160	45	41	6,640	640	14,096
2005	4,850	1,875	1,500	1,700	400	60	350	9,560	1,300	21,595	
2010	5,700	2,700	1,900	2,505	775	155	600	12,375	1,540	28,250	
Domestic swewage yield (m ³ /d)	For the whole region										
	Present	216,683	412,921	40,120	509,785	8,385	21,658	15,356	123,264	75,464	1,423,636
	2000	294,683	505,679	52,704	607,292	9,294	23,652	17,623	144,155	88,324	1,743,405
	2005	373,999	588,612	64,054	694,161	10,001	25,309	19,406	172,601	98,822	2,046,965
	2010	462,637	679,594	76,175	697,172	10,648	26,954	21,152	204,740	109,310	2,288,382
	For accommodation										
	Present	1,600	720	695	306	19	10	28	3,928	234	7,540
	2000	2,680	948	848	780	128	36	32	5,312	512	11,276
2005	3,880	1,500	1,200	1,360	320	48	280	7,648	1,040	17,276	
2010	4,560	2,160	1,520	2,004	620	124	480	9,900	1,232	22,600	
Domestic solid waste yield (kg/d)	For the whole region										
	Present	541,709	373,603	22,516	318,616	629	20,060	15,613	201,382	19,988	1,514,115
	2000	982,278	545,657	35,107	446,682	697	23,954	20,759	244,209	29,562	2,328,906
	2005	1,402,496	711,838	46,491	575,764	750	27,309	25,822	319,033	39,113	3,148,616
	2010	1,927,654	912,742	59,304	424,785	799	30,787	31,189	407,993	50,340	3,845,591
	For Accommodation										
	Present	5,400	2,431	2,345	1,031	65	32	96	13,257	788	25,446
	2000	9,045	3,200	2,862	2,633	432	122	109	17,928	1,728	38,058
2005	13,095	5,063	4,050	4,590	1,080	162	945	25,812	3,510	58,307	
2010	15,390	7,290	5,130	6,764	2,093	419	1,620	33,413	4,158	76,275	

Source: JICA Study Team

Table 7.10 Available Water

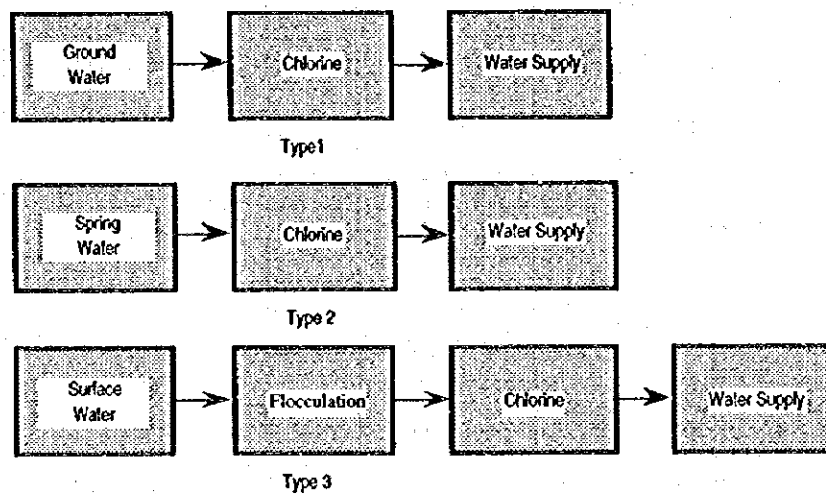
	Surface Water (m ³ /d)	Ground Water (m ³ /d)	Water Demand for the Whole Area in 2010 (m ³ /d)	Rating of Water Demand to Available Water (%)
1. Central Tourism Region including Nairobi	24,879,240	86,046	2,257,000	9.0
2. Masailand Tourism Region	69,984	12,845	108,000	130.0
3. Western Tourism Region	11,991,456	374,802	1,050,000	8.5
4. Turkana Tourism Region	0	22,534	10,000	43.0
5. Northern Tourism Region	0	73,429	35,000	47.7
6. Tana Basin Tourism Region	47,151,072	203,509	25,000	0.1
7. Coastal Tourism Region	49,248	37,242	257,000	297.1
8. Eastern Tourism Region	394,848	151,985	83,000	15.2

Source: JICA Study Team

(3) Typical Water Treatment

Based on the kind of water source, typical water treatment methods are classified into three types as illustrated in Figure 7.9.

Figure 7.9 Type of Typical Water Treatment



Source: JICA Study Team

2.4. Proposed Water Supply System for Tourism Region

2.4.1. Proposed Water Supply System

Based on the formulation of the water supply plan for each tourism region, the following schemes are proposed in order to ensure the implementation of the Master Plan.

(1) Water resources development scheme

- For the concentrated tourism development type to be provided by the relevant public enterprise.

- For the scattered tourism development type to be provided individually by means of spot unit of several water sources, such as groundwater and pipeline of urban water supply.

(2) Water supply development scheme

- Urban water supply scheme to be provided by the relevant public enterprise for urban areas classified into the concentrated tourism development type.
- Community water supply scheme to be provided by the relevant public enterprise for the concentrated tourism development type and resident around the tourism area.
- Individual water supply scheme to be provided individually for the scattered tourism development type.

2.4.2. Water Resources Development Scheme

Available water resources at each tourism region for the concentrated tourism development type are summarised in Table 7. 11. These water resources will be developed by public enterprise in harmony with the urban water supply schemes in the NWMP and the tourism development master plan.

Table 7. 11 Water Resources in Tourism Regions

Tourism Regions	Surface Water	Groundwater	Location
1. Central Tourism Region including Nairobi	Tana(Grand Falls)		Muranga Dist. Meru Dist.
2. Masailand Tourism Region	Upper Narok River		Narok Dist.
3. Western Tourism Region	Sondu River, Kima River, Lake Victoria	Ahero Borehole, Nyabikaya Borehole	Kisumu Dist., South Nyanza Dist.
4. Turkana Tourism Region	Kerio River	Lodwar Borehole	Turkana Dist.
5. Northern Tourism Region	Ewaso Ngiro River	Wajir Borehole	Wajir Dist.
6. Tana Basin Tourism Region	Tana River	Ijara Borehole, Kotile Borehole	Tana River Dist.
7. Coastal Tourism Region	Tana River, Sabaki (Rare dam), Muzima Spring		Lamu, Kilifi (Malindi) Dist., Taita Taveta Dist.
8. Eastern Tourism Region	Muzima Spring, Njoro Spring		Taita Taveta Dist.

Source: JICA Study Team

2.4.3. Water Supply Development Scheme

Urban water supply schemes planned in the NWMP are listed in Table 7. 12, and the locations of urban water supply schemes are already shown in Figure 7. 7. These urban water supply schemes involve in principle the required water for tourism areas and it is therefore not necessary for the tourism development to coordinate with the implementation plan for the urban water supply schemes.

2.4.4. Environmental Aspects

The following issues are recommended in the National Tourism Master Plan for the purpose of the wildlife survival and preservation of the water quality of rivers/streams.

- The national census of wildlife population shall urgently be undertaken by relevant public agencies to establish wildlife population in the country to provide the basis for projection of future water demand for wildlife.
- Control and monitoring of affluent discharged in some of the water masses within wildlife habitats should be enhanced by relevant public agencies.

Table 7. 12 Urban Water Supply Schemes Planned in the NWMP(1)

District	Urban name	City code	Population (2010)	Water source	Water demand (m3/day)		
					1990	2000	2010
Nairobi	Nairobi	U- 1	3,465,400	Thika Dam, Ndarugu, Ruiru-A, Chania B	332,826	552,294	802,168
Kiambaa	Karuri	U- 2	46,400	Kiambaa Dam (Rui Ruaka RA)	2,554	5,070	7,557
Kiambu Municipality	Kiambu	U- 3	16,600	Kiambaa Dam (Rui Ruaka R)	1,589	3,212	4,805
Ngenda	Gatundu & Ngenda	U- 4	2,000	Thirika River	170	332	460
Limuru	Limuru	U- 5	4,600	Chania P/L	931	1,699	2,337
Ruiru	Ruiru	U- 6	40,900	Ruiru River	2,602	5,076	7,456
Thika Municipality	Thika	U- 7	217,500	Chania River (Lower)	11,134	24,737	39,416
Githunguri	Githunguri	U- 8	14,100	Ruiru River	671	1,523	2,444
Kikuyu	Kikuyu	U- 9	22,500	Kikuyu Dam	4,561	8,081	10,567
Tebere	Wanguru	U- 10	1,500	Thiba River	181	341	490
Kine	Sagana	U- 11	11,100	Ragati River	518	1,191	1,950
Inoi	Keruova	U- 12	34,100	Krinoa River	1,395	3,263	5,445
Kabare	Kutus	U- 13	23,500	Thiba River	925	2,150	3,575
Muruka	Kandara	U- 14	1,800	Thika River	103	193	272
Nginda	Maragua	U- 15	91,200	Githari River	5,183	9,545	13,813
Iyego	Kangema	U- 16	3,900	Mathiya River	219	415	590
Mbiru	Murang'a	U- 17	70,100	Maragua River	3,241	7,992	12,449
Makuyu	Makuyu	U- 18	16,500	Motoho River	745	1,589	2,495
Oi Kalou	Oi Kalou	U- 19	37,900	Malewa River	1,740	4,316	6,662
Konyu	Karatina	U- 20	20,700	Ragati River	975	2,152	3,606
Karima	Othava	U- 21	18,400	Tuthi River	702	1,623	2,796
Nyeri Municipality	Nyeri	U- 22	370,700	Chania River	15,559	35,042	59,718
Mariakani	Mariakani	U- 23	33,100	2nd Mzima P/L	3,954	7,518	10,502
Tezo	Kili	U- 24	54,500	Rare Reservoir	2,119	5,288	8,994
Gede	Watumu	U- 25	9,200	Sabaki Pipeline	306	801	1,389
Malindi Town	Malindi	U- 26	159,600	Sabaki Pipeline & Rare Dam	5,818	14,805	25,406
Magarini	Mamburi	U-135	14,400	Sabaki River	466	1,024	2,092
Shimba North	Kwale	U- 27	15,200	Marere Pipeline	547	1,455	2,326
Kinango South	Kinango	U- 28	5,800	Marere Pipeline	310	660	885
Msamweni	Msamweni	U- 29	34,500	Boreholes + Mkurumaji River	298	3,394	5,427
Lungalunga	Lungalunga	U-136	8,200	Umba River	441	959	1,404
Witu	Witu	U- 30	12,500	Mkondo wa Cambi River	494	1,146	1,987
Lamu Town	Lamu	U- 31	34,000	P/L from Tana River + B/H	1,691	3,751	6,317
Mombasa	Mombasa	U- 32	904,400	2nd Mzima/Mwachi Dam, Pamba Dam	100,256	151,634	202,822
Taveta	Taveta	U-137	28,900	Njoro Spring	2,254	3,890	5,445
Voi	Voi	U- 33	36,000	2nd Mzima Pipeline	2,177	4,257	6,565
Weruaha	Wundanyi	U- 34	8,000	Sigaso/Manguri River	403	803	1,237
Bura	Bura & Madogo	U- 35	2,800	Tana River	149	334	450
Zabaki	Hofa	U- 36	34,800	Tana River	1,374	3,615	5,862
Bilisa	Garsen	U- 37	11,700	Tana River	570	1,272	1,882
Kanoani South	Runvenies	U- 38	6,100	Ena River	407	821	1,228
Nuhawa	Siakago	U- 39	800	Ena River	50	88	120
Embu Municipality	Embu	U- 40	72,900	Lower Kapingazi River & Upper Rapingazi	3,010	7,201	11,899
Central	Isiolo	U- 41	88,100	Borehole & Spring	3,023	9,559	18,914
Otdouonyiro	Oi Doingo Ng'ro	U- 42	17,600	Ewaso Ng'ro River	788	2,064	3,681
Garbatula	Garbatula	U-138	7,600	Boreholes	340	898	1,590
Merti	Merti	U-139	22,700	Ewaso Ng'ro	1,021	2,668	4,757
Changwithya	Kitui	U- 43	40,800	Masinga Dam	1,560	4,017	6,755
Mutomo	Mutomo	U- 44	1,600	Sub-Surface Dam on Tiva River	87	178	242
Mwingi	Mwingi	U- 45	32,000	Kiambere Dam	1,076	2,879	4,886
Muvuti	Machakos	U- 46	356,400	Athi River P/L	14,309	33,750	56,631
Mitaboni Settlement Area	Mitaboni & Machakos	U- 47	114,000	Kaathana River	4,288	10,248	17,296
Kileleshwa	Athi River	U- 48	98,200	Upper Athi Dam	4,891	10,907	27,645
Kangundo	Uaani/Tawa	U- 49	700	Tawa River	37	74	105
Matungulu	Kangundo	U- 50	43,900	Pipeline from Athi River	1,695	4,037	6,812
Kitungu	Tala	U-140	6,400	Pipeline from Athi River	667	1,299	1,951
Makueni	Nunguri	U- 51	1,000	Kyangonyo River	62	117	151
Nzai	Wote	U-141	9,000	Kaili River + Nzumi River	431	995	1,629
Mito Andei	Emali	U- 52	800	Nol Tresh P/L	50	89	121
North Horr	Mito Andei & Kibwezi	U- 53	13,500	Pipeline from Athi River	557	1,264	2,045
Kargi	North Horr	U-142	6,300	Boreholes	374	795	1,244
Korr	Kargi	U- 54	16,600	Boreholes & Surface Dam	764	1,910	3,220
Mountain	Korr	U-143	17,200	Boreholes	1,030	2,166	3,411
Sololo	Marsabit	U- 55	42,700	Boreholes & Small Dam/Surface Dam/S	2,201	5,350	9,076
Moyale	Sololo	U- 56	14,300	Boreholes	658	1,652	2,832
Njima	Moyale	U- 57	26,200	Boreholes + Small Dam	1,493	3,548	5,956
Nkuene	Meru	U- 58	319,900	Kathita River	13,209	31,863	53,095
Chogoria	Nkubu	U- 59	20,300	Thinqithu River	737	1,843	3,102
Kariniani	Chogoria	U- 60	2,900	North Mara River	161	329	443
Maua	Chuka	U- 61	12,400	Tungu River	590	1,244	1,894
Madogashe	Maua	U- 62	12,400	Ura River	590	1,244	1,894
Ijara	Mudo Gashe	U- 63	6,700	Boreholes + Surface Dam	359	773	1,141
Kobile	Ijara	U- 64	3,200	Boreholes + Small Dam	173	409	545
Masalani	Kobile	U- 65	3,200	Boreholes/Surface Dam/Tana	173	409	545
Sankuri	Masalani	U- 66	3,200	Tana River	173	409	545
Mandera	Garissa	U- 67	115,300	Tana River	4,862	12,392	20,030
Etwak	Mandera	U- 68	18,100	Daau River	1,222	2,876	3,602
	Etwak	U- 69	24,400	Boreholes	1,730	2,876	4,242

Source: NWMP

Table 7.12 Urban Water Supply Schemes Planned in the NWMP(2)

District	Urban name	City code	Population (2010)	Water source	Water demand (m ³ /day)		
					1990	2000	2010
Rhamu	Rhamu	U-70	10,200	Daua River	727	1,202	1,772
Wajir Township	Wajir	U-71	75,500	Boreholes + Ewaso Ngiro River	3,428	7,469	12,493
Buna	Buna	U-72	18,700	Boreholes (Lago Bor River)	1,087	2,040	3,094
Bute	Bute	U-73	6,100	Boreholes + Small Dams	353	664	1,008
Erango	Manga	U-74	2,100	Bunyonyu Dam	136	252	320
East Kiufu	Keroka	U-75	6,100	Bunyonyu Dam	596	1,079	1,537
East Mugirango	Nyamira + Kebirigo	U-144	32,400	Kuja River	1,671	3,322	5,090
Kisi Municipality	Kisi	U-76	138,500	Bunyonyu Dam	7,815	15,630	24,020
Majoe Chache	Ogembo	U-77	2,700	Kuja River	162	298	412
West Kisumu	Maseno	U-78	50,600	Edzawa Dam	7,413	13,794	19,934
East Kisumu	Kisumu + Kiboswa	U-79	578,700	Kibos Dam	26,032	54,693	89,344
South East Kano	Ahero	U-80	26,900	Nyando River	1,787	3,279	4,864
Muhoroni	Muhoroni	U-81	26,700	Nyando River	1,422	2,937	4,720
West Sakwa	Bondo	U-145	8,600	Yala River	703	1,231	1,771
East Gem	Yala	U-82	6,500	Yala River	683	1,216	1,751
East Alego	Siaya	U-83	57,200	Yala River	3,245	6,283	9,778
North Aoenya	Ukwala	U-84	2,700	Nzoia River	162	284	411
Kanyada West	Homa Bay	U-85	73,900	Lake Victoria	3,945	8,308	12,741
Suna East	Migori	U-86	24,100	Migori River	1,321	2,781	4,255
Bukira East	Kehancha + Tarano'anya	U-146	9,800	Moori River	555	1,038	1,481
Bugemba West	Nyabikaya	U-147	9,300	Boreholes	525	980	1,405
Central Kasipul	Oyugis	U-148	9,800	Isanta River (Awach Tende)	624	1,155	1,629
Central Karachuoyo	Kendu Bay	U-87	8,700	Lake Victoria	635	1,311	1,974
South Sakwa	Awendo/Sare	U-149	11,000	Sare River	1,082	2,015	2,877
Odomorogi	Ofoitokitok	U-88	24,500	Nol-Turesh Spring	698	2,098	4,034
Ngong	Ngong	U-89	81,800	Krarapon spring	2,614	7,278	13,474
Idamat	Kajiado	U-90	34,100	Kiserian P/L	973	2,916	5,617
Namanga	Namanga	U-91	27,300	Namanga Spring	779	2,342	4,496
Magadi	Magadi	U-92	16,000	Oloibofoto River	524	1,484	2,781
Kepletudo	Sofik	U-93	16,600	Kipsonoi River	1,295	2,443	3,640
Kericho Township	Kericho	U-94	145,000	Dimlich Dam, Kimugung Dam	8,034	16,974	27,497
Kipkelion	Kipkelion	U-95	7,800	Nyando River	330	730	1,210
Londiani	Londiani	U-96	11,300	Londiani Dam	504	1,098	1,816
Nanyuki	Nanyuki	U-97	114,900	Liki River	4,489	11,167	20,540
Rumuruti	Rumuruti	U-150	8,200	Rumuruti Dam + Borehole	485	1,015	1,651
Nyahururu Township	Nyahururu	U-98	60,000	Nyahururu Dam + Borehole	2,642	6,505	11,055
Gilgil	Gilgil	U-99	73,800	Turasha P/L + Malewa Dam	2,325	6,340	12,065
Naivasha	Naivasha	U-100	194,500	Turasha P/L + Malewa Dam	6,151	16,752	31,924
Njoro	Njoro	U-101	46,000	Itare Dam	1,463	3,993	7,606
Eiburgon	Eiburgon	U-102	62,700	Itare Dam	1,953	5,363	10,239
Molo South	Molo	U-103	55,100	Itare Dam	1,813	4,892	9,255
Nakuru Municipality	Nakuru	U-104	869,900	Turasha P/L + Malewa Dam +	34,623	86,813	151,718
Lower Malili	Narok	U-105	85,700	Upper Narok Dam	2,084	7,240	14,516
Keekonyokie	Nairagio Ngare	U-106	2,500	Nasampolai River	82	230	413
Uasin Gishu East	Kigoris	U-151	16,200	Boroko River	541	1,526	2,688
Siria East	Lolkorian	U-152	8,400	Migori River	279	788	1,301
Kitale	Kitale	U-107	249,200	Koitobos River	9,391	23,346	40,988
Kimini	Kimini/Saboti + Spr.	KU-108	4,200	Kabewyan River	211	450	642
Endebess	Endebess/Kwanza	U-109	6,700	Koitobos River	348	723	1,029
Moi's Bridge	Moi's Bridge	U-153	10,100	Nzoia River	464	975	15,677
Turbo West	Turbo	U-154	14,000	Sosiani River	644	1,342	2,185
Eldoret Municipality	Eldoret	U-110	486,800	Moiben Dam + Nzoia River	20,374	47,755	84,415
Ofare	Burnt Forest	U-111	7,200	Kipkaren River	330	687	1,124
Kabarnet Mosoo	Kabarnet	U-112	34,700	Krandich Dam	1,475	3,249	5,558
Maji Mazuri	Maji Mazuri	U-113	19,200	Maji Mazuri River	785	1,745	2,991
Ekdama Ravine	Ekdama Ravine	U-114	20,700	Chemususu Dam	902	1,985	3,372
Lembus Sof	Moootio	U-115	10,700	Molo River/Chemususu Dam	436	975	1,662
Marigat	Marigat	U-155	8,600	Perkerra River	452	871	1,340
Kiptuliong	Iten + Tambach	U-116	19,700	Moiben Dam	952	2,035	3,194
Chemelli	Nandi Hills	U-117	4,200	Mokong River	877	1,687	2,467
Chemundu	Kapasabet + Baraton	U-118	56,300	Mokong River	2,114	5,238	9,002
Maralal	Maralal	U-119	74,800	Loikas/Yamo River	3,036	7,296	13,177
Wamba	Wamba	U-120	15,600	Boreholes	593	1,449	2,651
Ebarta	Baragoi	U-121	13,500	Boreholes + Sub-surface Dam	512	1,265	2,294
Lodwar	Lodwar	U-122	33,400	Boreholes + Sub-surface Dam	1,890	4,543	7,881
Kapenguria	Kapenguria/Makutano	U-123	48,200	Kapenguria River	1,846	4,332	7,536
Malakisi	Mawalie + Malakisi	U-156	10,700	Malakisi River	627	1,376	2,084
Musikoma	Bungoma	U-124	142,700	Kuywa River	5,098	13,776	23,561
Kimili	Kimili	U-125	31,500	Kimili River	955	2,735	4,795
Webuye	Webuye	U-126	128,700	Nzoia River	4,054	11,472	19,991
Cheptais	Cheptais	U-157	10,000	Sasuri River	468	1,076	1,675
South Teso	Busia	U-127	70,200	Sio River	2,105	6,489	11,113
Central Bukhayo	Nambale	U-158	8,100	Sio River	308	791	1,233
West Bunyore	Lvanda	U-128	12,600	Edzawa River	690	1,563	2,476
Central Maragoli	Vihiga + Majengo	U-129	14,400	Edzawa River (Kmondri River)	801	1,591	2,332
Shamakhoko	Kaimosi	U-130	1,300	Galagofi River	188	358	498
West Isukha	Khaveta	U-131	1,400	Yala River	188	360	513
Kakamega Municipality	Kakamega	U-132	187,500	Isukhu River, Mukufusi Dam	7,884	18,648	30,526
Central Marama	Butere	U-133	7,400	Viratsi River	366	758	1,121
Central Wang'a	Mumias	U-134	75,900	Nzoia River	3,886	7,923	11,814

Source: JNWMP

3. Sewerage and Solid Waste

3.1. Present Conditions in Kenya

3.1.1. Sewerage

The condition of the sanitary system in Kenya is still very unsatisfactory. About half the population doesn't have sanitary facilities. A centralised sewerage system is provided in only 20 urban areas, while in other urban areas, waste water is directly discharged onto the road, or is stored in pits installed at each house and dumped into a manhole. Even in big cities, the sewerage system covers only limited areas as shown in Table 7. 13.

The most common method of sewage treatment is a stabilisation pond process (SP), although a trickling filter process (TF) is adopted in some of the service areas. In almost all the sewage treatment facilities, overloading of treatment capacity occurs, due to the increase of the population.

Table 7. 13 Percentage of Served Population by Sanitary System

	Nairobi	Mombasa
Centralised Treatment (Treatment Method)	55 % SP/TF	24 % Primary Treatment
Septic Tank	25 %	20 %
Pit Latrine	20 %	52 %

Source: JICA Study Team

3.1.2. Solid Waste

Solid waste disposal is gradually becoming a serious problem, due to its increased amount with the progress of urbanisation. The amount of municipal waste disposal in Nairobi City increased from 300t/d in 1972 to 2,630t in 1985 as shown in Table 7. 14. The industrial waste disposal also increased from 70t/d in 1972 to 620t/d in 1985. The amount of waste discharged per person has increased to 1.7 kg in 1985 from 0.65 kg/d in 1972.

Table 7. 14 Solid Waste Disposal in Nairobi City

Type	(Unit : ton/d)			
	1972	1975	1980	1985
Municipal waste disposal	300	560	1,100	2,630
Industrial waste disposal	70	120	200	620
Sand and soil	100	110	160	210
Total	470	790	1460	3460

Source: Nairobi City Council

Although waste disposal composition has not yet been studied, it is supposed that domestic waste has recently contained poisonous substances.

Generally solid waste is collected by the local authority at intervals of 2 to 3 days and transported to the disposal sites, which are located away from the populated areas. Solid waste is disposed of by means of open dumping or controlled tipping method.

As the result of the facility survey undertaken by the study team, about 80 % of the existing tourist accommodations receive public service. The remaining accommodations have treated their waste with their own facilities, such as garbage pits, burning and dumping. A few hotels have provided on-site incinerators and compost facilities.

3.1.3. Management Authority and Level of Service

The local administration authority executes normally the following works :

- Implementation and management of the centralised sewerage system
- Removal and disposal of sludge from the septic tank and pit latrine, and
- Collection and disposal of garbage.

In Nairobi, however, the private sector is engaged in the services of garbage collection and disposal to supplement the local authority's service.

The level of solid waste management is as poor as the sewerage management. It is clear that the urban infrastructure service needs to be expanded and strengthened in compliance with the increasing population and economic development activity, and also in order to create amenity of living environment, to improve the hygienic conditions and enhance economic activities including the tourism industry.

3.2. Urban Sewerage Scheme in the NWMP

According to the NWMP, urban sewerage schemes have been planned concurrently with the urban water supply schemes. Almost all the tourism promotion zones in the tourism regions are covered by and related with the urban sewerage schemes in the NWMP.

Urban sewerage projects have also been planned in the NWMP as shown in Table 7. 15. These projects will be executed by MOLG.

Table 7. 15 Urban sewerage Projects in the NWMP

Urban Name	Location of Town		Urban Area (km ²)	Cost (1,000\$)
	District	Location		
1 Nairobi	Nairobi		90.00	360,000
2 Kiambu	Kiambu	Kiambu Municipality	1.62	12,920
3 Thika	Kiambu	Thika Municipality	1.85	14,800
4 Kerugoya	Kirinyaga	Inoi	0.96	7,680
5 Murang'a	Murang'a	Mbiri	5.25	31,500
6 Otikaou	Nyandarua	Oikaou	0.75	5,980
7 Nyeri	Nyeri	Nyeri Municipality	1.64	13,120
8 Kilifi	Kilifi	Tezo	0.62	4,940
9 Malindi	Kilifi	Malindi	0.95	7,600
10 Kwale	Kwale	Shimba North	0.90	7,200
11 Lamu	Lamu	Lamu Town	0.88	7,000
12 Mombasa	Mombasa	Mombasa	11.64	46,550
13 Voi	Taita Taveta	Voi	1.15	9,200
14 Wundanyi	Taita Taveta	Werugha	0.28	2,240
15 Hola	Tana River	Zabaki	0.93	7,400
16 Embu	Embu	Embu Municipality	0.95	7,600
17 Isiolo	Isiolo	Central	0.45	3,600
18 Kitui	Kitui	Changwithya	0.46	3,640
19 Machakos	Machakos	Muvubi	2.76	22,080
20 Mitaboni	Machakos	Mutituni	0.20	1,600
21 Marsabit	Marsabit	Mountain	0.11	840
22 Meru	Meru	Ntima	0.34	2,700
23 Garissa	Garissa	Sankuri	0.80	6,400
24 Mandera	Mandera	Mandera	0.06	500
25 Wajir	Wajir	Wajir Township	0.19	1,540
26 Kii	Kisii	Kisii Municipality	2.64	21,080
27 Kisumu	Kisumu	Central Kisumu	5.58	33,480
28 Siaya	Siaya	East Alego	0.12	960
29 Homa Bay	South Nyanza	Kanyada West	1.15	9,180
30 Kajiado	Kajiado	Ildamat	1.16	9,240
31 Kericho	Kericho	Kericho Township	1.17	9,360
32 Nanyuki	Laikipia	Nanyuki	1.96	15,640
33 Naivasha	Nakuru	Naivasha	0.90	7,200
34 Nakuru	Nakuru	Nakuru Municipality	12.95	51,800
35 Narok	Narok	Lower Melili	0.81	6,440
36 Kitale	Trans Nzoia	Kitale	4.20	25,200
37 Eldoret	Uasin Gishu	Eldoret Municipality	8.58	34,320
38 Kabarnet	Baringo	Kabarnet Mosop	0.16	1,280
39 Iten	Elgeyo-Marakwet	Kiptuilong	0.33	2,640
40 Kapsabet + Baraton	Nandi	Chemundu	1.64	13,120
41 Maralal	Samburu	Maralal Urban	0.70	5,600
42 Lodwar	Turukana	Lodwar	0.22	1,760
43 Kapenguria/Makutano	West Pokot	Kapenguria	0.35	2,800
44 Bungoma	Bungoma	Kanduyi	1.87	14,960
45 Webuye	Bungoma	Webuye	0.23	1,840
46 Busia	Busia	South Teso	0.11	900
47 Kakamega	Kakamega	Kakamega Municipality	2.07	16,560
Total			174.64	873,990

Source: Ministry of Land Reclamation, Regional and Water Development

3.3. Formulation of Sewerage and Solid Waste Disposal Plan for Tourism Development

3.3.1. Basic Concept

(1) Target Year

The target completion year of the master plan of infrastructure is set for the year 2010, in coordination with the national tourism master plan.

(2) Tourism Development Pattern and Sewerage Development Strategy

Tourism development is grouped into two patterns, one is the concentrated type and the other is the scattered type. The concentrated type will be developed in the vicinity of the urban areas and so sewerage and solid waste disposal for this type will be planned by the public system, such as urban sewerage schemes or community systems according to the NWMP. For the scattered type of development, it will not be economical to plan integration with the public infrastructure, owing to geographic and environmental constraints. Therefore, the scattered type will adopt the individual sewerage and solid waste disposal system.

(3) Urban Sewerage and Drainage System

A basic principle assumed is that sewerage and drainage facilities would be developed in conjunction with the provision of water supply facilities. Accordingly, the implementation of urban sewerage and drainage development will be along the principles and priority order set forth for the urban water supply schemes.

(4) Sewage Treatment Level

The treated sewage quality shall be decided in conformity with the effluent standards in Kenya, as shown in Table 7. 16.

Table 7. 16 Treated Sewage Quality

Type of Receiving Waters	Treatment Level (mg/l)			Tourism Region
	BOD	COD	SS	
River	20-80		30-60	Regions except Coastal
Ocean		80-120	30-60	Coastal region

Source: Ministry of Water Development Standard and Ministry of Environment

However, further studies on environmental issues, such as receiving waters' quality and water use conditions, are required for the determination of treatment level.

(5) Design Stormwater Flow

The design stormwater flow will be calculated by using the rational formula and the rainfall intensity formula worked out by the NWMP.

3.3.2. Planning Conditions

The characteristics of each tourism region are summarised in the previous Table 7. 9.

(1) Forecast Sewage and Solid waste Yield

Sewage and solid waste yields for the whole region and accommodation are estimated respectively in Table 7. 9.

(2) Sewage Collection System

Combined sewer systems handling both, stormwater and wastewater will be adopted for Nairobi and Mombasa, because this system has been used in both towns. A separate sewer system is recommended for the other tourism areas.

(3) Sewage Treatment Method

The relative merits of the practical treatment methods were examined by comparing several typical treatment processes in regard to land acquisition, the technology level of O & M work and the adaptability in Kenya, as shown in Table 7. 17.

Table 7. 17 Comparison of Typical Sewage treatment Method

Treatment Method	Required Area	O&M Work	Removal Efficiency	Requirement Cost	Side Effect against Environment	Adaptability
Stabilisation Pond/Aerated Lagoon	Large	Easy	High	Low	Bad	Easy
Conventional Activated Sludge	Medium	Difficult	High	High	Moderate	Difficult
Oxidation Ditch	Medium	Moderate	High	Medium	Moderate	Moderate
Rotating Biological Contactor	Small	Moderate	High	Medium	Moderate	Moderate
Septic tank	Small	Easy	Low	Low	Bad	Easy
Japanese Type Septic Tank (Johkaso)	Small	Moderate	High	High	Moderate	Moderate

Source: JICA Study Team

The stabilisation pond/aerated lagoon process is recommendable for the public sewerage systems, including the urban and community

sewerage systems, because of the simplicity of operations and maintenance and their cheap construction cost. The individual sewerage system will adopt septic tank, able to treat both, toilet wastewater and grey water, such as Japanese septic tank (Johkaso) or equivalent.

(4) Excess Sludge Dewatering Facilities

Excess sludge yielded from the public sewerage systems shall be thickened and dewatered, in order to reduce its weight, and be disposed of at a dumping site. The dry bed method is recommended for the excess sludge dewatering facilities, because of the cheap construction cost and the technical simplicity of operation and maintenance.

(5) Solid Waste

Solid waste except toxic/hazardous waste yielded from each tourism region shall be collected properly and disposed of at a dumping site by garbage collection service agencies. Each hotel will keep its solid waste temporarily with stationary or hauled containers. Solid waste shall be disposed of by means of a controlled tipping method, so-called a sanitary landfilling.

3.4. Proposed Sewerage and Solid Waste Disposal System for Tourism Region

3.4.1. Proposed Sewerage System

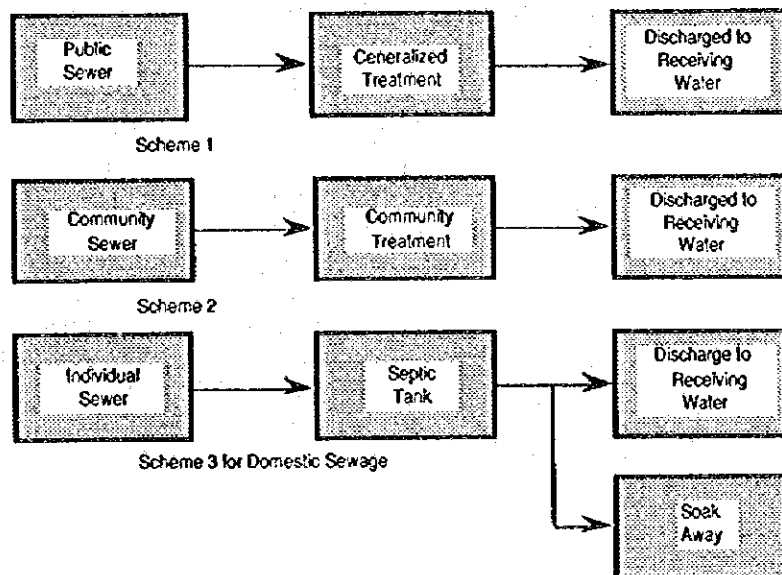
(1) Sewerage development scheme

Based on the formulation of a sewerage plan for the tourism regions, the following schemes are proposed in order to ensure the implementation of the Master Plan.

- Urban sewerage scheme to be provided by public enterprises for urban areas classified into the concentrated tourism development type.
- Community sewerage scheme to be provided by public enterprise for the concentrated tourism development type and residents around the tourism area.
- Individual sewerage scheme to be provided individually for the scattered tourism development type.

Flow diagram of the above three schemes is shown in Figure 7. 10.

Figure 7.10 Flow Diagram of Sewerage Scheme

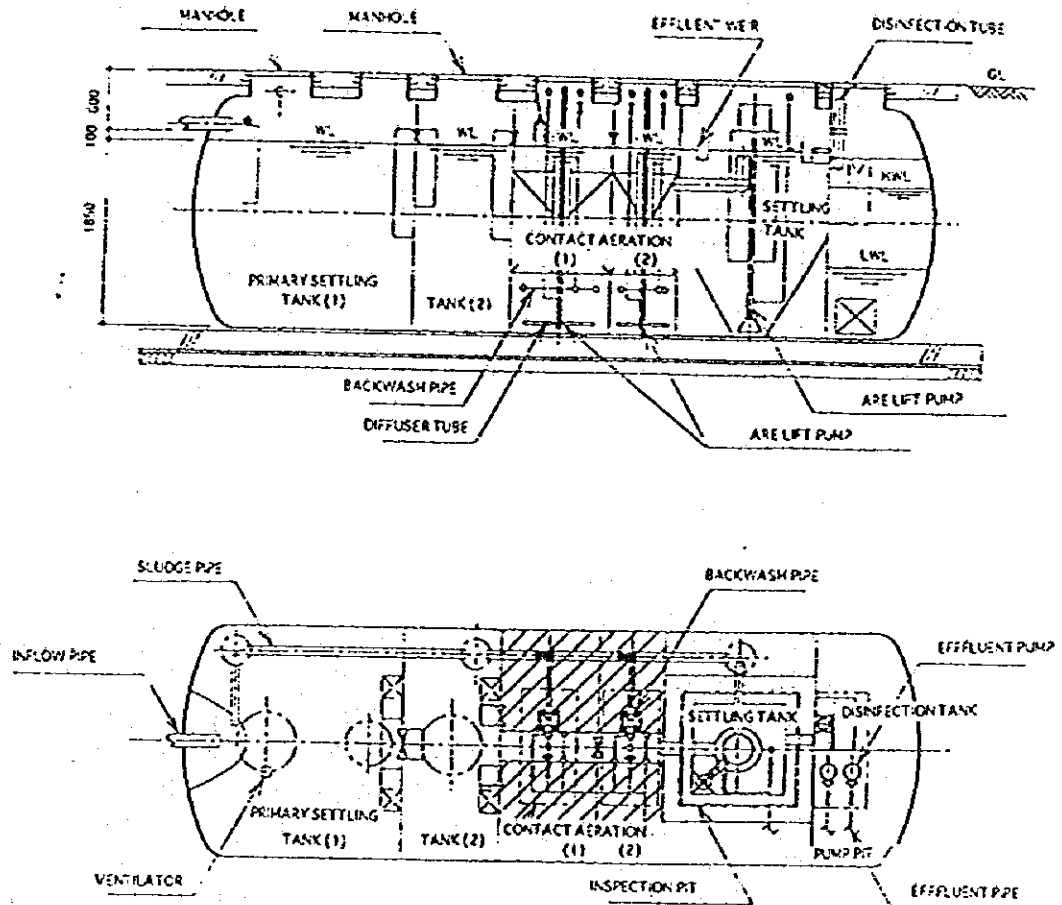


Source: JICA Study Team

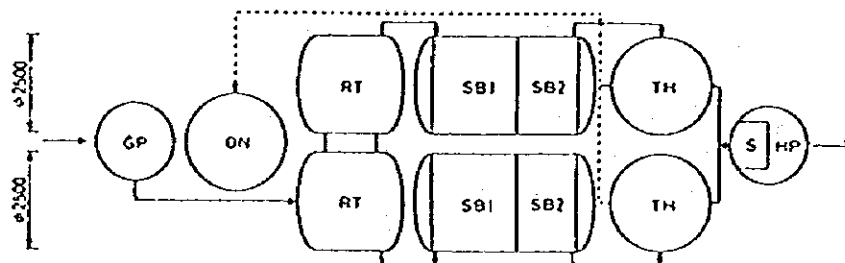
(2) Sewage Treatment Method

The stabilisation pond/aerated lagoon process is proposed for the public sewerage systems, including the urban and community sewerage systems, because of simplicity of operation and maintenance and the cheap construction cost. A schematic treatment flow of the stabilisation pond/aerated lagoon process is shown in Figure 7. 11. The individual sewerage system shall adopt septic tank, able to treat both, toilet waste water and grey water, such as Japanese septic tank or equivalent. A typical Japanese septic tank is shown in Figure 7. 12.

Figure 7.11 Typical Waste Water Treatment Methods
IN CASE OF DESIGN FLOW: $Q < 50 \text{ m}^3/\text{d}$



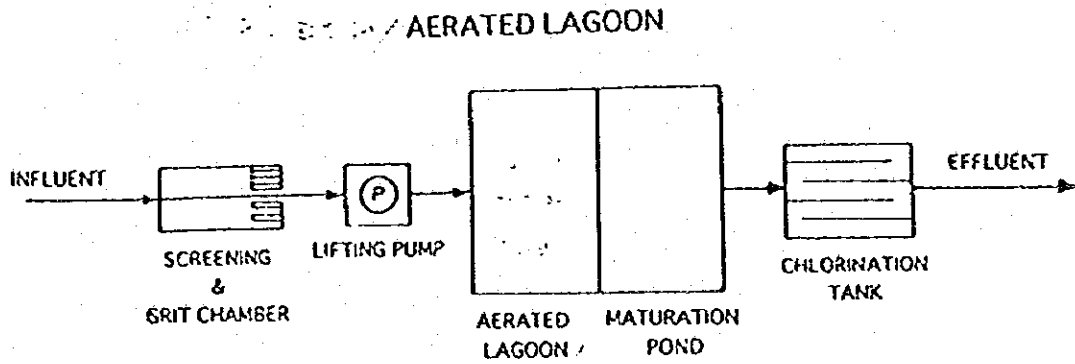
IN CASE OF DESIGN FLOW: $Q > 50 \text{ m}^3/\text{d}$



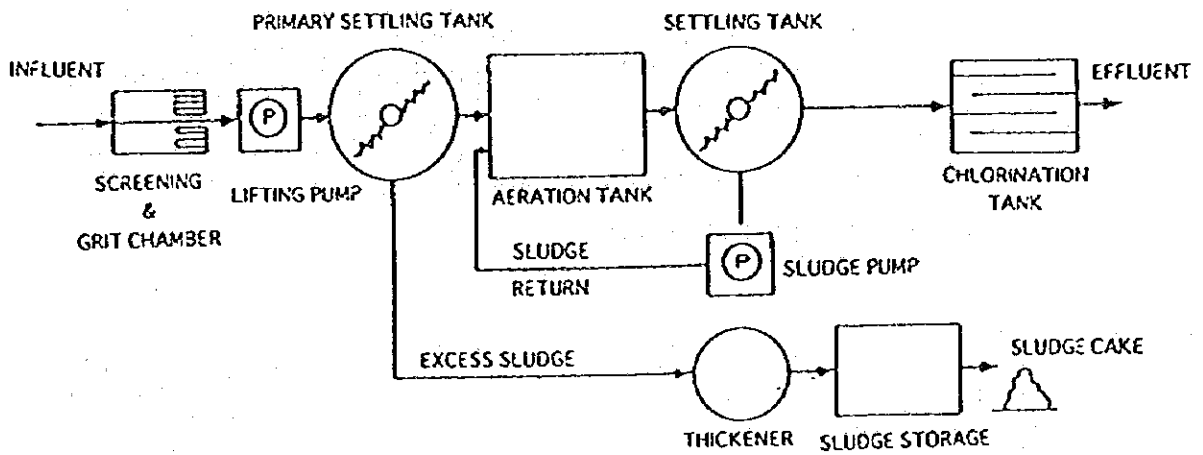
- | | |
|-----------------------------|-----------------------|
| GP : PUMP PIT | TH : SETTLING TANK |
| RT : FLOW EQUALIZATION TANK | S : DISINFECTION TANK |
| SB1 : CONTACT AERATION (1) | HP : SETTLING TANK |
| SB2 : CONTACT AERATION (2) | ON : SLUDGE THICKENER |

Source: JICA Study Team

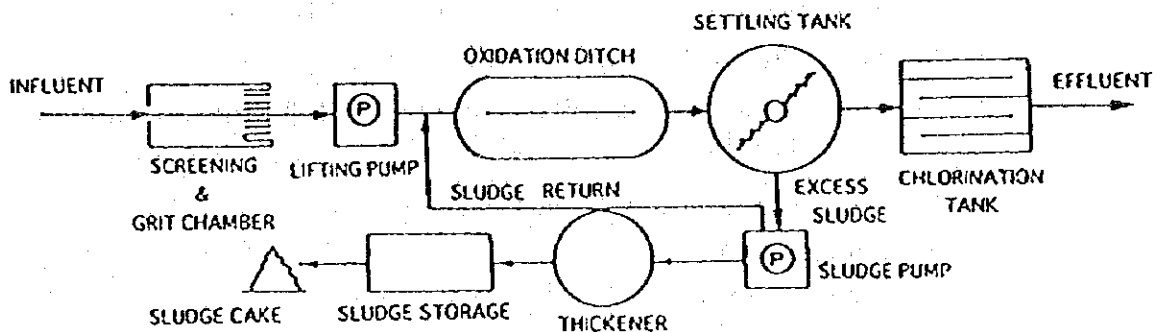
Figure 7.12 Japanese Type Septic Tank



CONVENTIONAL ACTIVATED SLUDGE



OXIDATION DITCH



Source: JICA Study Team

(3) Urban Sewerage and Drainage Scheme

Urban sewerage schemes planned in the NWMP are listed in Table 7.15. Urban drainage projects are summarised in Table 7.15. These urban sewerage and drainage schemes include, in principle, the yield expected from tourism areas. It is accordingly indispensable to coordinate with the implementation plan of the urban sewerage and drainage schemes.

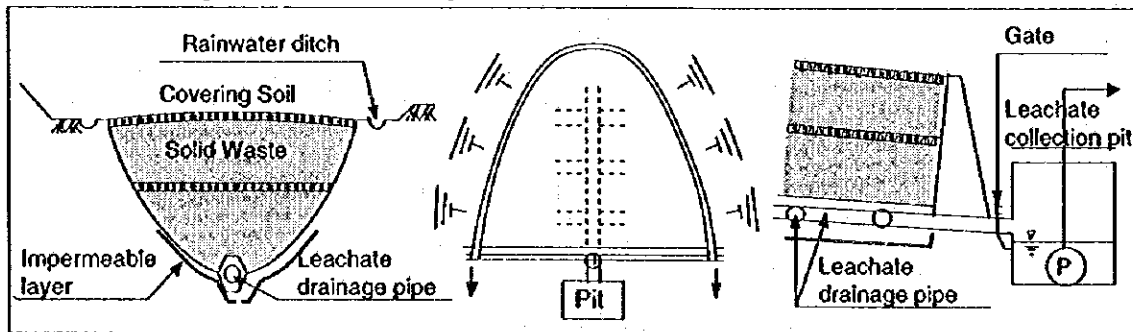
3.4.2. Proposed Solid Waste Disposal System

(1) Urban Solid Waste Disposal Schemes

In urban center in Table 7.15, systematic garbage collection and disposal shall be established by each local authority from the viewpoint of improvement of people's livelihood and hygienic conditions and amenity of the city. The concentrated tourism development type will utilise the system of the urban solid waste disposal scheme.

Sanitary landfill, defined as waste filling with daily soil cover, is proposed as the final solid waste disposal method as shown in Figure 7.13 and Figure 7.14. This method is advantageous from economical and operational points of view as compared to other methods, such as incineration, composting and ocean disposal.

Figure 7.13 Sanitary Landfill



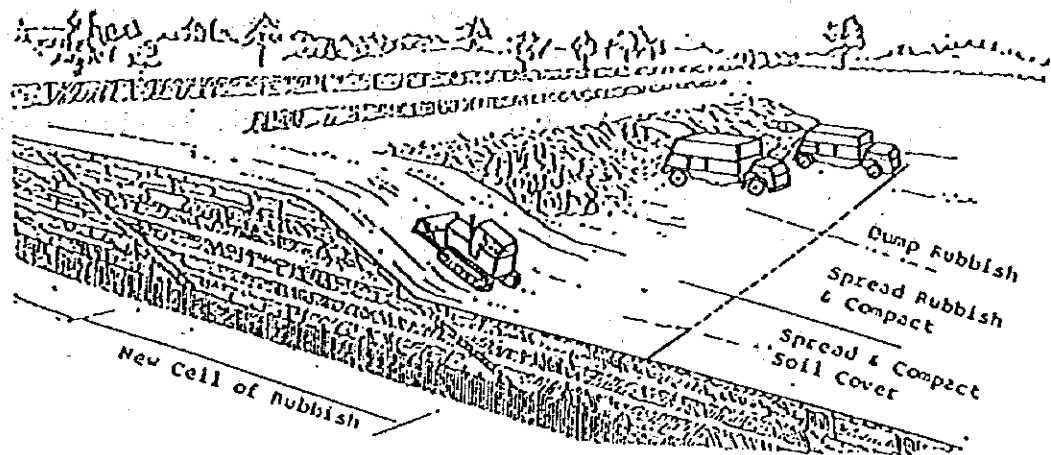
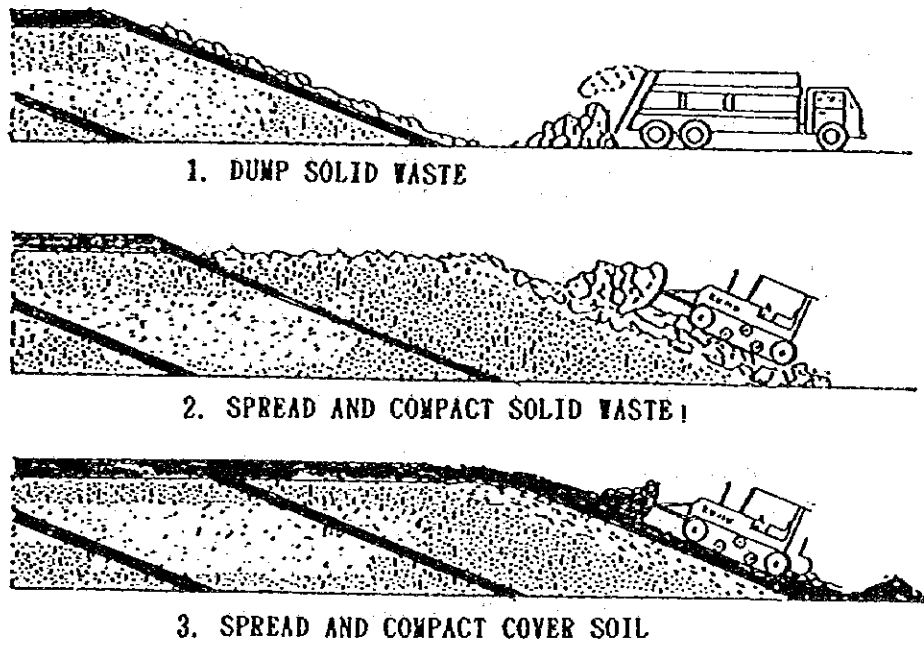
Source: Text for Japan-USA Solid Waste conference by M. Hanajima

(2) On-site Solid waste Disposal Schemes

For the scattered tourism development type, the following on-site solid waste disposal facilities are required :

- Garbage storage yard with separation system
- Recycling system
- On-site incinerator
- Garbage pits with protection of leachate, and
- On-site Composting.

Figure 7.14 Procedure of Sanitary Landfill



Source: Solid Waste Design Notes, 1985

4. Power and Communication

4.1. Power

4.1.1. General

Presently, the generation and transmission of electricity in Kenya is the mandate of the following companies, which fall under the general direction of the Ministry of Energy (MOE) :

Table 7. 18 Responsible Organisation of Electricity

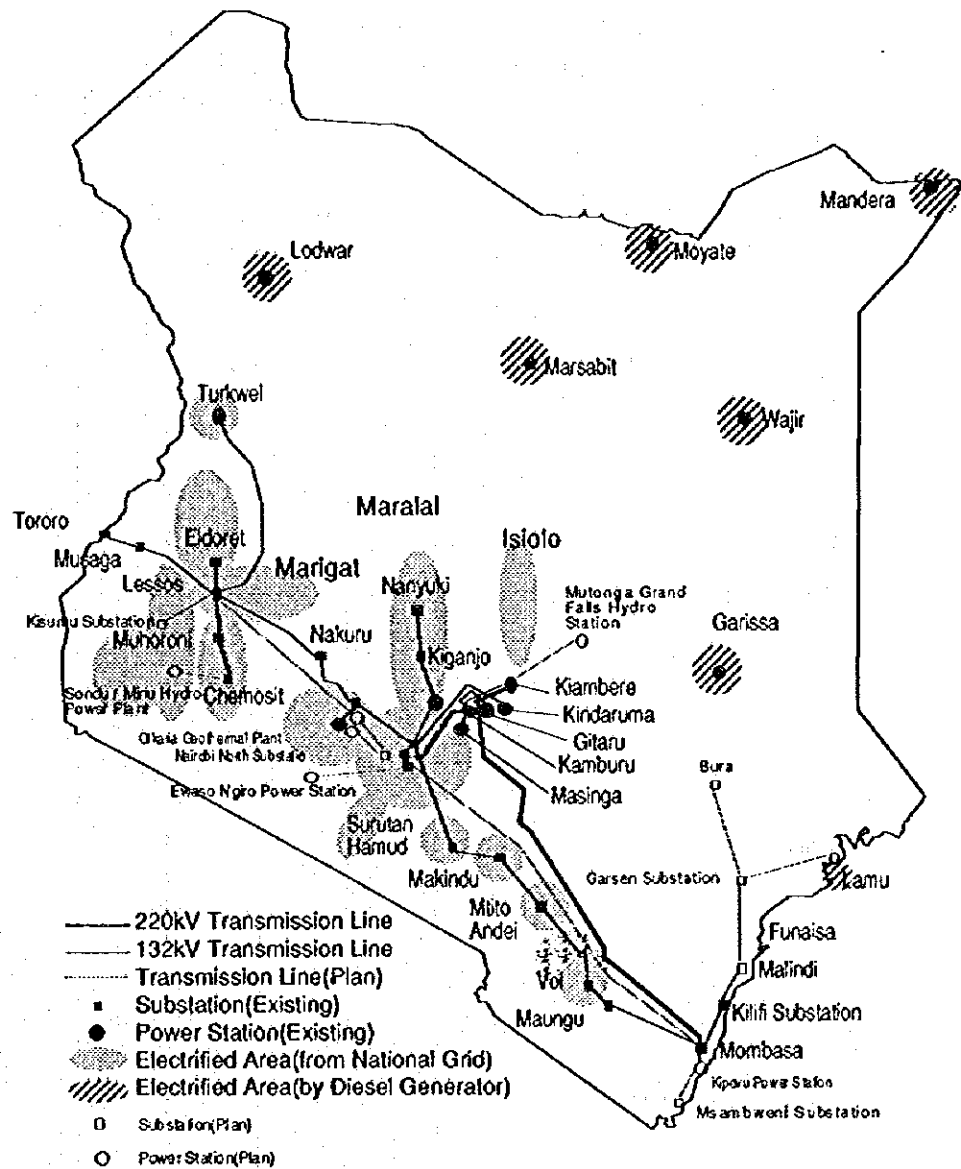
Company & Authority	Own facilities	Development	Operation & maintenance
KPLC (Kenya Power and Lighting Limited)	<ul style="list-style-type: none">•All thermal generating facilities•transmission system•Small hydro project		KPLC KPLC KPLC
KPC (Kenya Power Company)	<ul style="list-style-type: none">•Transmission line from Uganda•Wanjii and Tana hydro station & TL•Olkaria geothermal plant & TL	•geothermal resources	KPLC KPLC KPLC
TRDC (Tana River Development Company)	<ul style="list-style-type: none">•Kamburu hydro station•Gitaru hydro station•Kindaruma hydro station•Transmission line connecting above project to Nairobi		KPLC KPLC KPLC KPLC
TARDA (Tana and Athi Rivers Development Authority)	<ul style="list-style-type: none">•Masinga hydrostation•Kiambere hydrostation	<ul style="list-style-type: none">•Tana Basin•Athi Basin	KPLC KPLC

Source: KPLC

The KPLC (Kenya Power & Lighting Company) operates and manages all generating facilities and most of the power transmission facilities under agreement with other developing companies and authorities.

Figure 7. 15 presents the general scheme of the national grid, including present plans for construction of generating stations and transmission lines by KPLC.

Figure 7.15 National Grid and Plan



Source: JICA Study Team

The electrified area can be categorised roughly into two types by supply source as follows :

- Area supplied from national grid, and
- Area supplied from diesel generator through an independent system.

An outline of the electricity supply and demand forecast is mentioned below.

4.1.2. Generating Facilities

Table 7. 19 shows the existing gross generation and consumption of electricity for interconnected and isolated systems. Figure 7.16 shows the proportion of generation type (GWH) for 1992/93 data of the KPLC annual report.

Table 7. 19 Gross Generation and Consumption of Electricity

Location	Capacity(MW) as at 30. 6. 93		Energy(GWhr)						Avg. Annual growth
	Installed	Effective	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	
Hydro									
Tana(KPC)	14.4	12.4	82	77	94	80	72	75	
Wanjii(KPC)	7.4	7.4	46	57	55	44	42	62	
Kamburu(TRDC)	91.5	84.0	432	400	382	431	402	417	
Gitaru(TRDC)	145.0	145.0	841	779	762	794	811	844	
Kindaruma(TRDC)	44.0	44.0	223	214	216	201	206	213	
K.P.&L.C.	6.2	3.6	21	25	21	20	19	24	
UEB(Imports)	30.0	0.0	154	112	174	134	240	273	
Masinga(TARDA)	40.0	40.0	182	103	124	181	185	177	
Kiambere(TARDA)	144.0	144.0	211	794	863	962	872	887	
Turkwel(KVDA)	106.0	106.0				47	166	275	
Total hydro incl. imports	628.5	586.4	2,192	2,561	2,691	2,894	3,016	3,246	8.2%
Thermal									
Kipevu	93.0	20.8*	208	25	97	74	75	59	
Geothermal									
Olkaria	45.0	31.0	348	322	336	298	272	272	
Gas Turbine									
Fiat-Nbi.South	13.5	12.0	13	1	0	4	3	2	
JBE-Kipevu	30.0	0*	52	20	10	17	0	0	
Diesel									
Interconnected Diesel Station	4.0	1.0	3	2	2	0.3	3	0.3	
Interconnected System	814.0	630.4	2,816	2,932	3,136	3,287	3,370	3,579	4.9%
Isolated Diesels	3.8	3.5	10	11	12	14	16	20	
Gross Generation	817.8	633.9	2,827	2,943	3,148	3,301	3,386	3,599	5.0%
Auxiliary Consumption			43	27	33	33	30	29	
System Losses**			407	448	453	484	510	566	
Sales-KPLC System			2,340	2,418	2,595	2,708	2,760	2,901	4.4%
REF SYSTEM			36	49	66	76	85	104	23.7%
Total Sales			2,376	2,468	2,661	2,784	2,846	3,005	4.8%
System Peak Demand (MW)			461	480	520	550	566	596	5.3%
System Load Factor			69.7%	69.7%	68.9%	68.2%	68.0%	68.6%	
Sales % of Net Generation			85.4%	84.6%	85.4%	85.2%	84.8%	84.2%	
Losses as % of Net Generation			14.6%	15.4%	14.6%	14.8%	15.2%	15.8%	
Annual Growth									
Generation			8.5%	4.1%	7.0%	4.9%	2.6%	6.3%	
Sales KPLC			6.0%	3.3%	7.3%	4.4%	1.9%	5.1%	
Sales REF			43.1%	37.7%	35.0%	14.7%	11.8%	21.6%	

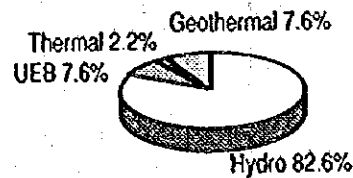
Note: * Most of the year the station was undergoing repairs.

** Comprised technical and non-technical losses.

*** There was load shedding from 8th April to May, 1992 in order to conserve water, resulting in an estimated loss of sales of 38 GWh.

Source : Annual Report of KPLC

Figure 7.16 Generation Type



Note: UEB: Uganda Electricity Board
Source: KPLC

The main generating facilities in the country are presently hydroelectric plants, which are located in the Central and Western Region.

In terms of load demand, there will be three principal centres. In the Northwest, around Kisumu, Eldoret, the load is expected to grow from about 80 MW to 300 MW during the plan period (1996-2010). In the central area, that is Nairobi, Mount Kenya and the Rift Valley, the load is expected to grow from about 310 MW to more than 1100 MW, while in the coastal region around Mombasa, it will expand from about 80 to over 300 MW during the period.

The total national demand in the year 2010 will be over 1700 MW, which will be covered by geothermal plants (possible reserves measured in 1000 MW), hydroelectric plants (undeveloped resources in 1400 MW), and thermal plants, which will be developed.

In the early years, diesel and combustion turbines are required to firm up hydroelectric energy in case a drought occurs and to provide low-cost standby capacities. In a dry year, and especially during the dry season, these units will operate as base-load generation. In a wet year and during the wet season, these units will be shut down, when hydroelectric facilities can generate sufficient energy. Their long-term average plant factor will thus be around 40% to 50%.

4.1.3. Transmission and distribution facilities

The voltages of the transmission line are 220 kV, 132 kV, 66 kV, 40 kV, and 33 kV. The voltages of the distribution lines have 33 kV and 11 kV. Line lengths and installed transformer capacities are shown in Table 7. 20 and Table 7. 21.

Table 7.20 Transmission and Distribution Lines Total Circuit Length (Km)

Voltage	1988	1989	1990	1991	1992	1993	Annual growth
220kV	838	633	657	877	877	877	
132kV	1,977	1,977	1,980	1,980	1,980	1,980	
66kV	400	408	444	451	451	451	
40kV	113	113	113	113	126	126	
33kV	3,194	3,268	3,300	3,342	3,451	3,583	
11kV	7,252	7,440	7,627	7,870	8,309	8,613	
TOTAL	13,774	13,839	14,121	14,633	15,194	15,630	2.9%
% Increase P.A.	3.7%	2.0%	2.0%	3.6%	3.8%	2.9%	

Source: Annual Report of KPLC

Table 7.21 Transformers in Service (Total Installed Capacity in MVA)

Voltage	1988	1989	1990	1991	1992	1993	Annual growth
Substations							
220/132 kV	580	580	580	580	580	580	
220/66 kV			180	180	180	180	
132/66 kV	210	270	330	330	330	330	
132/33 kV	285	308	331	349	349	372	
66/11 kV	395	441	441	470	470	470	
66/40 kV	15	15	15	15	15	15	
40/11 kV	19	19	19	24	24	24	
33/11 kV	358	356	375	392	392	400	
Total	1,862	1,989	2,271	2,340	2,340	2,371	5.0%
Distribution							
11/0.415 kV and							
33/0.415 kV	1,300	1,376	1,448	1,510	1,557	1,615	4.4%

Source: Annual Report of KPLC

Area maximum demand (MW) is shown in Table 7.22 and area total number of consumers is shown in Table 7.23. Both tables have a similar proportion in areas.

Table 7.22 Area Maximum Demand (MW)

Area	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	Annual growth
Nairobi	231	238	271	281	277	304	5.6%
Coast	107	98	105	120	124	124	3.0%
Central Rift	30	35	38	32	43	39	5.6%
West Kenya	79	78	45	43	55	64	
Mt. Kenya	22	25	24	30	31	36	1.1%
North Rift			19	28	26	27	
Total System	461	480	520	550	566	596	5.3%
% Increase P.A.	7.2%	4.1%	8.3%	5.8%	2.9%	5.2%	

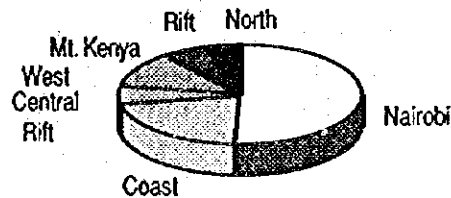
Source: Annual Report of KPLC

Table 7.23 Area Total Number of Consumers

Area	1988	1989	1990	1991	1992	1993	Annual growth
Nairobi	125,146	131,686	136,772	145,759	153,334	161,929	5.3%
Coast	43,815	44,958	47,287	49,609	51,872	53,844	4.2%
Central Rift	14,807	15,703	16,798	18,194	19,729	21,596	7.8%
West Kenya	24,796	25,839	20,092	21,699	23,118	24,689	-
Mt. Kenya	15,154	16,488	17,689	18,619	20,113	21,718	7.5%
North Rift	-	-	7,728	8,641	9,456	10,744	-
KPLC consumers	223,718	234,674	246,366	262,521	277,622	294,520	5.7%
R.E.F. consumers	11,494	15,132	19,067	24,491	29,513	34,561	24.6%
Total System	235,212	249,806	265,433	287,012	307,135	329,081	6.9%
% Increase P.A.	5.8%	6.2%	6.2%	8.1%	7.0%	7.1%	

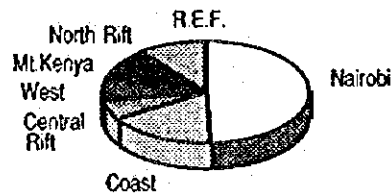
Source: Annual Report of KPLC

Figure 7.17 Area Maximum Demand (MW)



Source: KPLC

Figure 7.18 Total Consumers Number per Area



Note: R.E.F.: Rural Electrification Fund

Source: KPLC

Regarding the power transfer in the national grid, sources of generation are expected to grow as follows:

Area	Generation Type	Capacity
Northwest	Hydroelectric	90 MW
Central	Hydroelectric(Tana)	630 MW
	Geothermal	470 MW
Coast	Thermal	500 MW

Source: KPLC

These numbers would indicate that under normal conditions there will nearly be a balance between demand and principal sources of generation in the three major load centres. However, this balance may be shifted enough to demand increased transmission requirements between regions.

Critical loading conditions could occur during the wet season with peak or intermediate demands, when hydroelectric plants operate at full output and thermal generation at Mombasa is minimised to supply only the remaining peak demand. As thermal installation at the coast increases transmission requirements this will also become critical at minimum demand in the dry season, when hydroelectric generation is minimised to conserve water for the supply of the daily peak, thermal generation could be operating at maximum output, and minimum coastal demand leaves large surpluses to supply the central and western parts of the system.

Therefore, reliability of regional power supply by 220 kV transmission lines becomes increasingly important with growing demand. Co-ordination of the development between generation facilities and transmission lines are a necessity.

4.1.4. Applicable Type of Supply by Tourism Area

The study team sets the following types of power supply to the tourism areas. Following this, detailed plans are formulated in Volume 2.

Table 7. 24 Applicable Type of Power Supply by Tourism Area

Type	Applied Area	Supply Mode & Note
Electrified with national grid	Nairobi, Mombasa, S. Mombasa (Diani), Malindi (Kilifi), Rift Valley Lakes	-Extension of lines with considerations on environment and landscape
Isolated area from national grid, supplied with concentrated system	Lamu, S. Mombasa (Funzi, Shimon), Mt. Elgon/Kitale, Mt. Kenya (Naro Moru)	-Extension of lines from national grid -Expansion of existing service area
Isolated area from national grid	Mt. Kenya, Lamu (Islands)	-Individual generators for each facility

Source: JICA Study Team

4.2. Telecommunication

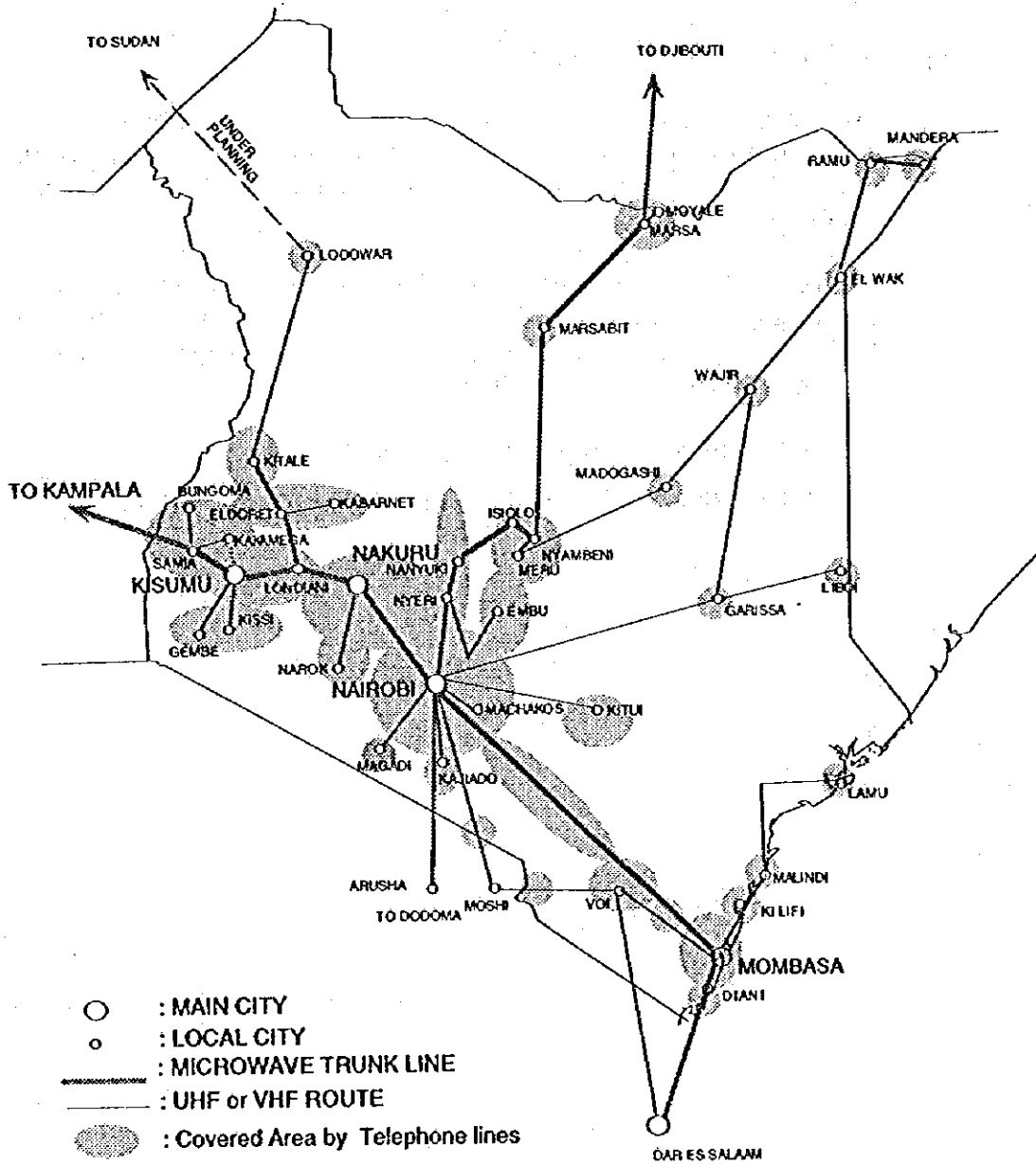
4.2.1. Organisation and National Network

The Kenyan telecommunication services are provided by the Post and Telecommunication Corporation (KPTC). The KPTC is responsible for mail, the domestic and international telephone system, telex, and telegrams.

Figure 7. 19 presents the national telecommunication network. The telecommunication network, which is operated and maintained by KPTC, covers almost all of local towns. Its future expansion plan takes into account two modes as follows :

- Cable connection from exchange station, and
- UHF/VHF radio connection from key exchange stations.

Figure 7.19 National Communication Network



Source: JICA Study Team

4.2.2. Access to Service

The installed exchange capacity is 334,360 lines and 207,442 connected subscriber lines (DELS) as of 1992 (connected rate is 62%). In addition, mobile telephone facilities were provided from 1992 onwards and the number of mobile telephone subscribers reached 1,162. Table 7. 25 shows the network growth of telecommunication services. Kenya's average telephone density of 0.6 DELs per 100 population is among the lowest among the "lower-middle income" countries. Table 7. 26 shows the telephone penetration level. Existing telecommunication services are concentrated around the major cities Nairobi and Mombasa.

Table 7. 25 Network Growth of Telecommunication Services

Category	1986/87	1987/88	1988/89	1989/90	1990/91
Domestic Services					
Telephone Exchanges(No.)					
Automatic	78	93	106	114	130
Manual	320	326	331	301	329
Total	398	419	437	415	459
Exchange Capacity(Lines)					
Automatic	181,290	195,950	200,800	201,400	258,500
Manual	28,730	26,160	25,860	26,470	28,240
Total	210,020	222,110	226,660	227,870	286,740
Exchange Connections(Lines)					
Automatic	123,349	138,967	150,213	161,528	176,851
Manual	14,156	12,997	12,681	13,522	14,196
Total	137,505	151,964	162,894	175,050	191,047
Public Telephone(No.)	3,160	3,630	3,754	4,615	5,345
Telex Services					
Exchange Capacity	3,616	3,616	3,616	3,616	3,616
Exchange Connections	2,479	2,536	2,508	2,438	2,109
Radio Call Stations	542	558	579	588	594
Pagers	389	395	623	765	700
Data Modems	303	307	396	444	508
International Services					
Telephone Circuits	411	431	402	405	472
Telex Circuits	267	302	307	310	298
Telegraph Circuits		56	18	20	18

Source: KPTC's Annual Report, 1990/91

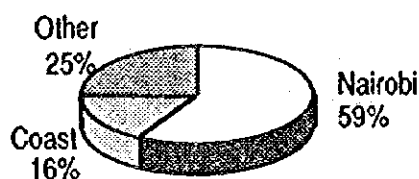
Table 7. 26 Telephone Penetration Levels per District

(Telephone lines per 100 persons)

District	1985	1986	1987	1988	1989	1990	1991	1992	1993
Baringo	0.1	0.2	0.2	0.2	0.1	0.3	0.3	0.3	0.3
Bungoma	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3
Busia	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Marakwet	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1
Embu	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.5
Garissa	0.1	0.2	0.2	0.2	0.2	0.2	0.6	0.6	0.6
Isiolo	0.4	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6
Kapado	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.6	0.6
Kakamega	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Kericho	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Kiambu	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7
Kilifi	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.5
Kirinyaga	0.2	0.2	0.2	0.2	0.4	0.2	0.3	0.3	0.3
Kisii	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Kisumu	0.5	0.6	0.6	0.6	0.6	0.6	0.8	0.8	0.8
Kitui	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Kwale	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.3
Lakipia	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
Lamu	0.5	0.5	0.5	0.5	0.5	0.5	0.8	0.8	0.8
Machakos	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Mandera	0	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4
Marsabit	0.1	0.1	0.2	0.2	0.2	0.3	0.4	0.4	0.4
Meru	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Mombasa	3.6	3.7	4.1	3.8	3.5	4.0	5.0	4.8	4.8
Muranga	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Nairobi	5.6	5.9	6.2	6.1	6.4	5.2	7.0	7.1	7.1
Nakuru	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0
Nandi	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Narok	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Nyandarua	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4
Nyeri	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6
Samburu	0.1	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2
Siaya	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
South Nyanza	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Taita Taveta	0.3	0.3	0.3	0.4	0.4	0.4	0.1	0.1	0.1
Tana River	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.2
Trans Nzoia	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
Turkana	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Uasin Gishu	0.5	0.5	0.5	0.6	0.6	0.5	0.8	0.8	0.8
Wajir	0	0.1	0.1	0.1	0.1	0.1	0.3	0.3	0.3
West Pokot	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Kenya	0.6	0.6	0.7	0.7	0.7	0.7	0.5	0.6	0.6

Source: KPTC's Annual Report, 1990/91

Figure 7. 20 Telephone Connection Lines per Area



Source: KPTC

Access to international service is available through two earth satellite stations, and through microwave radio links. In 1991, the total circuits in operation were distributed as follows:

Table 7.27 Access to International Service

	Number of circuit
Indian Ocean Region	431
Atlantic Ocean Region	244
Panafitel	113
Total	788

Source: KPTC

4.2.3. Usage of Service

According to the annual report of KPTC, 48.1% of the main lines are connected to digital exchanges, which contribute to the improvement of quality of services and addition of supplementary value. Some 66.6% of exchange capacities are filled and connected by service lines. The automation level has reached 92.6% as of fiscal year 1991. Table 7.28 shows the traffic of telecommunication services.

The telephone tariffs for domestic and international calls are shown in Table 7.29 and Table 7.30.

Table 7.28 Traffic of Telecommunication Services

	1986/87	1987/88	1988/89	1989/90	1990/91
Domestic Services					
Telephone					
Subscriber Dialed Unit(000)	990,000	1,199,032	1,435,875	842,129	2,063,535
Manually Controlled Calls					
Untimed(000)	6,845	6,401	5,477	5,119	4,231
Timed(000)	7,323	7,099	6,656	6,225	6,024
Total	14,168	13,500	12,133	11,344	10,255
Telex and Telegrams					
Inland Telegrams(000)	1,301	1,447	1,610	1,770	1,717
Local Telex Calls	490	489	485	489	383
Level of Automation(%)	89.7%	91.4%	92.2%	92.3%	92.6%
Percentage of Exchange fill(%)	65.5%	68.4%	71.8%	76.8%	66.6%
International Services					
Telephone(Paid minutes)					
Incoming(000)	14,258	15,734	19,057	23,250	29,295
Outgoing(000)	9,784	13,835	16,906	20,622	21,806
Total	24,042	29,569	35,960	43,872	51,101
Telex(Paid minutes)					
Incoming(000)	3,353	4,170	3,339	2,670	2,348
Outgoing(000)	3,385	3,324	3,173	3,014	2,500
Total	6,738	7,494	6,512	5,684	4,848
Telegraph(Paid Words)					
Incoming(000)	2,111	1,780	1,203	806	1,053
Outgoing(000)	1,795	1,410	1,335	1,264	999
Total	3,906	3,190	2,538	2,070	2,052

Source: KPTC's Annual Report, 1990/91

Table 7. 29 Domestic Tariffs

Service	Current Rate (Ksh)
A. TELEPHONE	
1) Local and Trunk Calls	3.50
2) Standing Charges	
Automatic	255.00
Manual	150.00
3) Installation	
Automatic	2,100.00
Manual	1,100.00
4) Deposit	
Automatic	2,500.00
Manual	1,250.00
5) Payphones	3.00
B. TELEX	
1) Local and Trunk Calls	4.00
2) Standing Charges	2,618.00
3) Installation	4,598.00
4) Deposit	3,921.00
C. TELEGRAPHS	
1) Telegrams	
Ordinary	1.00
Urgent	2.00
2) Radio Calls	
Service Fees	11.00
Licences	146.15

Source: KPTC's Annual Report, 1990/91

Table 7. 30 International Tariffs

International Area	Telephone (US\$ per min.)	Telex (US\$ per min.)	Telegraph Ordinary (US\$ per word)
1 Europe and Mediteranean	3.00	2.52	0.512
2 North America	3.00	2.52	0.512
3 Latin America and Caribbean	3.98	3.36	0.512
4 Asia	3.98	3.00	0.512
5 Far East Pacific and Australia	3.98	3.00	0.496
6 Africa (PTA)	2.01	1.50	0.255
7 Africa (Rest)	3.00	2.01	0.365

Source: KPTC's Annual Report, 1990/91

4.2.4. Quality of Services

The call completion rate of automatic local services is 51.8% in major cities compared to 71.5% of a good manual local network. Table 7. 31 shows completion rates of telephone calls. Most of the automatic telephone calls sampled failed due to called numbers being engaged in 33.9% or to no reply in 7.5% of the cases. This low completion rate mainly results from high traffic per DEL and KPTC's inability to supply more DEL's for business subscribers. Telephone waiters increased to 90,770 in 1990/91.

Table 7.31 Completion Rates of Telephone Calls

Category	1985	1986	1987	1988	1989	1990	1991	1992
Manual Local Calls	84.1%	83.9%	81.9%	80.6%	78.9%	78.0%	75.4%	71.5%
Trunk Calls	73.6%	74.0%	72.4%	71.2%	68.7%	66.2%	64.7%	63.0%
Automatic Local Calls	49.4%	49.9%	56.7%	57.2%	53.7%	48.8%	47.5%	51.8%
Trunk Calls	29.6%	24.8%	24.8%	29.1%	23.7%	21.0%		

Source: KPTC

Table 7.32 shows the telephone maintenance fault classification. Most of the faults occur on service lines and exchanges. Maintenance and repair capabilities should be increased, in order to improve the service quality.

Table 7.32 Telephone Maintenance Faults Classifications

Fault Category	Number of Faults	Percentage
Exchange	16,813	34.0%
Cable Line	89,119	17.7%
Service Line	259,247	51.5%
PBXs	13,227	2.6%
Instruments	38,132	7.6%
Miscellaneous	86,677	17.2%
Total	503,125	100.0%

Source: KPTC's Annual Report, 1990/91

4.2.5. Demand by Tourism

For the estimation of telephone line demands from the tourism infrastructure, the following data will be used :

Accommodation capacity of guests	Number of circuit
500	25
400	20
200	10

Source: JICA Study Team

Direct dialling access to the public telephone network from each guest room is considered. Each of the above figures includes one telex and data circuit.

4.2.6. Domestic Satellite Network Project

KPTC is planning a domestic satellite network project. KPTC's major strategy for expanding and improving telephone service in the rural parts of the country involves implementation of a Domestic Satellite (DOMSAT) network project. These areas of the country are characterised by poor topographical conditions with sparse and widely distributed potential subscribers, which make it unfeasible to use a transmission network via terrestrial links. Satellite technology in this case provides the most optimal, technical and economical solution.

4.2.7. Applicable Type of Supply by Tourism Area

The study team sets the following types of tele-communication systems to be installed in the tourism areas. Following this, detailed plans are formulated for each tourism area in Volume 2.

Table 7. 33 Applicable Types of Tele-communication System to the Tourism Areas

Type	Applied Area	Supply Mode & Note
Isolated area from national network	Rift Valley Lakes, Mt. Kenya, Lamu (Islands)	UHF/VHF radio connection from key exchange station
Neighbouring area to present service area	Nairobi, Mombasa, S. Mombasa, Malindi, Lamu, Mt. Elgon/Kitale,	Cable connection from exchange station

Source: JICA Study Team