Part II: Master Plan

8. Development Vision and Structure Plan

8.1 Development Vision

8.1.1 Development Vision Formulation Procedure

The development vision shows uniqueness and direction of Mombasa County in 2040, which can be shared with the stakeholders. The development vision was drafted by referring to related plans and inputs from the technical working group which was attended by all departments of the County Government of Mombasa (CGM). Steps and result of discussion for the development vision formulation are summarised as follows:

a) Share the meaning and importance of development vision of Mombasa County by answering the following questions:

- Development vision shows uniqueness and direction of Mombasa County that can be shared with the stakeholders
- What are the key words for describing Mombasa County?
- How do you want Mombasa County to be in 2040?
- What is the role of Mombasa County in achieving Kenya Vision 2030?
- What is the role of Mombasa County in the Northern Economic Corridor (Gate City)?

b) Understand related development visions:

- "Kenya Vision 2030: A globally competitive and prosperous nation with high quality of life by 2030"
- Development vision proposed in the Integrated Strategic Urban Development Plan(ISUDP)-Mombasa under the Kenya Municipal Programme (KMP): A vibrant world class commercial hub of excellence that promotes diversity, natural environment, and heritage.

c) Identify the key words/phrases and image to describe Mombasa County in 2040:

- Gateway, port, commercial, tourism, culture and heritage, world class

d) Compile various ideas and prepare draft development vision:

- Vibrant and secure tourist and commercial port city that promotes diversity and cultural heritage;
- Premier commercial tourism port city that promotes diversity; and
- A premier gateway city that upholds diversity and heritage.

e) Confirming the development vision to be shared in public meetings.

8.1.2 Development Vision of Mombasa 2040

After a series of technical working group discussions, the development vision is proposed as follows:

Development Vision
"A premier gateway port city that upholds diversity and heritage."

[Aim/Explanation]

- The development vision of Mombasa is to support the achievement of Kenya's Vision 2030.
- Mombasa as "original gateway to Eastern Africa" will be maintained.
- Two distinctive pillars of Mombasa, namely: "Port/Logistics" and "Tourism", will be promoted hand in hand.
- Tangible and intangible heritage will be preserved and utilised.

Well-being of the people of Mombasa will be promoted and sustained.

[Four pillars to support the development vision]

- Vibrant Economy
  - Commercial/logistics promotion through efficient transport system, land use, infrastructure/urban services that contribute to improve conditions of Mombasa County and strengthen the Northern Economic Corridor.
  - Economic development through tourism development, special economic zone (SEZ), and infrastructure development.
  - Mitigation of traffic congestion through separation of traffic movement for Northern Economic Corridor and regional transport.
  - Promotion of commercial and tourism activity through dynamic shift in land use.
  - Provision of high quality labour through improving higher education (logistics, manufacturing, tourism, and services).
- High Quality of Life (Social and culture)
  - Strengthening the urban function in the mainland through subcentre development.
  - Improvement of infrastructure and social facilities gap between the Mombasa Island and the mainland (water supply, sewerage, power, and telecommunication).
  - Reduce traffic congestion and improve efficiency in transport services through strengthening traffic management and infrastructure development.
  - Improve housing conditions.
  - Provide social facilities; particularly education and health, to those in need.
- Good Governance
  - Transparent urban management which promotes infrastructure development, urban facility development, and land use control (regulation and human resources).
  - Promotion of infrastructure development.
  - Preservation and utilisation of heritage through land use management and tourism promotion.
- Environment and Energy
  - Natural condition conservation including coastal area erosion, degradation of creeks, and water contamination.
  - Strengthening disaster management to mitigate climate change impacts including flooding.
  - Creation of environmentally friendly county as a centre of logistics and industry.
  - Improving solid waste management.
  - Installation of renewable energy.

The development vision was discussed during the stakeholder meeting for receiving public comments. After the development vision was agreed upon during the stakeholder meeting, the Steering Committee met in Nairobi in April 2016 and approved the development vision.

8.2 Structure Plan

8.2.1 Structure Plan Formulation Procedure

The Structure Plan, which shows the hierarchy and linkage of urban centres, transport network, and other urban areas of Mombasa County, is formulated based on the urbanisation trend, existing development plans, and the position of the county in the Northern Economic Corridor. Steps for structure plan formulation are as follows:

- Understand the meaning of structure plan,
- Understand the conditions of Mombasa County,
- Discuss the urban development directions/strategy and development focus, and
- Prepare structure plan alternatives.

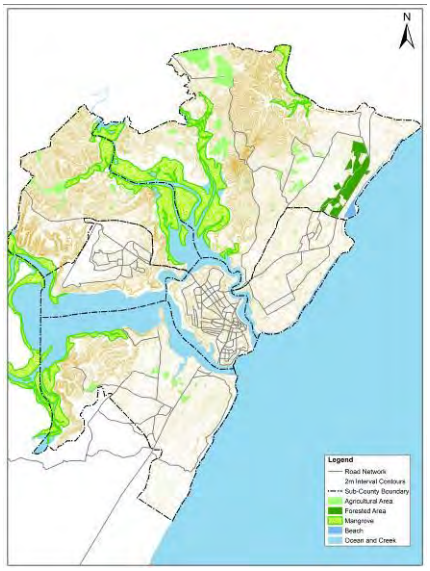
Technical working groups' meetings were held several times to discuss the ideas of the structure plan.

8.2.2 Conditions for Structure Plan Formulation

The conditions for structure plan formulation are summarised below.

(1) Natural and Geographic Condition

Geographically, Mombasa County is relatively flat situated along the coast and hilly in the inland. Elevation in Junda/Mwakirunge area is highest with average elevation of 30 m to 120 m. The elevation of Changamwe/Jomvu is from 30 m to 90 m. Creeks and mangroves are prevalent in Mombasa County, which limit the expansion of urban areas in certain places. Considering the geographical condition, development should be directed mainly along the coastal area and along the Northern Economic Corridor (Mombasa Road). Infrastructure development in the Junda/Mwakirunge area is costly and also has an impact on natural condition because of the geographical and natural conditions. Figure 8.2.1 shows the natural and topographic conditions.



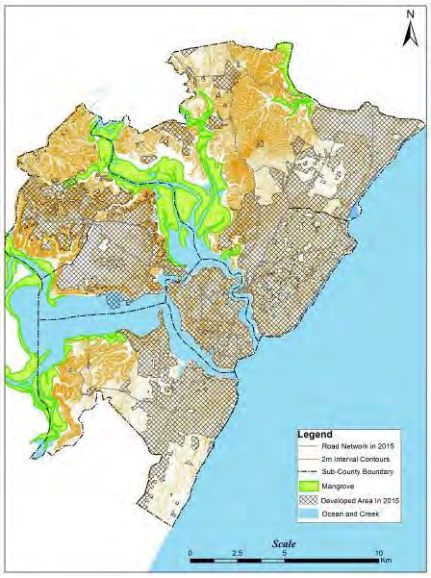
Source: JICA Expert Team prepared from ISUDP data

Figure 8.2.1: Natural and Topographic Condition

(2) Urbanisation Condition

Since 1971, when the urban area was concentrated in the Mombasa Island, un-planned urbanisation has been taking place in the mainland without proper land management and without forming a linkage or network to connect the urban areas. As a result, there is no clear subcentre system and hierarchy of settlements in Mombasa County. Urbanisation trend is shown in Figure 8.2.2. The following points have to be considered in forming the structure plan.

- Mombasa Island still plays an important role as the centre of Mombasa County and urban function has to be strengthened (commercial, tourism, residential, urban facilities, and utilities), together with shifting traffic movement and improving land use.
- Existing urban centres in the mainland have to be strengthened:
  - Kongowea: Hosts the largest market in Mombasa County; the cause of traffic congestion and inefficient land use in the area. Housing and infrastructure services have to be improved, including roads and drainage.
  - Miritini, in which bypass and SGR intersects and proper land use plan is necessary, is identified as new subcentre by County Government of Mombasa. Land use has to be properly managed.
  - Bamburi: Artery road stretches to Kilifi and some urban functions are emerging. Proper land use management is necessary.
  - Likoni: Housing and infrastructure services have to be improved, including roads and drainage.



Source: JICA Expert Team prepared from ISUDP data

Figure 8.2.2: Urbanisation Trend

- New urban centres with clear hierarchy have to be developed both in the existing urban areas and un-developed areas to control urban sprawl and provide infrastructure.

(3) Position of Mombasa County in the Northern Economic Corridor

One of the key constraints in urban condition is traffic congestion in the Mombasa Island, Changamwe, and Jomvu which is generated from mixture of logistics activity and local activity. Transport network which aims to separate logistics related transport and local transport has to be considered.

(4) Ongoing and Planned Development Projects

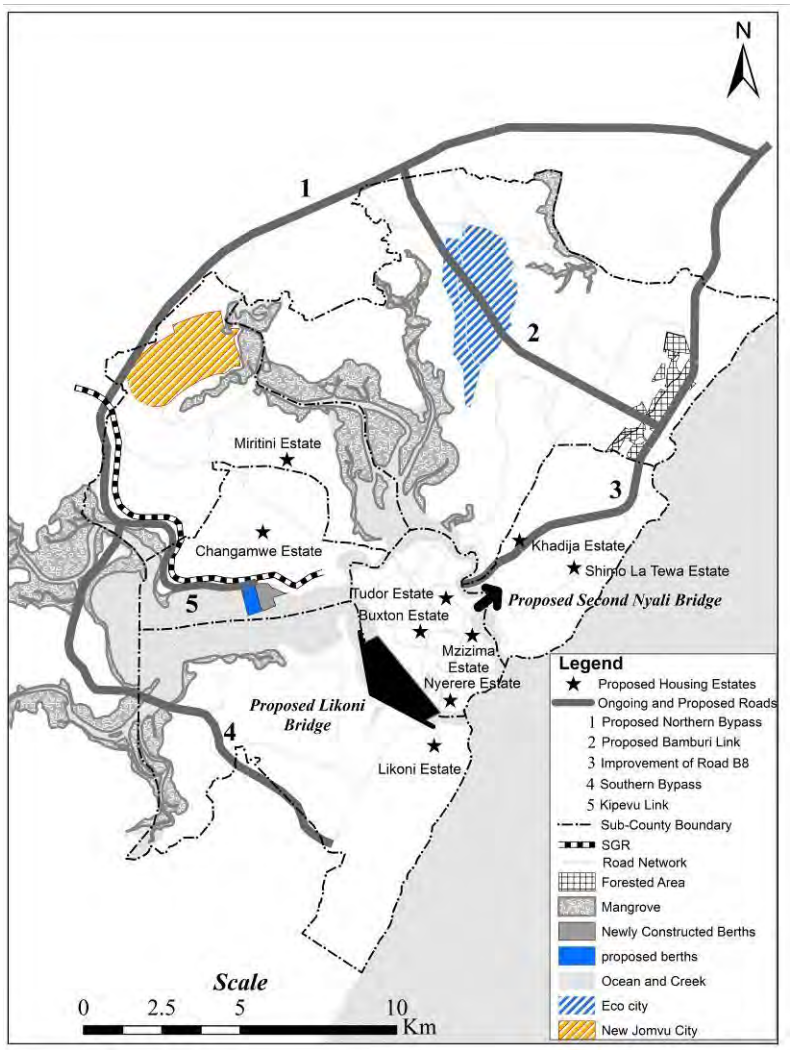
Since Mombasa County is located in a strategically important area not only for the economy of Kenya but also the economy of other countries along the Northern Economic Corridor, many projects are either ongoing or planned. These projects are considered for forming the structure plan. The major projects which have an impact on the structure plan formulation are shown below.

- Road/bridge projects which strengthen the ring-type network and radial function: Northern Bypass, Southern Bypass (including Kipevu Link, Bamburi Links), improvement of New Malindi Road, Nyali Second Bridge, and Gate Bridge.
- Logistics/Transport project: Mombasa Port Expansion, SGR.
- Urban development which expects to change urbanisation patterns and movement of people:
  - New Miritini: New town development mainly in the public land which is located at the junction of logistics and local transport.
  - Dongo Kundu SEZ: SEZ (1,292 ha) is considered a centre of economic activity which is composed of port, freeport, industrial park, natural gas power plant, and residential area.
  - Eco City: The County Government of Mombasa is promoting development of eco-city in Mwakirunge as low density residential area and some government functions are expected to move into the area.

- Housing development by County Government of Mombasa: Housing development is expected in Khadija, Miritini, Shimo La Tewa, Tudor, Mzizima, Buxton, and Likoni.

- ISUDP-Mombasa shows strategy and general direction of development towards 2035 (please refer to Section 2.3 KMP Situation).

Ongoing and planned projects are shown in Figure 8.2.3.



Source: JICA Expert Team

Figure 8.2.3: Ongoing and Planned Projects

8.2.3 Structure Plan Development Strategy

The Structure Plan is proposed to support achieving development vision, namely, "A premier gateway port city that upholds diversity and heritage". Based on the discussion through the technical working group, "Multi-core development", through which existing urban areas are improved and new urban centres are developed, has been identified as an ideal structure to be adopted.

The development strategy of the structure plan is formulated as follows:

- Urban hierarchy is strengthened:

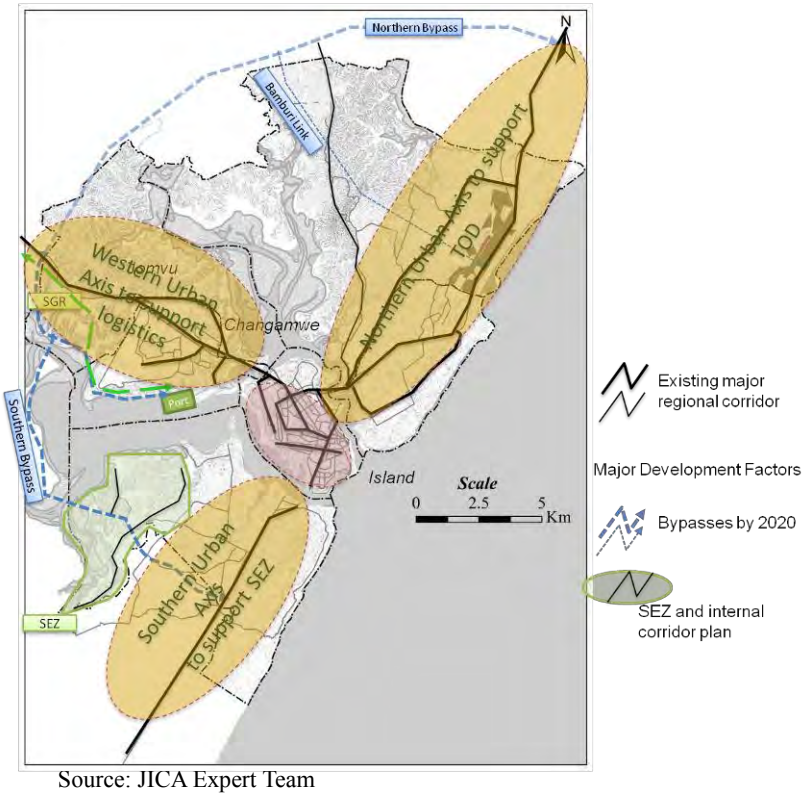
  - Subcentres are developed and urban support centres (mainly the existing urban area) are strengthened, and

- Population is allocated based on urban hierarchy.

- Linkage is improved through developing the missing link and improving the existing link to supplement the ring road development:
  - Regional linkage for the entire county is strengthened by connecting the ring road and radial road,
  - Local linkage at subcounty level is strengthened,
  - Structure on the island is re-organised, and
  - Logistics transport and local transport are separated.

Expected contribution of the multi-core development to development vision is identified as shown below.

- Vibrant economy:
  - Improvement of the transport network and separation of logistics transport and local transport are expected to improve the logistics for Northern Economic Corridor.
- High quality of life:
  - Social facilities provision is facilitated in subcentres to be located in the mainland where social facilities are not fully developed.



Source: JICA Expert Team

Figure 8.2.4: Direction of Development Axis

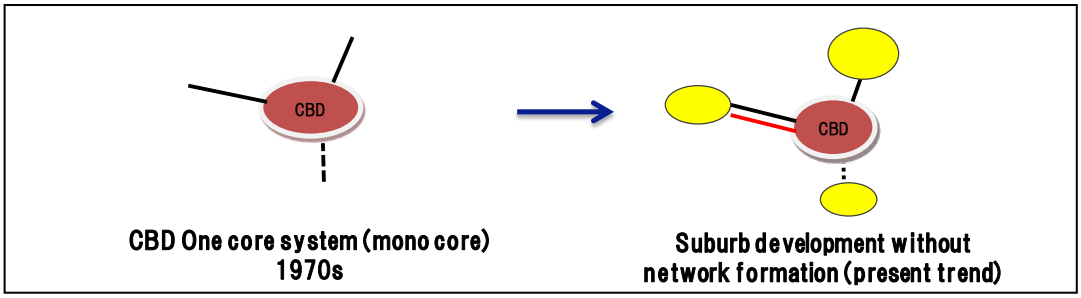
- Good governance:
  - Designation of subcentres is aiming to strengthen development control in un-developed area.
  - Defining hierarchy of subcentres and urban areas promotes efficient investment.

- Environment and energy:
  - Defining development area (hierarchy of subcentres and urban areas) avoids development in protected and conservation areas (forest, agriculture, mangrove, creek) and mitigate risk of disaster (flood, landslide).
  - Development of subcentres where energy is utilised efficiently. One of the subcentres is identified/designated as eco-city.

8.2.4 Structure Plan Alternatives Analysis

(1) Outline of Structure Plan Alternatives

In the 1970s, the urban area was limited to the Mombasa Island and urbanisation is now spreading into the mainland with poor linkage connecting urban areas as illustrated in Figure 8.2.5.

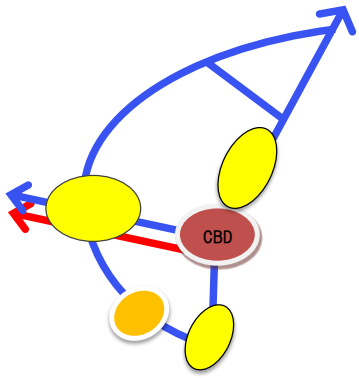
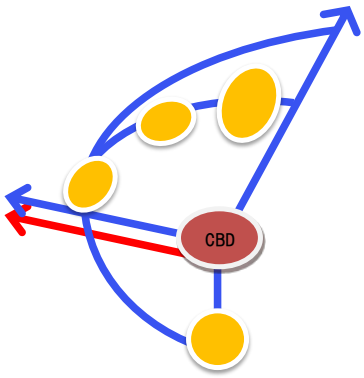
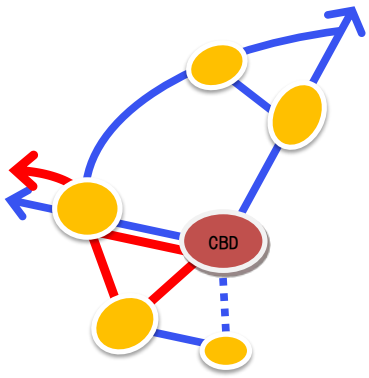


Source: JICA Expert Team

Figure 8.2.5: Urban Expansion Pattern

Three alternatives of structure plan, which show the pattern of network and focus of development, are proposed for realising "multi-core development" based on the ring structure to be formed by bypass development. Details of each pattern are described in the subsequent section. Table 8.2.1 shows the pattern of multi-core development that can be applied in Mombasa County.

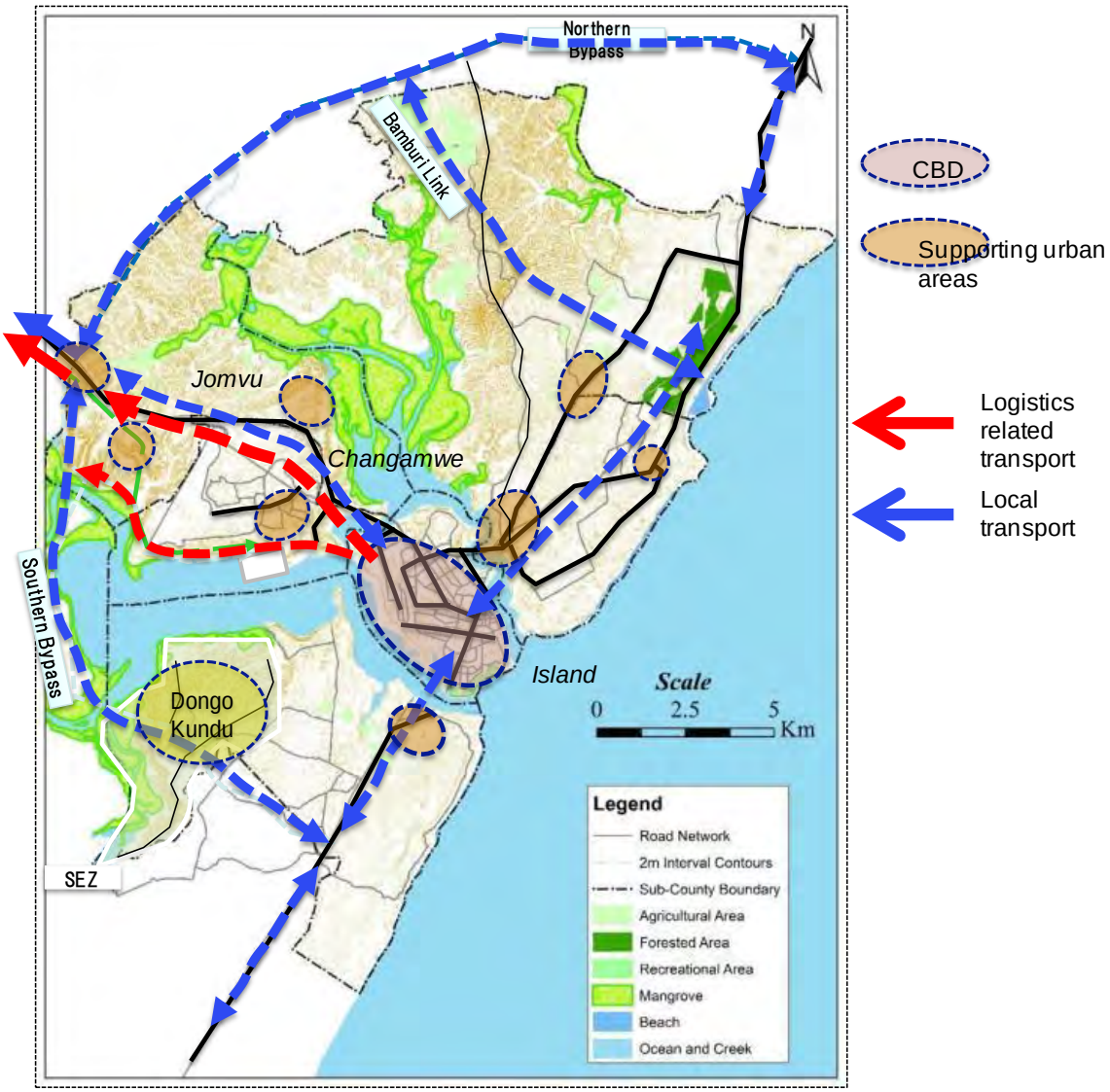
Table 8.2.1: Structure Plan Alternatives

Trend Development (Minimum Intervention)	Northwest Corridor Development (Double Ring Road Development)	Southwest Corridor Development (Logistics Oriented Development)
		
・ Trend development is considered which only forms ring structure by connecting the bypass and radial road (coastal road, Bamburi Link). ・ Intervention on urban management is minimal.	・ Following the idea of ISUDP-Mombasa. ・ Undeveloped area is considered as a priority area for development. ・ Double ring road in Mainland North and West is formed (bypass and inner ring road). ・ Special functional areas are developed along ring road (Subcentres). ・ There is no major shift in the land use for existing urban areas, that is, current land use and structures in urban areas are applied in the land use plan.	・ Northern Economic Corridor links are strengthened and logistics and local transport are separated. ・ Subcentres are developed mainly along the Northern Economic Corridor to support logistics condition. ・ Land use and structure in the Mombasa Island and other existing urban areas are re-organised. ・ Land use is improved by focusing on promoting commercial and tourism in the Mombasa Island and other urban areas.

Source: JICA Expert Team

(2) Trend Development (Minimum Intervention)

Trend development is proposed as a base case through which subcentres proposed in all directions of the development axis and ring road are formed along Mombasa County boundary.



Source: JICA Expert Team prepared based on working group results

Figure 8.2.6: Trend Development (Minimum Intervention)

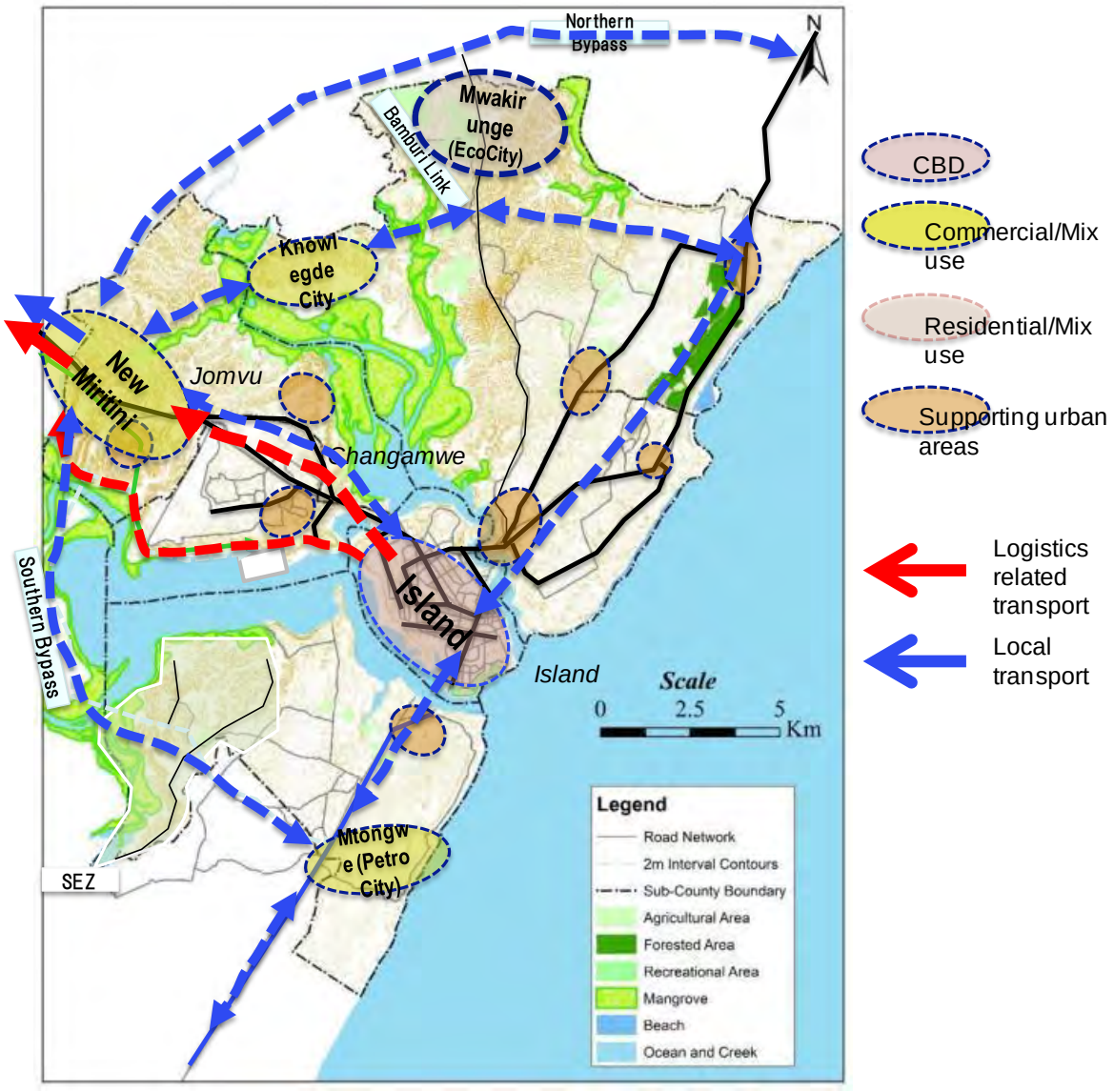
Table 8.2.2: Characteristics of Trend Development (Minimum Intervention)

Objectives	・ To form ring structure by realising road development plan.
Characteristic (Strategy)	・ Bypass and existing radial road are linked to from ring type structure. ・ North-south axis passes through Nyali, CBD (Digo Road), Likoni. ・ Coastal area (Nyali, Bamburi) is strengthened by road improvement and public transport.
Subcentres (main function)	・ Mombasa Island still plays a major role in the county as commercial, administrative, and transport centre. ・ There is no clear subcentre. ・ Existing urban area expands and sprawl continues.
Impact to urban development	・ There is a risk of further congestion in the CBD and Mama Ngina Drive, if road network is linked from Nyali-CBD-Likoni. ・ Logistics transport and local transport is still mixed, which still has impact to logistics transport. ・ Further congestions are expected in the existing urban areas. ・ Gap amongst urban areas in social facility and infrastructure continues. ・ There is a risk of negative impact to natural environment (forest, creek, beach) without sprawl management.

Source: JICA Expert Team

(3) Northern Corridor Development (Double Ring Road Development)

The Northern Corridor Development is prepared based on ISUDP-Mombasa Proposal, which aims at developing the un-developed area which is observed mainly in the Mainland North.



Source: JICA Expert Team prepared based on working group results

Figure 8.2.7: Northwest Corridor Development (Double Ring Road Development)

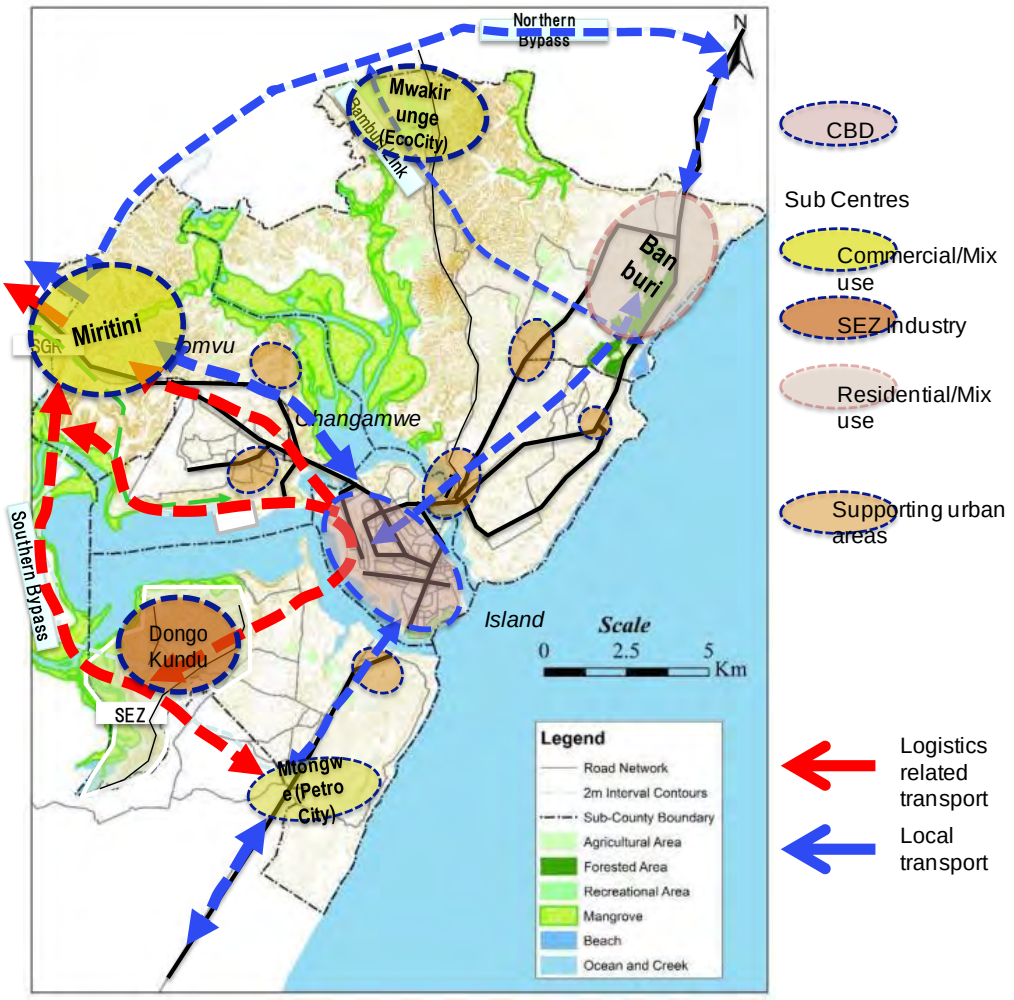
Table 8.2.3: Characteristics of Northwest Corridor Development (Double Ring Road Development)

Objective	・ To develop un-developed area in Mainland North with inner ring type structure development.
Characteristics (Strategy)	・ Ring road is formed within the county boundary in addition to bypass and new road development is concentrated in un-developed area. ・ Most un-developed areas are to be developed. ・ This structure plan is prepared based on structure plan proposed in ISUDP-Mombasa.
Subcentres (Main functions)	・ Eco-city (Mwakirunge), dumping site (Kisauni), Knowledge City (Maunguja), New Jomvu City, Petro City (Mtongwe)
Impact to urban development	・ Urban area is large and investment cost is expected to be high due to large covering area and complicated geographic condition (hilly, mangrove). ・ Logistics transport and local transport are still mixed. ・ There is a risk of interfering with natural environment including forest and mangrove.

Source: JICA Expert Team, ISUDP-Mombasa

(4) Southern Corridor Development (Logistics-oriented Development)

The Southern Corridor Development aims to improve transport network and urban area mainly in the Mombasa Island and Mainland West. This is considered one of the most congested areas and an area where urbanisation has been taking place in recent years.



Source: JICA Expert Team prepared based on working group results

Figure 8.2.8: Southwest Corridor Development (Logistics Corridor Development)

Table 8.2.4: Characteristics of Southwest Corridor Development (Logistics Corridor Development)

Objective	・ To strengthen major logistics functions in Mombasa County, namely, the Mombasa Island, Changamwe, Jomvu, and Dongo Kundu, through accelerating separation of logistics transport and local transport, together with strengthening the urban function in the area.
Characteristics (Strategy)	・ Small rings are formed within a big ring to be formed by bypass. ・ Ring-type network to connect logistics and industrial functions (port, special economic zone (SEZ), standard gauge railway (SGR), Southern Bypass, and Gate Bridge) are developed as priority structures to strengthen the linkage between the Mombasa Island and Mainland West for the Northern Economic Corridor. ・ Ring-type network is formed in Bamburi and Mwakirunge for residential and commercial functions. ・ Logistics transport and local transport are separated by creating three-way connection in the Mombasa Island and Mainland West (Mombasa Road, Kipevu Link, and Gate Bridge). ・ Managing traffic to avoid un-necessary traffic flows to the Mombasa Island. ・ Developing new corridor in the Mombasa Island to avoid further congestion in CBD, Old Town, Digo Road, and Mama Ngina Drive.

Subcentres (main function)	・ Dongo Kundu: SEZ, export oriented industry with commercial and residential functions. ・ Miritini: commercial and residential functions, intersection of transport mode (road, SGR, public transport). ・ Bamburi: Residential and commercial functions. ・ Mwakirunge: Eco-city development aiming for low density residential function. ・ Other subcentres are developed in long term.
Impact to urban development	・ Major shift in urban structure is expected (within the Mombasa Island, subcentres, and transport network). ・ Land use is expected to be re-organised drastically which may have impact on social and cultural aspects. ・ Economic activity is expected to be accelerated by linking logistics (port) function and industrial function (SEZ). ・ Infrastructure and social facility is developed in subcentres together with economic development.

Source: JICA Expert Team

8.2.5 Comparison of Alternatives

The characteristics of structure plan alternatives are discussed amongst the technical working group members. The major points of each alternative are summarised in Table 8.2.5 below.

Table 8.2.5: Function Image of Subcentres

Alternatives	Subcentres	Transport Network
Trend Development (Minimum Intervention)	・ No major subcentres are located. ・ Urban sprawl is expected to continue without proper subcentre development.	・ Diversion of logistics transport is limited around the Mombasa Island, Changamwe, and Miritini
Northwest Corridor Development (Double Ring Road Development)	・ Location of some subcentre is not efficient due to geographical condition.	・ Diversion of logistics transport is limited around the Mombasa Island, Changamwe, and Miritini ・ Inner ring road is not necessary considering the traffic volume.
Southwest Corridor Development (Logistics Corridor Development)	・ Subcentres are located at strategic locations to support improvement of logistics for Northern Economic Corridor.	・ Diversion of logistics transport is efficient through Gateway Bridge connecting the port area, SEZ, and Southern Bypass.

Source: JICA Expert Team

The characteristics of structure plan alternatives are discussed amongst the technical working group members. The "Southwest Corridor Development" was identified as an ideal alternative, as a result of discussions, for the following reasons:

- Logistics and local transport separation is important to increase convenience of people in Mombasa County. This structure will divert logistics traffic to three ways from the port area.
- Location of subcentres is appropriate, particularly New Miritini and Mwakirunge (Eco-city). Miritini and Mwakirunge areas have public land which can be used for urban development, and also strengthen subcentre function in Mombasa County.
- Inner ring road (inside bypass) is not necessary by 2040, considering the traffic volume from and to the north is low. In addition, since inner ring road is planned in the hilly land and water mass area including mangroves, construction cost will be high and there is a risk of interfering with the natural environment. Capacity of Bamburi Link and Southern Bypass is enough to form a linkage.
- Improvement of structure of Mombasa Island can be achieved together with improvement of the entire structure of Mombasa County. Congestion in Mombasa Island is caused by poor land use and inefficient road network. Land use has to be improved and traffic movement has to be re-organised such as the "short gun structure" proposed in the island transport.

The proposed alternatives were discussed in the stakeholder meetings. "Southwest Corridor Development" was selected as the best alternative during the stakeholder meeting as well as in the focus group meeting. Based on the results of technical working group and stakeholder meetings, development

vision and structure plan were presented and discussed in the second Steering Committee meeting in April 2016 in Nairobi, and the development vision and "Southwest Corridor Development" were approved to be adopted for the master plan preparation.

8.2.6 Description of Proposed Structure Plan

Based on the "Southwest Corridor Development", which was selected as the best alternative structure plan for Mombasa County, details are proposed for the transport network and subcentre development.

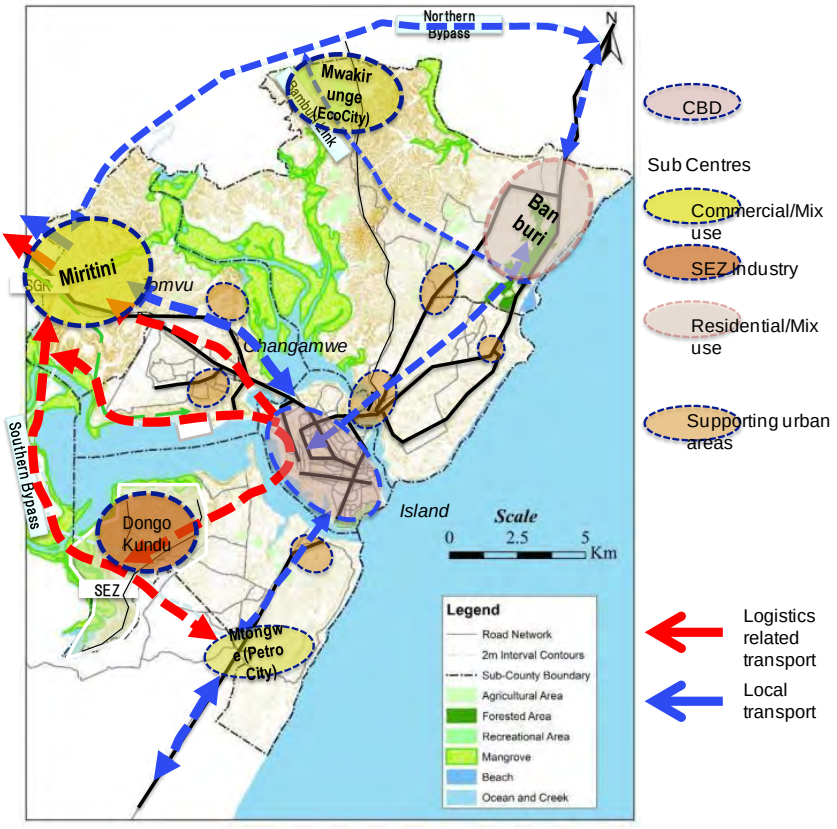
As mentioned in the structure plan alternative analysis, the direction of Mombasa County is to become "a premier gateway port city", to ease the pressure in Mombasa Island and narrow the gap between Mombasa Island and the mainland, and to control the development in the mainland. The structure plan is proposed to achieve the development vision and to solve urban challenges.

(1) Transport Network

The main aim for developing transport network is to separate logistics transport and regional transport, and reducing traffic inflow in Mombasa Island. Forming a ring structure with radial structure is a priority for transport network development. Bypass which forms ring structure has already been proposed and part of it was implemented. The Southern Bypass and Northern Bypass including Bamburi Link are important roads to divert traffic moving into urban centres. Kipevu Link, Gate Bridge (Likoni Bridge), and Southern Bypass are important to improve logistic traffic from the port. In addition, Malindi Road Improvement is important to accommodate population increase in Nyali, Kisauni, and Bamburi. Public transport will be installed to connect Mombasa Island and the mainland in order to move people into the area through Miritini/Changamwe to Mombasa Island, and Mombasa Island to Kongowea/Nyali areas.

(2) Function of Subcentres

Subcentres are important to promote development in the mainland, which expects to accommodate some urban functions currently provided (mainly) in Mombasa Island such as commercial and public services. In order to strengthen urban function in the mainland, location and function of subcentres are examined and proposed based on transport network, planned urban development projects, and urbanisation trend in the past years. The location of subcentres is shown in Figure 8.2.9 below.



Source: JICA Expert Team

Figure 8.2.9: Structure Plan and Major Subcentres

The characteristics of subcentres are summarised in Table 8.2.6 below.

Table 8.2.6: Characteristics of Subcentres

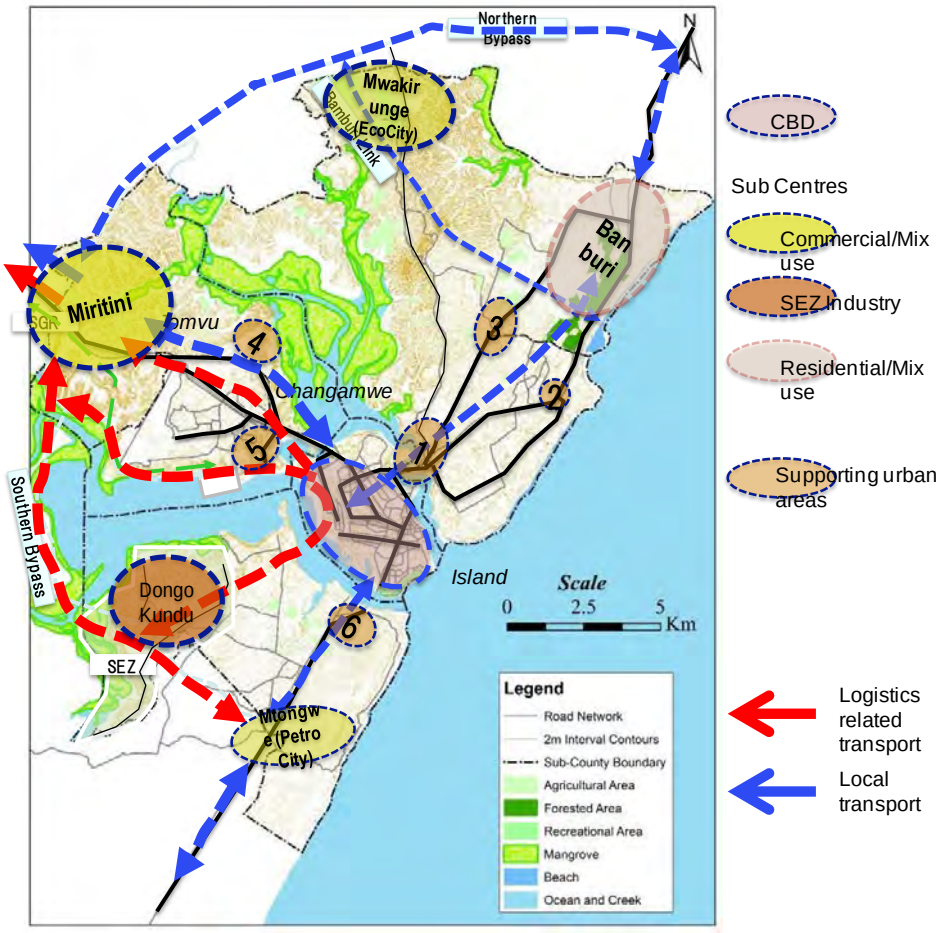
Subcentres	Characteristic	Function/Social Facility
Mombasa Island (Main Centre)	・ Revive commercial and tourism functions in Mombasa Island instead of industry function. ・ Restore historic appearance especially in the Old Town, and also some streetscape along Digo Road, Haile Selassie Road, and Moi Avenue. ・ Government administrative functions and businesses are still one of the major functions in Mombasa Island as a centre of the county. ・ Change some port and logistics functions to commercial and residential functions.	・ Government services ・ Commercial and market ・ Tourism destination
Bamburi	・ Commercial, residential and tourism development with apartments and hotels. ・ Coast side shall be low density but western side of Malindi Road (B8) shall be high density residence.	・ Shopping complex ・ Apartment for long stay ・ Low density residence
Mwakirunge (Eco City)	・ Mainly low density residential area with some high-density apartment zone along Bamburi Link Road. ・ Environmentally friendly development shall be applied in this area to protect steep slope and mangrove forest.	・ Low density eco residence ・ High density mixed-use apartment along Bamburi Link ・ Energy friendly environment
Mtongwe/Likoni (Petro City)	・ Oil treatment and oil stock centre of Northern Corridor Pipeline Development. ・ A relocation site of oil-related facility in Mombasa Island and in Changamwe ・ Commercial centre of Likoni Mainland.	・ Oil terminal with off shore oil jetty ・ Shopping complex for Likoni area

Subcentres	Characteristic	Function/Social Facility
Dongo Kundu (SEZ)	・ Industrial Centre of Mombasa County connected through the Southern Bypass. ・ One of major locations for re-location of industry activity in Mombasa Island and in the mainland. ・ SEZ development with worker residence.	・ Industry ・ Public facilities for Likoni
Changamwe/Miritini	・ Residential and commercial development along Mombasa Road (A109). ・ Mid to high density and commercial mixed-use development as a subcentre function for Miritini area. ・ Some industry functions are located in Miritini.	・ Logistics centre with CFS

Source: JICA Expert Team

(3) Function of Supporting Urban Areas

Supporting urban centres designated between subcentres and considered as focus of urban development to supplement CBD and subcentre function. Some areas are oriented for residential development and some areas are oriented for commercial development. Some supporting urban centres are also considered as model of Transit Oriented Development (TOD) through which, transport development and urban development are used to promote usage of public transport in Mombasa County. Characteristics and functions of supporting urban areas are proposed as shown in Figure 8.2.10 and Table 8.2.7 below.



Source: JICA Expert Team

Figure 8.2.10: Structure Plan and Supporting Urban Areas

Table 8.2.7: Function Image of Supporting Urban Areas

Supporting Urban Areas	Characteristics	Function/Social Facility
1 Kongowea	・ This is where the largest market in the region is located. ・ Intersection of road network from Mombasa Island, Kisauni, and Nyali. ・ Public transport is planned to pass market area and TOD should be promoted to ease congestion. ・ High density	・ Commercial and market
2 Bamburi/Nyali	・ Intersection of New Malindi Road and links road. ・ Commercial activity (shopping malls, offices) ・ Mid to high density	・ Commercial function
3 Kisauni	・ Located between Bamburi and Kongowea ・ Urban sprawl is observed. Some commercial activities are emerging along the residential area. ・ Proper land use has to be promoted to ease congestion. ・ Mid to high density	・ Residential with commercial function
4 Mikindani	・ Middle income residential area ・ Urbanisation is taking place along the Northern Economic Corridor. ・ Residential function has to be strengthened and high density has to be promoted.	・ Mid to high density residential function
5 Kipevu/Makupa	・ Centre of logistics. ・ Logistics has to be improved through road development and SGR development. ・ Mid to high density with commercial and residential mixed development. ・ Develop in line with closure of Kibarani Landfill site (proposed as public park in ISUDP-Mombasa). Newly reclaimed land for new development includes public facilities for Mombasa people. Waterway has to be secured.	・ Logistics centre with CFS and ICD ・ Waterfront park
6 Bofu (Likoni)	・ Location of Likoni Ferry. ・ Commercial and residential functions have to be strengthened.	・ Commercial with residential function

Source: JICA Expert Team

8.3 Framework and Development Conditions

8.3.1 Population Framework Review

(1) Population Trend in Kenya

Population trend and projection done by related studies were examined as a reference for population projection for the Mombasa Gate City Master Plan (MGCMP). Population trend and population growth for 2030 was calculated in Census 2009. Population growth in Coastal Region is higher with an average growth rate of 3.1% per year compared with that for the national average with 2.6% per year as shown in Table 8.3.1 below. In addition, in the National Spatial Plan (2015-2045), population growth rate for urban area is predicted at 4.4% per year.

Table 8.3.1: Population Growth Rate in Kenya

	Kenya	Coastal Region
2010－2015	2.8%	3.6%
2015－2020	2.6%	3.3%
2020－2025	2.5%	3.0%
2025－2030	2.3%	2.7%
Average rate	2.6%	3.1%

Source: 2009 Population Census

(2) Population Growth Scenario Proposed in ISUDP-Mombasa

ISUDP-Mombasa applied a scenario-based method for population projection of Mombasa County for planning purposes based on the trend available from the Kenya National Bureau of Statistics (KNBS) census reports and other relevant assumptions. The population projections done for the three scenarios are summarised in Table 8.3.2.

Table 8.3.2: Population Growth Scenarios in ISUDP-Mombasa

Scenarios	Descriptions
High Growth Rate	・ Average natural growth rate of 8% in twenty years (2015-2035) that will continue as it is. ・ In-migration growth rate will increase annually by 0.01% for the first five years, and then it will continue to grow by 0.11% to 0.19% every year from 2020 to 2029, followed by 0.2% to 0.25% growth rate in the last five years of the total plan period of 20 years. ・ In such case the population of Mombasa County will grow to 3.1 million by year 2035.
Medium Growth Rate	・ Average natural growth rate of 5% in twenty years (2015-2035), assuming that the natural rate of growth will decrease at 0.01% for the first ten years and then will decline by 0.05% per year. ・ In-migration rate (currently 2%/annum) will increase by 0.01% every year for the first ten years, followed by 0.06% till the target year 2035. ・ In such case the population of Mombasa County will grow to 2.3 million by year 2035.
Low Growth Rate	・ Average natural growth rate of 2.6% in twenty years (2015-2035), assuming that the natural rate of growth will decrease at 0.02% during the plan period. ・ In-migration rate will reduce by 0.02% during the plan period. ・ In such case the population of Mombasa County will grow to 1.7 million by year 2035.

Source: KMP, ISUDP-Mombasa

(3) Population Projection of Mombasa County Based on Macro Analysis

In order to capture the image of future population, future population of Mombasa County is calculated based on a variety of growth scenarios proposed by census analysis and other related studies. Three cases are proposed.

1) Population projection based on census analysis (Case 1)

Population increase rate for the Coastal Region in the census, average of 2.9%, is applied for calculating the population of Mombasa County. Population in 2040 is calculated to be 2.26 million.

Table 8.3.3: Population Based on Census

	2010	2015	2020	2025	2030	2035	2040	Average
Kenya	**38,474,893**	**44,156,577**	**50,319,253**	**56,998,894**	**63,859,547**	**71,545,980**	**80,157,588**	
% increase		2.8%	2.6%	2.5%	2.3%	2.3%	2.3%	2.6%
Coastal	**3,396,107**	**4,054,921**	**4,770,767**	**5,520,138**	**6,295,125**			
% increase		3.6%	3.3%	3.0%	2.7%			3.1%
Mombasa	**959,187**	**1,145,259**	**1,347,440**	**1,559,091**	**1,777,973**	**2,004,754**	**2,260,460**	
% increase		**3.6%**	**3.3%**	**3.0%**	**2.7%**	**2.4%**	**2.4%**	**2.9%**

Source: Prepared based on 2009 Kenya Population and Housing Census, Analytical Report on Population Projections

2) Population projection based on census analysis (Case 2)

Since Mombasa County plays an important role in the Coastal Region by providing urban services such as education, health, and employment opportunity, population inflow to Mombasa County is expected to continue, thus, population increase rate is expected to be higher in Mombasa County compared with other counties in the Coastal Region. Higher rate (+0.3% to the rate in the Coastal Region) is applied. Population in 2040 is calculated to be 2.41 million.

Table 8.3.4: Population Projection Based on Census (High Case)

	2010	2015	2020	2025	2030	2035	2040	Average
Mombasa	959,187	1,161,738	1,384,880	1,621,426	1,868,835	2,124,005	2,414,016	
		3.9%	3.6%	3.2%	2.9%	2.6%	2.6%	3.1%

Source: Prepared based on 2009 Kenya Population and Housing Census, Analytical Report on Population Projections

3) Population projection based on age structure (Case 3)

Population is calculated based on age structure (applying the idea of cohort) through which population change by age was analysed, then a trend is applied for population projection in 2040. Two cases were calculated.

Table 8.3.5: Population Projection Based on Census (High Case)

Age	2009	2019	2029	2039
0 - 4	127,320	149,827	221,019	263,268
5 - 9	99,916	119,015	165,926	237,280
10 - 14	82,881	118,523	139,474	205,748
15 - 19	86,735	127,949	152,406	212,478
20 - 24	126,261	176,028	251,725	296,223
25 - 29	124,465	149,827	221,019	263,268
30 - 34	91,310	119,015	165,926	237,280
35 - 39	66,857	93,874	113,002	166,697
40 - 44	42,037	68,664	89,499	124,775
45 - 49	31,361	50,977	71,577	86,162
50 - 54	21,205	31,453	51,376	66,964
55 - 59	13,354	18,664	30,338	42,597
60 - 64	9,227	12,276	18,208	29,742
65 - 69	5,362	8,174	11,423	18,569
70 - 74	4,176	6,290	8,368	12,412
75 +	6,033	3,920	5,975	8,351
NS	870			
	939,370	1,254,474	1,717,262	2,271,813

Trend Case

Age	2009	2019	2029	2039
0 - 4	127,320	149,827	221,019	263,032
5 - 9	99,916	118,908	165,777	237,437
10 - 14	82,881	118,708	139,692	206,069
15 - 19	86,735	127,949	152,270	212,287
20 - 24	126,261	176,028	252,119	296,686
25 - 29	124,465	149,827	221,019	263,032
30 - 34	91,310	118,908	165,777	237,437
35 - 39	66,857	97,727	122,135	184,589
40 - 44	42,037	69,049	93,486	133,650
45 - 49	31,361	51,822	78,681	100,775
50 - 54	21,205	33,378	56,897	78,903
55 - 59	13,354	20,882	36,061	56,326
60 - 64	9,227	13,707	22,577	39,623
65 - 69	5,362	9,097	14,852	26,368
70 - 74	4,176	6,657	10,301	17,418
75 +	6,033	4,607	8,089	13,503
NS	870			
	939,370	1,267,080	1,760,751	2,367,136

High Case

Source: Calculated based on census data

The result is shown below.

- Trend Case (apply trend): 2.27 million
- High Case (low decrease rate due to medical improvement): 2.36 million

8.3.2 Population Framework

Based on the above analysis and after considering the past trend and growth potential in Mombasa County, and macro trend in Kenya, Case 2 scenario seems most appropriate for planning purpose. Therefore,2.41 million population in 2040 is used for MGCMP planning purpose.

The population projection includes the idea of "Floating Population" which is workers or students inflow to Mombasa County during the day. ISUDP-Mombasa estimated the current floating population to be less than 6% of the existing population based on the Origin Destination (OD) survey. With improved economic growth and efficient transport connectivity, the floating population in Mombasa County is expected to increase and estimated to be from 8% to 10% in 2035.

Mombasa Gate City Master Plan (MGCMP) applies 10% of floating population ratio by the year 2040. Thus, the day-time population becomes just over 2.6 million in 2040.

8.3.3 Population Capacity Analysis in Mombasa County

Population capacity in Mombasa County is calculated for 35 zones and areas in Mombasa County in order to review justification of the future population size. For calculating population capacity, the following conditions are examined:

- Analyse current situation: urban trend/character, environment, and geography
- Setting development direction: urban function, development potential, and population
- Set maximum population density: range of population density

It is estimated that the population capacity of Mombasa County is 2.56 million, which is 2.2 larger than the current population size.

Table 8.3.6: Population Capacity Projection

Area	2015	2040	Change (times)
Mombasa	157,441	220,855	1.4
Mainland North	486,334	978,526	2.0
Mainland West	304,606	630,179	2.1
Mainland South	207,511	737,739	3.6
Total	1,155,892	2,567,300	2.2

Source: JICA Expert Team

Table 8.3.7 shows the guidance of population and population density by sublocation.

Table 8.3.7: Estimated Population Distribution for Sublocation

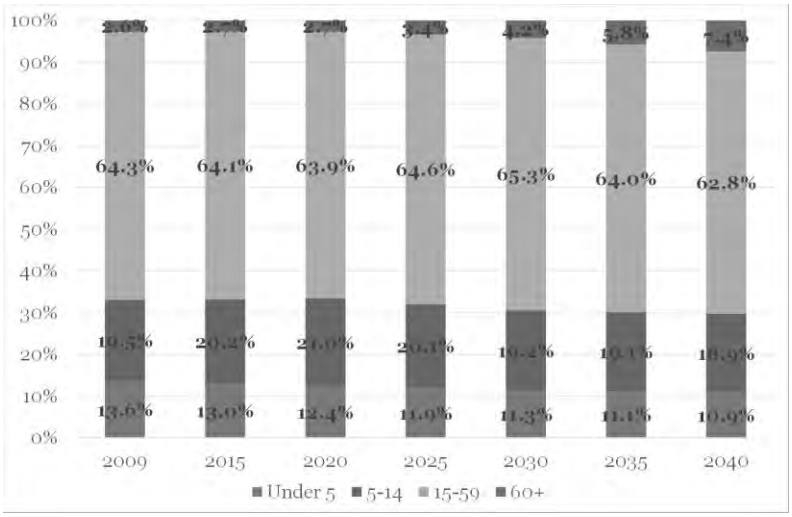
A Zone	B Zone	ID	C Zone	2009 Pop.	Area Census*	Pop. Density 2009 p/km^2	Pop. Density 2040 p/km^2	**Max. Pop. (2040)**
Mombasa Island	Mwembe Tayari	1	Mwembe Tayari	7,914	0.6	13,190	23,000	13,000
	Ganjoni	2	Ganjoni	10,418	2.2	4,735	9,000	18,745
	Ganjoni	3	Kizingo	7,163	2.2	3,256	9,000	20,394
	Old Town	4	Makadara	8,656	0.4	21,640	18,000	10,337
	Old Town	5	Mji Wa Kale	10,056	0.4	25,140	23,000	13,553
	Tononoka	6	Bondeni	10,157	0.5	20,314	30,000	12,459
	Tononoka	7	Tononoka	17,356	1.0	17,356	20,000	14,896
	Majengo	8	Majengo	30,920	1.5	20,613	32,000	35,226
	Tudor	9	Tudor 4	14,470	1.7	8,512	17,000	27,243
	Tudor	10	Tudor Estate	17,630	0.8	22,038	30,000	20,930
	Railway	11	Railway	8,388	3.4	2,467	9,000	34,071
	Mombasa Island Subtotal			**143,128**	**14.7**			**220,855**
Kisauni	Kongowea	12	Kongowea	63,993	8.4	7,618	15,000	127,693
	Kongowea	13	Maweni	42,187	6.4	6,592	15,000	100,402
	Kisauni	14	Kisauni	79,811	8.1	9,853	20,000	160,657
	Kisauni	15	Magogoni	82,718	8.3	9,966	20,000	134,638
	Kisauni	16	Junda	39,432	7.5	5,258	15,000	70,503
Bamburi	Bamburi	17	Shanzu	9,264	7.2	1,287	3,200	20,849
	Bamburi	18	Mwembelengeza	28,803	11.1	2,595	10,000	126,222
	Bamburi	19	Bamburi	24,918	12.3	2,026	10,000	135,550
	Bamburi	20	Mwakirunge	7,403	31.3	237	2,500	79,120
	Bamburi	22	Maungja	1,526	11.1	137	3,500	22,893
	Mainland North Subtotal			**380,055**	**111.7**			**978,526**
Jomvu	Mikindani	23	Birikani	17,520	2.3	7,617	13,000	21,972
	Mikindani	25	Kwashee	35,257	3.8	9,278	15,000	56,151
	Miritini	28	Miritini	25,934	10.4	2,494	13,000	111,113
	Miritini	29	Jomvu Kuu	38,776	19.0	2,041	12,000	243,484

A Zone	B Zone	ID	C Zone	2009 Pop.	Area Census*	Pop. Density 2009 p/km^2	Pop. Density 2040 p/km^2	**Max. Pop. (2040)**
Changamwe	Chaani	24	Chaani	58,238	4.2	13,866	10,000	41,749
	Changamwe	26	Changamwe	11,013	3.8	2,898	12,000	45,626
	Portreitz	27	Portreitz	63,441	8.0	7,930	11,000	110,084
	Mainland West Subtotal			**250,179**	**52**			**630,179**
Likoni	Likoni	30	Bofu	29,154	1.6	18,221	30,000	46,706
	Likoni	31	Likoni	21,639	1.1	19,672	30,000	27,707
	Likoni	32	Timbwani	61,011	6.8	8,972	20,000	126,718
Longo	Shika Adabu	33	Vijiweni	11,458	3.9	2,938	13,000	177,192
	Shika Adabu	34	Vyemani	14,578	2.2	6,626	20,000	56,926
	Mtongwe	35	Mtongwe	28,168	25.5	1,105	12,000	302,490
	Mainland South Subtotal			**166,008**	**41.1**			**737,739**
TOTAL				**939,370**	**219**	**308,488**	**12,564**	**2,567,300**

Source: JICA Expert Team * Because of accuracy of census date, total area is different from the area calculated by GIS data.

8.3.4 Population Allocation by Age

Kenya currently has high crude birth rate of 35.4%. It is expected to decline in the next decades, but the rate is highly maintained at 25.9% in 2040 according to the estimations from the United Nations Department of Economic and Social Affairs. The crude death rate is expected to decrease from currently 8.7% to 6.1%. Mombasa County, being one of the leading urban centres in the country, is expected to maintain high rate of working population between the ages 15–59 with high migration of working age population



Source: JICA Expert Team

Figure 8.3.1: Mombasa County Population Distribution by Age

8.3.5 Economic Framework Review

The Northern Economic Corridor Master Plan (NECMP) suggests that the economy of Kenya sees high rate of growth between 2020 and 2025 due to the commencement of the crude oil exports. However, the rate is expected to reduce thereafter to 4%-5% per annum as illustrated in Table 8.3.8 below.

Table 8.3.8: Future GDP Projection in Kenya 2015-2040

GDP Growth	2015	2020	2025	2030	2035	2040
GDP (%, base case)	5.6	9.3	5.3	4.6	4.3	4.0
GDP/Sector (base case)	2015	2020	2025	2030	2035	2040
Primary (% of total)	24.0	22.5	20.9	20.0	19.6	18.7
Secondary (% of total)	21.0	24.2	25.9	25.4	24.5	24.5
Tertiary (% of total)	55.0	53.3	53.3	54.6	55.9	56.7

Source: JICA Expert Team (based on NECMP)

ISUDP-Mombasa predicts the labour market in Mombasa County in 2035 (Table 8.3.9). The active labour force in 2035 is expected to grow up to 1.3 million. Ninety percent of the total labour force will serve in the formal sector. Within such, employment in agricultural sector is only 2%. Industrial sector will hold about 22% and service sector will grow to 76%.

Table 8.3.9: Future Employment Projection

Sl. No.	Sector	Labour Force	Share (%)
1	Formal Sector	1,163,096	90
1-1	Primary Sector	25,847	(2)
1-2	Secondary Sector	258,466	(22)
1-3	Tertiary Sector	878,783	(76)
2	Informal Sector	129,233	10
Total		1,292,329	100

Source: ISUDP-Mombasa Final Report

8.3.6 Economic Strengths and Weaknesses

Citizens and officers of Mombasa County consider the Strengths, Weaknesses, Opportunities and Threats (SWOT) of Mombasa County as shown in Table 8.3.10.

Table 8.3.10: SWOT Analysis for Mombasa County

Strength		Weakness	
1	High quality of life	1	Limited land mass and weak land tenure
2	High quality natural environment	2	Poor road network and congestion
3	Regional and international linkages	3	Poor public transport system
4	Abundance of waterways	4	Inadequate skilled manpower
5	Significant catchment area	5	Lack of operational capacity in health facilities
6	Strong cultural distinctiveness	6	Weak regulatory framework
7	Tourism attraction	7	Water shortage
8	Rich historical background and heritage	8	Poor quality of services and lack of capacity in education facilities
9	Affordable standard of living		
10	Surrounded by raw material producing counties	9	Unbalanced development
11	Traditional skills of Jua Kali artisans	10	Underdeveloped business environment
12	Tropical climate	11	Unemployment
13	Availability of a strong market	12	Weak governance
14	Biggest tea market in the world	13	Land degradation
		14	Lack of essential sewerage, solid waste management public facilities
		15	Informal settlements
Opportunity		**Threat**	
1	Devolution	1	Macroeconomic slow down and fast growing neighbours
2	Further regional and international linkages	2	Insecurity (incl. terrorism and crime)
3	Trade and importation of new technology	3	In-migration overflow
4	Corridor development (incl. SGR)	4	Weak governance of surrounding institutions
5	Road infrastructure development	5	Environmental pollution and degradation (incl. climate change)
6	Port development		
7	SEZ development	6	Drug and substance abuse
8	Real estate development	7	Erosion of cultural practices due to external influences

Opportunity		Threat	
9	Regional integration (i.e., EAC, COMESA, EU)		
10	Improvement in public transport system		
11	Improvement ofpublic services infrastructure		
12	Commercial fishing		
13	Improvement in security condition		

Source: JICA Expert Team (developed based on working group discussion)

8.3.7 Economic Framework

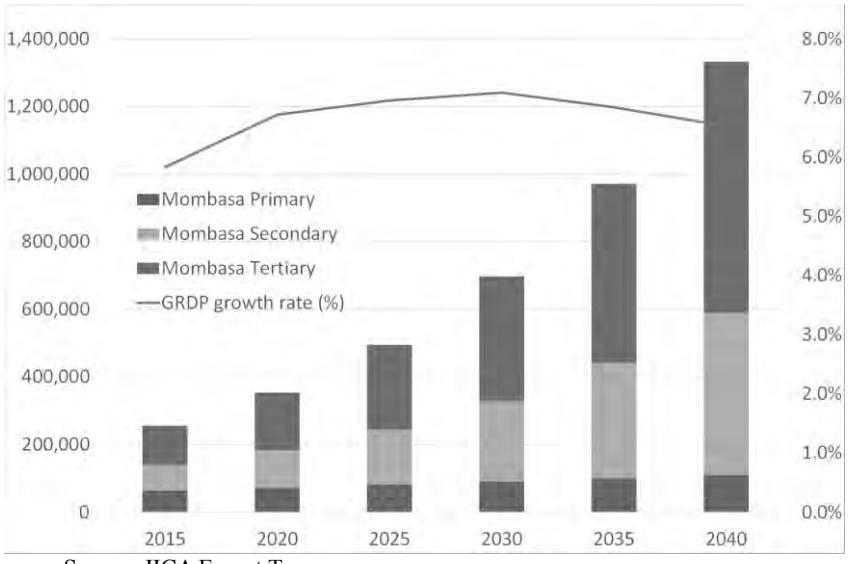
(1) GRP Growth Projection

The Japan International Cooperation Agency (JICA) Expert Team predicts the future gross regional product (GRP) growth projection as illustrated in Table 8.3.11 and Figure 8.3.2 below. The target area will observe a sustained growth of 6%-7% in the coming years. The growth rate continues to rise up to year 2030, but slower trend is expected due to the economic slowdown in the entire economy of Kenya. Especially, high growth is expected in the secondary and tertiary sectors. The tertiary sector continues to be the driving force of Mombasa economy and its GRP share in the year 2040 will be almost 60%.

Table 8.3.11: Future GRP Projection in Mombasa County 2015-2040

GRP Growth	2015	2020	2025	2030	2035	2040
GRP Growth (%/annum)	5.8	6.7	7.0	7.1	6.8	6.5
GRP/Sector	2015	2020	2025	2030	2035	2040
Primary (% of total)	25.2	23.1	21.5	20.7	19.9	19.1
Secondary (% of total)	29.3	21.7	22.2	22.4	22.6	22.9
Tertiary (% of total)	45.5	55.2	56.3	56.9	57.5	58.0
Sector Growth	2015	2020	2025	2030	2035	2040
Primary (%/annum)	2.5	2.5	2.5	2.0	2.0	2.0
Secondary (%/annum)	7.0	8.0	8.0	8.0	7.5	7.0
Tertiary (%/annum)	7.0	8.0	8.0	8.0	7.5	7.0

Source: JICA Expert Team



Source: JICA Expert Team

Figure 8.3.2: Scenario of Economic Development

(2) Growth by Sector

1) Primary Sector

Due to its limited size of landmass and limited arable lands, agriculture is not likely to grow in the future in Mombasa County. Current agricultural fields can either aim at high-efficiency and high-yielding urban agriculture or transform to secondary and tertiary sector uses. The potential in primary sector is fishery activities. Although Mombasa County is one of the few counties in Kenya with a coastal boarder, fishery industry in Mombasa County is quite small. The constraints for the growth of fishery industry lie in the lack of adequate cold-storage facilities and modern fishing markets. In addition, training in aquaculture and fishery management is required to foster the industry.

2) Secondary Sector

To comply with the lack of land mass and natural resources for growth, Mombasa County has to enforce greater effort into fostering secondary and tertiary sectors. Secondary and tertiary sectors will be the driving force of economy in Mombasa County. There is a great potential for secondary sector to grow by introduction of SEZ. The SEZ planned site is currently used for some agricultural activities, but the opening of SEZ and Southern Bypass provides opportunity for new industry to commence operations. It also gives opportunities to restructure the current industrial and warehousing facilities.

SEZ will foster transit-processing industries such as food-processing, metallic-processing, electronics in the short to medium term. These processing industries import inputs through Mombasa Port, export finished products from Mombasa Port, or do both. Mombasa County becomes the processing hub exploiting the strength of close proximity to the biggest port in East Africa. In the long term, Mombasa County has the potential to become the manufacturing hub of automobile industries. At present, cars sold in Kenya and East Africa are imported through Mombasa Port and almost all are used. Mombasa County has the potential to attract the first automobile manufacturing industry based in East Africa as the demand for new cars increases in Kenya.

3) Tertiary Sector

Continuous expansions in the Port of Mombasa also provide further growth potential to logistics and transport sectors. Freeports and free trade zones are planned within the SEZ for private entities to benefit from duty-free trading. More warehousing and storage facilities will be created.

To ensure efficiency in transactions of goods within Mombasa County, maintenance of Kongowea Market and establishment of other wholesale markets should be prioritised. Although Mombasa County is rich in tourism attraction, the industry faces challenges from insecurity. As the county grows to be safe and with more international businesses, tourism should be promoted since it has great potential to grow in the future.

8.3.8 Growth in Employment

Following the existing analysis, the JICA Expert Team projected the future Mombasa employment projection up to 2040 as shown in Table 8.3.12. Considering acceptable rate of unemployment, jobs available in Mombasa County will be approximately 1.45 million against the total active labour force of 1.54 million. In 2015, the number of jobs in Mombasa County compared with the total of jobs in Kenya is 3.4%, but such rate is expected to grow up to 4.8% in 2040.

Table 8.3.12: Future Employment Projection up to 2040

	2015	2020	2025	2030	2035	2040
Population of Mombasa	1,155,875	1,373,944	1,633,176	1,941,366	2,307,721	2,751,500
Active Labour Force	561,255	681,709	828,027	1,005,774	1,221,680	1,540,840
(% of total pop)	48.6%	49.6%	50.7%	51.8%	52.9%	56.0%
Non-labour Force	594,621	692,235	805,149	935,592	1,086,041	1,210,660
(% of total pop)	51.4%	50.4%	49.3%	48.2%	47.1%	44.0%
Employed Labour Force	475,834	590,576	732,998	909,787	1,129,219	1,455,323
(% of Active Labour Force)	84.8%	86.6%	88.5%	90.5%	92.4%	94.5%
Formal Sector	286,179	392,847	539,281	740,316	1,016,297	1,309,791
(% of Emp'd Labour Force)	60.1%	66.5%	73.6%	81.4%	90.0%	90.0%
Primary Sector	29,300	27,453	25,723	24,103	22,584	20,392
(% of Formal Sector)	10.2%	7.0%	4.8%	3.3%	2%	1.6%
Employment Sector	76,511	100,284	131,447	172,297	225,844	278,797
(% of Formal Sector)	26.7%	25.5%	24.4%	23.3%	22%	21.3%
Tertiary Sector	180,369	265,110	382,111	543,916	767,869	1,069,824
(% of Formal Sector)	63.0%	67.5%	70.9%	73.5%	76%	81.7%
Informal Sector	189,654	197,729	193,716	169,470	112,922	145,532
(% of Emp'd Labour Force)	39.9%	33.5%	26.4%	18.6%	10.0%	10.0%
Unemployed	85,421	91,133	95,030	95,987	92,461	85,258
(% of Active Labour Force)	15.2%	13.4%	11.5%	9.5%	7.6%	5.6%

Source: JICA Expert Team

9. Land Use Plan

9.1 Method of Land Use Policy Preparation

In order for the land use plan to contribute in solving urban issues and satisfying the needs of Mombasa County, land use policy is prepared to show guidance on development and control to realise efficient land utilisation and infrastructure development. Even though the area of Mombasa County is the smallest in Kenya, and the development of the entire area is not efficient due to geographic and natural condition. The area to be developed should be clearly defined through land use policy.

Land use policy was discussed and proposed through at technical working group with the following steps. In addition, the Zoning Policy, which is under preparation by the County Government of Mombasa (CGM), is referred for determining land use.

a) Analysing Land Condition

Since Mombasa County borders the ocean and mangroves, some parts of the available land are hilly thus limiting the area for development. Factors such as existing urbanisation, condition for urban development, and suitable land for development are examined.

b) Clarifying Objectives of the Land Use

The County Government of Mombasa has been trying to prepare zoning policy for each area for land use control, but the intention and contents are not clear. In order for the stakeholders to understand the meaning of land use plan, objectives of land use plan have to be clearly defined and understood.

c) Confirming Development and Control Factors

Urban development is composed of development factor and control factor. Development factor includes spatial development and infrastructure development to accommodate urbanisation. Control factor includes conservation of natural/historical/cultural heritage and management of urban sprawl in the suburb. What needs to be developed and what needs to be controlled has to be clarified and the intention is adopted in the land use plan.

d) Determining and Describing Land Use Classification

Structure plan is used as basis for land use classification, particularly major transport network and subcentres. Land use classification is prepared by considering development and control factors, which can be classified by function and usage of the area or volume or density of the area.

Examples of land use classification by functions and usage are residential use, commercial use, industrial use, and public use. Other land use can be applied depending on the needs. Volume or density can be described as high density, medium density, and low density. Usage and density can be combined if usage and density have to be controlled.

The land use classification description is proposed and includes allowed/not allowed activity and controlled items, which are considered as guidance of development control.

9.2 Land Conditions Analysis

9.2.1 Existing Urbanisation Image by Population Density

Population distribution plan is made to share development image in each subzone in Mombasa County. The following satellite images in Figure 9.2.1 show the characteristics of urbanisation in Mombasa County with population density. Old Town in the Mombasa Island shows highest population density of 25,000 p/km^2 (250 p/ha), whilst Nyali area of Mainland North shows 3,000 p/km^2 (30 p/ha).

Source: Google Earth Pro, Census 2009

Figure 9.2.1: Urbanisation Types of Mombasa County with Population Density

9.2.2 Considered Condition for Urban Development

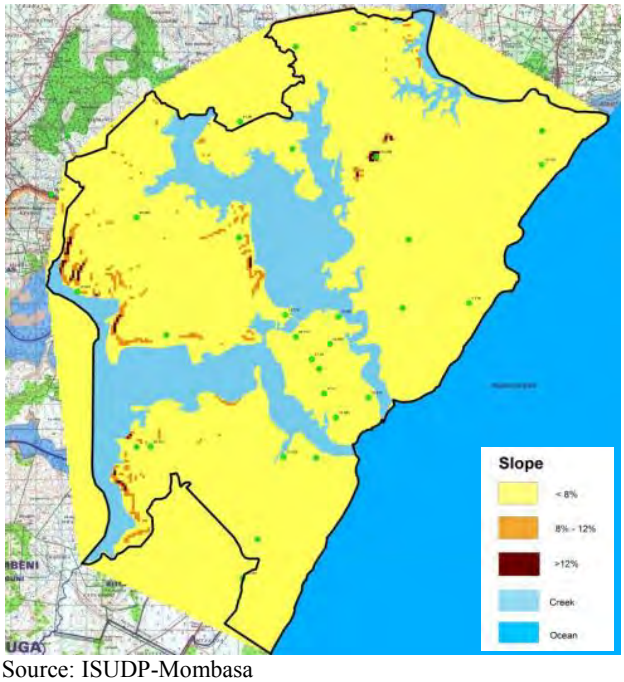
The "Policy on Environment and Coastal Resources Protection and Conservation" is proposed in the Draft Mombasa County Zoning Plan. This policy shall be considered prior to all land use planning in Mombasa County. The following is a summary of the policy and considered conditions:

(1) Reservation of Natural Topography

The terrain situation in Mombasa County is unique. The terrain which is approximately 5 km width from the seashore is almost flat; however, other inland areas complicated with creeks and large variety of surface features. Suitable land for development is limited in Mombasa County. Figure 9.2.2 shows the result of slope analysis which is generated from the geographic information system (GIS) contour data. The conditions of the analysis are as follows:

- Industrial area: up to 8%
- Residential area: up to 14%

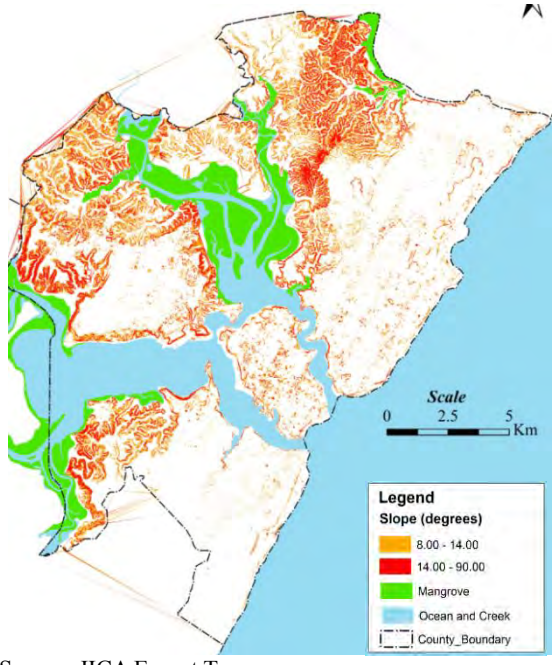
In the Integrated Strategic Urban Development Plan (ISUDP)-Mombasa, slope analysis was also done. However, the result does not reflect the existing situation of terrain. Mesh system is applied for analysis and unable to provide accurate results on terrain appearance. The Japan International Cooperation Agency (JICA) Expert Team used contour based slope analysis to show a more detailed slope situation. Figure 9.2.2 and Figure 9.2.3 show the difference in slope analysis between ISUDP-Mombasa and Mombasa Gate City Master Plan (MGCMP) analysis.



Source: ISUDP-Mombasa

- Very limited steep slope is indicated in this analysis map. This analysis does not accurately reflect the existing situation.
- As a result, ISUDP-Mombasa makes new and daring development proposals especially in Mainland North and Mainland West.

Figure 9.2.2: Mesh Based Slope Analysis



Source: JICA Expert Team

- Red colour contour line indicates slope over 14% degree. The yellow one shows 8~14% degree slope.
- Long and deep creeks make difficult terrain with steep slope extending to the north.

Figure 9.2.3: Contour Based Slope Analysis

(2) Mangrove Forest Conservation

Mangrove forests are spread in the heads of Tudor Creek, Port Reitz Creek, and Mtwapa Creek. Development activity at the upstream of mangrove forest might affect the ecology of such mangrove forest and consequently, the upper streams of mangrove forest shall be conserved as a protection measure. Areas of mangrove forests are shown in Figure 9.2.3 with dark blue colour.

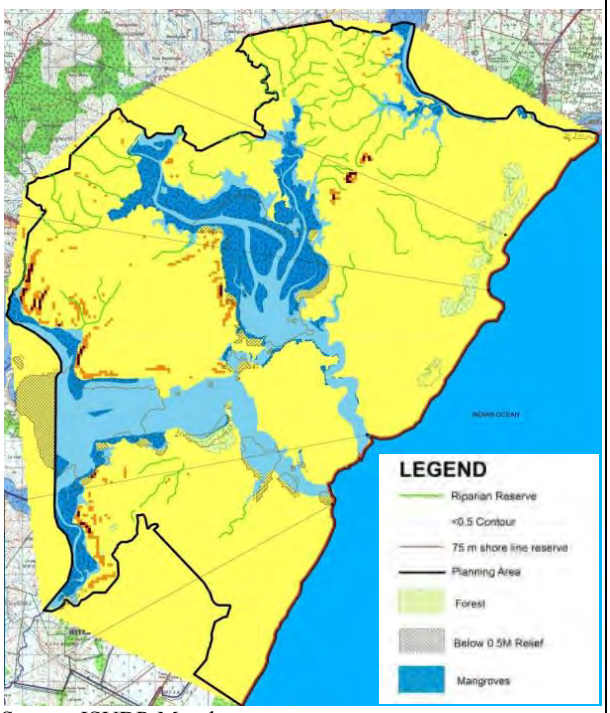
(3) Riparian Reserve and Water Catchment Conservation

Either side of the water course is defined as riparian reserve. The water courses are shown in Figure 9.2.4. There are many water courses mainly in the northern part of Mombasa County. The width of the reserved area shall be defined in detailed zoning plan, but minimum width shall be at 2 m. A green buffer zone of 20 m should be created between the catchment and development areas. Ensure primary use and justification for water catchments, water supply, drainage, flood prevention, and recreation.

(4) Beach and Coastal Environment Conservation

Coastal areas are of great potential and receive tremendous development pressure especially on development related to tourism, industry, and agriculture (fishery). This development is commonly associated with degradation of environmental quality and ecosystem of respective area. Development of these areas should be planned and controlled to enhance sustainable development.

White sand sea shore is the most valuable tourism resource in Mombasa County. Any activities that violate coastal environment must be prohibited.



Source: ISUDP-Mombasa

- Especially in the northern part, where many rivers or streams flow from.
- Also mangroves are extending into the creeks.

Figure 9.2.4: Map Showing Natural Environment

Source: ISUDP-Mombasa

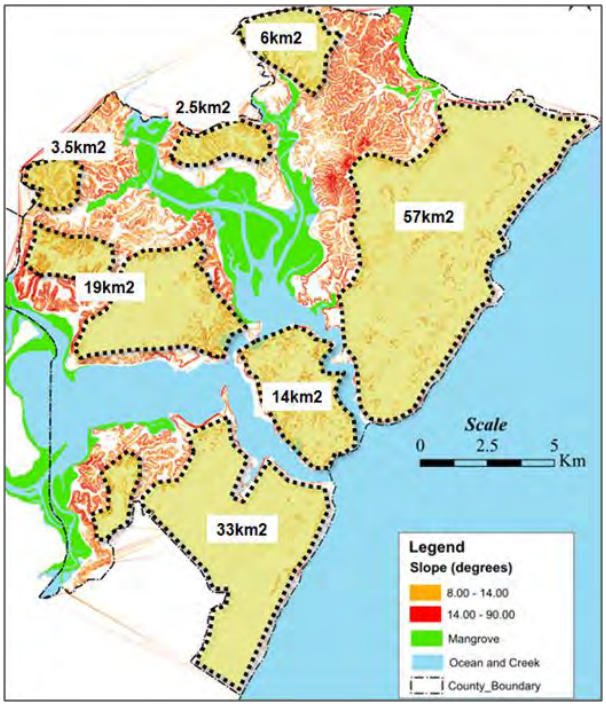
- This map shows environmentally sensitive areas against ISUDP-Mombasa development proposals.
- Compared with the map on the left, many riparian reserves are not considered in ISUDP-Mombasa's development plan.

Figure 9.2.5: Environmentally Sensitive Areas

9.2.3 Land Suitable for Development

Based on the above condition for environmental reservation area, the JICA Expert Team recommends avoiding steep slope area and riparian area from new urban development in Mainland North and Mainland West. The area of land suitable for development is shown in Figure 9.2.6.

Estimated land area for development is 134 km^2. Allocating projected population of 2.41 million in 2040, the average population density is going to reach 10,000 p/km^2 (100 p/ha). In addition, not only residential area but also areas for economic activities such as large-scale industrial zone, commercial accumulated area has to be secured for efficient development. This means that it is necessary to make sure certain high population density development in Mombasa County to accommodate the more than one million and increasing-population in a limited land.



Source: JICA Expert Team

Figure 9.2.6: Suitable Land for Development

9.3 Analysis of Draft Mombasa County Zoning Policy (2015-2025) by County Government of Mombasa (CGM)

The CGM drafted the "Mombasa County Zoning Policy (2015-2025)" based on the existing land use which was surveyed during the ISUDP-Mombasa study and Physical Planning Guidebook (2007) prepared by the Department of Physical Planning of the national government. The MGCMP adopted this zoning policy as a short- to medium-term plan to control urbanisation in Mombasa County. Land use plan is proposed by integrating the philosophy of the zoning policy.

9.3.1 Outline of CGM Zoning Policy

This zoning policy (as of July 2016) consists of the following chapters:

- Chapter 1: Introduction (Principles, Vision, and Mission)
- Chapter 2: Situational Analysis (Background of the Planning Area, Socioeconomic Profile, Land Use, Emerging Concerns)
- Chapter 3: Policy and Legal Framework (Legal Framework)
- Chapter 4: General Land Use Policies (General Guidelines)
- Chapter 5: Zoning (Zoning by Areas)
- Chapter 6: Development Control
- Chapter 7: Enforcement (Implementation and Monitoring)
- Chapter 8: District Specific Policies

The main purpose of this plan by CGM is to manage/control development pressure in planned manner, especially spreading industrial land use in Mombasa Island. Before the draft zoning maps, there was no drawn land use zoning map and zoning policy to control the development in Mombasa County.

The land use zoning maps aim to manage existing development activities, not reflecting the future image of Mombasa County that is going to be discussed in this MGCMP study.

9.3.2 Objectives of CGM Zoning Policy

The following objectives in the policy describe important consideration for land use zoning policy in Mombasa County.

- Enhance and promote **integrated socio-economic development** in the city county;
- Provide and develop sustainable human environmental and resource system;
- Allocate **sufficient space** for all land-uses to ensure efficient operation and comfort of users and accommodate future growth;
- Ensure **compactness of urban form** and design of transport and communication network to enhance interaction whilst minimising loss of open land, agricultural land, forest, wildlife (land and riverside), water catchment areas, etc.;
- **Avoid juxtaposition of incongruous** uses and bringing together especially **harmonious uses**, or those whose combination will enhance special benefits;
- Preserve and protect the existing cultural heritage and fragile ecosystem;
- Create a **specific town character** by different uses of topography and other natural features and by specific groupings of uses and densities;
- Provide a policy framework for **socio-economic investments**, economic use of space, infrastructure services and community facilities; and
- Provide a framework of **plan implementation, organisation and administration structure** requirement, and resources needed to implement the plan.
- (Bold font words are enhanced by the JICA Expert Team)

9.3.3 Issues on CGM Land Use Zoning

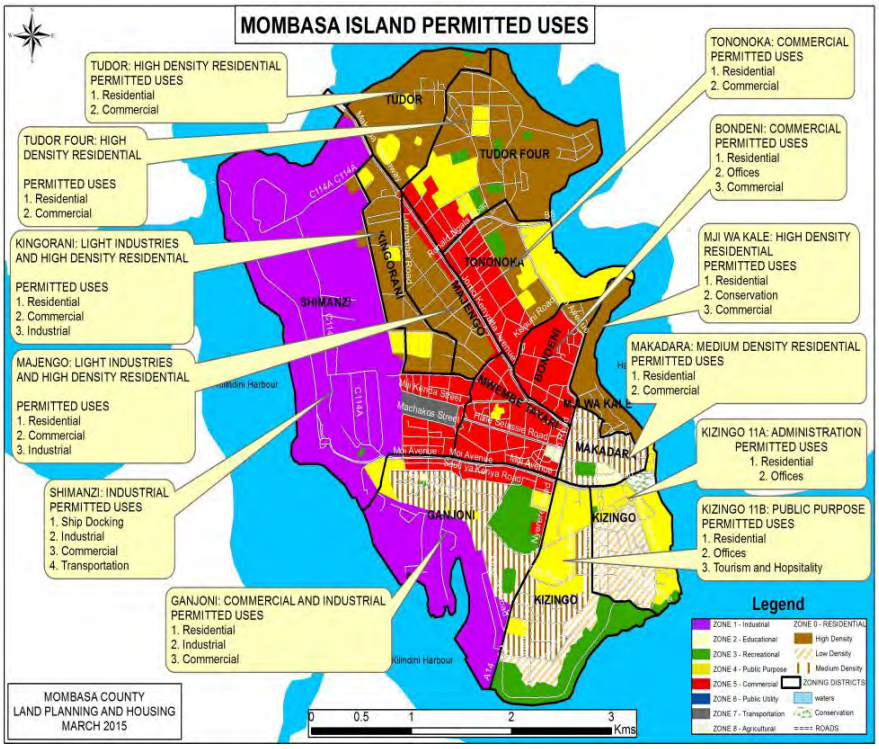
Although, the general zoning policy for all zonal districts stated is the same idea as the Physical Planning Guideline to preserve natural topography, there are some issues to be reconsidered to fit the situation in Mombasa County. Issues to be considered on draft CGM land use zoning are summarised in Table 9.3.1 below.

Table 9.3.1: Issues on CGM Land Use Zoning

Issue	Description	Direction
Need clear concept/philosophy of zoning policy	・ Development factor and preservation factor are not clearly mentioned which are based in determining the zoning policy. ・ Concept/philosophy on which zoning policy is based is not clearly stated.	・ Need to state a clear concept/philosophy of zoning policy to show the direction that stakeholders can share.
Need of future land use image for existing build-up area	・ The zoning plans are just following the existing land use situation. ・ Long-term aspect for land use zoning is lacking the future land use image.	・ Re-structuring of land use shall be considered to improve efficiency of land utilisation. ・ Future development image of Mombasa County shall be clarified.
Need of volume control idea	・ Ground Coverage (GC) and Floor Area Ratio (FAR) shall be important development control indicators. ・ However, the CGM land use zoning does not describe GC and FAR in each zone. Only the maximum number of stories is determined in some zones.	・ Volume control shall be studied based on the concept/philosophy.
Need of localised standards	・ Chapter 4 of this plan describes planning standards. However, those standards are adopted from the Physical Planning Guidebook and not fit to the situation in Mombasa County.	・ Modified and localised planning standards shall be considered to fit the situation in Mombasa County.

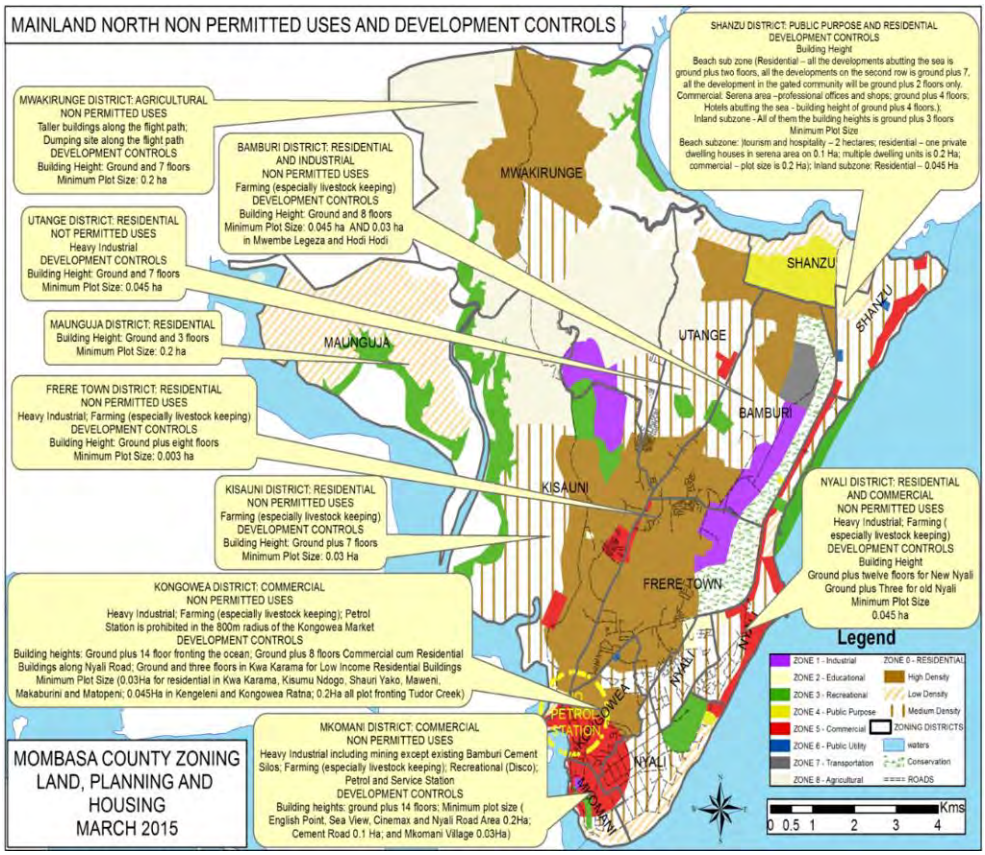
Source: JICA Expert Team

Figure 9.3.1, Figure 9.3.2, Figure 9.3.3, and Figure 9.3.4 are consolidated draft land use zoning maps in CGM Zoning Plan prepared by CGM.



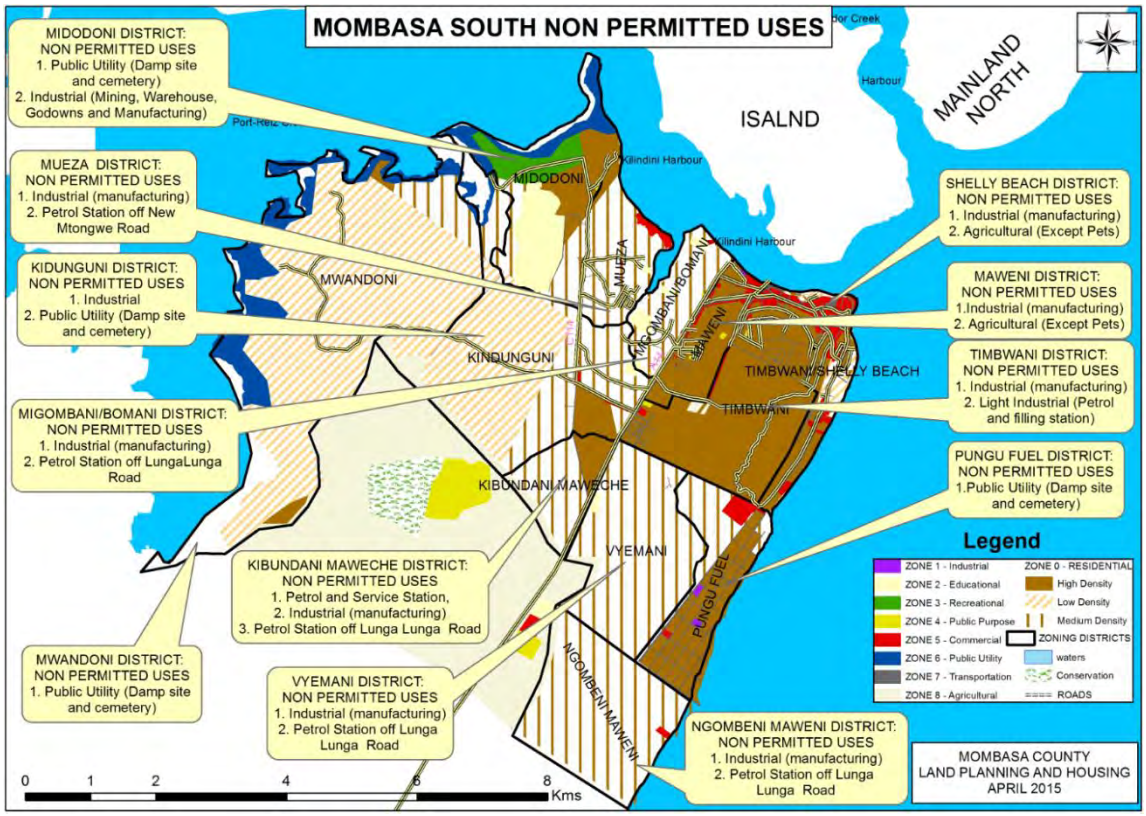
Source: CGM

Figure 9.3.1: Draft Land Use Zoning Map for Mombasa Island



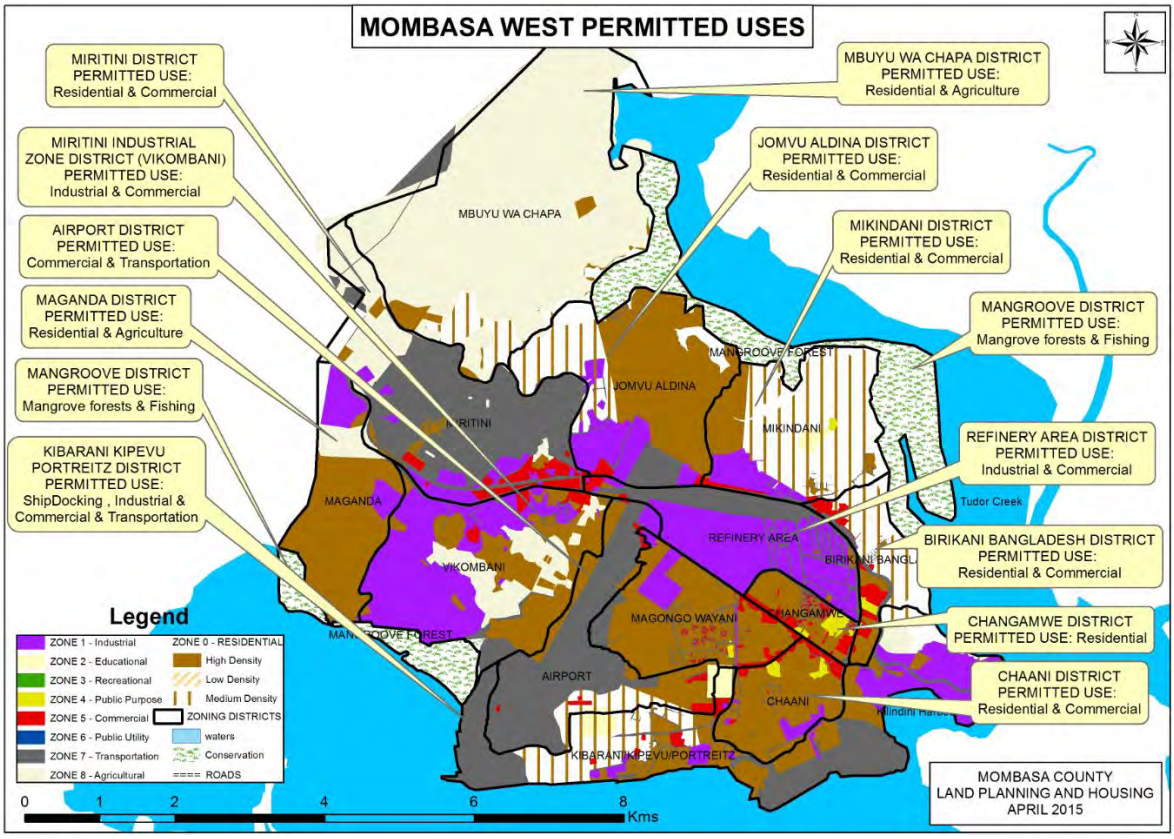
Source: CGM

Figure 9.3.2: Draft Land Use Zoning Map for Mainland North



Source: CGM

Figure 9.3.3: Draft Land Use Zoning Map for Mainland South



Source: CGM

Figure 9.3.4: Draft Land Use Zoning Map for Mainland West

9.4 Proposed Land Use Policy

9.4.1 Objectives of Land Use Policy

Land use plan is used as guidance to promote sound urban development by mitigating the disturbing factor, promoting development, and concentrating infrastructure and urban/public facility. For the existing urban area, land use is used to guide efficient land utilisation by proposing change and relocation of existing function. For expansion area and undeveloped area, land use is used to control and guide development through identification of function and density.

9.4.2 Land Use Concept

For future urbanisation in Mombasa County up to 2040, some land use change or land use relocation is necessary to rationalise and vitalise its urban function.

Traffic constraints caused by land use mixture in the Mombasa Island and Mainland West are identified as major challenges in Mombasa County. This situation causes depreciation in the value of realty and tourism business. Also traffic congestion in those areas causes huge loss of business opportunities.

Basic concepts of long-term land use plan in Mombasa County are described as below.

(1) Clarifying Urban Function and Its Allocation

- Logistics and industrial functions are integrated along the industrial loop (Mainland West, Mainland South)
- Coastal area is utilised as residential and tourism purposes.
- Subcentres are developed in the mainland and re-organise urban function.
- Mixed use function in Mombasa Island is maintained and re-activated.
- Transport network is improved so that it connects each area efficiently.

(2) Expanding Urban Function with Subcentre Development and Strengthening Supporting Urban Areas

- Planned subcentres are necessary to accommodate the increasing population in the future as well as industrial and commercial development to support the gate city for the Northern Economic Corridor.
- Supporting urban areas are identified in the existing urban area where urban function has to be strengthened.
- Certain public functions such as schools, health facilities, and parks shall be planned and developed.
- Geographic conditions are considered as one of the criteria for urbanisation including density. Steep area should be avoided for urbanisation.

(3) Protect Natural Environment and Promote Environmentally Friendly Urban Area

- The coast of Mombasa is the most valuable resource for tourism. Protection of white sand coast is essential. In addition, coastal area is utilised for residential and tourism purposes.
- Mangroves and its upper stream shall be conserved to protect aquatic life.
- Historical and cultural values have to be preserved and utilised.

- Provide infrastructure and utility that contribute to improve the environment and minimise the impact of industry development through integrated logistics and industry function.

(4) Revive Land Use of Mvita (Island) to Commercial and Tourism

Multi-functions and inefficient land use of Mombasa Island is one of the causes of congestion. In order to strengthen the functions of the island, some of the existing functions have to be relocated to the mainland whilst maintaining and utilising mixed use characteristics. Policy of relocation is proposed below.

- **Industrial Area in Mombasa Island**: One of the land use issues of concern in Mombasa Island is the encroachment of industrial land use on commercial and residential land use area. Mainly, these are the second car sellers' office and its storage and parking space. This reduces the attractiveness of Mombasa Island. Industrial functions in Mombasa Island have to be minimised to improve attractiveness of the island.
- **Port Function in Mbaraki Area**: Port functions at the Mbaraki area are grain bulk, imported car stockyard, and warehouses. These are nonessential land uses in Mombasa Island. Consequently, these functions shall be relocated to Dongo Kundu Special Economic Zone (SEZ) and planned new bulk port.
- **Freight Companies, Container Freight Services (CFSs), and Empty Container Depots (ECDs)**: Many freight related companies are located in Mainland West and Mombasa Island. Especially along Mombasa Road (A109), there are many CFSs and ECDs. The traffic originated from such CFSs and ECDs stagnate traffic flow in Mombasa County. Rearrangement of location of these functions is necessary to ease traffic problem in the county.
- **Kibarani Landfill Site**: Next to the Makupa Causeway, garbage and clinker dumping to the narrow creek between Mombasa Island and Mainland West are observed. Also, the National Environment Management Authority (NEMA) ordered to stop garbage dumping. These problems at the narrow creek area shall be resolved and redeveloped to rationalise and beautify the existing land use and landscape in this area.
- **Oil Refineries and Oil Distribution Stations**: There are several oil refineries and oil distribution stations located in Mombasa Island and Mainland West. Especially, oil tankers to/from oil distribution in Mombasa Island are one of reasons for traffic jam at Makupa Roundabout and Shimanzi Road. The Caltex's oil refinery facilities have stopped operation because the refinery cost is higher than import price of petroleum products. Rearrangement of these oil facilities is important to increase competitiveness of Kenya's petroleum business.
- Petro City development at Likoni shall include new oil refinery and storage facilities at the site together with off shore oil jetty to connect mega tanker anchored off the reef.
- **Utilising Existing Assets in Mombasa Island**: Historical and cultural assets scattered in Mombasa Island, particularly in Old Town, Fort Jesus, and Mama Ngina Drive, should be preserved and improved for tourism promotion.

(5) Rationalise Logistics/Port Related Functions in Changamwe and Miritini

- Port related function shall be reorganised to maximise its capacity to handle 3 million TEU containers and cargo at world class freight service.
- CFS, warehouses, oil facilities, and car stockyards shall be relocated in a coordinated manner amongst industrial corridor (proposed in the transport sector).

9.4.3 Proposed Land Use Plan

(1) Designed Items

For the land use policy to be effective and efficient, what should be promoted and what should be controlled have to be identified for land use and density.

1) Land Use

Land use is designated to remove disturbing factors and promote development factors. One of the main disturbing factors is the logistics and transport related activities including CFS, ECD, and warehouses; these should not be located in the commercial and residential area, but should be concentrated in the transport, industry/logistics area.

Development factor includes commercial activity and tourism activity which expect to contribute to the economic development of Mombasa County. Historic/cultural heritage and beach resources are promoted as tourism area by preserving and utilising the heritage and asset.

2) Density

High-density area has to be promoted to accommodate population increase. Mid- to high-density area are designated as main density. The area where high density shall be promoted and the area where low density shall be maintained. Coastal areas in Mainland North, Mwakirunge, amongst others are designated as low-density area. Subcentres, supporting urban areas, and their surrounding areas are designated as mid- to high-density area.

Range of population density is proposed to determine the population by land use category, which is prepared based on the population density standard utilised in Kenya.

Table 9.4.1: Proposed Area Classification of Population Density

Classification	Proposed Range
(0) Special Density I	~3, 000
(1) Low Density	3, 000 - 8, 000
(2) Medium- High Density	8, 000 - 28, 000
(3) Special Density II	>30, 000

Source: JICA Expert Team

Population by area is projected as follows:

Table 9.4.2: Population Allocation by Area

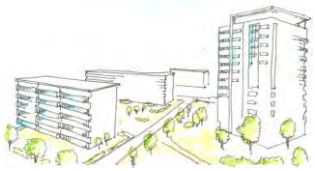
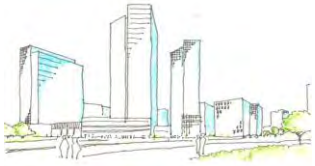
Area	2015	2040	Rate
Mombasa Island	157,441	222,950	1.42
Mainland North	486,334	10,005,294	2.07
Mainland West	304,606	565,471	1.86
Mainland South	207,511	619,377	2.98
Mombasa Total	1,155,892	2,413,092	2.09

Source: Result of discussion with Mombasa County

(2) Land Use Classification and Its Description

Land use classification is proposed based on the structure plan, land use concept and control, and development measures. Land use classification is compiled in Table 9.4.3 below.

Table 9.4.3: Proposed Land Use Classification

	Land Use Classification	Description	Range of FAR
1	Residential (Low density) 	・ Provide comfortable residential environment by prohibiting disturbing activity (CFS, industry/warehouse, and transport) ・ Exclusive residential area with some urban support facility (small-scale commercial activity)	50-200%
2	Residential (Low to mid density) 	・ Provide comfortable residential environment by prohibiting disturbing activity (CFS, industry/warehouse, and transport) (Low to mid density) ・ Urban support facility (small-scale commercial activity)	100-300%
3	Residential (Mid density) 	・ Provide comfortable residential environment by prohibiting disturbing activity (CFS, industry/warehouse, and transport) (Mid density) ・ Urban support facility (small-scale commercial activity)	50-200%
4	Residential with mix (mid to high density) 	・ Provide comfortable residential environment by prohibiting disturbing activity (CFS, industry/warehouse, transport) (High density) ・ Urban support facility (small-scale commercial activity)	200-500%
5	Residential (High density) 	・ Provide comfortable residential environment by prohibiting disturbing activity (CFS, industry/warehouse, transport) ・ Apply in Mombasa Island	50-200%
6	Commercial (Tourism oriented) (Low density) 	・ Beach resort oriented area where hotels and tourism activity is expected ・ Cultural and historical area ・ Some cityscape rules are applied (façade, demolition/restoration of building)	50-200%
7	Commercial (Business oriented) (High density) 	・ Provide commercial-oriented area ・ Considered as mixed land use where residential activity is allowed (upto high density)	50-200%
8	Industry/Logistics	・ Provide space for industry and logistics and promote industry and logistics facilities to be relocated to this area. ・ CFS/ECD and other logistics related activities are allowed on only in this area and transport area. ・ Provide some conditions to mitigate social and environmental impact	-

	Land Use Classification	Description	Range of FAR
9	Transport	・ Provide infrastructure for transport and logistics activity. ・ CFS/ECD and other logistics related activities are allowed on only in this area and transport area. ・ Port, airport, terminal	-
10	Agriculture	・ Utilised as agriculture and related activities. Large scale development is not allowed.	-
11	Controlled area	・ Development allowed depending on the land development permit with some conditions (infrastructure, facility, environmental consideration).	-
12	Natural condition protection area	・ Mangrove, ocean/creek, and forest are designated as protection area where any type of development is prohibited.	
13	Special area	・ Military base and other areas security area	
14	Urban development projects	・ Urban development projects which are planned or on-going. ・ Special condition applies for controlling the development	

Source: JICA Expert Team

(3) Proposed Land Use Plan

Based on the structure plan, control measure, and land use classification, land use plan is proposed. The following approaches are applied for the land use allocation.

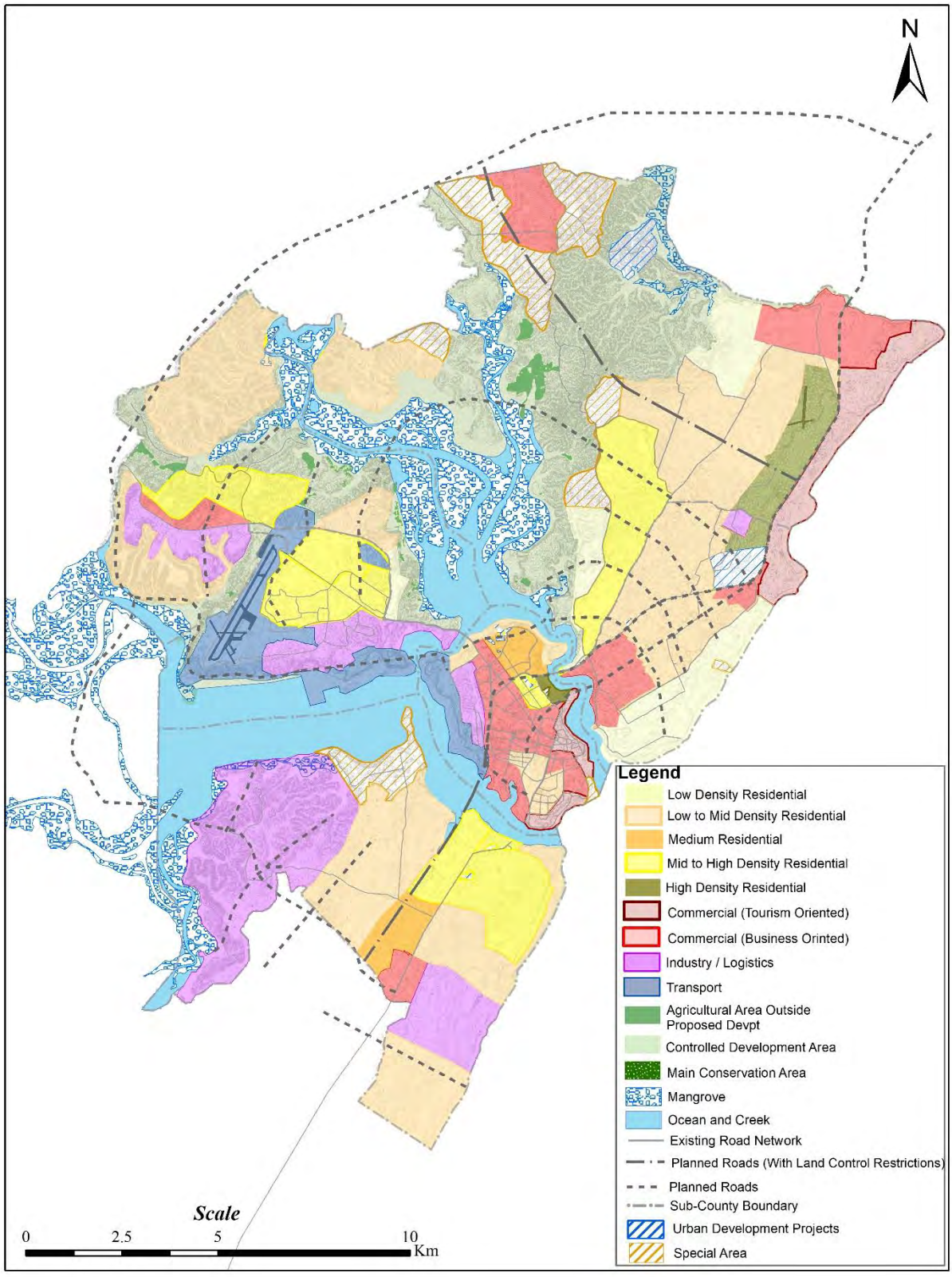
- Population allocation estimated in Table 9.4.2 is utilised for determining the density of each area.
- Coastal area is kept as low density area to maintain residential environment and promote tourism.
- Commercial areas are allocated to the subcentre proposed in the structure plan.
- Residential mixed area is allocated to most of the urban areas or areas to be urbanised.
- Industrial and logistics functions are integrated around the port area and SEZ area (Dongo Kundu).

Allocation of land use and proposed land use plan is shown in Table 9.4.4 and Figure 9.4.1 below.

Table 9.4.4: Location and Area of Land Use

	Land Use Classification	Location and Description	Area	
			(km^2)	(%)
1	Residential (Low density)	・ Bamburi, Junda	11.6	4.0
2	Residential (Exclusive nature with low to mid density)	・ Mwembelengeza, Maweni ・ Kongowea	61.3	21.3
3	Residential (Mid density)	・ Tudor 4	3.7	1.3
4	Residential with mixed use (Mid to high density)	・ Magogoni, Jomvu, Changamwe, and Timbwani	25.2	8.8
5	Residential (High density)	・ Mji wa Kale	0.3	0.1
6	Commercial tourism oriented (Low density)	・ Along the beach ・ Some parts of Mombasa Island	7.7	2.7
7	Commercial (Business oriented) (High density)	・ Bamburi, parts of Nyali, Miritini, parts of Mombasa Island	18.3	6.4
8	Industry/logistics	・ Dongo Kundu, parts of Mombasa Island	28.4	9.9
9	Transport	・ Parts of Mombasa Island, Changamwe	10.3	3.6
10	Agriculture	・ Scattered in Mombasa County	1.6	0.6
11	Controlled area	・ Inland hilly area	46.7	16.2
12	Natural condition protection area	・ Mangrove, ocean/creek, and forest	4.8	1.7
13	Special area	・ Security, public use	12.0	4.1
14	Urban development projects	・ Urban development project sites	2.6	0.9
15	Water mass		53.54	53.5
	Total		288.04	288.0

Source: JICA Expert Team



Source: JICA Expert Team

Figure 9.4.1: Proposed Land Use Plan

9.4.4 Regional Development Strategy

Development strategy for four regions is proposed as follows:

Mombasa Island: Moderate increase of population (1.42 times)

- Main land uses; high density commercial (business and tourism oriented), mid- to high- density residential, industry/logistics and transport.
- Proposed housing project sites; Mzizima, Tudor, Tom Mboya, Nyerere, and Kaa Chonjo
- Development strategy: Change in housing density from single dwelling to multi-dwelling housing especially ground plus four and mixed-use character buildings (e.g., Ganjoni, Tudor, Majengo, Kizingo, Old Town, Mwembe Tayari, etc.), restructuring of land use and promotion of transit oriented development (TOD) along the railway.

Mainland North: Double the current population (2.07 times)

- Main land uses: exclusive residential, controlled development, mixed use, natural condition protection
- Proposed housing project site: Khadija
- Trend: Change in housing density from single dwelling to multi-dwelling housing especially ground plus four and mixed-use character building. It is also observed the opening of suburban areas such as Mwakirunge.
- Development strategy: settlement schemes improvement (e.g., securing tenure; individual titling) and regularisation of 'tenants at will' in some areas. Improvement in connectivity and infrastructural facilities by both county and national government. Controlled development in hilly area and suburban area (Mwakirunge, Bamburi). Promotion of TOD along the railway.

Mainland West: Increase the population to about double the current population (1.86 times)

- Main land uses: industry/logistics zone, transport zone, controlled development zone, and mid- to high-density residential.
- Proposed housing project sites: Changamwe, Greenfield Miritini Housing Scheme
- Development strategy: reorganisation of land uses; industrial zone separated from residential and promotion of mixed use. Standard Gauge Railway starts in this zone and facilities such as stations, marshalling yards, etc., and coupled with port expansion, Jomvu New City likely to increase the population in the area. Promotion of TOD along the railway.

Mainland South: Increase the population to about triple the current population (2.98 times)

- Main land uses: industry/logistics, mid-high density residential.
- Proposed housing project sites: Likoni
- Development strategy: Development of Dongo Kundu Special Economic Zone, Petro City at Pungu, Construction of Southern Bypass. Securing tenure (individual titles) through settlement schemes; Bububu, Shika Adabu, Vyemani, Ujamaa Shonda, Waitiki, (Improvement of connectivity; Mombasa Lunga Lunga Road, Mtongwe to Likoni, Likoni area to Shelly Beach Road). Change in housing density from single dwelling to multi-dwelling housing especially ground plus four and mixed-use character buildings. Infrastructure and social facility development in the area where population growth is high.

10. Transport Systems Development Strategy

10.1 Introduction

This chapter will describe the long-term strategies and plans for improving the transport capacity, systems, and services in Mombasa County and its surrounding areas, based on the analysis of problems presented in the previous chapters.

Section 10.2 uses a Strengths, Weaknesses, Opportunity and Threats (SWOT) analysis to prepare the general concept for improvements, examining freight movement, region-wide road network improvements, and district-level traffic management. The overall strategy is to "minimise traffic focal points, and create alternative paths". Following this, Section 10.3 lists several project ideas alongside short descriptions, and summarises various project ideas in chronological order as development scenario. Section 10.4 evaluates the impacts of the development scenario using traffic analysis software (JICA STRADA). Section 10.5 gives thematic analysis for special interests in Mombasa County and topics in the master plan, i.e., bridge locations, freight movement, feasibility of transit system, etc. Finally, in Section 10.5, institutional arrangements are discussed which will help materialise the master plan programme, mainly focusing on communication between the county and national governments.

The strategy section shows the general concept for development based on the SWOT analysis results, i.e., freight movement, region-wide network improvement, and district-level traffic management. The countermeasures with multi-layered idea seem complicated; however, it is designed as an integrated intervention for the overall direction to "minimise the focal points, create alternative". Based on the strategy, several project ideas are listed with short narrative introduction

10.2 SWOT Analysis, Strategies for Development

10.2.1 SWOT Analysis

Based on the analysis of issues in Chapter 4, the SWOT analysis is presented in Table 10.2.1 below.

Table 10.2.1: SWOT Analysis on Mombasa Transport

Strength	**Weakness**
・ High accessibility to international markets ・ Strengths in freight/logistics industry ・ High road ratio in Mombasa Island ・ High dependency on matatu system for passenger transport ・ Low dependency on cars/private transport, low motorisation rate ・ High dependency on walking ・ Airport and seaport connections	・ National/county government relations/chain of command ・ Terrain difficulty (creeks, channels, cliffs, hills) ・ Concentration of development is in the island ・ Low road ratio in the mainland areas ・ High traffic concentration at few focal points ・ Limited capacity of port Berths 1-13 ・ Low stability of electric supply ・ High tariffs for low-quality matatu services
Opportunity	**Threat**
・ Pipeline projects for transport (Standard Gauge Railway (SGR), Kipevu Link, Mombasa Southern Bypass Road (MSBR), Northern Bypass, port expansion) ・ New land use and urban structure plan (proposed in this master plan) ・ Special Economic Zone (SEZ), Dongo Kundu Port, and Gate Bridge ・ SCT progress, SIMBA system upgrade	・ Population growth, motorisation ・ Increasing demand from upcountry areas ・ Single Customs Territory (SCT) might bring more traffic to Mombasa as systems are streamlined elsewhere ・ Increase of exports/traffic at port ・ Motorisation increase in Kwale after MSBR

Source: JICA Expert Team

a) **Examining Strengths and Opportunities**: major **pipeline projects** will form a new structure for the Mombasa transport network. The **MSBR** and **Northern Bypass** will divert regional traffic away from the city; **port expansion** will provide greater container handling capacity, and **SGR** will provide a new arterial path for container traffic headed to upcounty areas. The customs/freight **SIMBA system upgrades** will help reduce port delays and can reduce the reliance on/necessity of container freight stations (CFSs). This **master plan's proposal for a "multi-core" development structure** will reduce the traffic concentration on the Mombasa Island, and the transport master plan will be organised around this urban development plan. With the **high reliance on matatus** and their relatively high fares, there is a strong opportunity to install a competitive mass rapid transit (MRT) system or systems.
b) **Examining Weaknesses and Threats**: Single Customs Territory (SCT) policy calls for all customs clearance to occur in Mombasa – making the port busier. (However, at the same time, it is an opportunity for Mombasa County to mainly improve its logistics industry and create employment opportunities). After the opening of the Mombasa Gate Bridge, **motorisation in Kwale** will increase, in a way that is difficult to predict. Countermeasures for through traffic between Kwale-SEZ-Likoni and Nyali-Kilifi must be considered carefully. Additionally, most investments into the port focus on container logistics, not the bulk cargo (which is handled in Mombasa Island). This accounts for 70% of the whole dry weight at the port, and cannot be ignored. This can be addressed by extending SGR to Mombasa Island, shifting bulk cargo to Dongo Kundu, and directly connecting the Mombasa Gate Bridge with Gate 10 of the port to absorb bulk cargo traffic into the MSBR. Considering passenger transport, it is important to **upgrade the electric supply system** in Mombasa Island to handle the power requirements of MRT. Additionally, looking at the road network, the **low road ratio** in the mainland areas will require a proper funding mechanism and political commitment, as well as continuous monitoring/assessment, to improve.

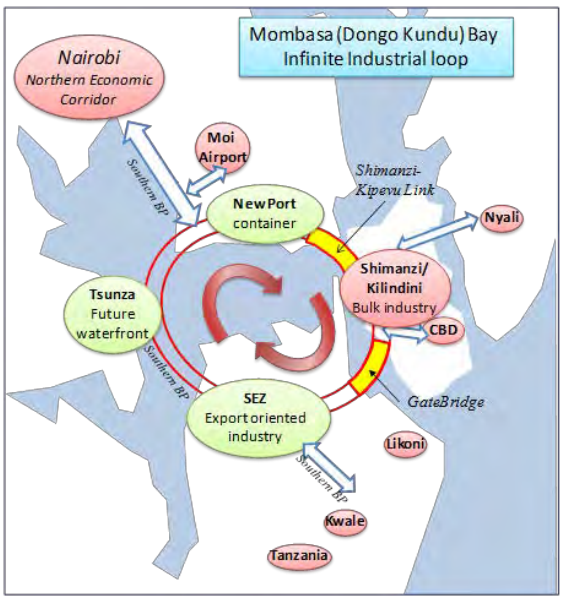
10.2.2 Strategies

Based on the SWOT analysis, the following strategies are considered:

- Strategy 1: Create an "Infinite Industrial Loop"
- Strategy 2: Create a "Hyper Corridor"
- Strategy 3: Traffic calming, car free areas

(1) Strategy 1: Create an "Infinite Industrial Loop"

The concept of Infinite Industrial Loop can be depicted as follows. Old, new, and future port facilities will be reorganised in a way to promote new industrial growth around Mombasa Bay. Similar to San Francisco and Tokyo, new innovations and industries can be incubated to emerge from the new logistics flow patterns.



Source: JICA Expert Team

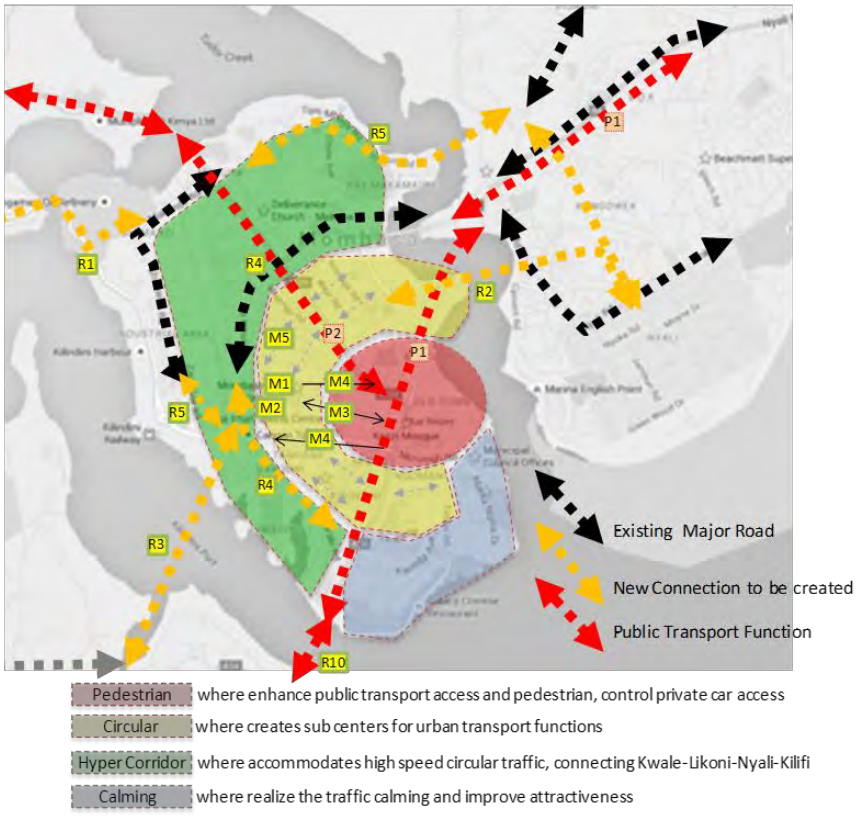
Figure 10.2.1: Concept of Infinite Industrial Loop

The loop will connect Kilindini Port, the bulk cargo terminal in Shimanzi, Moi International Airport, the Kipevu Container Terminal and new berths, and future development sites in Tsunza and Dongo Kundu with a well-developed and high-quality highway network. With the smooth connections enabled, bulk cargo in Kilindini Port can be transferred to the Dongo Kundu SEZ, and similarly, containerised cargo from the SEZ can be transported to the new container terminal. SEZ workers will be able to commute to the island via an associated MRT network, connecting major modes in Mombasa (e.g., Moi Avenue, Nyali Bridge, Mombasa Gate Bridge).

(2) Strategy 2: Create a "Hyper Corridor"

In the past, Mombasa Island was the centre of all development. But the new master plan will encourage a multi-core urban development structure, decreasing the intensity of development in Mombasa Island but generating traffic flows between the new cores in the Mainland North, Mainland West, and Mainland South. Mombasa Island will thus provide through-corridor transport functions. At present, only Digo Road exists for such trips.

The "Hyper Corridor" will be developed along the SEZ – Saba Saba – Railway Station – Nyali Bridge – Voice of Kenya (VOK) route. Ideally, these road sections would all be elevated roads. However, it is not easy to develop such large infrastructure all at once. Therefore, the Hyper Corridor will be a combination of various infrastructure projects, i.e.,: Mombasa Gate Bridge, the railway station crossing flyover, intersection improvements at Saba Saba and at Buxton and Kongowea (Nyali Bridge), an elevated MRT route connecting VOK and the ferry, and bus rapid transit (BRT) along the existing meter gauge railway (MGR) alignment.



Note: Same figure is mentioned as Figure 10.3.2 below.
Source: JICA Expert Team

Figure 10.2.2: Concept of Hyper Corridor

(3) Strategy 3: Traffic Calming, Car-free Zones

Traffic calming measures and the implementation of car-free zones should be aggressively applied in Mombasa County. After the Hyper Corridor and Infinite Industrial Loop are established, some districts will have their traffic reduced to the point where they can become car-free with little impact on traffic flows.

For example, Haile Selassie Road can be redeveloped as a 1 km long car-free stretch right in the centre of the city. The Kongowea Market area can become a car-free transit oriented development (TOD) area, after MRT is installed. Traffic in Kizingo can be calmed such as to help promote tourism development.

Such initiatives are not unprecedented in Mombasa County; the County Government of Mombasa (CGM) created a "pocket park" in 2016 on Narok Road to develop a futsal (soccer) court with off-street parking instead of widening the existing two-lane road.

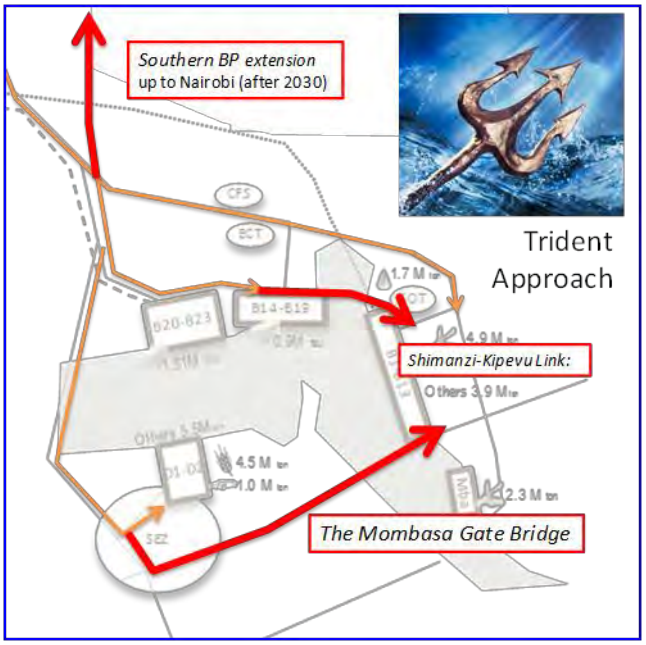
10.2.3 Approaches

To realise these three strategies, there are three approaches to be taken as follows:

- Approach 1: "Trident" Approach
- Approach 2: Create Alternatives for Existing Logistics Functions
- Approach 3: Quantitative Road Development Approach for Mainland Areas

(1) Approach 1: "Trident" Approach

The "Trident Approach" is part of the Infinite Industrial Loop strategy, to divert bulk traffic from the Makupa Causeway. This is crucial because bulk traffic increase in Mombasa County, which will follow population growth, is a major future traffic/congestion threat. The first of the three arms is the Shimanzi-Kipevu connection, which can be achieved by using information, communication, and technology (ICT) to extend the customs-bonded area for the port. The second is the Mombasa Gate Bridge, connecting Kilindini to the MSBR. The third is the existing Makupa Causeway. Connecting all three at present is A109, but as it is already over its capacity, it should be instead replaced by extending the MSBR to Nairobi. 95% of import traffic goes to upcountry areas, mostly through Nairobi. (This MSBR extension idea is also proposed in the JICA NEC MP.)



Source: JICA Expert Team

Figure 10.2.3: Concept of Trident Approach

(2) Approach 2: Create Alternatives for Existing Logistics/Transport Functions

The second approach is to create alternatives for existing functions, in both freight and passenger transport. CFSs can be converted into multi-function container yards, handling export processing and empty container storage. As the multi-core urban structure is developed, an elevated MRT will connect the subcores, and the matatu network will be reorganised into feeder routes to enhance local accessibility. New road connections to Mombasa Island, namely, between Changamwe and Mombasa Island, will provide freight movement alternatives – in addition to A109, the Shimanzi-Kipevu Link (as proposed in the Trident Approach) and SGR extension to Berths 1-10 will achieve this. Existing MGR can be converted into BRT alignments following the SGR extension.

(3) Approach 3: Quantitative Road Development Approach (Mainland Areas)

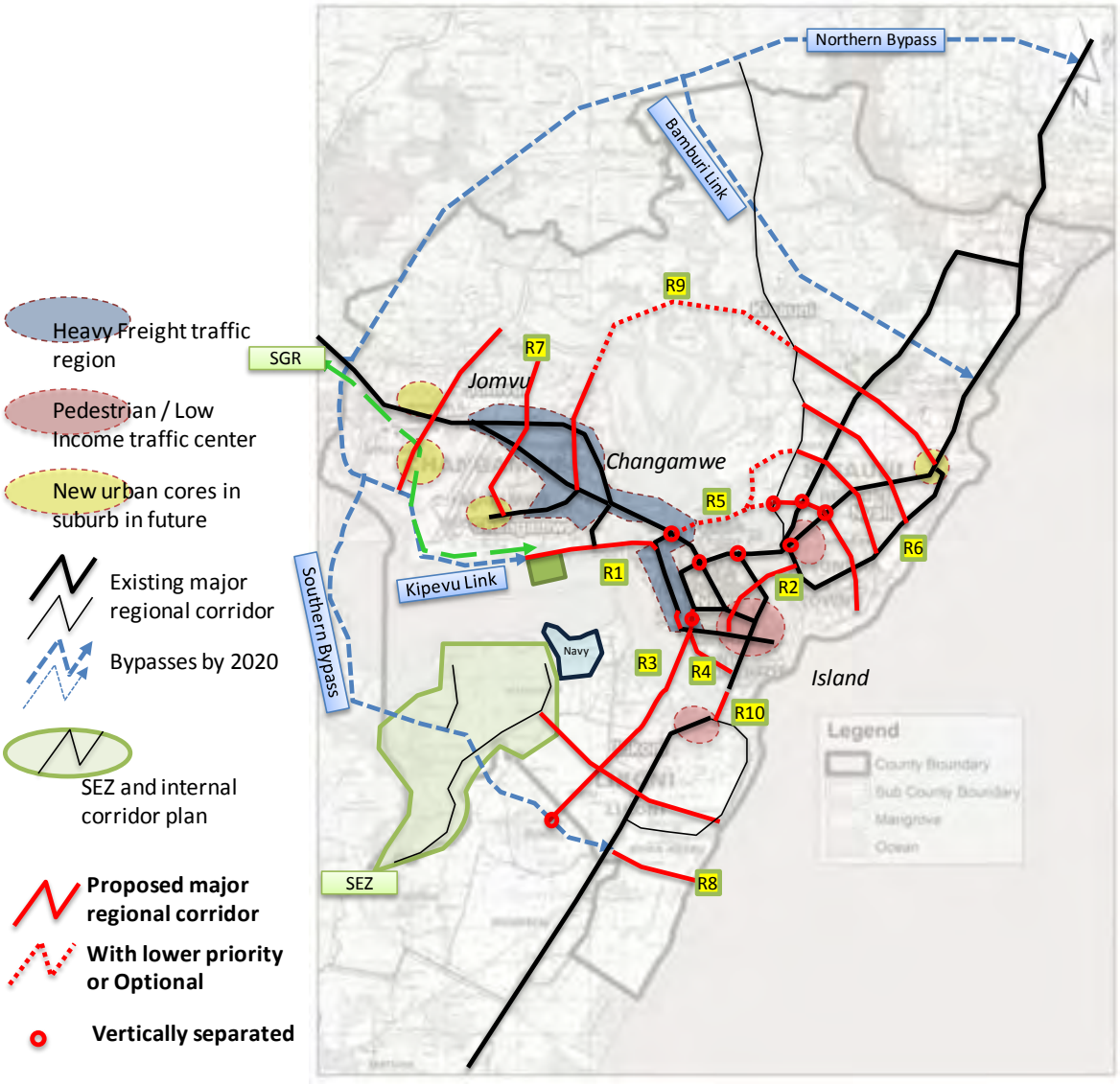
At present, road development in mainland areas does not follow a set programme or quantitatively-evaluated approach. The last approach is thus to design and develop a street grid with radial and circular connections, as found in other major cities with populations similar to that of Mombasa's population in the future (2-3 million). Most of the proposed work entails widening existing 2-lane roads into 4-lane roads along the grid every 1 km, with 2-lane roads retained every 500 m in between.

10.3 Plans and Projects

Based on the strategy and approaches above, the following structure plan and projects are proposed. Plans for (i) region-wide road network structure, (ii) road network structure in the island and mainland areas, (iii) exclusive passenger service alignments, and iv) traffic managements for passenger and freight

movements are explained. Institutional and regulatory revisions, including passenger transport service improvements, are also explained.

10.3.1 Structure Plan for Region-wide Road Network



Source: JICA Expert Team

Figure 10.3.1: Region-wide Road Network Structure Plan

Figure 10.3.1 above shows the road network plan that considers the relationships between existing regional corridors and their associated constraints (e.g., heavy freight, pedestrian traffic centres, future suburban hubs, major development sites, and the existing transport network). Key proposals are explained below.

- As mentioned in the Infinite Industrial Loop concept, the Shimanzi-Kipevu Link (R1 in Figure 10.3.1) is proposed to divert heavy vehicle traffic from Shimanzi and the Makupa Causeway.
- The Second Nyali Bridge (R2) can be proposed here to form a large ring road covering Kongowea and Mombasa Island's peripheral areas, avoiding major pedestrian traffic hubs.
- The Mombasa Gate Bridge (R3) can be located as shown above to connect to the SEZ and Nyali Bridge directly avoiding Mama Ngina Drive and Likoni, and absorbing Shimanzi traffic.

- The links for Lumumba-Nyerere (R4) and Shimanzi-Kisauni (R5) will also form the Hyper Corridor in Mombasa Island, by integrating existing network links.
- The proposed circular roads (6, 7, 8) are regional corridors for Mainland North, Mainland West, and Mainland South areas. The alignments of circular corridors are tentative proposals; however, the Road Development Programme shall be prepared alongside a target road ratio for each mainland area.
- The Third Nyali Bridge (R5) or (R9) could be proposed depending on future necessity. (See Section 10.5 for further discussion.)

Note that the MSBR and Kipevu Link, Northern Bypass and Bamburi Link, internal main roads of the SEZ, SGR, and widening of A109/A14/B8 are considered as pipeline projects.

Table 10.3.1: Major Physical Improvements for Region-wide Road Network Plan

No. on Map	Project	Responsible Agencies	Effects / JICA Expert Team Comments
R1	Shimanzi – Kipevu Link (6 km for all new construction, but 200 m for simple connection)	Kenya Ports Authority (KPA), County Government of Mombasa	・ Will divert the through traffic between Nairobi – Shimanzi/Kilindini industrial area in the island to the MSBR/Kipevu Link, which will alleviate the severe traffic congestion at the Changamwe and Jomvu junctions, the initial section of the Northern Economic Corridor ・ The through traffic is estimated as 2,000 heavy vehicles per day. The through traffic passes on the Makupa Causeway (52,834 PCU per day). ・ The Port Exclusive Road (10,126 per day) can be used for this road function. ・ 6 km of road shall be constructed to pass behind the port area, connecting from Shimanzi and the Kipevu Link entry; however, as a simple connection, a 200 m level stretch of road can be developed from the Shimanzi Oil Terminal internal road to the Port Exclusive Road, and IT can be used to give temporary accessibility to the customs-bonded area (a concern of KPA). ・ This would be synchronised with the opening of Kipevu Link in 2017 (short term).
R2	Second Nyali Bridge (400 m for bridge, plus connecting road development on both sides)	Kenya Urban Roads Authority (KURA), County Government of Mombasa	・ KURA's proposal is for connecting the congested Links Road to the CBD on the island, avoiding the Kongowea focal point. ・ It was originally proposed by a French group, and KURA and the Ministry of Finance prepared the feasibility study with engineering aspects in 2015, suggesting a PPP implementation scheme with tolling of users, announcing it as a DBFO project in early 2016. The study considers the necessary relocations in Nyali. ・ The JICA Expert Team evaluates this physical plan as preferable, but will create negative impacts on the CBD from through traffic. ・ The JICA Expert Team suggests connecting with Kisauni Road, and widening of Kisauni/Faza/Bajuni Corridor as mitigation of negative impacts. ・ The JICA Expert Team also doubts the viability of the toll policy/PPP approach, as the existing toll-free Nyali Bridge will only be 500 m away. ・ This connection should be developed with proper pedestrian corridor functionality, and perhaps with elevated MRT function. ・ This would be programmed as a medium-term project.
R3	Mombasa Gate Bridge (Likoni Bridge), 500-600 m for the channel, with 1 km approach roads on both sides	Kenya National Highways Authority (KeNHA), KPA, County Government of Mombasa, KRC	・ Initially, this link was proposed as a replacement of the saturated ferry function at Likoni Channel. ・ A French group proposed an elevation bridge, but it has risk of technical fault, blocking channel traffic. A Chinese group proposed a long elevated coastal road connection. A Japanese group (JICA) conducted a thorough engineering study in 1984, with bridge and tunnel options. The other Japanese group (METI) proposed an arch bridge structure with a thorough engineering study. ・ KeNHA and JICA conducted a further feasibility study in 2016. So far, the proposed alignment is close to the Mtongwe Ferry alignment, by Mweza Creek and connected to A14. The navy facility will be a barrier in the approach to SEZ internal corridor.

No. on Map	Project	Responsible Agencies	Effects / JICA Expert Team Comments
			・ KPA is another stakeholder, as it is concerned with securing navigational functions in the port. ・ This would be programmed as medium-term (2020-2030) project.
R4	Ring Roads in the island	County Government of Mombasa, KURA, KRC	・ The ring road function to secure the internal network in the island. (Refer to next section). ・ This development would be programmed together with the bridge developments of (R2) and (R3). ・ The implementation can be supported by external funding, with a programmed budget scheme, not single project-oriented funding. ・ This would be programmed as a medium-term project.
R5	Outer ring road 3 km	County Government of Mombasa, KURA, KPA	・ Northern side: Create new link between Shimanzi-Makande Road – Tudor District – Rassini Road – Kisauni District (Kengeleni/Old Malindi). Land re-adjustment is necessary in Tudor District. The Shimanzi Road has enough width to accommodate the future traffic, and mixed urban development. ・ The link between Rassini Road – Kisauni District will be an option for Second Nyali. See thematic analysis for further consideration. ・ Southern side: connection with R3 (Mombasa Gate Bridge) ・ This will be part of the Infinite Industrial Loop. ・ This would be programmed as long-term project.
R6-R7-R8	Ring road functions in mainland areas	County Government of Mombasa, KURA, KeNHA	・ The ring road functions to secure the smooth traffic flow of the radial directional roads (Section 10.3.4). ・ The JICA Expert Team does not show the alignment of the roads, but the basic design standards are as follows: 2-lane roads should be developed at least 1 km away from each other, and 4-lane roads 3 km away from each other; systemised signalisation should be installed, prioritising radial directions. ・ This would be programmed as a medium-term project.
R9	Kisauni – Jomvu connection (Third Nyali Link)	County Government of Mombasa, KURA, KeNHA	・ This has a lower priority due to its expected cost and environment impacts. ・ This would be programmed as long-term project.
R10	Likoni Ferry and terminal improvement	Kenya Ferry Services (KFS), County Government of Mombasa, Private Investors	・ The MSBR and Mombasa Gate Bridge (R3) will absorb the motorised traffic to Likoni; therefore, the ferry service must be exclusive for pedestrians and NMV, which will improve the safety at terminals. Such changes into vehicle-proof service can be gradually applied after opening of the MSBR for large freight first, then, for passenger cars after the commencement of the Mombasa Gate Bridge. As analysed in Chapter 4, there is a large concentration of foot-based low income residents depending on free ferry operation, and the master plan does not propose changing their lives and transportation options drastically. ・ The physical improvement of ferry terminals is already proposed through PFI schemes. The investment can be feasible due to continuous high demand of ferry users if it would be operated with low tariff scheme. Note that the mass transit station of the ferry should be integrated to optimise commercial feasibility and operational safety, which requires international design experience for high-volume passenger traffic, and which can be seen only in Asian cities and limited number of cities in the Western world. Note that the ferry carries 200,000-250,000 passengers as daily average, which is equivalent to the capacity of a busy 6-wagon metro, and perhaps, the ferry service will be the biggest passenger service in Sub-Sahara Africa.

Source: JICA Expert Team

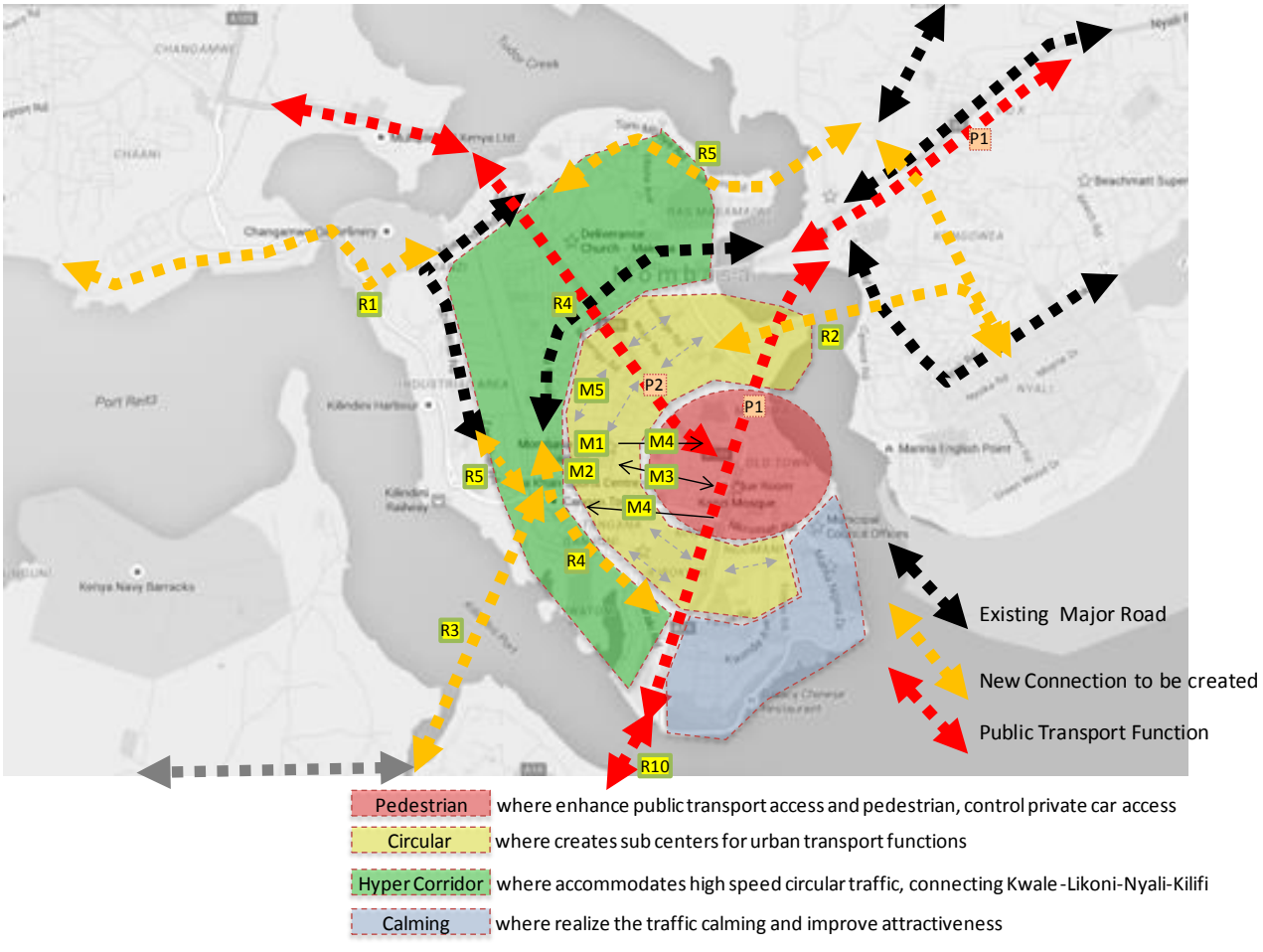
10.3.2 Structure Plan for Mombasa Island

Figure 10.3.2 focuses on transport in Mombasa Island and its nearby areas (crossings). This concept is based on the four transport policy zones in the island, namely: (i) pedestrian oriented, (ii) circular, (iii) hyper corridor, and (iv) traffic calming. The pedestrian-oriented area would be preserved as the Old

Town and shielded from major motorised traffic, whilst a circular and radial road network shall be constituted along the pedestrian-oriented area and hyper corridor zones.

The existing Nyali-Lumumba Road link to the new link (R4) will form an inner circular road, and the new connection links (R1) to (R5) will form the outer circular road. The former will distribute the traffic demand to the central business district (CBD) into proper radial connections, and the latter will serve the through traffic between the Mainland North and Mainland South.

The traffic calming area can be shielded from through traffic, suitable for tourism promotion. This concept is consistent with the traffic management strategy in Mombasa Island (fringe parking; refer to the next section).



Source: JICA Expert Team

Figure 10.3.2: Transport Structure Plan Proposal for Island

Table 10.3.2: Major Physical Improvements for Island Structure Plan

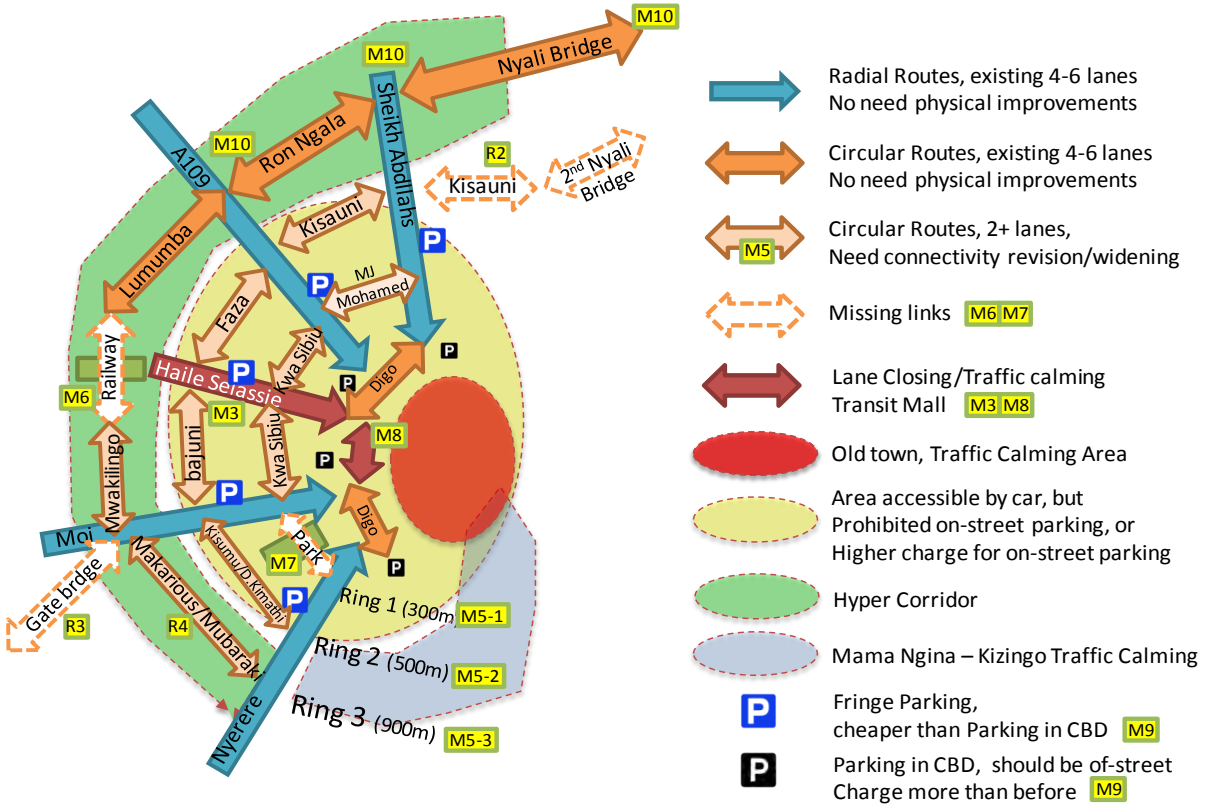
No. on Map	Project	Responsible Agencies	Effects/JICA Expert Team Comments
R1-R5			・ See the notes in the previous section
R4	Lumumba-Nyerere Connection (Island Internal Ring No.3) 2 km, 4-lane roads	County Government of Mombasa, KURA, Kenya Railways Corporation (KRC)	・ This project idea is one of the ring road development concept, forming the Ring 3 with a 900 m radius. ・ This project consists of two sections: (i) Lumumba-Moi Connection with missing link (200 m) over KRC MSA Station with minor improvements, and (ii) Moi-Nyerere Connection. ・ The former needs coordination with KRC, for lease of the area, new road development with proper level crossing, and operation monitoring. ・ The latter is the expansion of the road itself from 2 lanes to 4 lanes, with proper systemised signaling functions (TM3). ・ The section (i) would be short-term, and (ii) is medium-term.
P1	Elevated MRT to Nyali	Central Government, with PPP	・ Connection of Digo Road to the outer subcentres, with an exclusive transport link for omnibus passenger system, suitable for urban transport.
P2	MRT to Changamwe	KRC/County Government of Mombasa, with PPP	・ Convert the KRC Mombasa alignment for mass transit services. The RVR contract will be closed by 2030, and the MGR alignment can be used to install the exclusive passenger services using buses and larger matatu, or elevated alignment.
M1	Intercity bus operational integration at KRC Station	KRC, County Government of Mombasa	・ The existing KRC Mombasa station can accommodate long-distance (intercity) bus services, moving them from Mwembe Tayari on A109 (a congested area). ・ The existing KRC rail alignment can accommodate a shoulder road function whilst maintaining its rail functionality, using timetable coordination with RVR. (Note that passenger RVR services are three times per week, and the station premises are leased to freight companies.) ・ This would be programmed as a short- or medium-term project.
M2	Multimodal function with TOD / Station front development	County Government of Mombasa/KRC	・ As proposed in (M1), the multimodal function for intercity buses, matatu services, taxis, and the elevated MRT shall be aggregated. ・ The station grounds can be developed jointly between KRC and the CGM, a multi-land use project (shopping mall, hotel, etc.) alongside beautification of Haile Selassie Road, ・ This would be programmed as medium-term project.
M3	Beautification of Haile Selassie Road / Car free	County Government of Mombasa /KURA/Police	・ Traffic calming approach can be applied to this straight heritage road in the city centre. Even now, the road can have car-free implementation. ・ This would be programmed as medium-term project.
M4	One-way regulation	County Government of Mombasa/ KURA/Police	・ Area-wide one-way circulation can be proposed. ・ For example, Moi Avenue and Mwembe Tayari Road are good combinations for applying one-way regulation. ・ This would be programmed as medium-term project.
M5	Service/collector roads improvement (Island Internal Ring No.1 & No.2)	County Government of Mombasa/ KURA/Police	・ This project idea is same as the ring road development concept, forming Ring 1 and Ring 2 with 300 m and 500 m radius, respectively. ・ This entails: (i) road expansion from 2 lanes to 4 lanes, or proper lane segregation at intersections, (ii) proper systemised signaling functions, (iii) improvement of the intersection design, removing roundabouts. ・ This would be programmed as a medium-term project.

Source: JICA Expert Team

10.3.3 Hyper Corridor Coordination Plan for Mombasa Island

Figure 10.3.3 explains the set of projects to create hyper corridor and ring roads in the island, with traffic management policy.

The existing radial routes, i.e.: Sheikh Abdullah, A109, Moi, and Nyerere, are well developed; however, circular road functions are poor. The combination of three ring roads (M5) will divert the through traffic properly. The missing links (M6 and M7) are critical to realise this concept. Simultaneously, fringe parking policy (M9) and lane closing at Digo Road (M8) shall be applied.



Source: JICA Expert Team

Figure 10.3.3: Hyper Corridor Coordination Plan

Table 10.3.3: Hyper Corridor Coordination Plan

No. on Map	Project	Responsible Agencies	Effects/JICA Expert Team Comments
M5-1	Service/collector roads improvement (Island Internal Ring No.1)	County Government of Mombasa/ KURA/Police	・ Consists of MI Mohamed Road – Kwa Sibiu – (missing link in the park) ・ Widening, land adjustment, intersection re-designing to improve the connectivity, signal installation ・ This would be programmed as a medium-term project.
M5-2	Service/collector roads improvement (Island Internal Ring No.2)	County Government of Mombasa/ KURA/Police	・ Consists of Kisauni-Faza-Baluni-Kisumu Road ・ Widening, land adjustment, intersection re-designing to improve the connectivity, signal installation ・ This would be programmed as a medium-term project.
M5-3	Hyper corridor creation (Island Internal Ring No.3)	County Government of Mombasa/ KURA/Police	・ Consists of Arch. Makarios- Mwakilingo – (missing link in the railway station)- Lumumba-Ronald Ngala ・ Widening, land adjustment, intersection re-designing to improve the connectivity, signal installation ・ This will be integrated with the loop option for the elevated MRT in the section of Lumumba-Ronald Ngala Road; see other part for P2. ・ See R3, R4, M6, M10. and P2 for further information.

No. on Map	Project	Responsible Agencies	Effects/JICA Expert Team Comments
M6	Missing link improvement (Railway)	County Government of Mombasa/ KURA/Police	・ Level crossing creation (no flyover necessity as the railway is not busy) ・ Will accommodate the Mombasa Gate Bridge approach here. ・ This would be programmed as a short-term project.
M7	Missing link improvement (Sports Park)	County Government of Mombasa/ KURA/Police	・ This link development will require land adjustment of the Mombasa Sports Club grounds, closed membership society. ・ This would be programmed as a medium-term project.
M8	Digo car-free areas	County Government of Mombasa/ KURA/Police	・ Convert the sections into transit mall, not accessible by private cars. ・ See M3 also ・ This would be programmed as a short-term project.
M9	Off-street parking development, street beautifications	County Government of Mombasa/ KURA/Police	・ Applying fringe parking policy (create difference in parking tariff and enhance traffic calming in the city) ・ Footpath environment improvement (subsidy to create continuous balcony in the fringe parking district) ・ This would be programmed as a medium-term project.
M10	Hyper corridor intersection improvement	County Government of Mombasa/ KeNHA/Police	・ The Saba Saba and Sheikh Abdullas intersections, as well as Nyali intersection, should be improved with proper design of intersection to realise the hyper corridor strategy, including traffic management. ・ Traffic management for the Nyali Bridge should be programmed as a short-term project.

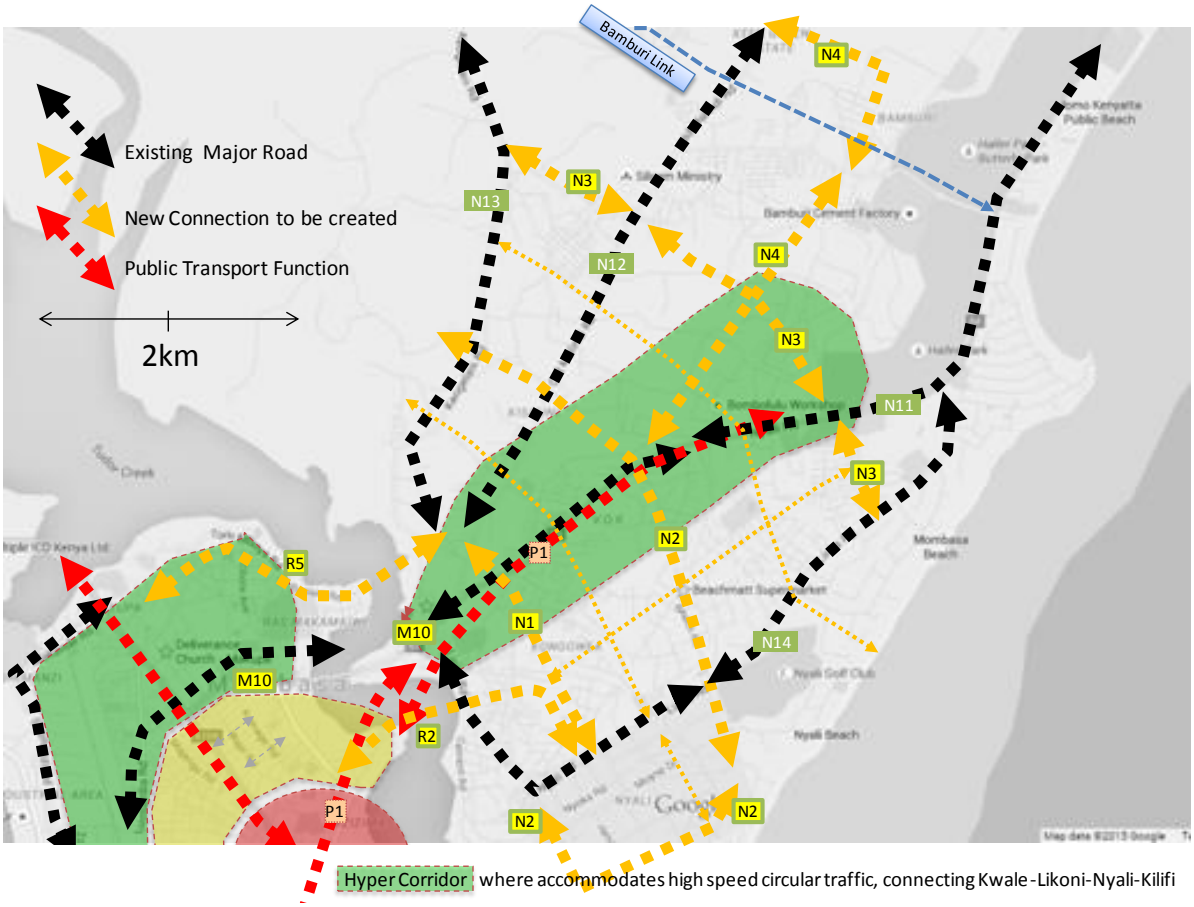
Source: JICA Expert Team

10.3.4 Structure Plan for Mainland Areas

The following figures and tables show the road network in the mainland areas (proposed as R6-R7-R8 projects). The major strategy is to develop the four lane/two lane street grid network, to alleviate the concentration of traffic at existing focal points. The JICA Expert Team shall propose possible road development alignments as concept. It is noted that mechanisms to secure road investment should be prioritised for the alignment, in order to avoid the failure of the 1971 master plan.

(1) Mainland North

The four major radial routes are to be widened properly as short-term projects (N11-14). The 1 km-grid urban road structure shall be facilitated as N1-N4 projects, which are medium-term projects, and 500 m grid urban road structure which shall be long-term project. The New Malindi Road will be improved as hyper corridor, and it will accommodate BRT function and elevated mass transit function.



Source: JICA Expert Team

Figure 10.3.4: Transport Structure Plan Proposal for Mainland Areas (North)

Table 10.3.4: Major Physical Improvements for Suburban Structure Plan (North)

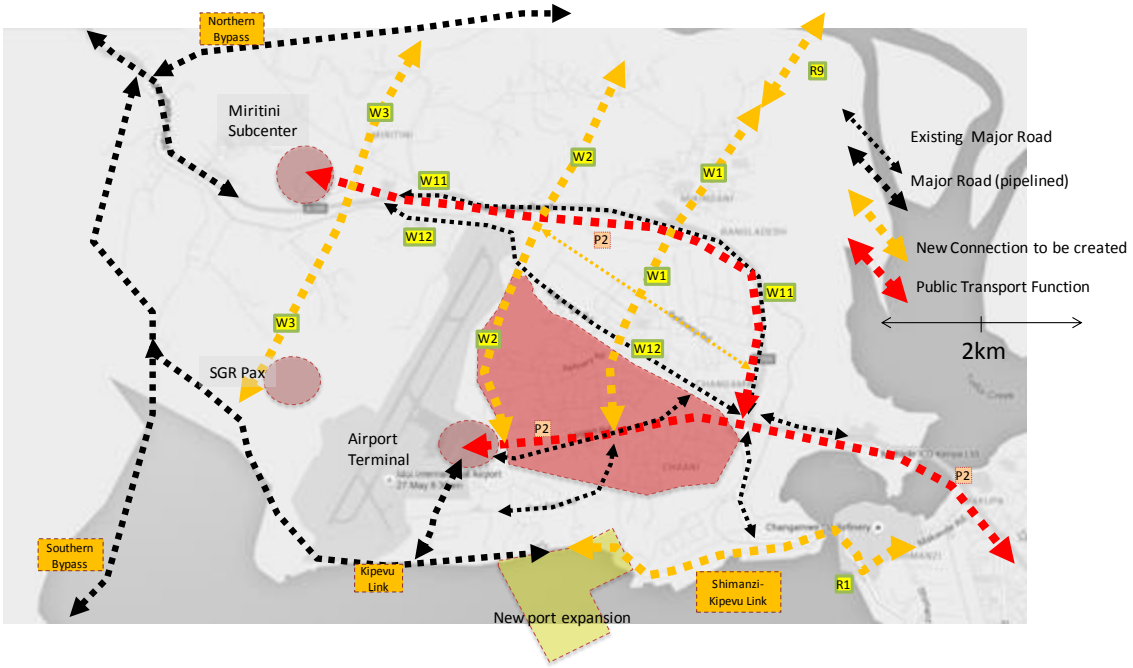
No. on Map	Project	Responsible Agencies	Effects/JICA Expert Team Comments
N11	Road Widening (B8- New Malindi Road)	KeNHA	・ B class road under KeNHA. Need to be expanded as 4-6 lane roads. ・ 4-lane widening is needed immediately (short term project, considered as pipeline project). ・ Proper traffic management at the bridge and adjacent sections are necessary. ・ 6-lane widening with accommodating priority bus services (P3) and elevated MRT structure would be for medium term.
N12	Road Widening (B8- Old Malindi Road)	KeNHA,	・ B class road under KeNHA. ・ Modification to proper 2 lanes will be for short term (considered as pipeline project). ・ Need to be expanded as 4-lane road; however, dense development surrounding the roadway complicates this. Coordination for land readjustment and relocation policy is needed. After the widening, prioritized bus service (P3) would be accommodated for long term. ・ Perhaps, the ownership should be transferred from KeNHA to KURA or the county. ・ 4-lane widening would be for the long term. Needs to be coordinated with R5 and P3.
N13	Road Widening (Kengeleni (Mwakirunge) Road)	Kenya Rural Roads Authority (KeRRA)	・ Belongs to KeRRA ・ Modification to proper 2 lanes will be short-term (considered as pipeline project). ・ Need to be expanded as 4 lane road, however, the habitation will barrier to this idea. Proper coordination for land readjustment and relocation policy is needed. ・ 4-lanes widening would be mid-term. Need to be coordinated with R5. ・ Perhaps, the ownership should be handed to KURA or County.

No. on Map	Project	Responsible Agencies	Effects/JICA Expert Team Comments
N14	Road Widening (Links)	County Government of Mombasa,	・ Belongs to the county. Widening to 4 lanes. ・ Partial 4-lane widening is on-going, but programmed as short-term project.
N1-N4 (R6)	Ring Road Function to create the 1 km-grid of 4 lanes, 500 m-grid of 2 lanes in the city	County Government of Mombasa, KURA	・ This is the same concept as (R6) in the region-wide project list. ・ The JICA Expert Team is less focused on detailed alignments (rather, it is focused on overall connectivity planning). However, major existing section to be widened are listed as N1-N4 ・ The figure shows the candidate alignment of 500 m -2-lane grid in the map, with thinner dot lines, which will be programmed as long-term projects.
N1	Access road to Kongowea (3 km)	County Government of Mombasa	・ Access route development to the biggest freight generator in the city, i.e., Kongowea Market, shall preferably be 4-lane road between Links and B8, as medium-term project. Land readjustment based on the Kongowea Market property is needed. ・ Need to consider connection with R5, with elevated structure crossing B8, as a long-term project
N2	Beach road (5 km-4 lanes)	KURA/ County Government of Mombasa	・ 4-lane widening, intersection improvement to secure the connectivity, lane marking, signalisation, and pedestrian facilities are necessary. ・ These would be programmed as medium-term projects.
N3	Road along the KRA school (5 km, 4 lanes)	KURA/ County Government of Mombasa	・ 4-lane widening, intersection improvement to secure the connectivity, lane marking, signalisation, and pedestrian facilities are necessary. ・ These would be programmed as medium-term projects.
N4	Road along the Bamburi-Bombolulu (5 km, 4 lanes)	KURA/ County Government of Mombasa	・ 4-lane widening, intersection improvement to secure the connectivity, lane marking, signalisation, and pedestrian facilities are necessary. ・ These would be programmed as medium-term projects.

Source: JICA Expert Team

(2) Mainland West

The two major radial routes are to be widened properly as short-term projects (W11-12). The 1 km grid urban road structure shall be facilitated as W1-W3 projects, which are medium-term projects, and 500 m grid urban road structure shall be long-term project. The combination of Mombasa Road and MGR alignment will be improved as hyper corridor, and it will accommodate mass transit function.



Source: JICA Expert Team

Figure 10.3.5: Transport Structure Plan Proposal for Mainland Areas (West)

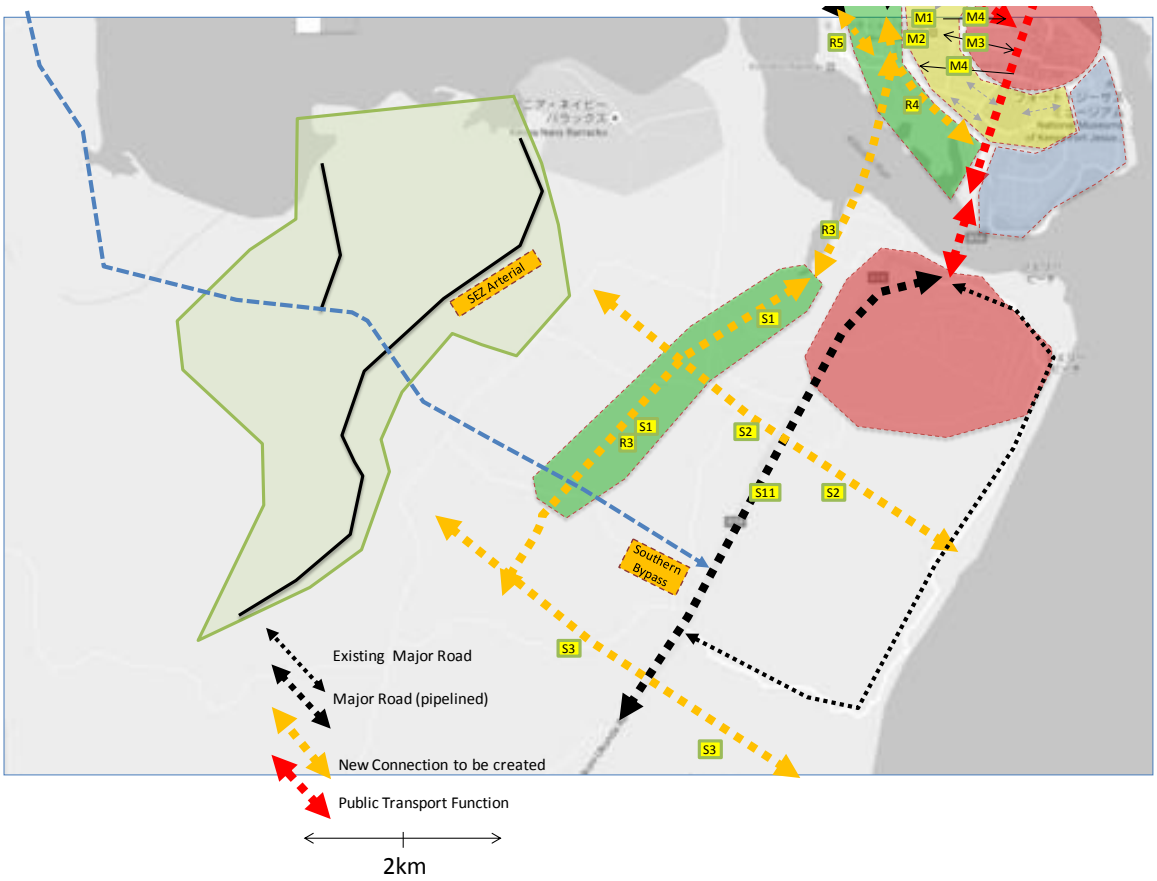
Table 10.3.5: Major Physical Improvements for Suburban Structure Plan (West)

No. on Map	Project	Responsible Agencies	Effects/JICA Expert Team Comments
W11	Road Widening (A109- Mombasa Road, 7 km)	KeNHA	・ A-class road under KeNHA. Needs to be expanded as a 4-6 lane road. ・ 4-lane widening is needed immediately (short-term project, considered as pipeline project). ・ 6-lane widening depends on the possible relocation and land readjustment for long term.
W12	Road Widening (A109- Magongo Road 5 km)	KeNHA	・ A-class road under KeNHA. Needs to be expanded as a 4-lane road. ・ Flyover construction in progress in 2016 at junction with airport road. ・ 4-lane widening is needed immediately (short-term project, considered as pipeline project).
W1-W4 (R7)	Ring road function to create the 1 km grid of 4 lanes, 500 m grid of 2 lanes in the city	County Government of Mombasa, KURA	・ This is same concept as (R7) in the region-wide project list. ・ The JICA Expert Team is less focused on detailed alignments for the master plan (rather, it is focused on overall connectivity planning). However, major existing sections to be widened are listed as W1-W4 ・ The figure shows the candidate alignment of 500 m-2 lanes grid in the map, with thinner dot lines, which will be programmed as long-term projects.
W1	Port Reitz – Refinery – Mombasa Road - Mikindani (new construction, 6 km)	KURA/ County Government of Mombasa	・ 4-lane road, new construction, connecting major branch roads in the district ・ Programmed as medium-term project ・ This will be connected with the Third Nyali Bridge function (R9, long term)
W2	Port Reitz – Magongo – East Miritini (new construction, 5 km)	KURA/ County Government of Mombasa	・ 4-lane road, new construction, connecting airport and East Miritini ・ Programmed as medium-term project
W3	SGR passenger terminal – Mombasa Road – Miritini	KURA/ County Government of Mombasa	・ 4-lane road, new construction, serving to SGR terminals ・ Programmed as medium-term project

Source: JICA Expert Team

(3) Mainland South

The one major radial route is to be widened properly as short-term project (S11) (Figure 10.3.6). The 1 km grid urban road structure shall be facilitated as S1-S3 projects, which are medium-term projects, and 500 m grid urban road structure shall be long-term project. The Mombasa Gate Bridge and its access road will create hyper corridor, and it will accommodate mass transit function.



Source: JICA Expert Team

Figure 10.3.6: Transport Structure Plan Proposal for Mainland Areas (South)

Table 10.3.6: Major Physical Improvements for Suburban Structure Plan (South)

No. on Map	Project	Responsible Agencies	Effects/JICA Expert Team Comments
S11	Road Widening (A14-Ukunda Road, 5 km)	KeNHA	・ A-class road under KeNHA. Need to be expanded as 4 lanes road. ・ 4-lane widening is needed immediately (short-term project, considered as pipeline project).
S1	Southern Bypass – Mombasa Gate Bridge approach (A14 Bypass, 4 km)	KeNHA	・ The JICA Expert Team suggests that the Mombasa Gate Bridge be connected to the Southern Bypass directly, not connected to A14. Create hyper corridor function as bypass of A14, which is already saturated with local traffic (medium-term measure). ・ Before the MSBR final detailed design (the third section) will be fixed around 2017, a junction structure installation shall be considered preferably, to handle through traffic and bulk fleets from bulk terminal (medium-term measure). ・ The southern end shall be extended and merged to A14, in Kwale County, as a function of A14 Bypass.
S2	Mtongwe – Sherry Beach section (new construction, 4 lanes, 4 km)	KURA/ County Government of Mombasa	・ 4 lanes, new construction, for medium term, to build 1 km grid, along the existing Mtongwe Road alignment running on Posta Mtongwe.

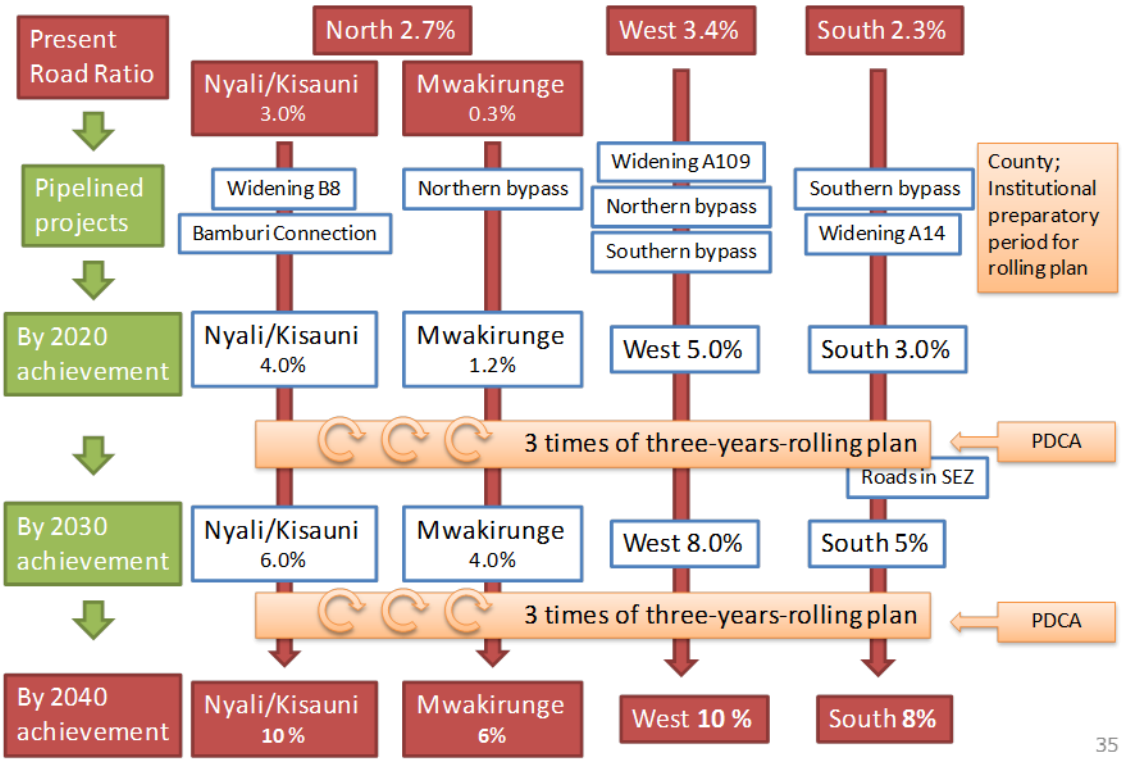
No. on Map	Project	Responsible Agencies	Effects/JICA Expert Team Comments
			・ Prepare circular road function around the high dense, low income housing area
S3	Second ring road function (new construction, 4 lanes, 4 km)	KURA/ County Government of Mombasa/ County Govt. of Kwale	・ Perhaps unnecessary due to it being located almost at the border of Mombasa County. However, in the future, urbanisation will extend beyond the border, requiring a second ring road with distributor function (medium term). ・ This development should be coordinated with Kwale County.

Source: JICA Expert Team

10.3.5 Road Development Management Programme in Mombasa County

As shown in the previous section, the investments in widening roads and developing missing links in the mainland areas were mostly assigned to the CGM. But at present, the county has less capacity to develop new roads. Other road development investments not assigned to the county nevertheless require county coordination in land acquisition and alignment coordination. Capacity building for the CGM, particularly the Roads and Transport Directorate, is needed in order to realise these improvements. The Project for CD1 (Consulting Services for Road Development Programme Preparation) 2020-2040 is described as follows:

The Road Development Programme for the suburb region can be depicted as shown in Figure 10.3.7 below. The vertical axis shows the time from present to the year 2040, and the horizontal axis contains sub regions in Mombasa County. The concept consists of two elements: i) development target (road ratio value), and ii) PDCA management on rolling plans.



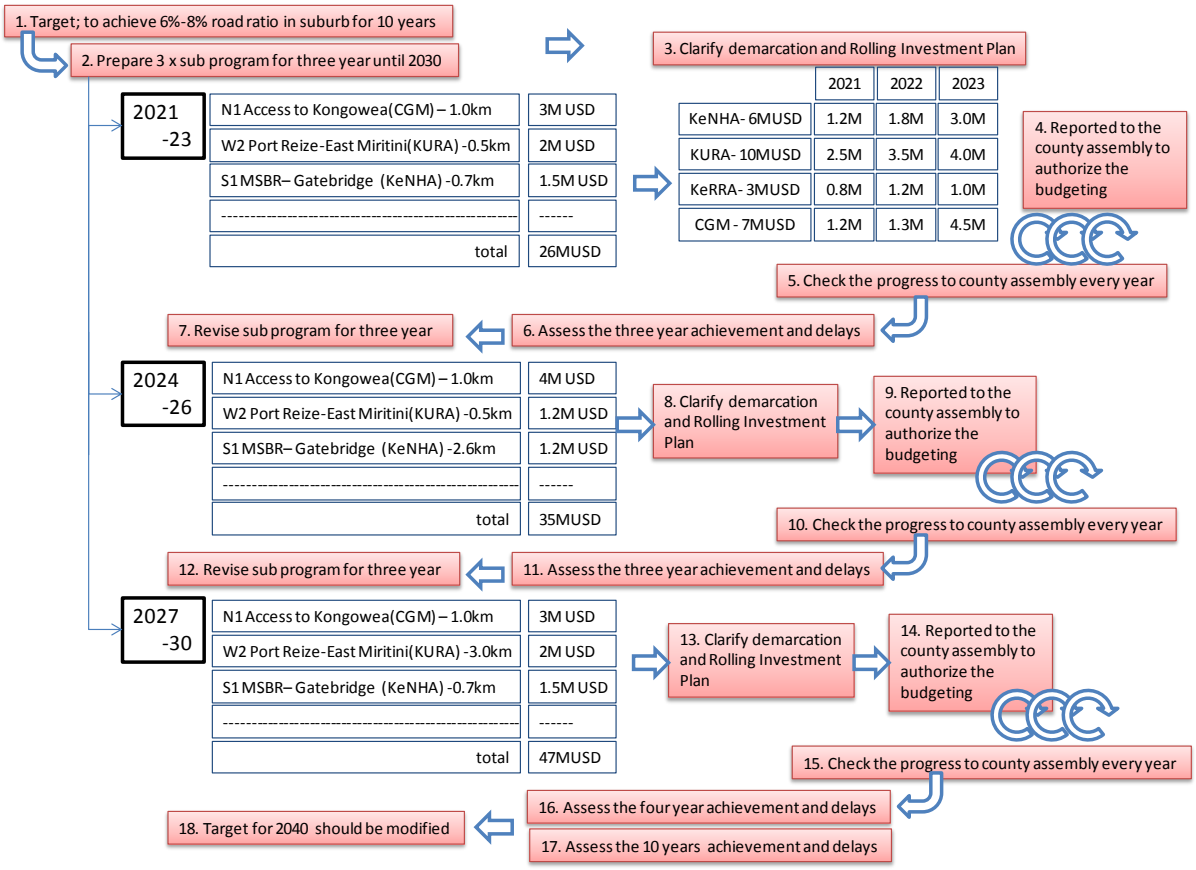
Source: JICA Expert Team

Figure 10.3.7: Suburb Road Development Programme (RDP)

The values in Figure 10.3.7 express the development target of the road ratio in the region. The present values of the road ratio by region are shown in the top, and these will grow with the development of the pipeline projects, and expected values in 2020 are forecasted as shown in the figure.

On the other hand, the expected road ratio value in 2040 can be agreed amongst the stakeholders in the region. The JICA Expert Team proposes 8-10% as target in 2040, which represents 1 km grid of 4 lane roads, 500 m grid of 2 lane roads, to build initial urban structure in the area, which needs to accommodate 200 persons/ha density at least. As reference, road ratio values in Bangkok and Jakarta in 2010 are around 8-10%. Consequently, the values in 2030 can be estimated, and the rolling plans could be materialised to achieve the interim and final targets.

The PDCA management on the rolling plans requires institutional arrangement. The development of rolling plan and procedure of PDCA management can be summarised in 18 steps as shown in Figure 10.3.8 below. The essence of this approach is to authorise the rolling plan with local planning authority (county assembly, as specified by the 2012 Constitution), which will empower the implementation agency in the county.



Source: JICA Expert Team

Figure 10.3.8: PDCA Mechanism in the RDP 2020-2030

The CGM requires i) the capacity to prepare the Road Development Programme, and ii) a monitoring organisation. The following capacity development projects in Table 10.3.7 are necessary to secure the mechanism above:

Table 10.3.7: Major Physical Improvements for Suburban Structure Plan

No. on Map	Project	Responsible Agencies	Effects/JICA Expert Team Comments
CD1	Road Development Programme preparation (2020-40); Consulting services	County Government of Mombasa	・ Create the Road Development Programmed, including the three-year subprogrammes for 2020-30 and 2030-40. ・ Organisation building for monitoring the PDCA progress. ・ Provided to CGM mainly, but including local offices of KeNHA, KURA, KeRRA, and other related agencies.

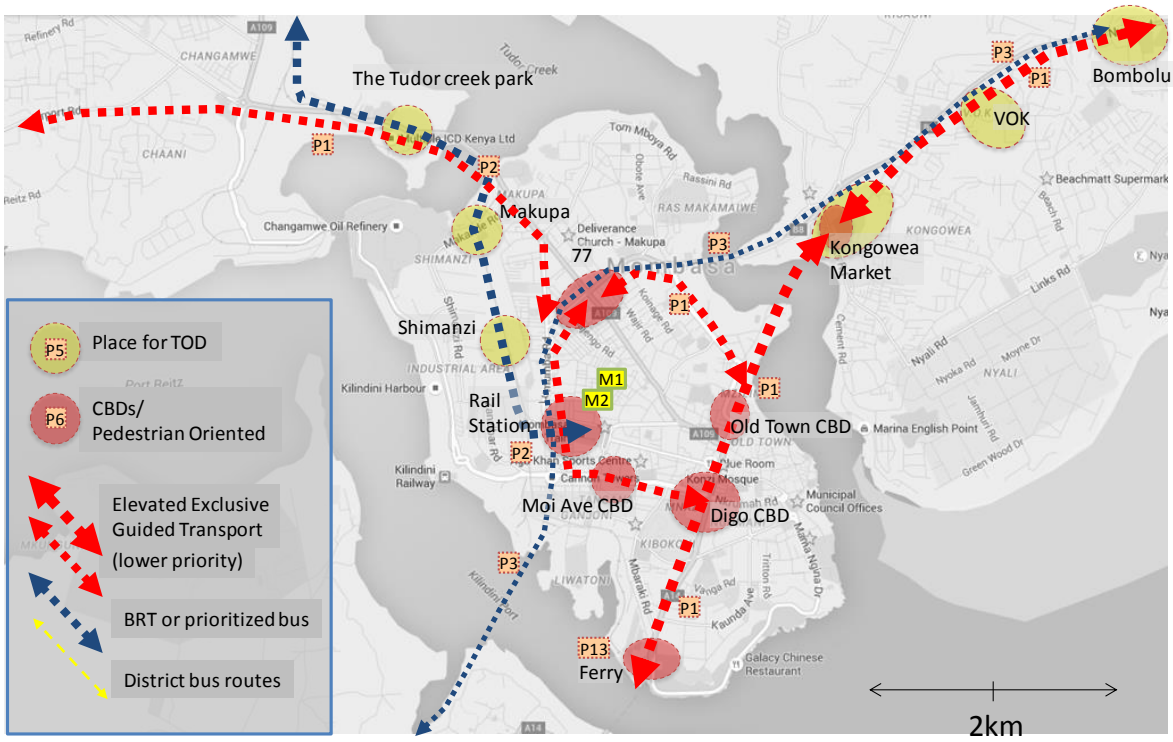
No. on Map	Project	Responsible Agencies	Effects/JICA Expert Team Comments
			・ Technical assistance for road and intersection design, pavement design and quality management, intersection management to achieve the expected projects to CGM ・ The service should be started in 2018. Trademark EA can be a candidate for facilitator of this consulting service.

Source: JICA Expert Team

10.3.6 Passenger Transport Service Plan

The expected alignment for the elevated passenger services, which can be the core of the passenger service network, is proposed as per Figure 10.3.9, overlaid on the transport structure plan.

The passenger transport service system could be constituted with three layers as shown in the figure, i.e.: i) elevated MRT (presented as P1 in this section), ii) MRT services without vertical segregation (P2 and P3), and iii) ordinary bus services (P4, P7 and P8). The elevated MRT will require larger funding but can provide higher capacity to districts with high density demand. Due to conservation policy of the world heritage site in the downtown, the required capacity for the elevated MRT should be controlled to calm demand growth in the future. On the other hand, the second and third layers of the services can be expanded outwards where demand density is low, instead of extending the first layer. Further consideration is explained in Sections 10.5.5 and 10.5.6.



Source: JICA Expert Team

Figure 10.3.9: Plans for Passenger Transport Service

Table 10.3.8: Plans for Passenger Transport Service

No. on Map	Project	Responsible Agencies	Effects/JICA Expert Team Comments
P1	MRT Ferry-VOK-City Mall Line, Loop Line	Ministry of Transport and Infrastructure (MOTI)/ County	・ The multi-core urban structure needs MRT to connect core centres, Ferry-Digo-Kongowea-Bombolulu alignment. The Moi-Makupa-Airport corridor will be another candidate for MRT preparation.

No. on Map	Project	Responsible Agencies	Effects/JICA Expert Team Comments
		Government of Mombasa/ PPP operator	・ Initial section, Ferry-VOK (7 km) for medium-term, and loop section for Moi, Rail Station/Saba Saba will be added as long-term project. ・ Exclusive elevated structure, with state-of-the-art rail services including AGT, monorail, etc. ・ In parallel, matatu route services will be reorganised as P6.
P2	MRT for CBD-Rail-Airport - Miritini	MOTI/ County Government of Mombasa/ PPP operator	・ The multi-core urban structure needs MRT to connect core centres, CBD- Rail-Makupa-Changamwe-Miritini. ・ Expecting to use MGR (meter gauge alignment), which is already grade-separated with the other surface transport modes to secure punctuality; medium-term project. ・ BRT system is expected on this alignment, should be designed to fit to Mombasa local needs. Or elevated structure transport system can be installed instead of BRT. ・ In parallel, matatu route services will be reorganised as P6.
P3	Prioritised bus service for Kisauni-77-SEZ/Likoni	MOTI/ County Government of Mombasa/ PPP operator	・ The multi-core urban structure needs light volume transport service to connect core centres, CBD- Kisauni-Saba Saba-SEZ/Likoni; medium-term project. ・ Expected to form a part of the hyper corridor and Mombasa Gate Bridge, serve as regional connector, providing labour power from Kisauni to SEZ. ・ BRT system can be expected in this alignment in Likoni region, where wider right of way can be expected. However, prioritised lanes and signals shall be applied in the island and Nyali sections ・ In parallel, matatu route services will be reorganised as P6.
P4	Bus/matatu circular routes	National Transport and Safety Authority (NTSA)/ County Government of Mombasa/ PPP operator	・ As master plan proposes urban core distribution, supporting local transport services shall be facilitated around the new cores. The suggested routes on the map are just examples; the JICA Expert Team is focused on overall connectivity planning. ・ This will be programmed as a medium-term project.
P5	TOD initiation	County Government of Mombasa/ PPP operator	・ The suggested areas are expected to be TOD to attract rail/MRT-based traffic along the corridor. ・ This will be programmed as long-term project.
P6	Pedestrian-oriented development (POD)	County Government of Mombasa/ PPP operator	・ Footpath and safety engineering investment should be arranged for the targeted zones, to enhance ingress/access for on-foot base transport ・ This will be programmed as long-term project.
P7	Matatu route revision and employment pool	NTSA/ County Government of Mombasa/ Matatu Operators	・ As master plan urban core distribution, MRT needs to connect core structure, and the matatu route also should be decentralised. ・ Install regional regulation, i.e., matatu routes shall not cross the channels (Nyali, Likoni, and Makupa). This idea shall be gradually installed as harmonising with acceptance of matatu operators, passenger diversion to MRT, and level of congestion at channels; medium- to long-term project. ・ As a kind of social policy, a function of employment pool is needed to secure the acceptance of matatu operators and organise the MRT services.
P8	Shift to higher-capacity vehicles for matatus	NTSA/ County Government of Mombasa/ Matatu Operators	・ Convert 14-seats matatu to over 26-40 seat vehicles. ・ The initial dissemination needs to be programmed as short term. ・ Develop a fleet lease company through PPP to comply with road worthiness and matatu owners' financial requirements (cheaper lease fee for route compliance as proposed in P3)

No. on Map	Project	Responsible Agencies	Effects/JICA Expert Team Comments
P9	Construct proper facilities for matatus	County Government of Mombasa	・ The county should construct dedication stops and terminals for matatus. ・ Main stations should include separate and clearly-marked (by road-painting and signage) areas for vehicles on different routes, passenger guidance information (route maps, fare ranges), and shelter facilities. ・ Intermediate stations should be marked with road painting and signage. ・ The order of introducing these facilities can be phased, with stations at key locations (Posta, Lights, Bamburi, etc.) coming first, and terminal development, which is more intensive, coming later (Ferry, etc.).
P10	Capacity building for matatu operators	NTSA, County Government of Mombasa	・ A joint effort between the NTSA (which can impose fines / remove operating licenses for non-compliance) and the county (with help of a TA programme/consultancy) should be undertaken to increase the capacity of matatu operators. ・ Eventual goal is to prepare operators to merge and bid for future MRT operating concessions (P7). ・ In the interim period, the associated capacity building will allow operators to improve their services.
P11	Regulation of tuktuk, creation of standing areas	NTSA/ County Government of Mombasa/ Tuktuk Operators	・ Control the number of tuktuk and enforce the regulation, design the service regulation to fit with the whole master plan network situation. ・ Creation of the standing area in Old Town (as reported in IT/R) can be a short-term project. ・ Restrict tuktuk access to narrow roads, forbidding them from operating on major thoroughfares ・ Examine potential locations for tuktuk staging grounds ・ Continue its existing policy directive of phasing them out as much as possible
P12	Water transport services along the Nyali Channel	County Government of Mombasa/ Private Investors	・ This was proposed by a Dutch group, and can be considered a project in the master plan; however, it is quite a niche market, will not cover the mass demand, and will not contribute to congestion alleviation. The gap in economy between the Nyali and Old Town is also difficult to traverse. It can be implemented as a part of city branding, image development (medium-long term).
P13	Mbaraki Terminal conversion to cruise ship terminal	KPA/ County Government of Mombasa	・ Mbaraki Terminal should be converted from a clinker terminal to a cruise ship terminal, as proposed by the tourism development plan in this master plan, bringing various positive impacts to the city: i) dusty clinkers pollute the area, requiring 600 dump trucks per day, nearby Mama Ngina Park; ii) tall cruise ships cannot pass underneath the Mombasa Gate Bridge without a very high span; iii) the ferry terminal, mass transit terminal, and cruise ship terminal should all be integrated. Short or medium term. (Note: the tallest cruise ship berth depth is 9 m, which can be accommodated by Mbaraki Berth.)
M1& M2	--	KRC, County Government of Mombasa	・ M1 intercity bus operation and M2 multimodal terminal are strongly related to the passenger transport service projects.

Source: JICA Expert Team

10.3.7 Traffic Management/Traffic Demand Management Projects

The passenger demand management projects are also proposed as follows:

Table 10.3.9: Plans for Demand Management

No.	Project	Responsible Agencies	Effects / JICA Expert Team Comments
TM1	Parking management improvement	County Government of Mombasa	・ The ongoing daily charge concept shall be revised to an hourly charge, based on M-Pesa payment, as implemented in Nairobi and other cities. ・ The tariff and parking regulation should be arranged as M9, fringe parking policy.
TM2	Pedestrian bridge installation	County Government of Mombasa	・ Install the pedestrian bridge on the major crossing points as short term or temporary measures for traffic safety improvement. ・ Put priority for the higher volume crossing as shown in Chapter 4. ・ The county government will facilitate pedestrian bridges in two locations along the Sheikh Abdullas Road in 2016-17.
TM3	Traffic lights system improvement	County Government of Mombasa/ Traffic Police	・ Coordinated traffic lights can be installed in compliance with the previous project idea. The following shows the priority: ・ The intersections along the hyper corridor (intersections of M10, M5-3), and radial axis in the island (short term) ・ The new intersections along M5-1, M5-2 in the island, and the grid structure intersections under R6, R7, and R8. (medium term)
TM4	General regulation/ agreement with private freight operators related to bypass installation	County Government of Mombasa/Traffic Police/Private	・ The regulation for region-wide traffic can be implemented after installation of Northern Bypass and MSBR (e.g., the traffic to Nairobi/upcountry from Nyali must use the Bamburi Link and Northern Corridor) ・ The JICA Expert Team proposes that a PPP agreement framework would be more effective to realise the diversion of commercial traffic. The procedure is as follows: An agreement amongst the county, traffic police, and freight operators (like Mombasa Cement, Bamburi Cement, clinker forwarders) can be exchanged and published in newspapers, noting the CSR (corporation social responsibility) aspects of the agreement. The companies can publish such CSR activities, cooperating with local to minimise the traffic, in their annual reports to investors, to advertise their social aspects. The public may open hotlines to voluntary citizens to monitor the regulation enforcement.
TM5	Area pricing	County Government of Mombasa	・ The area pricing policy was discussed between the JICA Expert Team and county government staff, and can be installed for the following scenario (long term): ・ i) when the MSBR and Northern Bypass are constructed, pricing application for region-wide through traffic can be considered, and/or ・ ii) when a reliable alternative transport mode for the private car user are facilitated (i.e., MRT), the pricing can be applied for the traffic coming into the island. The installation of checkpoints along the screen lines circulating the island seems easier because there are limited numbers of crossing points (bridges and causeway). However, it will be in contradiction to the hyper corridor concept. Basically, the area pricing into the island shall be in compliance with the concept of the M9 & TM1 (fringe parking policy) and M10 (hyper corridor intersection improvement).

Source: JICA Expert Team

10.3.8 Traffic Management Projects for Freight

The existing system of container handling between Berths 14-19, CFSs, and ECTs should be revised after SIMBA is upgraded, SCT is implemented, and the Kipevu Link and SGR connections are constructed. SIMBA upgrades will reduce the necessity of CFSs in Mombasa County. At the same time, SCT will require customs clearance functions for transit cargo to occur in Mombasa – creating more complexity/demand for logistics functions (processing, consignment, and seaport/airport connections).

The JICA Northern Economic Corridor Master Plan has proposed the promotion of the exporting of local products, and projects to support the exporting and transshipments are included in the list. The initial steps, however, focus on institutional arrangements (refer to Section 10.6 for more detail).

Table 10.3.10: Major Traffic Management Projects for Freight

No.	Project	Responsible Agencies	Effects/JICA Expert Team Comments
TM6	Integrated delivery operation for CFS/ECT	KRA, KPA, KMA County Government of Mombasa, KIFWA/CFS association	・ Integrate the operation of container collecting services between CFSs/ECTs and Berth 14-19. A trailer delivers an empty container from an ECT then the same trailer must pick up a loaded import container to a CFS, in order to minimise delivery with empty cargo. ・ This will be programmed as a short-term project
TM7	CFS termination, modification into multi-function facilities	KRA County Government of Mombasa,	・ Terminate operation of CFSs with lower productivity, and redevelop the land for other purposes such as new urban cores, land for TOD development, etc. ・ Modify some of the CFSs into multi-function freight yard, including i) import (ordinary), ii) export, iii) processing, and iv) empty container yard. Need to choose the CFSs to be modified in order to minimise the traffic congestion. ・ Particularly for export cargo, x-ray and document check functions should be integrated into the multi-function freight yards, under KRA supervision. This will alleviate the continuous trailer queue at Gate 18. ・ This will be programmed as short-term project for the termination, and medium-term project for the integration.
TM8	Marshalling yard for freight vehicles	County Government of Mombasa, KPA	・ Develop a freight marshalling yard (temporary parking for freights). CGM has two possible locations: i) near Gate 18, and ii) Miritini (CGM land) ・ X-ray and document check functions should be installed at the marshalling yard, under KRA supervision. This will alleviate the continuous trailer queue at Gate 18. This will also alleviate the on-street parking along the major and minor roads in Changamwe/Jomvu. ・ ICT application can be set for driver ・ This will be programmed as a medium-term project.
TM9	Tractor exchange practice	MOTI/KPA Private Operators (KIFWA)	・ This practice requires to leave the trailer with container from the tractor head at the CFS and marshalling yard in Mombasa County, and enable the tractor to return immediately or bring another import cargo back upcountry. This practice will improve the present low vehicle turnaround rate, which will benefit private forwarders for long distance services. ・ Apply the policy of tractor exchanging into the CFS and the marshalling yards. ・ Need to install the common container delivering services between the yards and port. The service can be more efficient because it can concentrate on short distance shuttling.
TM 10	Container consolidation for export cargo (drop-off)	Private Operators / KPA	・ Consignment of export bulk to a container in the multifunction CFS. So far, the export bulks are exported by bulk vessels, which have lower efficiency than container. ・ The CFS will arrange the consignment to various shipping companies, which will generate an added value for them. ・ The bulk forwarders can leave their bulk immediately and return, i.e., a drop-off operation, which will improve the turnaround rate for the forwarder. It will accept a smaller amount of bulk. ・ CFS can already handle this function, as they have good relations with forwarders. ・ The NEC MP promotes further exporting, which require this kind of function in Mombasa County.
TM 11	Sea and air service promotion	Private Operators / KPA	・ This service provides intermediate service between air and ocean in terms of transit time and cost, which can attract users who feel hesitation for expensive air transport cost. In addition, this service can avoid the current complex and unforeseeable border crossing procedures for realising speedy and foreseeable delivery.

No.	Project	Responsible Agencies	Effects/JICA Expert Team Comments
			・ CFSs can be potential sea-air service operators with their locations and business practices by providing deconsolidated/consolidated service up to now. ・ Note that the location of the Dar Es Salaam seaport is away from its airport by more than 10 km.
TM 12	Local wholesale market distribution	County Government of Mombasa	・ Local commercial freight concentrated at the Kongowea Market needs to be distributed to the suburbs and future urban cores as proposed in the structure plan. According to the freight OD survey, it was identified that wholesalers come from all over Kenya, particularly from upcountry areas for vegetables, which suggests that it is ideal to locate a wholesale market along the Northern or Southern Bypasses. However, the retail function of Kongowea during the daytime is quite large and complex with local demands, which is difficult to be clarified.

Source: JICA Expert Team

10.3.9 Development Scenario

Table 10.3.11 summarises the proposed major development elements by sector in the short term (by 2020), medium term (by 2030) and long term (2040), as agreed with the County Government of Mombasa. These development elements reflect the results of the traffic demand forecast presented in section 10.4. This table contains development elements for ports and SGR, which are not mentioned in the previous sections.

Table 10.3.11: Development Plan Scenarios

Function	2020 (Base Year)	2030	2040
Region-wide Traffic	・ Southern Bypass (MSBR) and Kipevu Link (KeNHA/JICA) ・ Northern Bypass and Bamburi Link (KeNHA/WB) ・ Widening of A109, B8 (New Malindi Rd.), A14 (KeNHA)	・ R2: Second Nyali bridge (KURA/PPP) ・ R3: Mombasa Gate Bridge (KeNHA) ・ Further widening of B8 New Malindi Rd.	・ R5: Third Nyali bridge ・ Extension of MSBR to Mariakani (or Nairobi) ・ N12: Widening of B8 Old Malindi Rd. ・ W11: Possible widening of A109
Freight Traffic	・ R1: Kipevu – Shimanzi Missing Link (CGM/KPA) ・ TM8: Marshalling yards (CGM)	・ TM6-11: CFS delivery reorganisation and modernisation	
Freight Regulation	・ Asycuda/SCT application (KRA)		
Rail	・ SGR operation started with passenger services (PR China)	・ MGR alignment utilisation process	
Port	・ Berth 20-22 (KPA/JICA)	・ Berth 20-24 ・ Dongo Kundu 1-2 + SEZ ・ Port function reorganisation	・ Berth 25 ・ Port function reorganisation
Airport		・ TM11 Sea-Air services	
Island	・ M6: Missing link at Lumumba -Moi with level crossing ・ M5: Ring roads ・ M3: Hail Selassie Traffic Calming ・ Intercity bus service terminal at Rail Station ・ M9: Fringe parking policy	・ M10: Organise the Hyper Corridor with Nyali Bridge – Lumumba – Mombasa Gate Bridge	
Nyali	・ N13: Proper 2 lanes of Kengeleni (Mwakirunge) Rd. ・ Traffic management along the Nyali bridge (N11)	・ 6% Road Ratio (1 km grid of 4lanes road, incl. Kengeleni (Mwakirunge) Rd.)	・ 10% Road ratio (1 km grid of 4lanes road + 500m grid of 2lanes road)
Changamwe		・ 8% Road Ratio	・ 10% Road Ratio

Likoni		・ 5% Road Ratio[1)] (Incl. 4lanes of Mtongwe - Sherry Beach Rd.)	・ 8% Road Ratio[1)]
Passenger Services	・ P8: Enlargement of matatu/bus fleet size (initial stage)	・ P1: Elevated Mass Rapid Transit for Ferry-Kongowea Line ・ P2: Miritini BRT (CBD – Changamwe - Miritini) ・ P3: North-South BRT (Kisauni – Mombasa Gate Bridge - SEZ/Likoni) ・ P7: Matatu regional regulation, Feeder matatu/bus ・ P8: Enlargement of matatu/bus fleet size	・ P1: Elevated Mass Rapid Transit for island loop line ・ P3: North-South BRT expansion to Old Malindi Rd. in Kisauni ・ P7: Matatu regional regulation, Feeder matatu/bus
Likoni Ferry		・ R10: Passenger + NMV exclusive service after the Mombasa Gate Bridge open.	

Note: 1) This includes road network improvement in adjacent regions of Kwale County considering that these regions are closely related to the development of the Southern Region of Mombasa County.
Source: JICA Expert Team

10.4 Analysis on Development Plan

10.4.1 Scenario Analysis by STRADA

The development scenarios in Table 10.3.11 were analysed using JICA STRADA (as explained in the Appendix) as shown in Table 10.4.1 below.

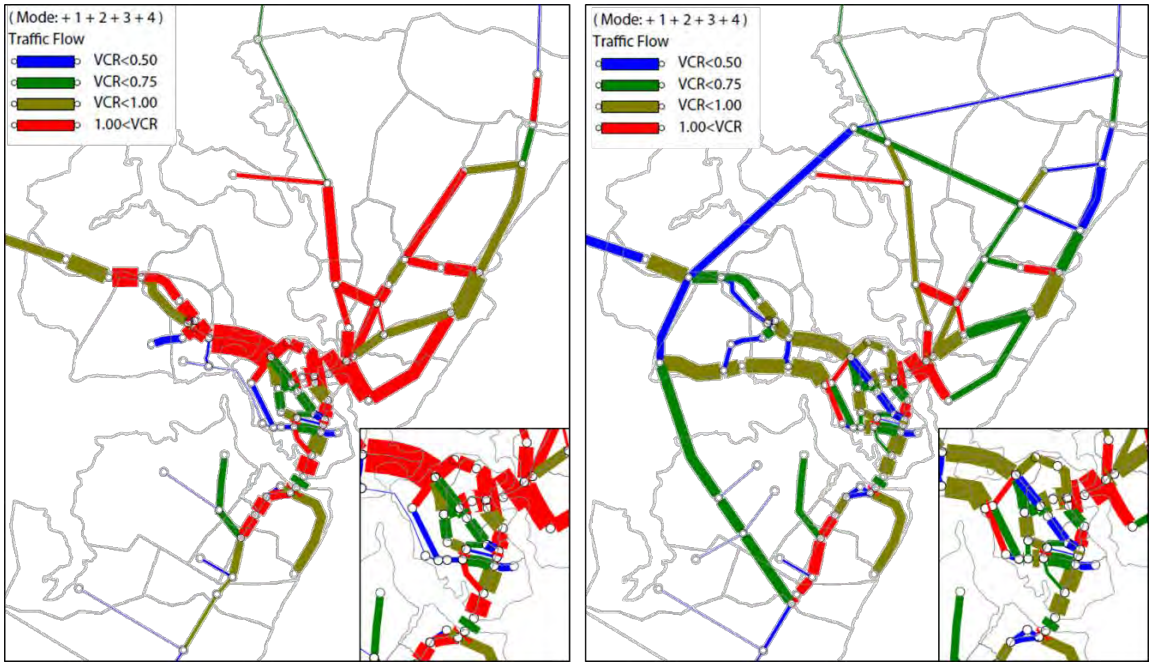
Table 10.4.1: Cases Used for Scenario Analysis

Cases	2020	2030	2040
Without	With the 2015 condition.	With the master plan scenario of 2020.	With the master plan scenario of 2020.
+Road	With the master plan scenario of 2020.	With the master plan road upgrade of 2030	With the master plan road upgrade of 2040
+MRT	---	With the master plan road upgrade and MRT of 2030	With the master plan road upgrade and MRT of 2040

Source: JICA Expert Team

The results are depicted as the output of the JICA STRADA network model, which shows the level of congestion and traffic concentration in the network. Scenarios were then evaluated by various macroscopic criteria (i.e., aggregated vehicle travel hours, vehicle-km) for each scenario. The differences between the "with","+Road" and "+MRT" cases demonstrate the benefit of the master plan scenario implementation. Following these metrics, the summary/description of the results are as follows.

(1) Case 2020



Source: JICA Expert Team

Figure 10.4.1: Assignment Results: 2020 (left: without; right: with)

Table 10.4.2: Evaluative Metrics: 2020

Case	Total Vehicle km (PCU-km)	Total Vehicle Hours (PCU-Hour)	Average Speed (km/h)	Average VCR
Without	4,042,478	207,029	19.5	0.84
+Road	4,768,597	144,166	33.1	0.53

・ Modal Share in PCU-km

Case	Private Car	Bus/Matatu	Taxi	Freight
Without	1,236,348	895,182	868,061	1,042,886
+Road	1,259,032	1,259,378	1,186,062	1,064,126

・ Modal Share in Number of Interzonal Passenger Trips

Case	Private Car	Bus/Matatu	Taxi	BRT	Elevated MRT
Without	212,000	626,000	277,000	--	--

Source: JICA Expert Team

1) Positive Aspects

The MSBR and Northern Bypass succeed in capturing a great deal of traffic and alleviating congestion on some focal points of the road network, particularly, traffic in Nyali is diverted to the Bamburi Link (capturing cement delivery traffic). Additionally, traffic in Likoni and the Ferry crossing are alleviated by the MSBR. MSBR is mostly uncongested (indicated by its green colour in the STRADA output) due to its large road capacity. The Kipevu-Shimanzi Link absorbs traffic from Makupa Causeway as well.

Vehicle operation speeds improve dramatically due to the high speed capacity of the bypass roads. At the same time, while travel distances to traverse the bypass roads increase, total travel hours are reduced, with the speed overcoming the increased distance.

2) Negative Aspects

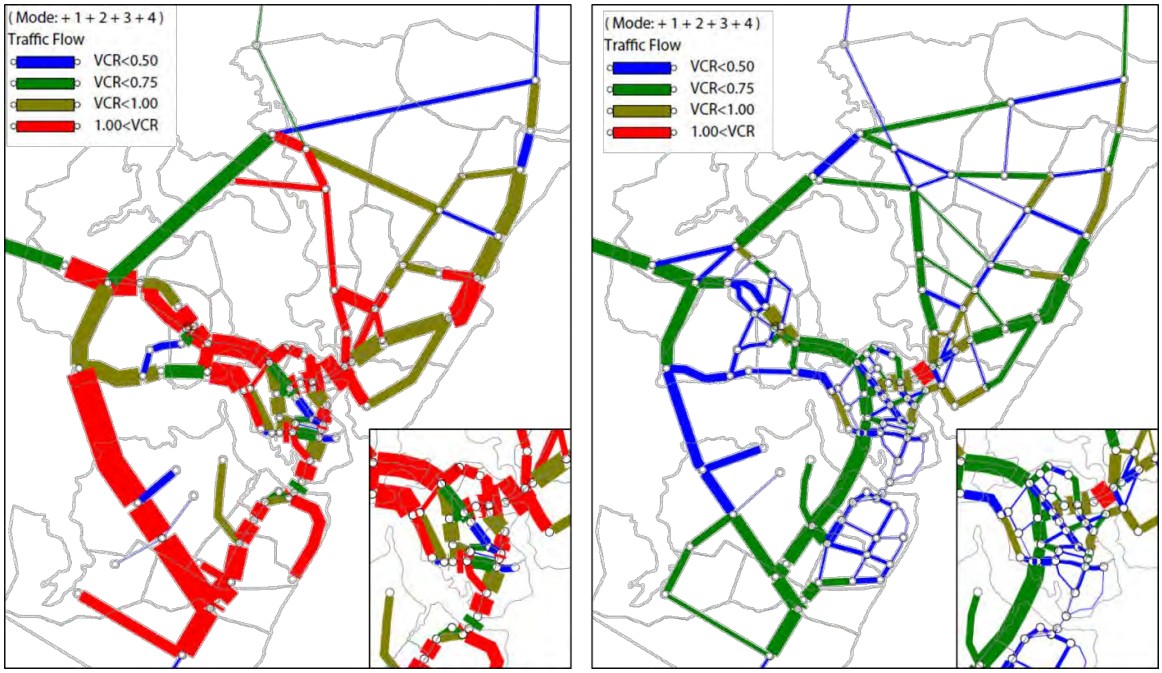
Nyali Crossing will continue to be congested due to population growth and increased motorisation in Mainland North, which will require proper traffic management measures. Kengeleni (Mwakirunge)

Road can be a shortcut in the network, but it first requires proper traffic control (signalling) and widening. Although the sections in Likoni to connect with the MSBR may be overloaded even in the +Road case, additional measures were not considered as the parallel road to these sections will be constructed to connect the MSBR and the Mombasa Gate Bridge by 2030.

3) Recommendation

The investments in the bypass roads have a great impact to the Mombasa road network. The implementation of other pipeline projects, included in the "With" scenario, should be secured. The Shimanzi-Kipevu Link will divert traffic from congested Changamwe, indicating the importance of its shortcut function. The existing Mombasa road network does not have the capacity to handle its own traffic in the near future. The other minor network improvements are necessary.

(2) Case 2030



Source: JICA Expert Team

Figure 10.4.2: Assignment Results: 2030 (left: without; right: +MRT Case)

Table 10.4.3: Evaluative Metrics: 2030

Case	Total Vehicle km (PCU-km)	Total Vehicle Hours (PCU-Hour)	Average Speed (km/h)	Average VCR
Without	7,937,974	315,801	25.1	0.88
+Road	6,289,404	170,314	36.9	0.52
+MRT	5,441,366	138,459	39.3	0.45

・ Modal Share in PCU-km

Case	Private Car	Bus/Matatu	Taxi	Freight
Without	3,054,184	1,892,476	1,620,100	1,371,214
+Road	2,344,776	1,427,202	1,230,314	1,287,111
+MRT	1,938,915	1,236,617	990,873	1,274,962

・ Modal Share in Number of Interzonal Passenger Trips

Case	Private Car	Bus/Matatu	Taxi	BRT	Elevated MRT
Without	344,000	854,000	339,000	--	--
+MRT	284,000	740,000	276,000	166,000	72,000

Source: JICA Expert Team

1) Positive Aspects

The major change in the road network between the two cases are: (i) Mombasa Gate Bridge (R3), (ii) Second Nyali Bridge (R2), (iii) 1 km grid in the mainland areas, and (iv) MRT between Ferry and Nyali. The assignment results show a large traffic diversion at the Mombasa Gate Bridge, because the model restricted motorised vehicles from crossing the Ferry. With the new Mombasa Gate Bridge, demand has been induced between Kwale/Likoni and Mombasa Island. (The local areas (Likoni Town, etc.) can be spared from the effects of this through traffic if the bridge is well located as a direct connector to the MSBR (S1). Most passengers will continue to walk to the Ferry, or take mass transit.)

2) Negative Aspects

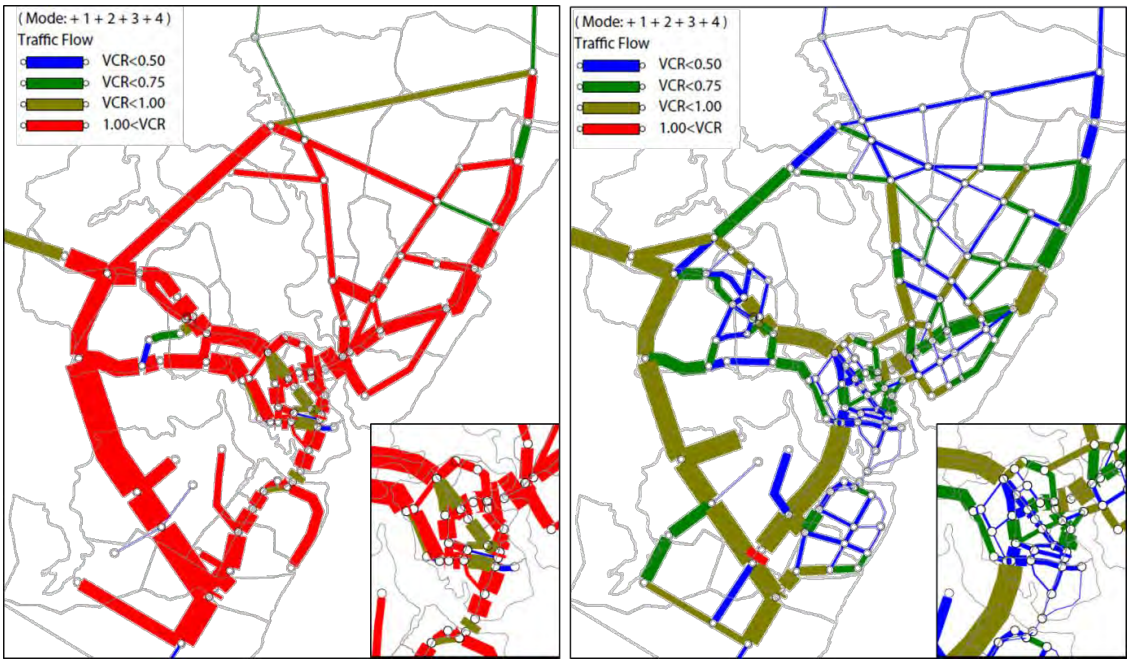
Although there could still be congestion at the Nyali Bridge section even in the +MRT case, the level of congestion could be manageable. The traffic in the adjacent sections would be alleviated due to the development of the Second Nyali Bridge.

3) Recommendation

The Mombasa Gate Bridge, the Simanji-Kipevu Link and the MSBR constitute the Infinite Industrial Loop around the Dongo Kundu Bay area, attract major traffic flow into the loop, and alleviate the congestions in the region. The Mombasa Gate Bridge is the core of this function and its development is essential.

The results also show the influence of MRT installation. The total vehicle-km and vehicle-hours for the "+Road" case has decreased due to the road network improvement. Moreover, in the "+MRT" case, both metrics decreased, as well as resulting in an improvement of average speed. It can be said that road development with MRT is essential to conquering the problem of increased motorisation that is inevitable in Mombasa County as incomes rise.

(3) Case 2040



Source: JICA Expert Team

Figure 10.4.3: Assignment Results: 2040 (left: without; right: +MRT Case)

Table 10.4.4: Evaluative Metrics: 2040

Case	Total Vehicle km (PCU-km)	Total Vehicle Hours (PCU-Hour)	Average Speed (km/h)	Average VCR
Without	11,374,567	572,945	19.9	1.25
+Road	9,065,436	278,442	32.6	0.65
+MRT	7,441,886	205,342	36.2	0.53

・ Modal Share in PCU-km

Case	Private Car	Bus/Matatu	Taxi	Freight
Without	4,765,301	2,658,287	2,114,592	1,836,387
+Road	3,662,457	2,052,657	1,615,848	1,734,474
+MRT	2,797,576	1,720,440	1,204,806	1,719,064

・ Modal Share in Number of Interzonal Passenger Trips

Case	Private Car	Bus/Matatu	Taxi	BRT	Elevated MRT
Without	506,000	1,159,000	425,000	--	--
+MRT	396,000	976,000	328,000	244,000	156,000

Source: JICA Expert Team

1) Positive Aspects

The major changes in 2040 include the Third Nyali Bridge as well as reorganisation of freight traffic resulting from internal port reorganisations. The Third Nyali Bridge succeeds in capturing trips from the existing crossing, as well as diverting traffic away from the congested CBD/island areas toward the hyper corridor and then to Mainland South. The widening of A109 in Changamwe will keep the traffic in the section manageable.

2) Negative Aspects

There is no apparent negative impact in the analysis for the MRT case.

3) Recommendation

Once again, the importance of MRT cannot be understated – the network is further expanded in the island to include the Loop Line, capturing trips that would otherwise be on congestion-prone taxis or private cars. Overall impacts on vehicle-km and vehicle-hours are significant when MRT is included. MRT is essential by 2040 – without it, the city will be in complete gridlock.

10.5 Thematic Analysis

Given the structure plans (Section 10.3) and quantitative analysis of road/MRT development (Section 10.4), the following sections examine specific themes common to discussions of the future of transportation in Mombasa County:

a) Nyali Corridor: dealing with high transport demand in the future
b) Changamwe-Jomvu Freight Congestion: how the Northern Economic Corridor can grow whilst the Gate City controls traffic
c) New Crossings: how the Mombasa Gate Bridge and Second Nyali Bridge influence CBD traffic
d) Missing Links: the effects of a Lumumba-Moi missing link construction, and traffic calming measures
e) Mass Transit: options and facilitation
f) Institutional Arrangement: Who operates? Who manages?

10.5.1 The Nyali Corridor

The Northern Bypass and Bamburi Link will absorb traffic after 2020, but the Second Nyali Bridge and elevated/exclusive mass transit corridors are necessary in 2030/2040. The investment scenarios are justified in Table 10.5.1 below:

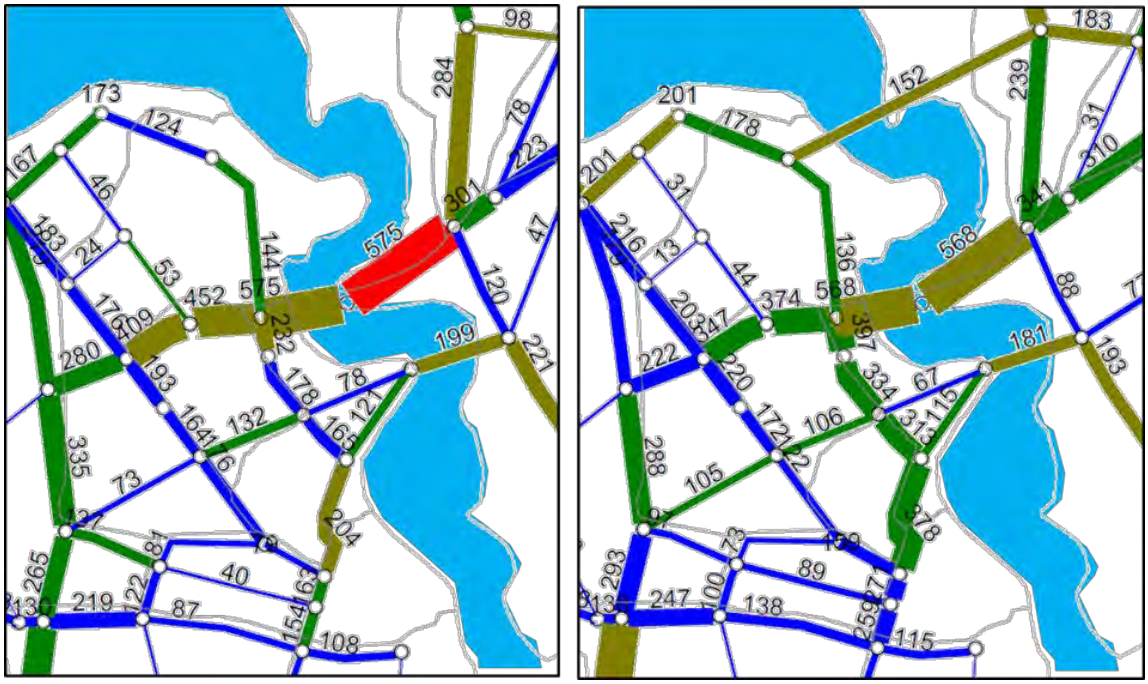
Table 10.5.1: Nyali Corridor Development Strategy with +MRT Cases

Period	2020	2030	2040
Estimated PCU per hour per direction	4,600 (estimated ADT in PCU – 76,400, 12% peak ratio is applied)	4,600 (estimated ADT in PCU – 77,400, 12% peak ratio is applied)	5,400 (estimated ADT in PCU – 90,100, 12% peak ratio is applied)
MRT function	(none, matatu only)	With MRT (MRT + Bus)	With MRT (MRT + Bus)
PCU capacity	Nyali Bridge: 2.5 lanes – 4500, 3 lanes - 5400 and 4 lanes – 7200	Nyali bridge: 2.5 lanes, 4500 Second Nyali Bridge: 1 lane, 1600	Nyali Bridge, 2.5 lanes: 4500 Second Nyali Bridge: 1600 Third Nyali Bridge: 1600
Load Ratio of the Nyali Bridge section	2.5 lanes: 1.02 3 lanes: 0.85 4 lanes: 0.63	Without Second Nyali: 1.02 With Second Nyali: 0.66	Without Second or Third Nyali: 1.2 With Second Nyali only:0.84 With all: 0.50
Solutions	・ Traffic management, intersection improvement in junctions for both ends ・ Try modifications to Nyali Bridge to include reversible lane ・ Matatu size enlargement regulations ・ Regulation of handcart in peak hour	・ Second Nyali is necessary but MRT functions are also necessary ・ TDM for Northern Bypass diversion, time staggering commuting, matatu regional operational regulation are needed.	・ Third Nyali Bridge can be justified but need further analysis

Source: JICA Expert Team

Figure 10.5.1 explains the situation of Nyali Corridor motorised vehicle traffic for 2020, 2030, and 2040, referring to the network analysis results of +MRT cases (+Road case for 2020). The peak hourly and directional motorised vehicle traffic volumes were estimated assuming the peak hour ratio at 12%. The PCU capacity[1] was extracted from the highway capacity standards, as very ideal case, and loading ratio are estimated.

[1] Design Manual for Roads and Bridges, The Highway Agency, UK, applying UAP 1 dual carriageway



Source: JICA Expert Team

Figure 10.5.1: Nyali Corridor Traffic Demand (in PCU x 100) – Left: 2030, Right: 2040

Situation in 2020: The existing Nyali Bridge provides two full carriageway (3.5 m x 2) and one service lane for non-motorised vehicle (NMV) (2.5 m), however, this cross sectional design can be modified to three lanes (3.15 m x 3 per direction, no NMV flow in peak) after opening of the Northern Bypass or by installing reversible lanes using the other direction, the capacity can be improved to accommodate the existing traffic. Of course, the present saturation is fully attributed to the intersection management at both ends of the Nyali Bridge, and serious intersection improvement is required for the initial improvement. The handcart is too influential to traffic flow and can be regulated only in peak hours. Enlargement of matatu is also a necessary intervention. The Northern Bypass will be traversed by heavy freight and the lanes can be reorganised for smaller vehicles. Similar approaches were applied in Tokyo and London in 2000s.

Situation in 2030: this analysis explains the necessity of the Second Nyali Bridge. Due to the installation of MRTs, the PCU is smaller than the without case. The JICA Expert Team proposes to keep three lanes for passenger and one lane for bus service (P3) for the peak direction, and two lanes for the other direction, expected to alleviate traffic congestion even on the new bridge. It can be said that the addition of the Second Nyali Bridge is necessary in terms of traffic loading aspect, as well as minimising traffic management in the intersections of both ends. The TDM approaches for staggering of commuting hours, sharing of rides, and diversion to Northern Bypass can be considered to alleviate the continuous traffic situation.

Situation in 2040: this analysis suggests the necessity of the Third Nyali Bridge. According to the present simulation, it can be said that the bridge function can be justified; however, further and continuous analysis should be done with updated land use and future population.

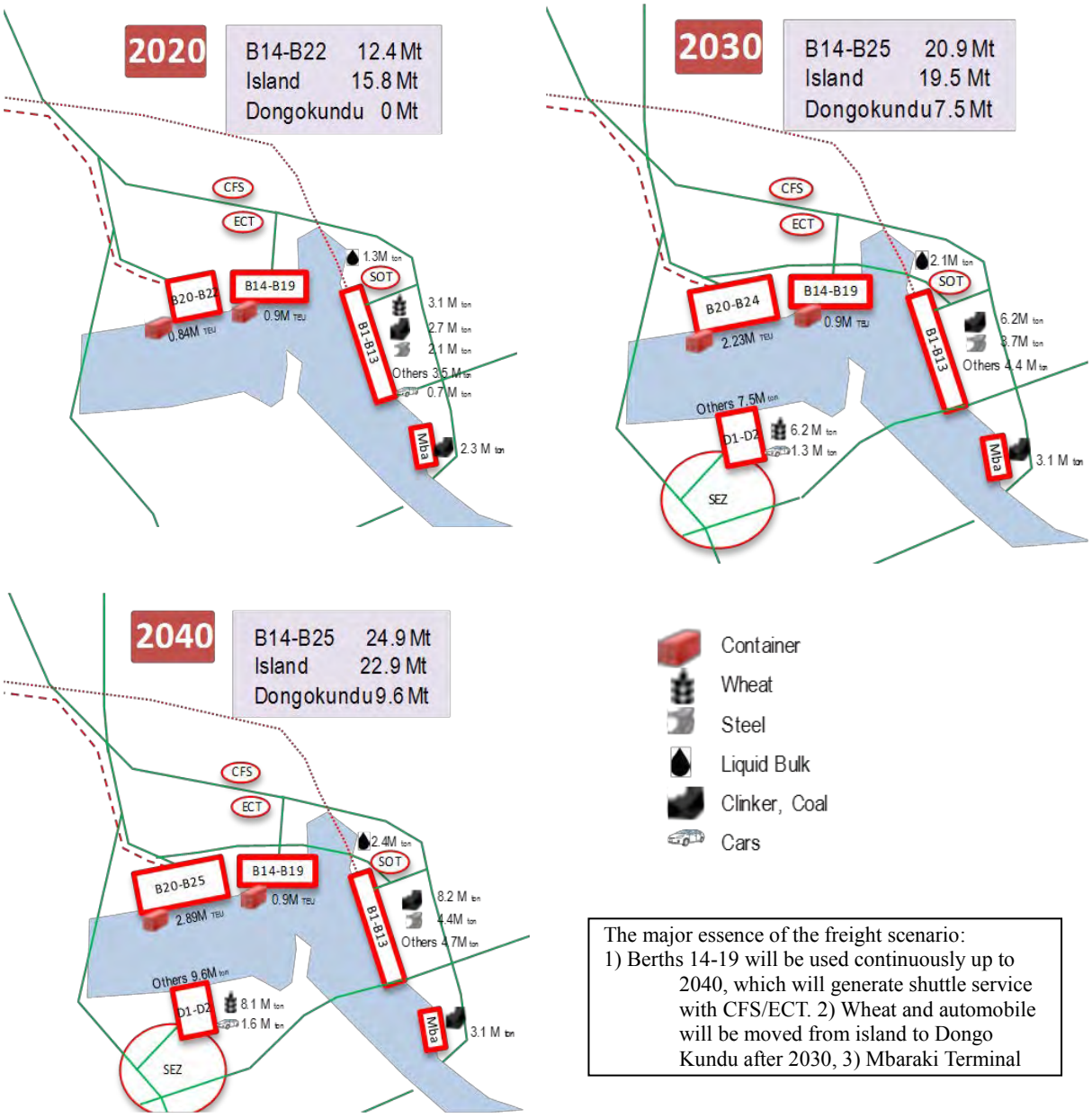
It should be noted that the bridge construction in the channel needs large investment than ordinary road development, and was a bottleneck of Mombasa County since the 1971 master plan implementation. The TDM and traffic management methodology should be prioritised than construction, as noted.

10.5.2 Freight Movements in Mombasa County (As the Gate of Northern Corridor)

This section discusses the management of the freight traffic along Makupa Causeway, Changamwe, and Jomvu in the future. The diagram and rough calculation shall present the result of simulation, instead of the output of traffic model, which has shortage in expressing micro and specific modes.

(1) The Future Freight Scenario

Figure 10.5.2 depicts the model of network development, expected function of port, and forecasted annual handling import amount at the port.



Source: JICA Expert Team

Figure 10.5.2: Maritime Import Freight Distribution Scenario for 2020, 2030 and 2040

Table 10.5.2: Maritime Import Freight Demand with Classification in the Port of Mombasa

	2015	2020	2030	2040
Container TEU	1.0 M	1.74 M	3.131 M	3.789 M
Handled in Berths 14-19	1.0 M	0.90 M	0.9 M	0.90 M
Handled in Berths 20-25	--	0.84 M	2.23 M	2.89 M
Drybulk in Island	11.0 Mt	15.8Mt	19.5Mt	22.9Mt
Drybulk in Dongo Kundu	--	--	7.5Mt	9.6Mt

Source: JICA Expert Team

The JICA Expert Team refers to the Dongo Kundu Port study, prepared by the other JICA Expert Team in October 2015, for the whole scenario of the port handling quantity. This master plan shows the following:

- The master plan forecasts the port freight demand for all berths with type of commodity in DWT with practical berth expansion scenario, including Berths 20-25 and Dongo Kundu, which clarify the locations of land traffic generation and attraction.
- The forecasts consider the influence of containerisation, shift of bulk terminal from Mombasa Island to Dongo Kundu for 2020, 2025, 2030, and 2035. The Gate City Master Plan adopted these figures as the base case scenario. Being conservative in forecast, the Gate City Master Plan adopted the port study's forecast for 2035 as the figures in 2040.
- Note that the Northern Economic Corridor Master Plan Study adopted[2] the forecast of the Dongo Kundu Port Study, and there is no gap amongst these three JICA studies.
- The following text describes the movements from Mombasa to upcountries due to its biased demand; however, the model covers both directional movements.

Table 10.5.3: Freight-related Development Scenario

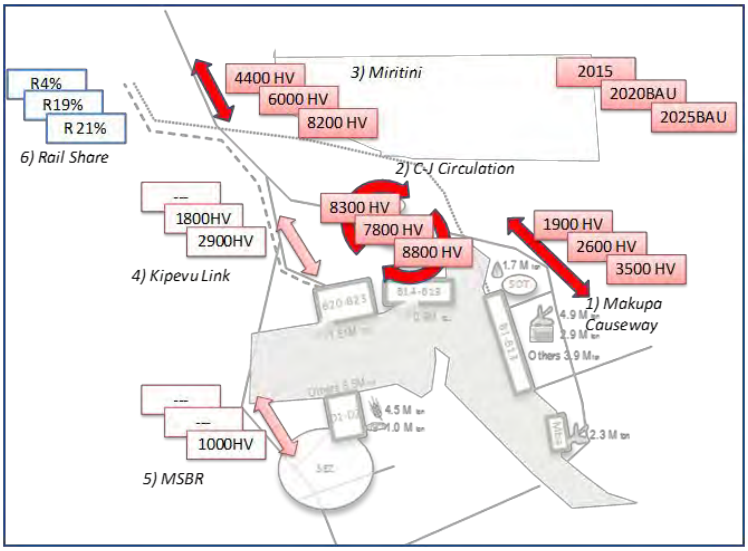
Period	Short-Medium Term (2015-2025)	Medium-Long Term (2025-2035)
Approach	Provide alternative corridor for the freight traffic	Complete the Trident Approach
BAU Solutions	・ SGR to Berths 20-21 ・ Kipevu Link to Berths 20-21 ・ Southern Bypass ・ Divert the bulk terminal function to Dongo Kundu	・ Divert the bulk terminal function to Dongo Kundu
Proposed Solutions	・ Shimanzi-Kipevu Link (R1) ・ Gate Bridge (R3 – by 2025) ・ MSBR-Gate Bridge Connection (S1) ・ CFS/ECT rationalisation (R10/11)- 30-40% rationalisation in delivery traffic	・ CFS/ECT rationalisation (R10/11)- 40-50% rationalisation in delivery traffic ・ MSBR extension to Mariakani/Nairobi (2030)
Unconsidered Solution		・ SGR extension to Berth 1-10

Source: JICA Expert Team

[2] JICA Master Plan on Logistics in Northern Economic Corridor Interim Report, P5-42

(2) Short-Medium Term Situation with BAU Scenario

The analysis evaluated the heavy vehicle (HV, more than 4-axle truck and trailers) circulation at the three focal locations along the Northern Corridor in Mombasa County, i.e.: 1) Makupa causeway, 2) Changamwe-Jomvu Circulation, and 3) Miritini. The figure depicts the forecasted daily port-related traffic volume for 2015, 2020, and 2025, under the situation of the BAU solutions.



Source: JICA Expert Team

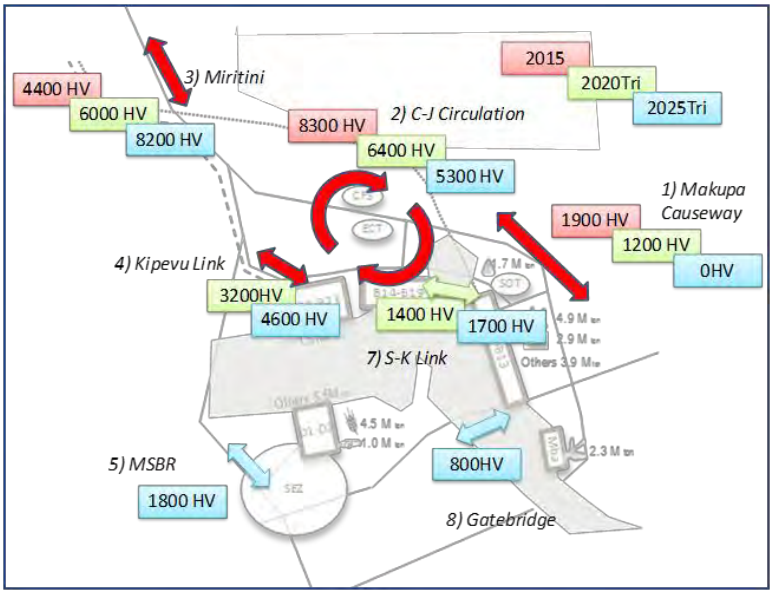
Figure 10.5.3: BAU Situation in Short-Medium Term

On 1) Makupa Causeway, the traffic will increase from 1900 HV to 3500 HV, due to high concentration of bulk in the island. The shift of bulk terminal from the island to Dongo Kundu does not work much. 2) Changamwe – Jomvu circulation will be alleviated slightly in 2020, due to diversion to 4) Kipevu Link (1800 HV), however, the added traffic from/to the island will worsen the situation in 2025. Note that Berths 14-19 will handle 0.90 million TEU annually, which is the equivalent amount in 2013, which needs CFS/ECT pickup.

3) The HV volume will be doubled in 2025 due to high import demands from upcountry. The SGR/MGR will absorb the 19-21% of freight movement; however, it can access to the container terminal and bulk traffic will not be absorbed by rail. Moreover, the wheat terminal who has good connection with MGR shall be shifted to Dongo Kundu, giving negative impact on the rail share.

(3) Short-Medium Term Situation (2015-2020-2030) with Master Plan Proposals (Trident Strategy)

The traffic forecast presented in 10.4.1 indicated the importance of developing the "Infinite Industrial Loop" that will attract a great deal of traffic including the freight traffic in Mombasa Country. Figure 10.5.4 shows the situation of the HV traffic volume with the Trident Approach, i.e., applying Shimanzi-Kipevu Link (by 2020) and Gate Bridge (before 2030).



Source: JICA Expert Team

Figure 10.5.4: Trident Strategy Situation in Short-Medium Term

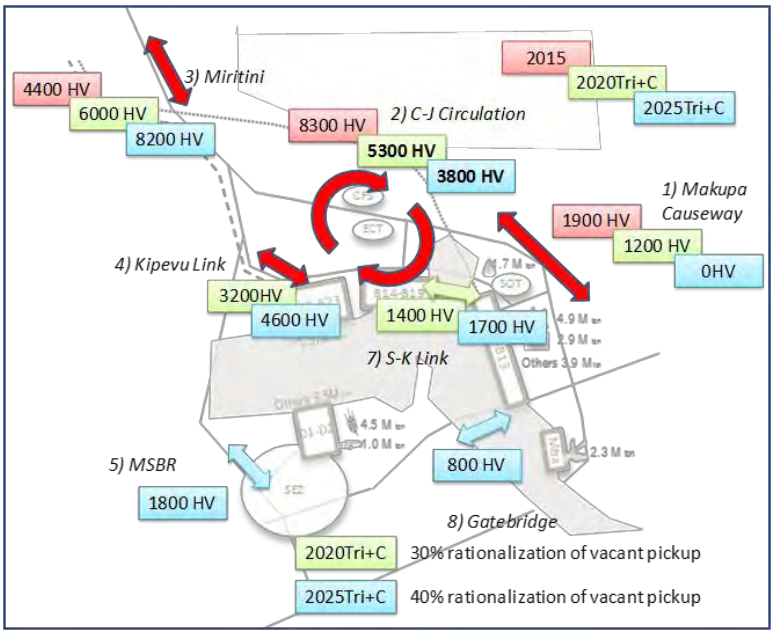
The situation of 1) Makupa Causeway can be dramatically changed; the traffic from Shimanzi will pass through the 7) S-K link and 8) Mombasa Gate Bridge. 2) C-J circulation will be shrunk due to the decrease of the island. 3) Miritini traffic is same to the BAU case. 4)

The Kipevu link traffic and 5) MSBR traffic will be increased due to the traffic from the island, which will improve the feasibility and necessity of the MSBR.

(4) Short-Medium Term Situation (2015-2020-2030) with Master Plan Proposals (Trident + CFS/ECT Rationalisation)

In addition to the Trident Approach, the rationalisation of the CFS/ECT delivery influence was considered in the previous scenario. The scenario assumes 30% of rationalisation of pick up vacant delivery were integrated between CFS and ECT in 2020, and 40% in 2025.

The 2) Changamwe-Jomvu circulation will be influenced by the intervention, and traffic decreased to 3800 HV, equivalent to the situation in Mombasa County in 2011.



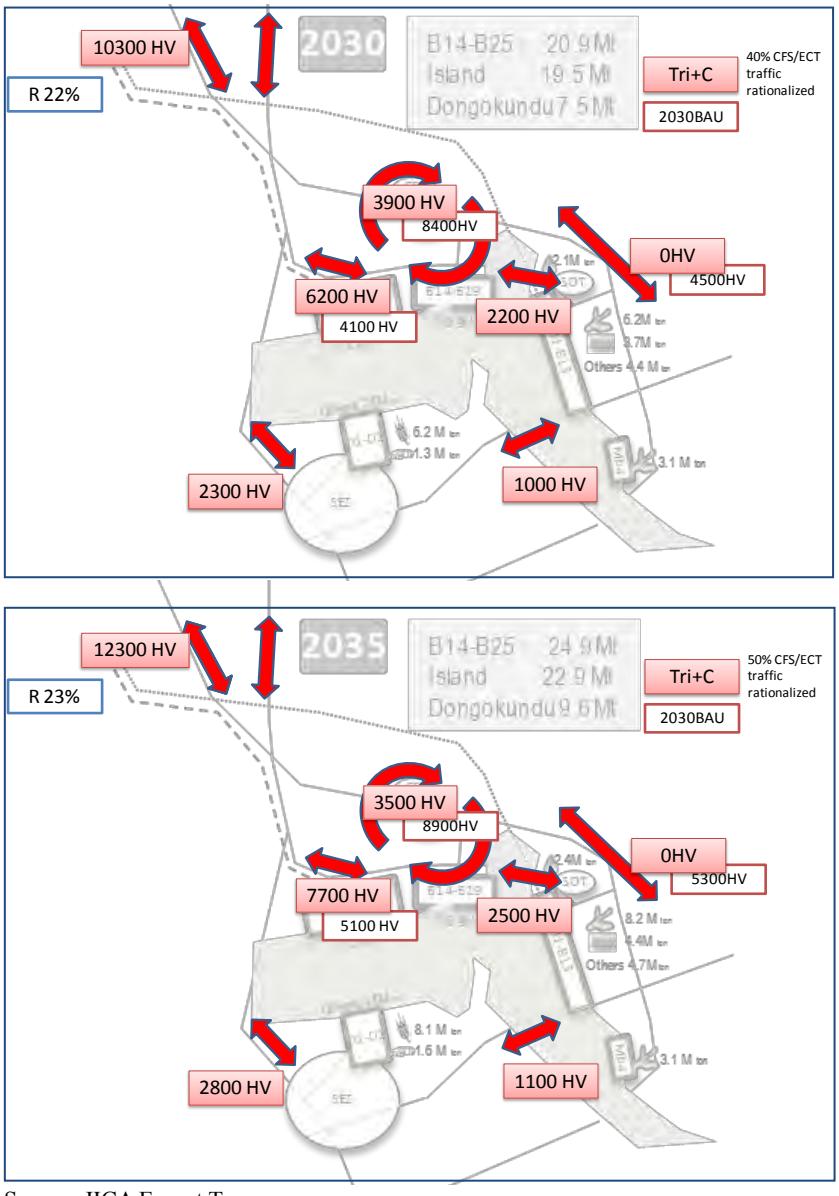
Source: JICA Expert Team

Figure 10.5.5: Trident + CFS Scenario in Short-Medium

(5) Medium-Long Term Situation (2030-2035)

The situation in 2030 and 2035 was forecasted between BAU case and proposed solutions, assuming that CFS/ECT rationalisation ratio will be 40% in 2030, and 50% in 2035.

1) The Makupa Causeway can avoid the port freight-related HV in the long term. 2) C-J circulation will keep the level of 2010 due to CFS/ECT rationalisation. 3) Miritini HV traffic goes beyond 10,000, which can be shared by the ordinal A109 and extension of MSBR to Mariakani/Nairobi (NEC MP proposal). 4) Kipevu Link and 5) MSBR with high road design standards can absorb high volume of traffic, which will justify the necessity of MSBR. 6) The rail share was assumed as 22-23%, which NEC Master Plan proposed as the medium scenario; however, the SGR extension to the bulk terminal may absorb more traffic from the island.



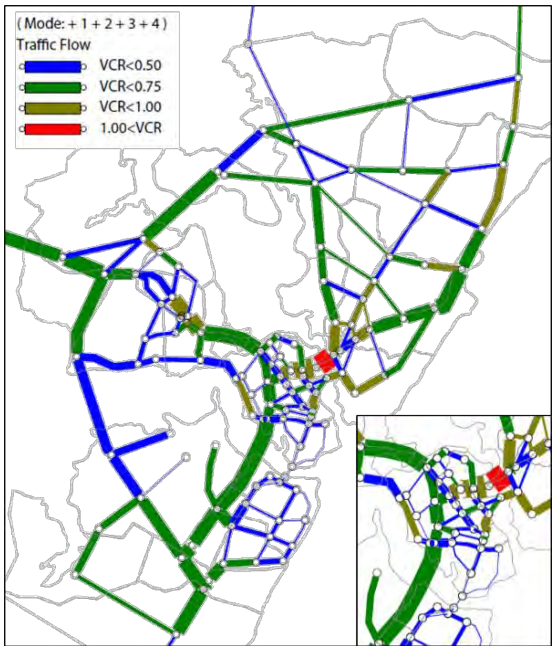
Source: JICA Expert Team

Figure 10.5.6: Trident + CFS Scenario in Medium-Long Term

(6) Harmonise with the Passenger Traffic

Referring to the whole Mombasa County situation in 2030 with +MRT case (right), this scenario contains effects of the Trident Approach and the CFS/ECT optimisation scenario.

On simulation, on the Makupa Causeway, port freight vehicle is virtually regulated to run and diverted to the Shimanzi-Kipevu Link and Mombasa Gate Bridge. The passenger will use the Makupa Causeway, without conflict with freight vehicle, and the congestion in Changamwe/Jomvu is alleviated due to less circulation of CFS/ECT delivery.

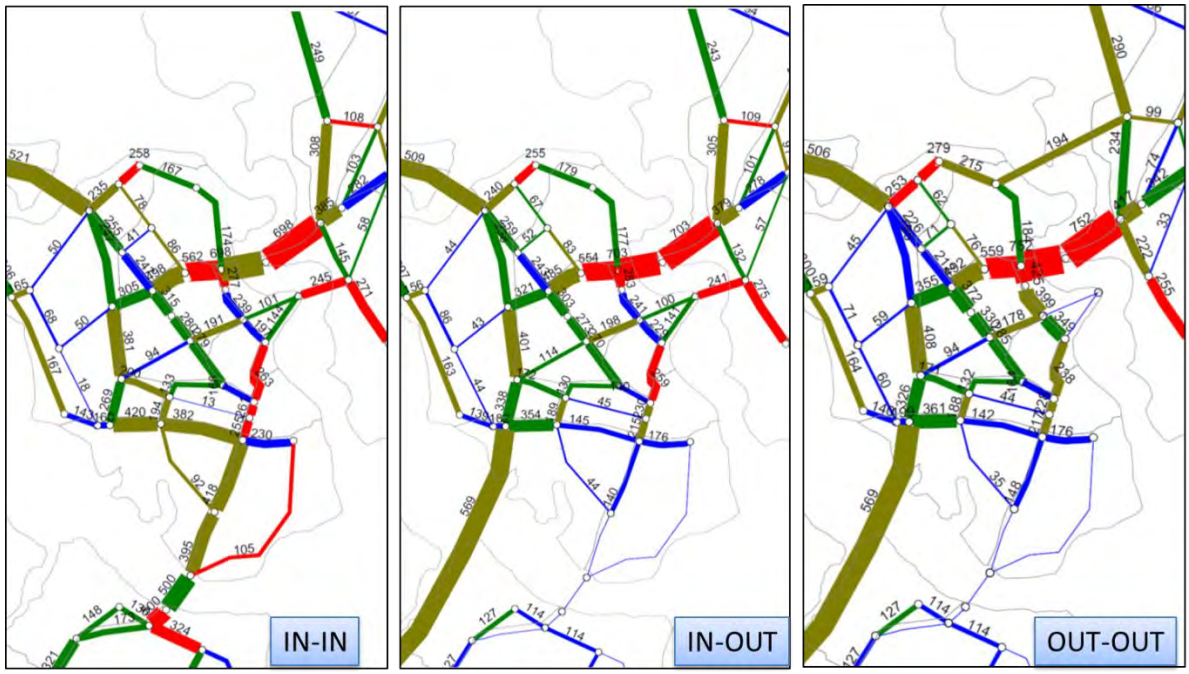


Source: JICA Expert Team

Figure 10.5.7: Harmonised Situation between Freight and Passenger Traffic in Medium Term

10.5.3 Combination of Bridges

The options of combination of locations of Second Nyali Bridge (R2) and Mombasa Gate Bridge (R3) will give different impact to the traffic situation in Mombasa Island. A comparison analysis for 2030 of the +Road scenario is shown in Figure 10.5.8. The IN-IN case (left) is a combination of the inner side of both bridges. The OUT-OUT case (right) is a combination of the outer side. The IN-OUT (centre) is a combination of the inner Second Nyali location with the outer Gate Bridge location.



Source: JICA Expert Team

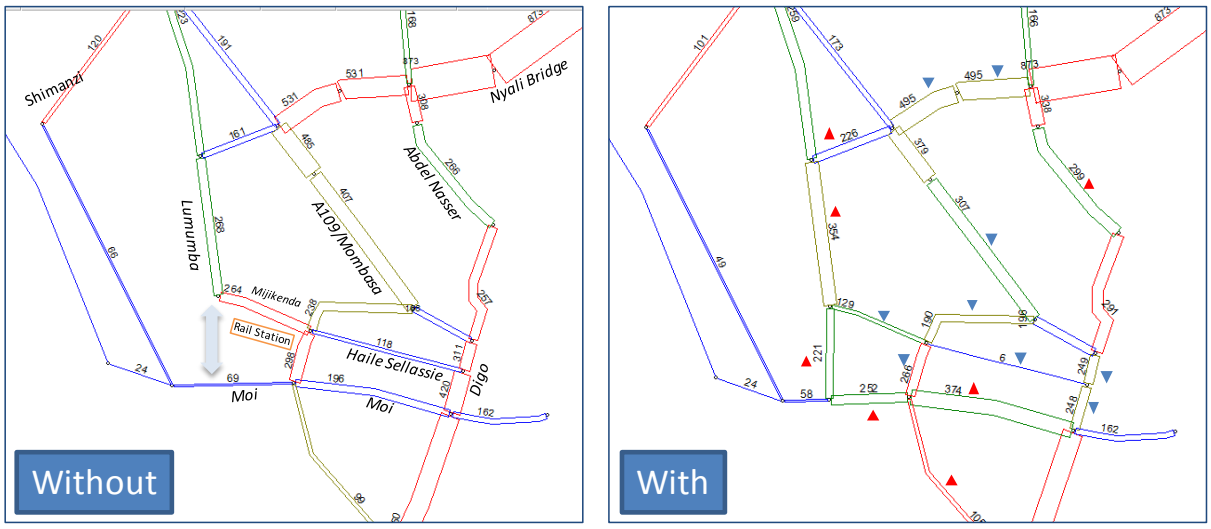
Figure 10.5.8: Proposed Shimanzi-Kipevu Link Connecting to the Ongoing Kipevu Link Construction

The IN-IN case (left) will bring traffic to Nyerere and Digo, Moi, and Likoni which cannot expect traffic calming in the CBD area. The IN-OUT case can realise traffic calming in Kizingo and Digo, and minimise the traffic on the Nyali Bridge. The OUT-OUT case can minimise the traffic in the CBD, but the traffic on Nyali Bridge will increase.

According to this simple comparison, the JICA Expert Team recommends that the location of the Second Nyali Bridge can be the location proposed by KURA. It should be noted that the ring road function connecting the Second Nyali Bridge to Kisauni Road (M5-2) traverses the traffic from CBD. The JICA Expert Team recommends that the ring road project (M5) should be implemented with the Second Nyali Bridge (R2).

10.5.4 Lumumba-Moi Link (M6) and Traffic Calming (M3/M8)

Figure 10.5.9 shows the impact of the missing link development in the island (M6, Lumumba-Moi Link behind the railway), assuming the situation in 2015.



Source: JICA Expert Team

Figure 10.5.9: Application of Lumumba-Moi Link to the 2015 Network

The case of "with" shows the influence of the hyper corridor development in the island. The sectional traffic in Digo, Mombasa County (A109) and Mijikenda are reduced, which are major bottlenecks of Mombasa County. The traffic on Moi, Abdel Nasser, and Lumumba has increased; these, however, have enough capacity to handle the additional traffic. It is noted that the traffic on Haile Selassie comes much smaller, which confirms applicability of the car-free policy. Consequently, the opening of the missing link will divert MV traffic from Digo Road to the hyper corridor, and initiate the structure of ring and radial network in Mombasa County.

Source: Urb-i

Figure 10.5.10: Example; Traffic Calming Application

The JICA Expert Team will note the direction of traffic calming here. The Moi Avenue is the historical axis of Mombasa County. It accommodates the Tusks Monument now and its buildings show large variety of historical design but it is occupied with tenants of second-hand vehicles, and its wide stretches are not straight. The JICA Expert Team proposes that Moi Avenue can have a more businesslike atmosphere, and accommodate the elevated structure for passenger transport. On the other hand, the Haile Selassie connects the rail station and CBD with 1 km very straight stretch with vista design, which suggests that the UK urban planning until 1950 considered the Haile Selassie Road as the axis of urbanisation. The JICA Expert Team proposes to conserve the Haile Selassie Road as a historical monument with traffic calming policy (M3/M8). The roundabout in front of the railway station can be closed partially and integrated with the Haile Selassie Road.

The typical example for design application can be illustrated with the photo in the right (Bucharest, 2008 to 2014, source: Urb-i). The centre divider can be renovated as pedestrian zone with proper street furniture (bollards), providing one lane to each direction for local traffic function. It requires the combination of off-street parking development in the surrounding (M9).

10.5.5 Mass Transit Operation Alternatives

As the proposed P1 and P2 projects, the mass transit proposal shall be programmed as one of the large investments in Mombasa County before 2030, and the following will note about the detailed plans for P1 and P2, with numerical analysis for demand and initial feasibility review:

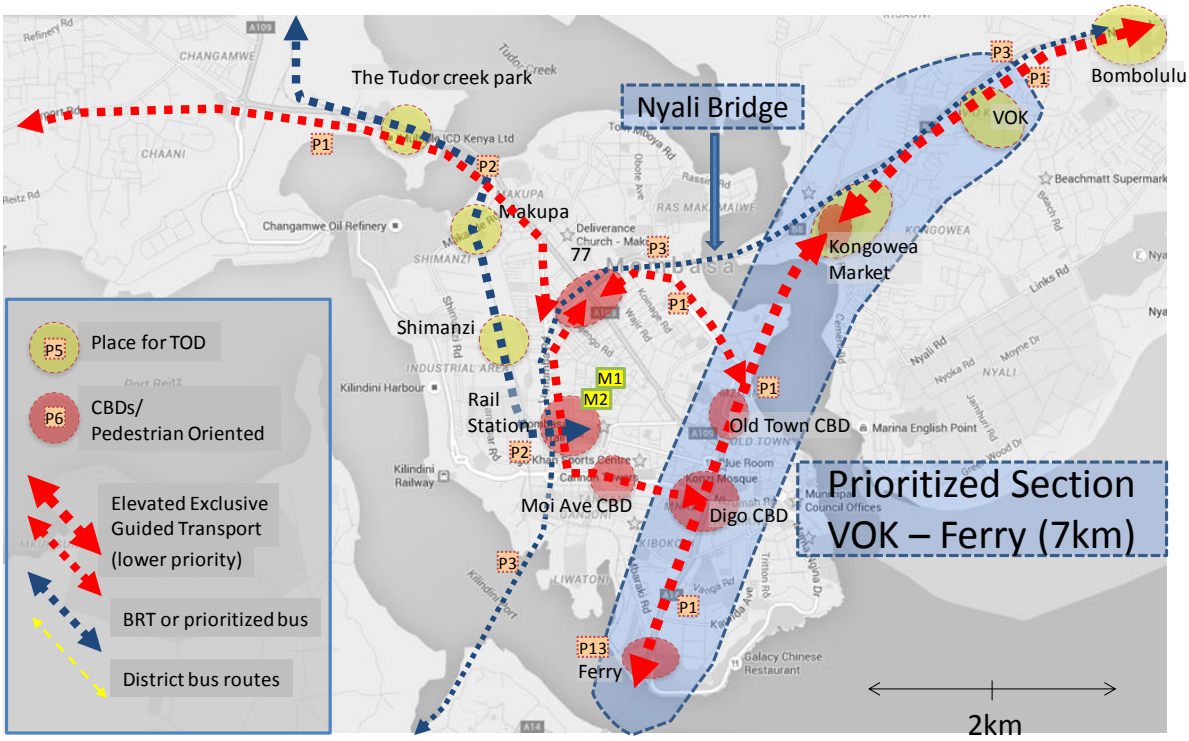
(1) P1 MRT Ferry-VOK-City Mall Line

The first phase will cover the Ferry-VOK (7 km) section, and the second phase will cover the extension from VOK to City Mall (3 km), adding the 6 km loop in Mvita. The rough alignment conceptual design can be summarised for the Ferry – VOK – City Mall section as follows:

Table 10.5.4: Mass Transit Alignment for Ferry – VOK – City Mall

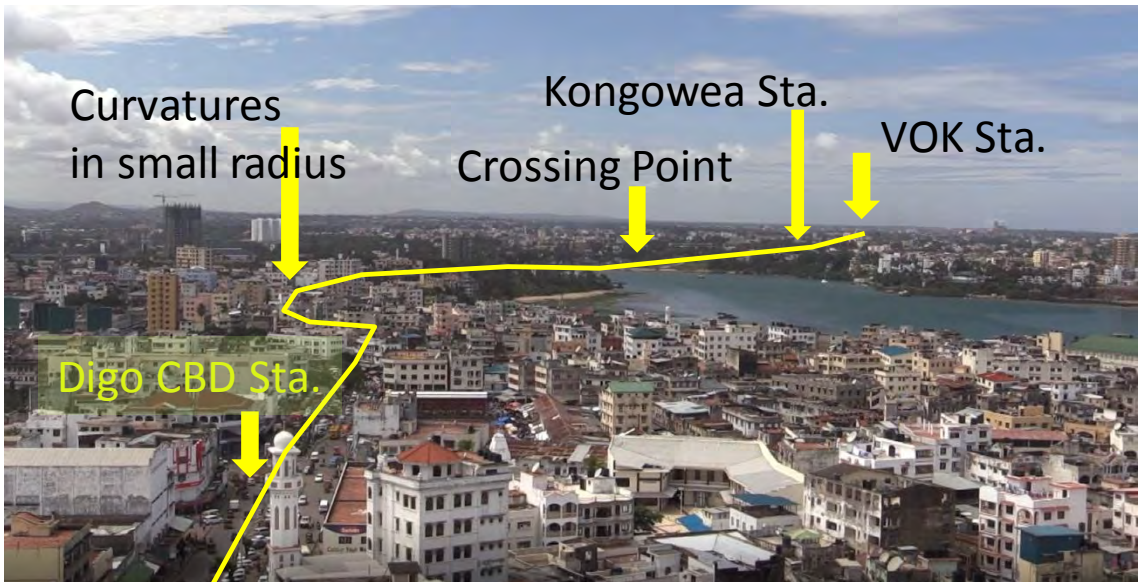
Station	Description
Ferry	・ Need to be well connected with ferry, as high volume concentration, and well connected with commercial facility development. PFI investment for commercial centre development with ferry terminal function is to be proposed by a private group, and CGM must coordinate the development approval for the proper passenger transferring function (0 km) ・ Need crossing for lane change (scissors) before the terminal in the transit alignment.
1.0 km	・ Elevated structure along Nyerere Avenue. Use the centre divider for pillar space.
Sports Club	・ Near to second ring road. 60 m-length elevated station structure here (+1.0 km)
1.0 km	・ Elevated structure along Nyerere Avenue. Use the centre divider for pillar space. ・ Need branch structure for junction to loop section to Moi Avenue
Moi Ave.	・ In front of the post office. 60 m-length elevated station structure here (+2.0 km)
0.7 km	・ Elevated structure along Digo Road. Use the centre divider for pillar space.
Marikiti Market	・ In front of the Marikiti Market (+2.7 km)
1.0 km	・ Along the centre of Abdel Nasser Road, 50-100 m small radius curb is needed along the road. ・ Need branch structure for junction to loop section to Sheikh Abdullah Road. ・ Go straight to Abdel Nasser Road
Tononoka	・ Near the coast provincial hospital, Kisauni Road; Need barrier free consideration. (+3.7 km)
1.5 km (bridge)	・ Cross the Nyali Channel (400-500 m). The clearance of the bridge will influence the transit climbing capacity. Try to run along the shortest way to the Kongowea Market, where land acquisition is needed. ・ The Second Nyali Bridge structure can be integrated with the bridge of the transit
Kongowea Market	・ Locate the station inside the market main building, to improve the accessibility and minimise pedestrian flow from the market area (+5.2 km) ・ TOD (commercial development) in the unused area can be considered
1.5 km	・ Exit from Kongowea Market premises, go along the centre divider of the New Malindi B8; elevated ・ Need crossing for lane change (scissors) before the terminal in the transit alignment.
VOK	・ Station structure along the New Malindi Road (6.7 km), with connection to depot
VOK Depot	・ 350x160 m structure for maintenance and stable yard, operation centre, integrated with commercial and residential development (TOD)
1.5 km	・ Go along the centre divider of the New Malindi B8, elevated
Bombolulu	・ In front of the Bombolulu Market (+8.2 km)
1.5 km	・ Go along the centre divider of the New Malindi B8, elevated ・ Need crossing for lane change (scissors) before the terminal in the transit alignment.
City Mall	・ Station structure along the New Malindi Rd (9.7 km)

Source: JICA Expert Team



Source: JICA Expert Team

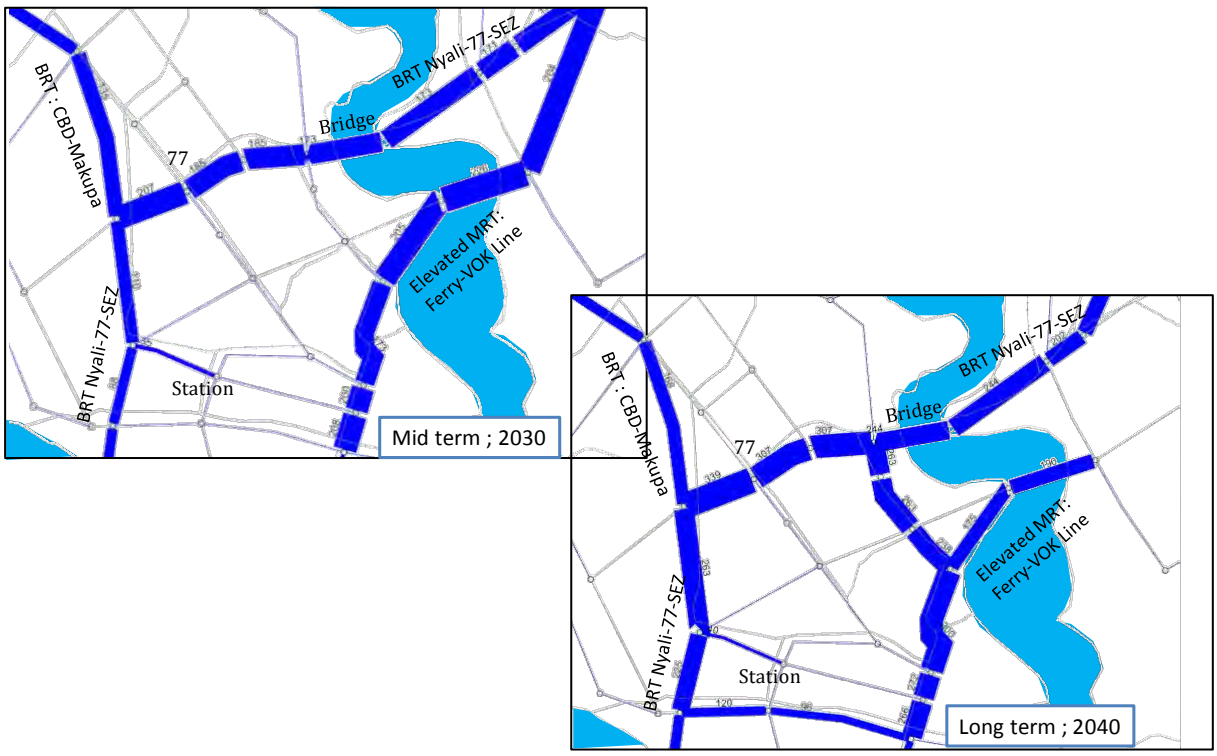
Figure 10.5.11: Mass Transit Alignment for Prioritised Section (P1)



Source: JICA Expert Team

Figure 10.5.12: Bird's Eye View of the Mass Transit Alignment (P1)

The expected PPHPD will be 3-4,000 at the bridge section in 2030, and 7-8,000 at the same section in 2040, according to the daily passenger rate in the +MRT case, applying 10-15% peak ratio.



Source: JICA Expert Team

Figure 10.5.13: Passenger Service Demand Projection (P1/P2, in Person x 100)

Table 10.5.5 shows the reference of selection of the MRT transit system, based on PPHPD and other criteria for P1.

Table 10.5.5: Comparison of MRT Systems

	Bus	BRT	AGT	LRT	Metro
Capacity in PPHPD *	2,500	3,000 - 20,000	5,000 – 15,000	5,000 - 30,000	20,000 - 80,000
Capacity in PPHPD * (example location)	2,500 (New York City, United States)	20,000 (Buenos Aires, Argentina)	5,000 (Yokohama, Japan)	30,000 (Kuala Lumpur, Malaysia)	80,000 (Hong Kong)
Construction Cost	Low	Low	Medium to High	High	Highest
Fleet Cost	Lowest	Low	Medium	High	Highest
Right-of-Way Requirements	None, Dedicated or Priority Lanes Optional	Dedicated Lanes	Elevated structure over median, steeper slope, tight turn radius.	At-grade or elevated structure over median, medium turn radius.	Elevated or underground
Operational Characteristics	Simplest	Requires high-capacity organisation and preferential traffic treatment to reach maximum capacity.	Automated driving, level of operational difficulty depends on intended capacity.	Requires a well-developed and well-funded operating authority.	Requires a well-developed and well-funded operating authority.
Maintenance Difficulty	Simplest	Relatively simple even with passenger information systems	Medium – AGT cars run on rubber tires, are similar to buses.	Difficult – requires advanced training or outsourcing.	Difficult – requires advanced training or outsourcing.
Appropriate Locations for Right-of-Way	Any major road. No land acquisition required.	Any major road, preferably with dedicated lanes. Land acquisition possibly required for stations.	Any major road with median or shoulder space. Minimal land acquisition except for maintenance yard.	Any major road with median or shoulder space. Moderate land acquisition.	Tunneling – most land acquisition required.

* PPHPD = Passengers per hour per direction

Source: JICA Expert Team. Sample capacity figures from the Institute for Transportation and Development Policy (ITDP), "Sustainable Transport: A Sourcebook for Policy-Makers in Developing Cities; Module 3a: Mass Transit Options", and U.S. Transportation Research Board (TRB), "Operational Analysis of Bus Lanes on Arterials".

As initial selection of the transit system, AGT can be the best option for the passenger demand amount, physical limitation in the road area, and alignment characteristics (50 to 100-meter radius curvature[3] at Abdul Nasser Road, longitudinal steepness in bridge section) as well as its capacity in PPHPD and demand characteristics in the future in Mombasa County. Further study is needed to finalise the optimal mode for the elevated MRT in Mombasa County, since AGT has some demerit in terms of maintenance costs.

Assuming construction cost and contingency, fare, O&M cost, etc., the operational cash flow can be estimated as follows:

- Construction cost (CAPEX): USD 70 million per km, 7 km alignment with 15% engineering cost and contingency (USD 563.5 million), From the 1st year (2025) of design and construction, 2%, 3%, 20%, 50%, and 25% of cost will be generated.
- Start operation in 2030, assuming 300 days of operation, USD 0.50 per ride, with an initial passenger of 50,400 per day in 2030, and 109,200 passengers per day in 2040 (70% of the forecast estimated in section 10.4).
- Operating expenses (OPEX): USD 5.25 million of operation cost (adopting 50% of similar mass transit system in Japan, adjusted 7 km length proportionally), and 8% of construction cost will be needed every 10 years.
- Prepared two types of cash flow, namely: i) whole CAPEX and OPEX, and ii) 27% of CAPEX and whole OPEX. Both cases ignored the remaining value in the 30-year evaluation period in the financial internal rate of return (FIRR) estimation.

[3] Detailed study is necessary for the suggested necessary radius in the alignment.

Table 10.5.6: Preliminary Cash Flow Analysis (P1)

Cashflow Case I: Whole CAPEX+OPEX (in Million USD)					Cashflow Case II: 30% CAPEX+OPEX (in Million USD)				
FIRR	Negative				FIRR	0.0%			
	Year	Expesditu	Revenue	Balance		Year	Expesditu	Revenue	Balance
1	2025	11.3	0.0	-11.3	1	2025	3.0	0.0	-3.0
2	2026	16.9	0.0	-16.9	2	2026	4.6	0.0	-4.6
3	2027	112.7	0.0	-112.7	3	2027	30.4	0.0	-30.4
4	2028	281.8	0.0	-281.8	4	2028	76.1	0.0	-76.1
5	2029	140.9	0.0	-140.9	5	2029	38.0	0.0	-38.0
6	2030	5.2	7.6	2.4	6	2030	5.2	7.6	2.4
7	2031	5.2	8.4	3.3	7	2031	5.2	8.4	3.3
8	2032	5.2	9.3	4.2	8	2032	5.2	9.3	4.2
9	2033	5.2	10.2	5.1	9	2033	5.2	10.2	5.1
10	2034	5.2	11.1	6.0	10	2034	5.2	11.1	6.0
11	2035	5.2	12.0	6.8	11	2035	5.2	12.0	6.8
12	2036	5.2	12.9	7.7	12	2036	5.2	12.9	7.7
13	2037	5.2	13.8	8.6	13	2037	5.2	13.8	8.6
14	2038	5.2	14.6	9.5	14	2038	5.2	14.6	9.5
15	2039	5.2	15.5	10.3	15	2039	5.2	15.5	10.3
16	2040	45.1	16.4	-28.7	16	2040	45.1	16.4	-28.7
17	2041	5.2	16.4	11.2	17	2041	5.2	16.4	11.2
18	2042	5.2	16.4	11.2	18	2042	5.2	16.4	11.2
19	2043	5.2	16.4	11.2	19	2043	5.2	16.4	11.2
20	2044	5.2	16.4	11.2	20	2044	5.2	16.4	11.2
21	2045	5.2	16.4	11.2	21	2045	5.2	16.4	11.2
22	2046	5.2	16.4	11.2	22	2046	5.2	16.4	11.2
23	2047	5.2	16.4	11.2	23	2047	5.2	16.4	11.2
24	2048	5.2	16.4	11.2	24	2048	5.2	16.4	11.2
25	2049	5.2	16.4	11.2	25	2049	5.2	16.4	11.2
26	2050	45.1	16.4	-28.7	26	2050	45.1	16.4	-28.7
27	2051	5.2	16.4	11.2	27	2051	5.2	16.4	11.2
28	2052	5.2	16.4	11.2	28	2052	5.2	16.4	11.2
29	2053	5.2	16.4	11.2	29	2053	5.2	16.4	11.2
30	2054	5.2	16.4	11.2	30	2054	5.2	16.4	11.2

Source: JICA Expert Team

The JICA Expert Team recommends the following implementation arrangement:

- The minimum passenger tariff (KSH 50 = USD 0.50) can generate profit from the initial year of operation, which is a competitive price compared to matatu services. (Note the +MRT case was prepared with the MRT tariff of KSH 50)
- If 70% of CAPEX, assumed to cover the cost for civil structure, E&M, and depot facility, was covered by the national government, the operational body can refund the 27% of CAPEX through operational income (the FIRR becomes balanced).
- CGM can operate the service on a PPP contract basis. Usually, public organisation does not have the capacity to handle the operation of transport service. A private operator with O&M and depot services can be invited through competitive bidding, with the condition of hiring local staff from the matatu employment pool (P7)
- The Kongowea Market, VOK, Bombolulu, and surroundings of City Mall are the place for station development (P5/P6). CGM can invite private development partners through competitive bidding for commercial and residential development along the corridor. The CGM can issue the development permit to the private bidder with the highest bidding price in order to capture the

initial value of development. Then, the CGM can capture the value of increased land price through the land tax after opening of the development.
- This is an initial and preliminary analysis for feasibility, and a full feasibility study is strongly required to facilitate the mass transit function as medium-term programme.

(2) P2 CBD-Rail-Airport – Miritini

The JICA Expert Team proposes to apply BRT system along the P2 alignment due to less passenger demand, referring to Table 10.5.5. The major challenging points of this application are the following:

- The alignment of the existing MGR from the central railway station to Changamwe Station will be converted to road pavement to realise the exclusive bus service lanes with less additional cost.
- The existing bridge for the MGR on Makupa Causeway has just one lane width for BRT. Additional lane or proper signaling system is necessary. The bulk demand in the island could be shifted to the extended SGR service to Berths 1-10, trailers on Gate Bridge, or moved to Dongo Kundu. This needs serious arrangement with KRC.
- The BRT lanes can be shared with intercity bus services on A109 and/or ordinary bus service. The rail station can be converted as BRT and intercity terminal. Some services can go into the CBD to expand the catchment area of transport services. The beautification of Haile Selassie Road can accommodate the transit function as a transit mall.
- The Changamwe Station shall be connected with ordinary streets, and bus lines will extend to the airport, SGR passenger terminals, Miritini subcentres and other destinations.
- The expected daily demand is not so large, approximately 1,500 – 3,000 PPHPD. The articulated bus fleets are not required for the initial phase.
- This is an initial and preliminary analysis for feasibility, and a full feasibility study is required to facilitate the mass transit function as medium-term programme.

The BRT alignment for P2 will require little land acquisition if it could be facilitated along the MGR right of way. In case P2 could not be arranged, the MRT (P1) to Changamwe will serve the function of P2, which will cost bigger[4] than P2. The JICA Expert Team notes that P2 arrangement along MGR alignment is cost effective, and worth to proceed with KRC.

(3) P3 Kisauni-77-SEZ/Likoni

The JICA Expert Team proposes to apply bus services (not full-spec-BRT services) along the P3 alignment due to less passenger demand. The major challenging points of this application are the following:

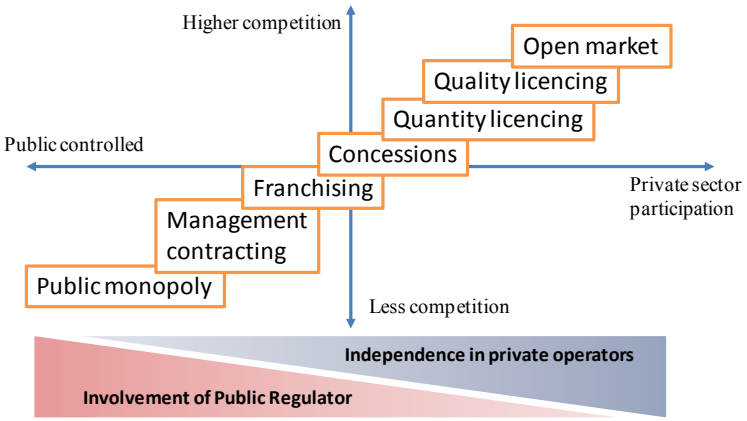
- The section in the hyper corridor does not have enough capacity to secure exclusive lanes. Bus priority signaling and exclusive phase for this bus services (TM10) must be applied to realise the transport service with higher reliability. A serious study of reversible lane installation along the Nyali Bridge to accommodate bus lanes in peak hours is also another challenge.
- This alignment can be connected with the terminal at the central railway station and alignment (P2).
- For Mombasa bridge section, exclusive bus lane is not necessary, due to its less demand and high capacity of the expected bridge
- This is an initial and preliminary analysis for feasibility, and a full feasibility study is required to facilitate the mass transit function as medium-term programme.

[4] The unit construction cost of P1 (AGT/Monorail) could be 7 to 10 times bigger than that of P2 (BRT), without land acquisition cost.

10.5.6 Institutional Arrangement on Transport Service and Management

(1) Passenger Transport Services

Figure 10.5.12 depicts variety of institutional arrangement in the passenger transport service market, showing balance between involvement of public regulators and independence of private operator, shall specify the market and type of operation. The present matatu market in Mombasa County can be classified as "quantity licensing" under control of the NTSA.

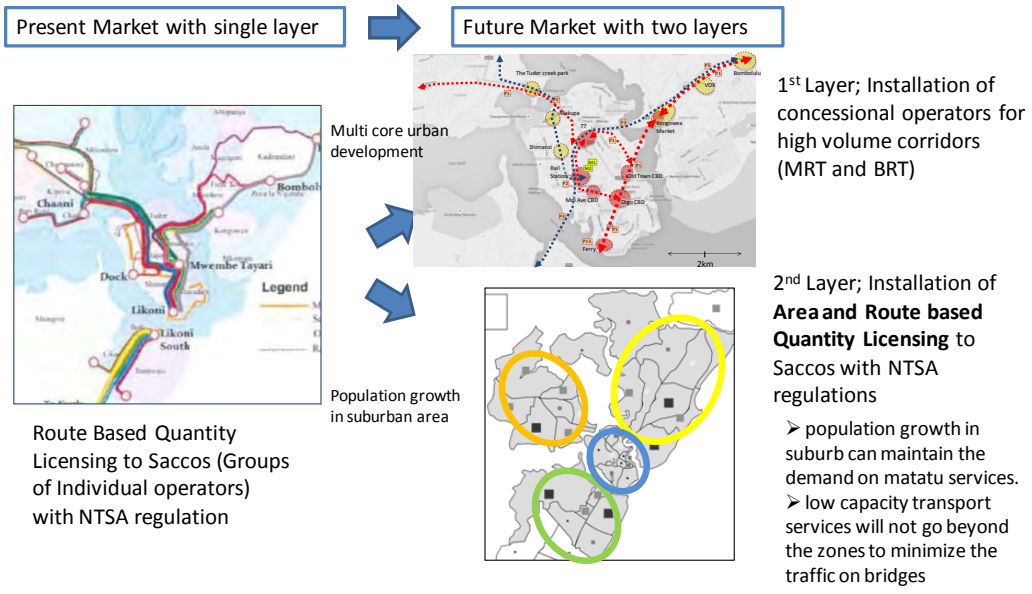


Source: Prepared by the JICA Expert Team, referring to the World Bank, "Review of Urban Public Transport Competition – Draft Final Report", prepared by Halcrow Fox, Washington, 2000

Figure 10.5.14: Public Regulator vs Private Operator

The JICA Expert Team proposes the new passenger services (BRT and MRT) in Mombasa County as a new service. On installation of such services, it needs to consider two aspects, i) how the large services can be harmonised with existing services without damaging the local vitality, ii) how the operational viability of all services can be secured.

The JICA Expert Team proposes that the NTSA should expand its capacity as an urban transport service regulator, to maintain private operator's participation, as well as secure operational sustainability of the BRT/MRT services. This concept is proposed as P7 "matatu route revision and employment pool".



Source: JICA Expert Team,

Figure 10.5.15: Concept of P7 "Matatu Route Revision and Employment Pool"

The present market has single layer of matatu, with route based quantity licensing to Saccos under the NTSA regulation. The multi-core development and population growth in the suburb area will require two layers of passenger services, i.e., high volume service with MRT/BRT in core corridors, and low volume matatu services with area and route licensing. The area licensing will secure the passenger demand on BRT/MRT; instead, population growth in the suburban area can maintain the demand for matatu.

The JICA Expert Team proposes that the BRT/MRT operation shall be under concession to experienced private operators. The JICA Expert Team considers that there is no organisation in Kenya who knows the necessary level of service and the county government cannot organise such operational body with its own capacity.

Note that the JICA Expert Team will not recommend establishing a transport authority (a monopolised transport service operator with regulatory authority), which may shrink the local vitality, and there is no existing public organisation to hold such function.

(2) Freight Transport Management

A coordinating function should be established, with participation of KPA, KRA, highway and road authorities, police, private associations (KIFWA, CFS Associations, ECT Associations) and the County Government of Mombasa. The existing coordination meeting for freight transport (organised by KPA) should be convened regularly, with strong participation of the county government. The function will coordinate the TM4 to TM12 projects.

(3) Road Development and Road Traffic Management

The CD1 project will cover the road development and traffic management in Mombasa County.

10.6 Institutional Arrangement – the Kick-off Coordination

In the following sections, the initial steps to be undertaken by the CGM with related national agencies in order to implement the proposed short- and medium-term projects are described.

10.6.1 Kenya Revenue Authority (KRA) or Treasury

The KRA can pursue the following initiatives to improve both port operations and the environmental conditions around the port:

- Creation of a special account for Mombasa County environmental improvement (similar to a congestion tax, which the CGM is already considering), and as compensation for the city having to manage the environmental issues caused by the port, earmark such funds for development of physical infrastructure to alleviate congestion problems. This special account can be considered as an investment in the national economy, as the proper functioning of Mombasa County results in the proper functioning of the Northern Economic Corridor at large. As a first step, it will be necessary to properly measure the environmental impacts/economic externalities resulting from Mombasa Port's operations, by providing funding (or requesting funding from a donor agency) for a team of port operations, economics, and econometric specialists.
- A mechanism to evaluate the large investment of urban transport facilities is created. People tend to compare the unit rate of SGR construction cost with that of urban mass transit construction cost (P1/P2). Investments to urban transport facilities are under-evaluated.
- Furthermore, CFS/ECT operations should be reorganised. Revision of the SIMBA system with the Uganda Asycuda system will minimise the necessity of CFSs, and KRA will not need CFSs as custom-collecting stations any more. The transformation of CFSs must be directed and initiated

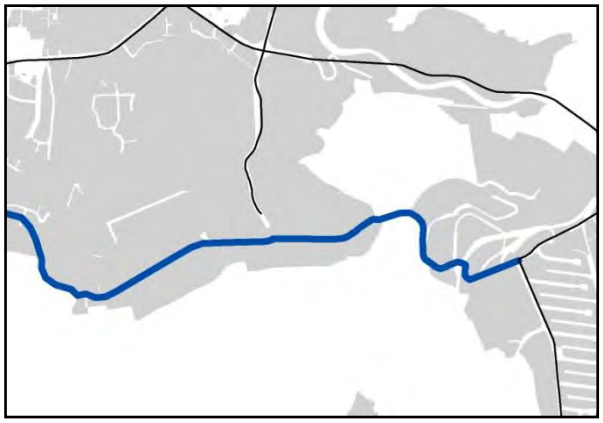
by KRA, which charter them. Existing CFSs should be converted into multi-purpose inland container terminals (ICTs), for import/export/empty container storage and processing. Processing is a profitable business, and thus CFS operators will likely be willing to include it in their operations, whilst simultaneously increasing employment opportunities for the local economy.

- Consider the necessity of Shimanzi Oil Terminal (customs-bonded tanks), which is located in the very centre of the port, and settle the accident risk. The Shimanzi Oil Terminal is responsible for 20% of freight traffic to the Changamwe intersection along A109. Pursue the relocation plan to the peninsula in Dongo Kundu and divert the traffic to MSBR.
- Whilst some CFSs will expand their operations, those with minimal operations should be forced to close – by the setting of a minimum threshold of historical cargo handling to qualify for an operational agreement (concession) with KRA. By consolidating the operations into fewer facilities and a centralised system, traffic congestion in Shimanzi/Changamwe can be partially alleviated.

10.6.2 Kenya Ports Authority (KPA)

The KPA can pursue the following initiatives:

- Focus on improving interior road connections within the port (R1 project). The JICA Expert Team has already identified a possible alignment for such road: from the Shimanzi Oil Terminal, running along the periphery of the port area, and connecting to the entrance at the Kipevu Link (Figure 10.6.1). It may be necessary to deregulate the customs area control measures in order to decrease implementation costs.



Source: JICA Expert Team

Figure 10.6.1: Proposed Shimanzi-Kipevu Link Connecting to Ongoing Kipevu Link Construction

- The existing mindset is that the port is the only customs-bounded territory. After SIMBA revisions, this will no longer be the case. The port's internal traffic should stay internal, and should absorb existing traffic from the Makupa Causeway in its internal links.
- The x-ray check and document check management for export cargo should be deregulated as proposed in R11 (CFS multi-function) and R12 (marshalling yard), which was strongly recommended by the Northern Economic Corridor Master Plan (JICA) as well.
- Facilitate R13 (tractor exchange), R14 (container consolidation) with private operators.
- Minimise the use of Gate 18 and shift toward Kipevu Link traffic, as Gate 18 backs up traffic to Changamwe Roundabout and on both directions on A109.
- Rehabilitate and create a usage plan for MGR within the port, which is presently severely underutilised and proposed in the port master plan. Accept the SGR extension plan to Berths 1-10 which is under preparation by the SGR office. SGR will fit more to bulk transport than containers.

- Reorganise the berth assignment plan, as proposed in the port master plan. Shift the dirty bulk from Mbaraki Terminal to other area, minimise the bulk in 1-9, 11-18, and Mbaraki, these should be converted to general cargo, reducing the reliance on external CFSs.
- Consider joint development of mass transit and mixed use development (TOD) in the KPA-owned land in Shimanzi and Kilindini. The low-density KPA residential areas and warehouses can be developed as modernised commercial and residential districts with mass transit, applying a "development value capture" strategy. The CGM can issue the development permission if it is compliant with the master plan structure.

10.6.3 Road and Traffic Authorities (KeNHA, KURA, KeRRA)

Road and traffic authorities should focus on road widening and traffic management solutions, as follows:

- Immediate implementation for short-term widening of major roads, (N11, 13, 14, W11-12, S11) should be materialised by 2020, by KeNHA and KURA.
- Facilitate the Northern Bypass project implementation, which will divert the traffic on the Nyali Bridge and Makupa Causeway. Consider to apply "full-access control" design to the Northern Bypass, to secure sustainability of the road function (KeNHA).
- Develop the R4 function (Moi-Lumumba connection) with KRC immediately. No need for flyover here in the short term (KURA).
- Review the junction design between the MSBR and Northern Bypass before the detailed design finalisation. Both road functions can be merged at Miritini, but the focal points will be the next Changamwe. It is better to consider that the Northern Bypass should branch off to Mazeras, and MSBR shall be extended to Mariakani or Nairobi (as proposed by Northern Economic Corridor Master Plan).
- Join the mechanism of the proposed Road Development Programme (CD1), and expand coordination opportunities with CGM. This mechanism was applied in all prefectures in Japan, over 50 years, to accelerate and secure the road investment between national and local governments. The project coordination necessity between KeNHA/KURA and CGM is to be expanded to Bamburi Link, hyper corridor concept (R4/M10), Second Nyali Bridge (R2), and Mombasa Gate Bridge (R3) projects.
- Review the junction design of the MSBR and Mombasa Gate Bridge before the MSBR's detailed design finalisation. Both road functions can be merged directly, not passing the existing A14.
- Review the scope of the Second Nyali Bridge project. The bridge approach in the island must not be connected to Digo Road directly. The proposed PFI scheme is just relying on the will of unknown investors, and poor commitment of KURA for rapid motorisation. The structure can be integrated with the mass transit structure to decrease the total cost.

10.6.4 Traffic Management and Regulation Authority (Police, NTSA)

- CFS/ECT-related policies (R11/R12/R13) can be added to the list of activities, and can be requested from the police to KRA/KPA. It will decrease the traffic congestion in Changamwe and Jomvu.
- Management of on-street parking (TM-1) can be implemented with CGM.
- The NTSA needs to lead the matatu regulation for enlargement of the vehicles (P7), and tuktuk operation (P11), with CGM and operators' association.

10.6.5 Kenya Railways Corporation (KRC)

- Facilitate the level crossing for station area (R4, M6) as a short-term project
- Facilitate the station development for multimodal terminal (M1, M2) as short- or medium-term project

- Need to understand necessary standard of "commuter railway" for Mombasa County, at least aiming at 5 minutes headway during peak, with high safety regulation, which cannot be accommodated by the present MGR system. It needs proper electrification and signalisation.
- The existing RVR lines in the island up to Changamwe/Miritini can be sold or leased to the county, for development as an MRT corridor to shift passenger traffic from road to mass transit development.
- Consider joint development of mass transit and mixed use development (TOD) in the KRC-owned land in Shimanzi and Changamwe. The low-density KRC residential areas and warehouses can be developed as modernised commercial and residential districts with mass transit function (P1/P2), applying a "development value capture" strategy. The county government can issue the development permission if it is compliant with the master plan structure.
- Prioritisation of freight movement over passenger movement on the SGR system operation.

10.6.6 County Government of Mombasa (CGM)

Last, but not least, as previously mentioned, the County Government of Mombasa (CGM) is currently not empowered to manage the port and its associated facilities with any serious level of control. Two major initiatives should be pursued by the county, as follows:

- Establishment of a monitoring organisation (CD1) to monitor all stakeholder activities. (Trade Mark EA could be a potential facilitator for this project, and a JICA technical cooperation scheme that is grant based may be implemented to assist its establishment.) The monitoring organisation would be charged with managing a combined implementation schedule for all port-related developments, as well as proposing additional minor initiatives to be taken by the county itself and other agencies.
- One such initiative to be taken, which the county is already empowered to do, would be the development of a freight parking area (i.e., a marshalling yard, R12), with potential areas being in Miritini, near Gate 18, or closer to the border with Mazeras. Under such an arrangement, trucks would wait in the yard until they have received their clearance to receive processing at a CFS, and only then would they be released onto the road. The timing of such movements can be controlled such that they only occur during low-traffic periods such as nights and weekends.

11. Urban Infrastructure Development Plan

11.1 Water Supply

11.1.1 Demand and Gap Analysis

Water demand projections for Mombasa County are based on the current average water supply and design standards of the Water Design Manual for Water Supply Services for Kenya in October 2005. The total water demand forecasted is the sum of the following:

- Domestic water demand is estimated to be 115 litres per capita per day (lpcd) and this includes 20% water losses in the water distribution systems (Assuming the following percentages of population: 10% rate of high income dwelling units 250 lpcd, 30% rate of middle income dwelling units 150 lpcd, and 60% rate of low income dwelling units 75 lpcd).
- Non-domestic water demand includes institutional, other public water demand, demand of floating population, and industrial demand.
- The non-domestic water demand is estimated to be 40% of the total domestic water demand.

The calculated projected water demand is shown in Table 11.1.1 and Figure 11.1.1.

Table 11.1.1: Demand and Gap Analysis of Water Supply

Target Years	Unit	2015	2020	2025	2030	2035	2040
Population (Day-time)	Person	1,161,738	1,384,880	1,621,426	1,868,835	2,124,005	2,414,016
Domestic Water	m^3/day	133,600	159,261	186,464	214,916	244,261	277,612
Non-Domestic Water	m^3/day	53,440	63,704	74,586	85,966	97,704	111,045
Total Water Demand	m^3/day	187,040	222,965	261,050	300,882	341,965	388,657
Water Sources	m^3/day	55,830	66,890	238,874	238,874	312,309	312,309
Gap	m^3/day	131,210	156,076	22,176	62,008	29,656	76,348
Service Coverage Rate	%	30%	30%	92%	79%	91%	80%

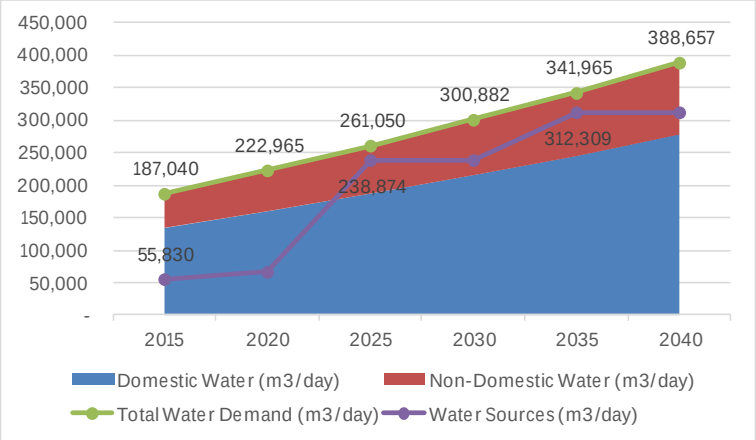
Source: JICA Expert Team (Water sources are based on the ISUDP-Mombasa)

In the table, the forecasted volume of the proposed water sources are based on the Integrated Strategic Urban Development Plan for Mombasa County hereafter referred to as ISUDP-Mombasa. It was referred from the report of Water Supply Master Plan for Mombasa and Other Towns within Coast Province in 2012. The potential water sources for Mombasa County include the following:

- Baricho: 106,594 m^3/day by 2025, 80,395 m^3/day by 2035
- Mzizima: 13,370 m^3/day by 2025 59,050 m^3/day by 2035
- Marere: 6,051 m^3/day by 2025, 3,173 m^3/day by 2035
- Tiwi: 10,000 m^3/day by 2025, 8,662 m^3/day by 2035
- Mwache Multipurpose Dam: 102,859 m^3/day by 2025, 145,838 m^3/day by 2035
- Msambweni Aquifer, Mkurumudzi Dam: 0 m^3/day by 2025, 15,191 m^3/day by 2035
- Total: 238,874 m^3/day by 2025, 312,309 m^3/day by 2035

Some water demand will be supplied from Baricho Wellfield and Mzizima Springs, whilest the Mwache Multipurpose Dam will be connected as the main source by 2025. For the target year, when all the water resources are already developed, it is assumed that water availability will meet the water demand by

76% in 2030 and 70% in 2040. This deficit will be partially covered by the local water sources (e.g., small bore wells). Mombasa County will continously suffer from chronic water scarcity and water stress situation. It is clear that the immediate gap between the water needs and the availability is massive. In order to do the urban development in Mombasa County, expanding the capacity through the development of new water resources is needed to cover the water demand in the near future.



Source: JICA Expert Team

Figure 11.1.1: Demand and Gap Analysis of Water Supply

11.1.2 Development Policy

Currently, coverage rate of all water sources is only 30% of the water demand in Mombasa County. Water demand will increase with the population growth and urban development. In addition, it is necessary to develop water sources, increase water supply coverage, and to rehabilitate old pipelines for the reduction of non-revenue water (NRW). Based on the development issues and demand and gap analysis of water supply, the following development policy is considered:

"Water Safety Plan"

The concept of the Water Safety Plan (WSP) is also proposed in the World Health Organisation (WHO) guidelines for drinking water quality. The plan is a management tool, which introduces a comprehensive risk assessment and risk management approach encompassing all steps in water supply. For the target year (2040) of this master plan, the main development policy of water supply is to ensure a safe drinking water supply for all the people in Mombasa County. The summarised development policy of water supply is shown in Table 11.1.2.

Table 11.1.2: Development Policy of Water Supply

No.	Items	Development Policy "Water Safety Plan"
1	Hours of service	Continuous water supply service for 24 hours per day
2	Water quality	Comply with WHO guidelines for drinking water
3	Metering	All consumers should have a metered supply
4	Coverage	Water supply distribution network to increase coverage
5	Reliability	Repair of old pipelines for reduction of NRW

Source: JICA Expert Team

The development policy of the water supply is explained in detail as follows:

- Current water supply system is not available for 24 hours a day. This is because of the shortage of resource and pressure. This should be improved for convenience of the users. Water supply service should be 24 hours per day, and at least continuous for 12 hours.
- Natural water sources like springs and groundwater are utilised for water supply or some users get water from rain or other surface water without suitable treatment. An increasing trend of

waterborne infectious diseases from pollution of these water sources is currently a concern. This is one of the multiple issues that adversely affect public health. The water management with the WHO guidelines for drinking water and water supply facilities, should be provided.

- In order to carefully manage water tariff, correct metering and monitoring systems are necessary. Connecting new meters for new users and upgrading the old non-metered connection to a metered connection should be done.
- Water supply is one of the infrastructures required for a sanitary environment and for the urban development in Mombasa County. The water supply distribution network should increase the target to 100% coverage by 2040.
- It is necessary to rehabilitate old pipelines for the reduction of NRW. The reduction target for NRW should be decreased from 45% to 20%.
- For the water supply in Mombasa Special Economic Zone (SEZ), the groundwater in Tiwi in the County Government of Kwale will be used for a short-term period, and the water from Mwache Dam will be used in the long-term period. In order to secure water supply to the County Government of Mombasa (CGM), water quality of groundwater has to be secured, and coordination with the County Government of Kwale is necessary.

11.1.3 Development Strategy

The development policy of the water supply can be attained by adopting the following strategies. The development vision of "Vibrant Economy and High Quality of Life (Social and Culture)" is linked closely to these strategies for the water supply. These strategies refer to the proposed projects of the (ISUDP-Mombasa) and are arranged in order of priority. The summarised project list is shown in Table 11.1.3.

Table 11.1.3: Project List of Water Supply

No.	Title	Objects	Term	Priority
1	Rehabilitation and Extension Project of Water Supply System	・ Pipe network: 500 km ・ Pump station: 5 points	Short	★
2	Development of Mwache Multipurpose Dam	・ Mwache Dam: Total 186,000 m^3/d ・ Related Infrastructure, etc.	Short /Middle	★
3	Feasibility Study for Establishing Seawater Desalination Plants	・ Capacity: 100,000 m^3/day ・ Review for cost reduction	Short	
4	Converting Project of New Water Meters and Project of Water Kiosk	・ Water meter: 45,000 sets ・ Water Kiosk: 50 points	Short	
5	Project of Water Sources, Rainwater Harvesting and Recycled Water	・ Target sources: More than 312,309 m^3/d ・ Harvesting and recycle: As necessary	Middle /Long	

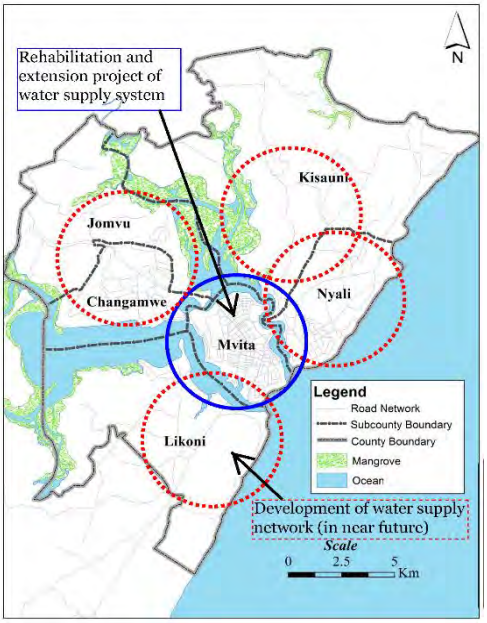
Note: Short-term (by 2020), Middle-term (by 2030), Long-term (by 2040); Priority project is marked ★
Source: JICA Expert Team

The project for the water supply is explained in detail as follows:

- In order to improve the water supply system in Mombasa Island area, it is necessary to rehabilitate the old pipelines for the reduction of NRW and to expand the water supply coverage. This is referred in the Water Supply Master Plan for Mombasa and Other Towns Planned in 2012, and in the proposed projects of the ISUDP-Mombasa. The components of the proposed projects include

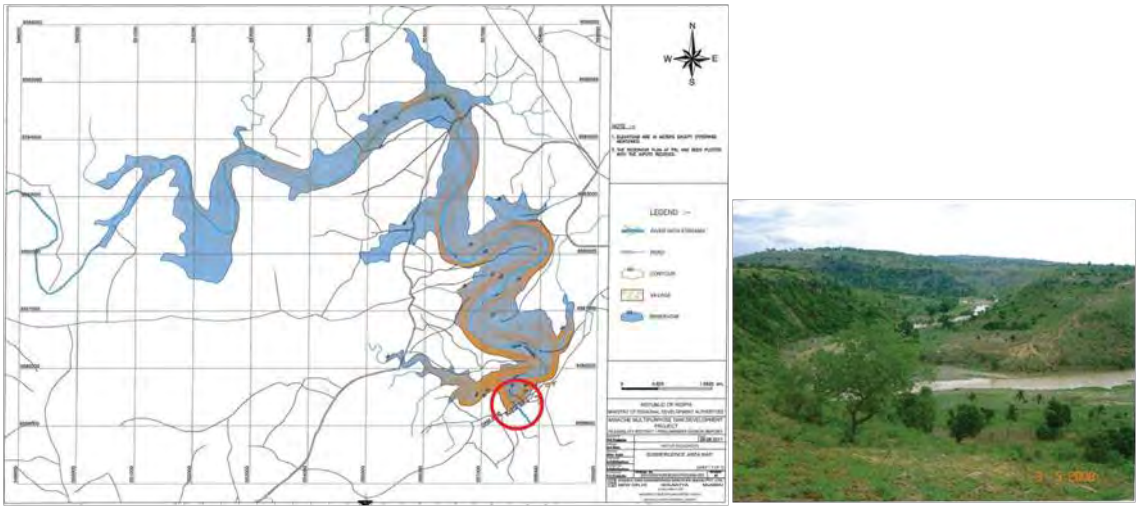
the repair and replacement of old pipelines, the development of about 500-km new pipelines, and the upgrading of the old pumping stations at 5 points. The project image is shown in Figure 11.1.2.

- It is clear that the immediate gap between the needs and the availability is massive, so the development of water sources is strongly required. The development objective of Mwache Multipurpose Dam (Coastal Region Water Security and Climate Resilience Project) is to sustainably increase bulk water supply to Mombasa County and Kwale County, and increase access to water and sanitation for the communities. The proposed project would have three components: 1) C1 - Mwache Dam and related infrastructure, 2) C2 - Kwale County Development Support, and 3) C3 - Project Management. The project image is shown in Figure 11.1.3.



Source: JICA Expert Team

Figure 11.1.2: Rehabilitation and Extension Project of Water Supply System



Source: JICA Expert Team (refer to F/S report of Mwache Multipurpose Dam Development Project)

Figure 11.1.3: Development of Mwache Multipurpose Dam

- Desalinated seawater can make up for the deficit of the natural water resources and meet part of the potable water demand, irrespective of the availability of other natural water sources. However, major constraints of desalination are environmental impacts and high energy cost. Energy costs, energy availability, and the wide range of environmental aspects can constitute serious obstacles and should be carefully investigated as soon as possible.
- Connection of digital water meters for new users and upgrading of the old non-metered connection to metered connection should be provided. The correct meter and monitoring system will be installed for water tariff management. In addition, Community Water Kiosk at 50 points will be installed for the people who do not have access to clean drinking water.
- In Mombasa County, utilisation of recycled water (recycling of wastewater) could be used only for non-potable commercial use including gardening and car washing. This will have a positive effect on the per capita water demand and will help reduce the total urban water demand. Rainwater harvesting (RWH) is not only useful for domestic purposes, but can also be used for

gardening, industrial/commercial applications that have heavy water requirements. RWH will likely see heightened importance as a water security measure in the context of climate change.

The development policy of water supply by area (where large population growth is expected) is explained in detail as follows:

- Mombasa Island: Water supply network was developed in Kizingo and railway, but has a high rate of NRW because of leaking. Many old pipes should also be repaired.
- Mainland North: Water supply network was developed in Shanzu and Mwembelengeza, but not developed in Bamburi, Mwakirunge, and Maunguja. The water supply network should be extended in the said areas through a new reservoir, tanks and pumps.
- Mainland West: Water supply network was developed in Changamwe, but not developed in Miritini and Jomvu Kuu. The water supply network should be extended in these areas.
- Mainland South: Water supply network was not developed in Vijiweni, Vyemani, and Mtongwe. The water supply network should be extended in these areas.
- At an industrial zone like Mombasa SEZ development, since water demand will increase along with the development stage/phase, the development of new water sources may be necessary and urgent.

The challenges of water supply development is identified as follows:

- Since water demand will increase with the growing population, developing water source is necessary.
- The water treatment plant and conveyance pipeline, which is planned by the French Development Agency (Agence Française de Développement: AFD) should be developed along with the development of Mwache Dam by the World Bank (WB).
- Feasibility study and profitability for seawater desalination plant should be done for supplementing water source.
- The legal system of the water supply is established, but the problems of human resources and finances exist in Mombasa County. The county is required to provide assistance (capacity building) including technical and management support to Mombasa Water and Sanitation Company (MOWASCO).

11.2 Sewerage/Drainage

11.2.1 Demand and Gap Analysis

(1) Sewerage

Currently, only 15% of the total population within the county is served by the sewerage system in Mombasa County. The sewerage demand projections for Mombasa County are forecasted based on the following:

- Target coverage of sewerage has been assumed to be 80% of forecasting population (day-time) on the target year of 2040.
- The sewage volume in the future years is estimated to be 80% of water supply demand for domestic water.
- The domestic water demand is estimated to be 115 litres per capita per day (lpcd).

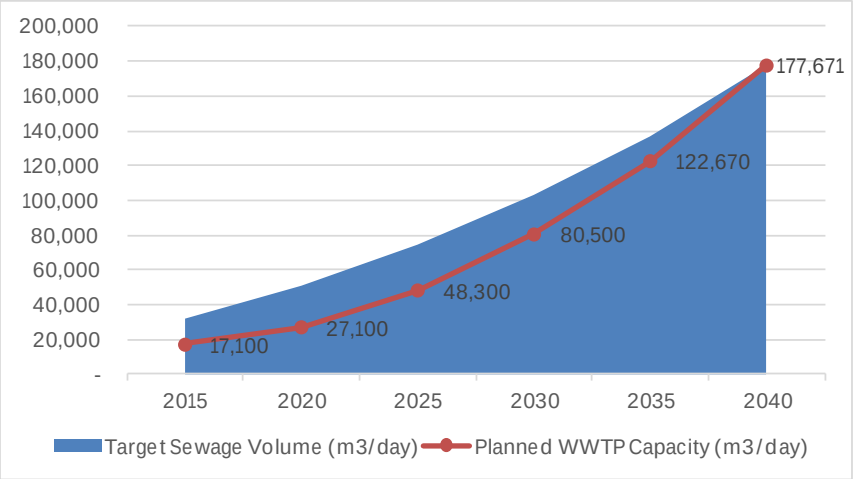
The calculated projected sewerage demand is shown in Table 11.2.1 and Figure 11.2.1.

Table 11.2.1: Demand and Gap Analysis of Sewerage

Target Years	Unit	2015	2020	2025	2030	2035	2040
Population (Day-time)	Person	1,161,738	1,384,880	1,621,426	1,868,835	2,124,005	2,414,016
Target of Population Rate	%	30%	40%	50%	60%	70%	80%
Target Population	m^3/day	348,521	553,952	810,713	1,121,301	1,486,803	1,931,212
Total Sewerage Volume	m^3/day	32,064	50,964	74,586	103,160	136,786	177,672
Planned WWTP Capacity	m^3/day	17,100	27,100	48,300	80,500	122,670	177,672
Gap (for Target Volume)	m^3/day	14,964	23,864	26,286	22,660	14,116	0
Service Coverage Rate	%	53%	53%	65%	78%	90%	100%

Source: JICA Expert Team

Mombasa County has two wastewater treatment plants (WWTPs) located in Kizingo and Kipevu. Kizingo WWTP has collapsed and is currently non-functional. Kipevu WWTP has a design capacity of 17,100 m^3/day, but rehabilitation and upgrading works for its facilities are required. Development of sewerage system is expected to mitigate the high priority problems associated with sanitation, public health and the environment, with effect on environmental improvement at the sea or river.



Source: JICA Expert Team

Figure 11.2.1: Demand and Gap Analysis of Water Supply

(2) Drainage

Currently, storm water drainage covers 10% of the total area and 25% of the total population of Mombasa County. The existing drainage length is about 60 km, and the drainage length that is currently under construction is about 30 km. Almost 92% of the existing roads do not have storm water drainage. Storm water drainage is important to collect and dispose the runoff water due to rainfall. These data refer to the ISUDP-Mombasa. The existing and implementation of drainage is shown in Table 11.2.2.

Table 11.2.2: Existing and Implementation of Drainage

Area	Existing Drainage (km)	Under Implementation (km)	Existing Outfall (No.)	Additional Outfalls (No.)
Mainland North	1.60	7.85	2	1
Mainland South	6.55	7.37	3	3
Mainland West	5.40	7.23	4	1
Mombasa Island	46.88	7.12	9	3
Total	**60.43**	**29.57**	**18**	**8**

Source: ISUDP-Mombasa

Projected demand of drainage is estimated as follows:

- The total length of drainage should be double the length of the road in a town.
- The total existing road length is 1,191 km and the proposed road length is 269 km. Hence, the total requirement for drainage is 2,920 km.
- Projected demand of drainage = 2,920 km - (60 + 30) = 2,830 km

The demand and gap analysis of drainage is shown in Table 11.2.3.

Table 11.2.3: Demand and Gap Analysis of Drainage

Road Type	Road Length (km)	Existing Drainage (km)	Under Implementation (km)	Total Length (km)	Coverage Length (%)
Paved Road	387	60	30	90	23%
Laterite Road	146	-	-	-	-
Earthen Road	658	-	-	-	-
Total	**1,191**	**60**	**30**	**90**	**8%**

Source: ISUDP-Mombasa

11.2.2 Development Policy

(1) Sewerage

For the target year of 2040 of this master plan, the main development policy for sewerage and sanitation is to provide 100% access to sanitation facilities in Mombasa County. Based on the development issues and demand and gap analysis of sewerage, the following development policy is considered:

"Improve Living and Public Water Environment"

It is important to set development policy as realistic goals and carry out a systematic construction plan. In addition to the existing sanitation conditions, key considerations including socioeconomic factors, financing measures needed for sewerage operation, and users' capability of paying for services have to be considered. Planning a management system suitable for the targeted scale and content of services is also required when setting goals. The summarised development policy of sewerage is shown in Table 11.2.4.

Table 11.2.4: Development Policy of Sewerage

No.	Items	Development Policy "Improve Living and Public Water Environment"
1	Coverage	Access to safe sanitation facilities for all
2	Water quality	Comply with effluent water quality standards
3	Monitoring	Confirming of effect on environmental improvement by analysis of water quality at the sea or river
4	Public relation	Campaign for creating demand for toilets and safe sanitations

Source: JICA Expert Team

The development policy of sewerage is explained in detail as follows:

- To provide 100% access to sanitation facilities in Mombasa County for proper sanitation, public health and environment.
- Kizingo WWTP collapsed 20 years ago, and it is currently non-functional. Due to the absence of functional sewerage system in Mombasa County, many residents discharge effluent into the river or sea without treatment. Development of sewerage system with effluent water quality standards of Kenya and WHO is needed. The probable reason for leaving the sewerage facilities unattended is that those constructed facilities require maintenance that is beyond the knowledge of personnel or technology available locally. To improve such situation, efforts are made to establish a cooperation system to provide technologies for the local staff. It is also necessary to positively

introduce not only structural components, but also non-structural components, including personnel training and capacity building.

- Confirming the effect on environmental improvement by analysis of water quality at the sea or river is very important. The county will check whether the development of sewerage system will affect the changes in its water quality. If there is a concern with industrial wastewater or other effluents hindering or damaging the functions of the sewerage facilities, it is necessary to remove such effluents (e.g., pre-treatment facilities) and to perform water quality monitoring.
- The county will conduct campaigns for creating demand for toilets and safe sanitations for public relation of sewerage system. Since sewerage system upgrading will be undertaken in the urban areas with well-developed sewerage, efforts must be made to obtain the understanding and cooperation of residents through public (residents) participation.
- Wastewater will be treated in Mombasa SEZ through the development of wastewater treatment system in the SEZ or individual treatment by zone developer or tenant.

(2) Drainage

For the target year of 2040 of the master plan, the main development policy for drainage is to provide high quality safety and sustainable environment to the citizens of Mombasa County by developing a comprehensive drainage system. Based on the development issues and demand and gap analysis of drainage, the following development policy is considered:

"Improvement of Flood Hazard"

Conventionally, storm water drainage facilities are the general means to alleviate water damage. Storm water retention facilities provided with a storm water reservoir, storm water storage pipes, and reservoirs for flood control, and infiltration functions are also employed. The summarised development policy of drainage is shown in Table 11.2.5.

Table 11.2.5: Development Policy of Drainage

No.	Items	Development Policy "Improvement of Flood Hazard"
1	Sustainable Development	・ To provide high quality safety and sustainable environment by developing a comprehensive drainage system.
2	Reduce Flooding	・ Remove the encroachment of drains in the market area. ・ Regular cleaning of existing drainage to avoid flooding.
3	Controlled Discharge of Rainwater	・ Controlled discharge of rainwater for development of large-scale land and housing in the future (e.g., rainwater infiltration facilities, regulation of management for the controlled discharge of rainwater)

Source: JICA Expert Team

The development policy of drainage is explained in detail as follows:

- For providing high quality safety and sustainable environment by developing a comprehensive drainage system, the county will recognise adaptability to climate change and will improve development of drainage in a sustainable manner.
- For reducing flooding, removing the encroachment of drains in the market area and regular cleaning of the existing drainage will be done.
- Rapid urbanisation causes increased storm water runoff, which contributes further to inundation.

This requires a controlled discharge of rainwater in the case of development of large-scale land and housing in Mombasa County in the future. Rainwater infiltration facilities, regulation of management for the controlled discharge of rainwater should be planned. The principal approaches are summarised below:

- Storm water storage:
  This is effective in averaging runoff rates to reduce the peak flow even though the gross storm runoff rate will remain the same. Included here are on-site storage facilities to store storm water (in parks, school yards, parking lots, etc.) and off-site flood-control facilities such as storm water reservoirs or multipurpose retarding basins to collect runoff storm water for storage in separate places.
- Storm water infiltration:
  This is effective in reducing the gross storm runoff rate itself by allowing storm water to infiltrate into the ground. Specific examples are infiltration inlets and trenches, as well as porous pavements.

For Mombasa SEZ, the flood probability year and rain intensity are determined by the Kenya Urban Road Design Guidelines. The receiving capacity of rainwater drainage facilities is calculated at design rainfall intensity of 46 mm/h with a five-year return period.

11.2.3 Development Strategy

(1) Sewerage

The development policy of sewerage can be attained by adopting the following strategies. These strategies refer to the proposed projects of the ISUDP-Mombasa and are arranged in order of priority. The summarised project list is shown in Table 11.2.6.

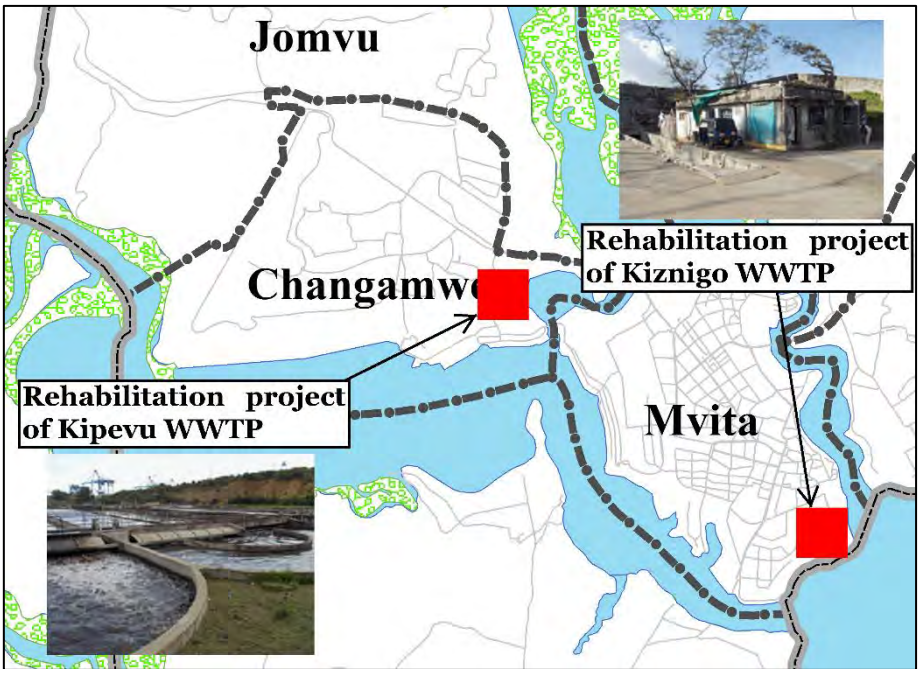
Table 11.2.6: Project List of Sewerage

No.	Title	Objects	Term	Priority
1	Rehabilitation Project of the Existing Wastewater Treatment Plant	・ Kizingo WWTP: 10,000 m^3/day ・ Kipevu WWTP: 17,100 m^3/day	Short	★
2	Rehabilitation and Extension Project of the Sewerage System	・ Mainland West and Mombasa Island ・ Sewer pipe, Pump station	Short	★
3	Development of New Sewerage Network and WWTP	・ Sewer pipe, Pump station ・ WWTP: Total 175,000 m^3/day	Middle /Long	
4	Installation of Public/Community Toilets with Septic Tanks	・ Public Toilets: 23 ・ Community Toilets: 21	Middle	

Note: Short-term (by 2020), Middle-term (by 2030), Long-term (by 2040), Priority project is marked ★
Source: JICA Expert Team (refer to ISUDP-Mombasa)

The project of sewerage is explained in detail as follows:

- Kizingo WWTP is located within the Mombasa Island, it is an underground plant constructed 20 years ago with a design capacity of 10,000 m^3/day. It is currently non-functional for Kizingo WWTP requires rehabilitation. Rehabilitating at the original location or a relocation should be considered. Kipevu WWTP has a design capacity of 17,100 m^3/day, but rehabilitation and upgrading works for its facilities is required. The project image is shown in Figure 11.2.2.



Source: JICA Expert Team

Figure 11.2.2: Rehabilitation Project of the Existing Wastewater Treatment Plant

- Rehabilitation and extension project of sewerage system is as follows: 1) Rehabilitation of sewer lines and trunk sewer lines, 2) Rehabilitation of pumping stations (Mainland West and Old Town), 3) Rehabilitation of 16 sea outfalls, and 4) Increase coverage of sewerage collection network.
- Development of new sewerage network and WWTP is explained as providing sewer system in the whole town area as required for the congested areas. It is as follows: To provide separate system for drainage and sewerage, to provide on-site sewerage management (decentralised treatment facilities), and ten places for WWTP as low-cost facility.
- To construct 21 community toilets with septic tank in informal settlements (1/25 families) where individual toilets are not feasible. To construct 23 public toilets with bath and urinals including the 20% area without sewerage system (public toilets in the market areas, bus stops, public beaches and public buildings).

The development policy of sewerage by area (where large population growth is expected) is explained in detail as follows:

- Mombasa Island: Kizingo WWTP is not functioning, so raw sewage in Mombasa Island is discharged directly to the sea. It is necessary to finance resources and land for its reconstruction.
- Mainland North: Sewerage is not developed in this area, so it is necessary to develop new sewer systems, and in priority, to the coastal areas such as Shanzu and Mwembelengeza. In the area of Bamburi, Mwakirunge, and Maunguja, the public/community toilet equipped with a septic tank should be installed until the development of a sewerage.
- Mainland West: Kipevu WWTP and a sewer pipeline were developed in Changamwe, but there is no system in Miritini and Jomvu Kuu. The sewer pipeline network should be expanded immediately in the said areas.
- Mainland South: New sewerage facilities at the coastal area, in association with the urban development, should be developed in Vijiweni, Vyemani, and Mtongwe.

The challenges of sewerage development are picked out as follows:

- The development of a new sewer takes a great deal of cost and time. Despite the expectations for considerable demand for infrastructure development over a long course of time, it is difficult to finance it through the government's budget.

- The rebuilding project of the Kizingo WWTP and the expansion project of the existing Kipevu WWTP area should be prioritised to improve the living and public water environment.

(2) Drainage

The development policy of drainage can be attained by adopting the following strategies. These strategies refer to the proposed projects of the ISUDP-Mombasa and are arranged in order of priority. The summarised project list is shown in Table 11.2.7.

Table 11.2.7: Project List of Drainage

No.	Title	Objects	Term	Priority
1	Construction of Drainage Along Existing Paved Roads (387 m)	・ Drainage: 684 km (387 x 2 – 90 = 684)	Short /Middle	★
2	Regular Cleaning of Existing Drainage to Avoid Flooding	・ Existing drainage: Any points	Short /Middle	
3	Preparatory Survey of the Controlled Discharge of Rainwater	・ Rainwater infiltration facility ・ Regulation of management	Middle /Long	

Note: Short-term (by 2020), Middle-term (by 2030), Long-term (by 2040), Priority project is marked ★
Source: JICA Expert Team (refer to ISUDP-Mombasa)

The project list of drainage is explained in detail as follows:

- The construction of drainage is to provide drainage along the existing paved roads (without drainage) to limit the damage caused by flooding within the Mombasa County. The project location is in various locations within the county. About 1500 mm wide open drain will be installed for the 684 km length road. The project image is shown in Figure 11.2.3.

Source: JICA Expert Team (Site photos)

Figure 11.2.3: Construction of Drainage Along the Existing Paved Road

- For reducing incidences of flooding, the county will act to remove the encroachment of drains in the market areas, and to regularly clean the existing drains to avoid flooding during the rainy season.
- The controlled discharge of rainwater in the case of developing a large-scale land and housing in Mombasa County is required in the future. Preparatory survey for a comprehensive storm water master plan for the controlled discharge of rainwater should be done. Proposed programme of the comprehensive storm water master plan is as follows:

  ・ As a rule, a storm drainage plan must be established to cope with the peak storm runoff rate. Then, if necessary, a section and longitudinal plan is established on the basis of calculated uniform or non-uniform flow. If there are existing sewers, their capacity must be evaluated. If insufficient capacity is a problem, consider such proposals as (1) changing the drainage

area; (2) installing supplementary pipes; (3) reducing a peak rate by providing a reservoir; and (4) sectional extension.

- The basic concept is to ensure instantaneous down-flow through sewers. Plans should be drafted on the basis of the actual regional conditions. The following surveys are needed for a storm drainage plan to be established:

  a) Current state of drainage. Since some kind of drainage plan exists, it is important to identify the existing drainage channels and pumps.
  b) How inundation damage occurs and its causes. Prioritisation of required facilities should be possible by sorting out reference data and studying the frequency of inundation and land utilisation in inundation-prone areas.
  c) The river plan and condition of receiving waters

- In addition to the surveys, the planned and actual river flow capacity, high-water levels, and river bed heights, grasping how river improvement can be achieved should also be attempted. Since there are cases in which receiving waters and sewerage are not well balanced in terms of river improvement, grasping river improvement plans and allowable discharge flows should be attempted. To develop a storm drainage plan, a review must be made not only of the conventional drainage plan, but also of storm damage countermeasures ensuring runoff as slow as possible through storage and infiltration of storm water. The results of the review should be reflected in the facilities plan, if necessary. Principal approaches are storm water storage and storm water infiltration.

The challenges of drainage development are identified as follows:

- Regulation and guideline for development of land and housing with controlled discharge system should be prepared.
- There are many roads that are not even paved in urban areas. It is necessary to construct a drainage side ditch in conjunction with road paving work. This is a required adjustment to the planning of road improvement.

11.3 Solid Waste Management

11.3.1 Demand and Gap Analysis

Gap between current situation and desirable situation was analysed as shown in Table 11.3.1.

Table 11.3.1: Current Situations of Solid Waste Management and its Gap Between Desirable Situations

Item	Current Situation	Demand/Desirable Situation	Gap
Master Plan for solid waste management (SWM)	・ CGM does not have a master plan for SWM. ・ Only recorded number of trips of the collection trucks and an estimate in the quantity of collected waste are done.	・ 1) Have a master plan for the SWM, 2) Set goals for final disposal rate, collection rate and recycling rate and 3) Identify priority project to reach the goals in the M/P ・ Monitor progress in achieving the goals and supply feedbacks	・ Prepare a master plan for SWM and identify priority projects ・ Develop capacity of government staff and system for monitoring and feedback in achieving the goals of the M/P.
Waste disposal	・ There are only open dumping sites in CGM. They pollute the surrounding environment. ・ CGM has a regulation for illegal dumping and does not have a system to check it.	・ All waste are recycled, reused or disposed at sanitary landfill sites. There is no pollution caused to the environment. ・ Have a regulation for illegal dumping and have a system to check it.	・ Construction of sanitary landfill site and proper operation for it. ・ Develop system to check and punish illegal dumping

Item	Current Situation	Demand/Desirable Situation	Gap
Waste collection and transportation	・ Collection service within the island is almost sufficient. ・ However, that is not sufficient due to poor number of collection points and collection frequency. ・ Collection rate: 77%	・ Collection service within the island is sufficient. ・ Collection rate: 100%	・ Develop efficient, adequate collection and transportation system ・ Purchase needed equipment and vehicle, and conduct proper maintenance
3R (Reduce, Reuse & Recycle)	・ Informally collected resources such as plastics, metals, and papers by waste pickers and private companies ・ CGM has not conducted 3R activities (no recycling facility)	・ Adequate sensitisation of 3R to waste generators such as households and shops ・ Adequate resource collection system and recycling facilities	・ Sensitisation of 3R to waste generators such as households and shops ・ Development of adequate recycling system including resource collection ・ Construction of recycling facilities
Institutional framework	・ There is no comprehensive institutional framework for solid waste management.	・ Comprehensive institutional framework for solid waste management and the future establishment of recycling-based society.	・ The establishment of law and new regulation is necessary.
Financial situation	・ There is little capacity to cover the solid waste management by current waste collection tariff. ・ Amount and details of expense for waste management are not identified.	・ The revenue from waste collection tariff, benefit from 3R activity and subsidy from the national government cover the cost for waste management. ・ Amount and details of expense for waste management are identified and its validation of the expense is analysed.	・ The revenue from waste collection tariff, benefits from 3R activities, and subsidy from the national government has to be increased. ・ Amount and details of expense for waste management have to be identified and also its validation of the expense has to be analysed for cost efficiency.
Human resources	・ A list of municipal officers, workers and other staff related to solid waste management has been prepared. ・ Sanitary workers and drivers for waste collection and transportation are not sufficient. ・ Key officers attend seminars and workshops for solid waste management.	・ A list of municipal officers, workers and other staff related to solid waste management has been prepared. ・ Sanitary workers and drivers for waste collection and transportation are sufficient.	・ Add sufficient sanitary workers and drivers for waste collection and transportation.

Source: JICA Expert Team

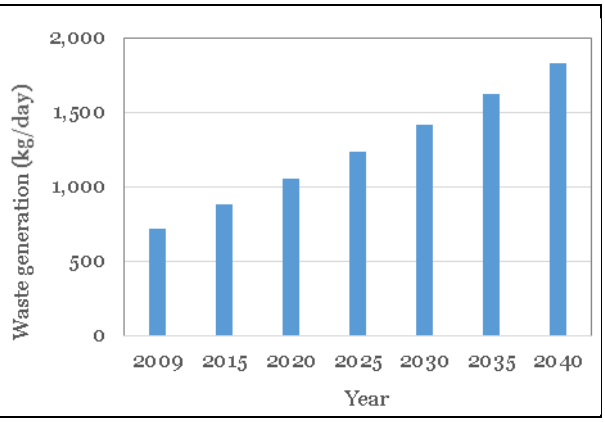
11.3.2 Development Policy

(1) Estimation of Waste Generation

According to ISUDP-Mombasa report, waste generation in the county was estimated by using a 0.76 kg per person per day of waste generation rate as shown in Table 11.3.2. Information regarding the estimate of the detailed waste generation at every source such as residential, commercial, and industrial areas was not available.

Table 11.3.2: Estimation of Waste Generation

Year	Population (person)	Waste Generation (t/day)
2009	939,370	714
2015	1,161,738	883
2020	1,384,880	1,053
2025	1,621,426	1,232
2030	1,868,835	1,420
2035	2,141,426	1,627
2040	2,414,016	1,835



Note: Waste Generation Rate: 0.76 kg/person・day
Source: JICA Expert Team

(2) General Development Policy of Solid Waste Management

In the National Solid Waste Management (SWM) Strategy, National Environment Management Authority (NEMA) set the "Sustainable Solid Waste Management System" and "Clean Healthy Environment" as the sector vision. Development policy has to be set as shown in Table 11.3.3 in order to achieve the sector vision.

Table 11.3.3: Proposed Sector Vision and Development Policy of Solid Waste Management Sector

Sector Vision	・ Sustainable solid waste management system ・ Clean healthy environment
Development Vision	"Development of ***Human/Eco-friendly*** Solid Waste Management System" ・ Prompt collection and transportation from residential and commercial areas (**Human-friendly**) ・ **Eco-friendly** waste disposal ・ Reduction of waste volume for final disposal

Source: National SWM Strategy, NEMA

(3) Goals of Solid Waste Management

NEMA prepared the National SWM Strategy in 2015. In the strategy, NEMA indicated the goals of SWM for both the short and long-term plans as shown in Table 11.3.4. A goal of collection rate was proposed by the JICA Expert Team since it was not mentioned in the strategy.

Regarding the recycling of organic waste such as composting, it is a bit difficult for Mombasa County to compost organic waste equivalent to 33% of all generated solid waste since organic waste has to be sorted or segregated at source before composting and where to use the compost have to be secured. Instead of the goals for recycling rate and composting rate, a goal of recovery rate, which is the amount of recycling rate and composting rate, was proposed to be set as shown in Table 11.3.4.

Table 11.3.4: Goals of Solid Waste Management

Parameters	2016 (Current status)	2022 (Short-term)	2040 (Long-term)
Collection rate	79%	90%	100%
Final disposal rate	77%	70%	50%
Recovery rate	3%	30%	50%
(Recycling rate)	(3%)	15%	17%
(Composting rate)	(<0%)	15%	33%

Source: National SWM Strategy

11.3.3 Management Plan

Based on the general development policy, the planning strategy is formulated as follows:

(1) Collection and Transportation

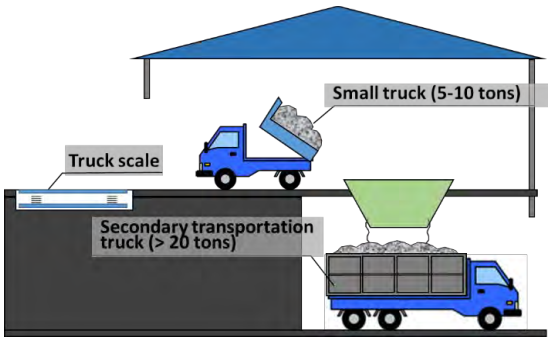
Adequate waste collection and transportation is essential to secure a sanitary living environment. In order to collect solid waste from living environment in a timely manner, capacity of collection and transportation has to be increased. First and second items are described in detail as follows:

a) Development of optimal collection and transportation system to each different zone.
b) Establishment and familiarisation of regulation for waste discharge.
c) Securing adequate collection vehicles, equipment, and staff.
d) Capacity development and maintenance of collection vehicles and equipment.

a) Development of optimal collection and transportation system to each different zone

In low-income areas such as the Old Town in Mombasa Island, the current handcart collection system from source to collection points conducted by youth groups and Community-based Organisations (CBOs) can be continued for preliminary collection. However, CGM has to check whether their service covers all the areas adequately. CGM has to support youth groups and CBOs to increase their working efficiency and to give them incentive to collect also in areas with low population.

In middle- and high-income area, private companies collect waste directly from apartment buildings or individuals by small charge. This voluntary collection system can be continued to lighten the loads of CGM.



Source: JICA Expert Team

Figure 11.3.1: Structure of Transfer Station

Secondary collection system from collection points, where station trucks are being utilised at present, has to be optimised since people living near these collection points complained to CGM about the bad smell of the collected waste. In order to avoid the complaints, the day and time of discharging and collecting waste have to be limited. This limitation can contribute to efficient collection.

In case that small collection vehicles such as 5 tons and 10 tons transport waste to landfill sites located more than 10 km from collection points, transfer stations are necessary for efficient transportation system. A transfer station is a facility that transfers the waste from small vehicles to larger secondary transportation trucks.

b) Establishment and familiarisation of regulation for waste discharge

In order to improve the efficiency of collection system and keep clean the public and living environment, CGM has to establish a regulation for the discharged waste of waste generators. The following are examples of items for regulation:

- To enforce generators to use designated plastic bags;
- To limit the day and time of discharging and collection of waste according to each area; and
- To apply a penalty for violation of the regulation.

After the establishment of the regulation, CGM has to familiarise it to the waste generators and monitor them.

c) Measures for the area wherein population will increase significantly

The areas wherein population will increase significantly, such as the new residential areas in the master plan, have to take specific measures for waste management. The following measures are recommended:

- To place new collection containers and stations in the areas;
- To enhance the waste collection system by adding sanitary workers and collection vehicles because time and labor for waste collection and transportation will increase;
- To instruct and train people in the areas on how to put out the trash; and
- To re-adjust the collection and transportation plan and system such as collection routes and rules to make them more efficient.

(2) Proper Final Disposal

It is necessary to introduce the 3R system and intermediate treatment system to reduce the waste to be disposed in the landfill site. In this context, the waste characterisation in Mombasa County should be considered as well as the financial and technical capability of the existing organisations. The calorific value of the waste generated in Mombasa County is too low for it to be considered for incineration or gasification, and organic waste occupies the higher portion of the waste composition. However, it will be difficult to introduce a large-scale compost or methanisation technology because the technology needs a slightly higher technical capability. Therefore, small- or middle-scale compositing should be considered for the 3R system for Mombasa County.

(3) Final Disposal

As mentioned above, there are three dumping sites in Mombasa County. In the case of Kibarani dumping site, which is the most polluted, the pollution is affecting not only the surrounding environment but also the people working or living near the dumping site. The affected people have complained to CGM, and the National Environmental Committee ordered CGM to stop the dumping of waste in the said area. Considering the current status, CGM has to urgently take actions and construct a new sanitary landfill site which will have a little environmental impact, and close the existing dumping site to minimise the existing environmental impacts. The outline of the new sanitary landfill site is shown in Table 11.3.5.

Table 11.3.5: Outline of New Sanitary Landfill Structure

Category	Facility		Description
Principal facilities	Landfill	Waste disposal facility	Soil embankment for retaining the solid waste
		Lining system	Waterproof liner using black cotton soil available at the site
		Leachate collection facility	Leachate collection piping network at the bottom of the disposal area
	Landfill gas exhaust facility		Distribution of landfill gas exhaust pipes
	Leachate treatment facility		Anaerobic pond, facultative pond, coagulating sedimentation pond, etc.
	Storm water drainage		Prevention of rainwater flowing into disposal area
	Monitoring facility		Monitoring well
Administration	Administration building		Office building and transport control station
	Others		Weigh bridge, parking lots
Others	Road network		Hauling road, access road, on-site road
	Enclosure facilities		Fence, gate, etc.

Source: JICA Expert Team

The sanitary landfill system will include the waste disposal area, a leachate treatment area, and a small area for administration. The semi-aerobic method will be applied for this sanitary landfill for quicker decomposition of organic matter in the accumulated waste and for reduction of the methane gas which is a greenhouse gas. The system will prevent environmental pollution to its surrounding areas.

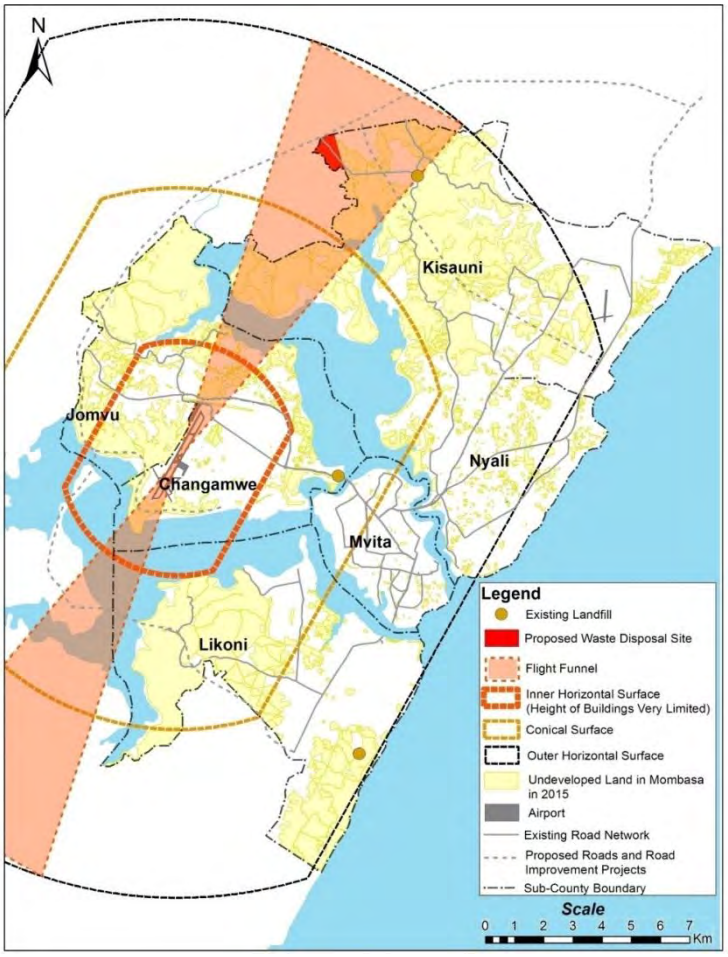
Nevertheless, it will take several years to construct a new sanitary landfill site and finally close the Kibarani dumping site. Therefore, it is necessary to take emergency measures to reduce the environmental impacts. Closing parts of the dumping site with additional environmental measures and limiting the waste disposal area are proposed as emergency measures.

1) Site Selection for New Sanitary Landfill Sites

According to the Kenya Civil Aviation Authority (KCAA), construction of landfill site in the surrounding areas of the airports, which are called flight funnel, inner horizontal surface, conical surface and outer horizontal, is restricted by a regulation of the civil aviation. Figure 11.3.2 is prepared based on an interview with the KCAA and it shows each restricted area. According to the figure, the whole land of Mombasa County is mostly covered by the restricted areas. Also, the candidate site proposed by CGM shown in the figure is located in the flight funnel. Thus, it is proposed that the new landfill sites should be located in the outer horizontal surface apart from the flight funnel, inner horizontal surface and conical surface, as the second option. The undeveloped lands located in the south and east of the Mwakirunge dumping site and/or in the south of Shonda dumping site are recommended sites for the new landfill.

In deciding for the location of the new landfill sites, the following criteria have to be considered:

- Location: within 10 to 40 km from the place of the waste generation, such as the populated areas, especially in case no waste transfer stations are developed.
- Land area of the site: more than 100 ha (about 250 acres) is preferable.
- Distance from the nearest residential area: more than 400 m
- Distance from a large-scale intake facilities from water body for drinking water: more than 1.0 km
- Distance from the aerodrome facility: more than 13 km
- No existence: nature conservation area, habitat area of the endangered species of flora/fauna, and historical/religious valuable places.
- Area designated for public facilities and close to public facilities shall be avoided.
- Availability of access road



Source: JICA Expert Team

Figure 11.3.2: Location of Landfill Sites and Restricted Area for Landfill Sites

2) Land Use Plan After Closing the Landfill Sites

After the decommissioning of the dumping site, the land will not be promptly used. Most organic waste in the disposed waste will take at least 10 years to decompose and only then will the land be stable.

When the land use plan is prepared, safety has to be secured in advance before using it. Items to be checked will be determined according to the land use. Generally, at least the following items are required to be checked:

- Combustible gas (methane), carbon dioxide (CO_2) and hydrogen sulfide (H_2S)
- Odor
- Soil pollution
- Stability of land

Considering low stability of land since disposed waste includes more than 50% of organic waste, parks and sport facilities are recommended for land use.

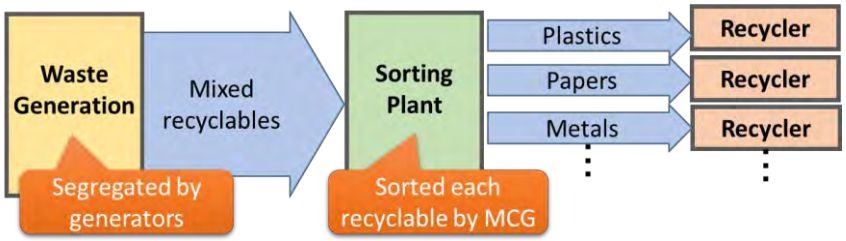
(4) Intermediary Treatment and 3R Activities

Reduction of waste volume disposed at landfill sites through intermediary treatment and 3R activities is very important for sustainable solid waste management since the capacity of landfill sites and available land for landfill sites is limited and to achieve the goals mentioned in Table 11.3.4. Therefore, the systems for intermediary treatment and 3R have to be developed promptly.

1) Proposed Recycling System for Inorganic Recyclables

In order to reduce waste, it is important to segregate recyclables at source, however, it is not easy to force people to implement it. Thus, a Materials Recovery Facility (MRF) to sort recyclable is proposed as a more realistic method.

In order to reduce waste efficiently, CGM has to identify large generators, on whom to apply special measures, for example, setting high tipping fee for waste and introduction of good practices for 3R activities.



Source: JICA Expert Team

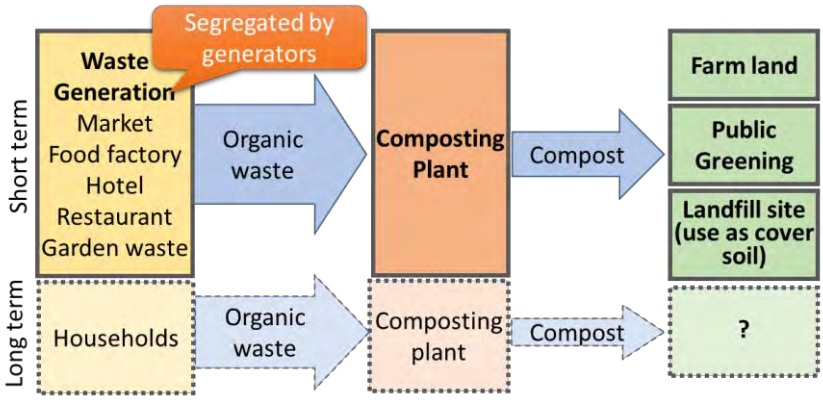
Figure 11.3.3: Proposed Intermediary Treatment through MRF

2) Proposed Recycling System for Organic Recyclables

It is critical to reduce organic waste that accounts for more than 60% of all solid waste. Composting plant is recommendable for recycling organic waste since high cost and high skills for operation and maintenance are not necessary. However, it is important to secure where to use compost and to balance demand and supply since the compost will be disposed at landfill sites if the compost will not be utilised. In a short-term period, it is better to limit target sources to only large generators such as markets, food factories, hotels, and restaurants. At the beginning, it is better to introduce composting plants in small scale as a pilot project for the following purposes:

- To identify suitable target sources and potential issues
- To train operation staffs
- To demonstrate quality of compost and how to use it

In the long-term period, target sources for composting can be expanded up to the households based on the future status.



Source: JICA Expert Team

Figure 11.3.4: Proposed Intermediary Treatment Through Composting Plant

(5) Hazardous Waste

Biohazardous waste generated at hospitals and hazardous waste generated by industrial factories have to be separated from the municipal solid waste and should be disposed properly under the responsibility of the companies generating it. NEMA has the responsibility to supervise the disposal of the hazardous waste.

Hazardous wastes such as condemned goods collected at the port and biohazardous waste generated at the hospitals are disposed at incinerators. The others are disposed at the dumping sites. However, the total capacity of the existing seven incinerators and generation volume of hazardous waste are unknown.

It is difficult and inefficient for both companies generating waste and NEMA to have an incinerator and operate it individually. Thus, it is suggested that large incinerators would be introduced and hazardous waste would be disposed altogether there on the initiative of NEMA. In case large volume of waste is incinerated at a large incinerator, operation cost will be lower and the efficiency of power generation will be high.

(6) Industrial Waste

According to the Special Economic Zone (SEZ) report, 975 tons of solid waste will be generated daily in the SEZ. About 975 tons is equal to the current generation volume of municipal solid waste. It is planned that waste generated in Mombasa SEZ will be dumped at the Shoda Quarry dumping site. It will make a large impact if it will be disposed at the landfill site of CGM. Thus, the waste volume has to be reduced dramatically. To reduce the waste volume, it is suggested that recyclables would be segregated at sources and unrecyclable waste would be incinerated at a new incineration plant to reduce the volume up to one tenth. Although, in general, high operation cost of an incineration plant is an obstacle to introducing disposal of domestic waste in developing counties. Private companies can afford to pay high tipping fee to cover the high operation cost in case of industrial waste. Consequently, the best scenario is:

- To recover recyclables at the sources;
- To dispose hazardous waste and industrial waste altogether and generate electricity at a new large incinerator; and
- To recycle incineration ash at a cement factory as much as possible to minimise waste disposed at the landfill sites.

11.3.4 Proposed Projects

The development projects of the solid waste management are proposed as shown in Table 11.3.6.

Table 11.3.6: Project List of Solid Waste Management Sector

No.	Title	Contents	Term	Priority
1	Provision of Waste Collection and Transportation Vehicle	・ Old transportation vehicles should be replaced with new ones for stable public service of waste collection and transportation, and prompt collection and transportation from residential and commercial areas. ・ Provision of maintenance equipment facilities including washing bay of transportation vehicles and training for vehicle maintenance staff to extend the life period of the transportation vehicles	Short	★
2	Capacity Development for Solid Waste Management	・ Preparation of action plans for short-term based on the master plan ・ Analysis and improvement of current collection and transportation system ・ Preparation of waste discharge manual for each kind of waste generators	Short	★

No.	Title	Contents	Term	Priority
		・ Planning and implementation of awareness and sensitisation programmes and revitalisation of cooperation with stakeholders ・ Training programmes for the government staff and O&M staff		
3	Decommissioning of Dumping Sites and Construction of New Sanitary Landfill Sites	・ Construction of two new sanitary landfill sites in Kasokoni and Likoni Shonda ➢ Project areas: 100 ha and 50 ha ➢ Procurement of O&M machinery and equipment such as weigh bridge, heavy machinery, and monitoring equipment ➢ Construction or improvement of access roads ・ Decommissioning of the existing dumping sites in Kisauni, Mwakirunge and Likoni Shonda ➢ Decommission area: 10 ha, 10 ha and 5 ha ➢ O&M equipment such as monitoring equipment	Short	★
4	Provision of Waste Collection and Transportation Vehicles and Construction of Transfer Stations	・ Construction of a new transfer stations at Voice of Kenya (VOK) and in Jomvu or Changamwe to develop efficient waste collection and transportation system ・ Provision of collection and transportation vehicles to expand coverage area for waste collection service of CGM	Short/Middle	
5	Construction of Hazardous Waste Disposal Facility	・ The following are necessary for proper disposal of hazardous waste: ➢ Construction of a new incinerator (disposal capacity: 100 waste-ton/day) ➢ Purchase of O&M equipment ➢ Training of O&M staff ➢ Development of enforcement and supervision system of waste generators	Short/Middle	

Source: JICA Expert Team

11.3.5 Challenges for Implementation

In order to secure implementation of solid waste management, financial management and human resources management have to be strengthened.

(1) Financial Management

At the beginning, the amount and details of the current expense for the waste management have to be identified. Its validation and cost efficiency, such as each cost per ton of waste collected by each kind of collection method, have to be analysed. The result of the cost analysis is necessary to improve the solid waste management plan and system, as well as usual financial management.

Based on the improved solid waste management plan, the necessary costs have to be budgeted properly.

In order to increase the revenue from the waste management, measures such as re-adjustment of waste collection tariffs have to be discussed and implemented.

(2) Human Resource Management

Based on the improved solid waste management plan, the necessary human resources with required skills and knowledge have to be determined and secured.

A human resource development plan for the solid waste management sector has to be prepared and implemented as planned.

11.4 Power Supply

11.4.1 Demand and Gap Analysis

(1) Power Demand Forecast of Kenya

The Ministry of Energy and Petroleum (MOEP's) has prepared the power implementation plan for delivering the power sector targets outlined in Vision 2030. The main contents are demand forecast scenarios for electricity demand, assessment of energy resources, and generation and transmission expansion plans for the respective study periods.

The following plans that have been prepared in the recent years are as follows:

- Least Cost Power Development Plans 2011–2031 (March 2011)
- Least Cost Power Development Plans 2013–2033 (May 2013)
- Power Sector Medium-term Plan 2014–2018 (April 2014)
- Ten-Year Power Sector Expansion Plan 2014–2024 (June 2014)
- Power Sector Medium-term Plan 2015–2020 (June 2015)
- Power Generation and Transmission Master Plan (June 2016)

The Power Generation and Transmission Master Plan is the latest power sector plan and describes the demand forecast from 2015 to 2035. The average annual growth rate of power demand will reach 7.5% by 2015, 7.8% by 2025, 7.6% by 2030, and 7.1% by 2035. Applying this trend of growth rate to calculate the power demand by 2040, the power demand will be 9,417 MW with the average annual growth rate of 7.1%, as shown in Table 11.4.1.

Table 11.4.1: Power Demand Forecast of Kenya

Year	2015	2020	2025	2030	2035	2040
Power Demand (MW)	1,570	2,259	3,282	4,732	6,683	9,417
Average Annual Growth Rate (%)		7.5	7.8	7.6	7.1	7.1

Source: JICA Expert Team based on Power Generation and Transmission Master Plan 2016

(2) Power Demand Forecast of Mombasa County

As discussed above, the power demand forecast of Kenya has been calculated. In 2015, the power demand of coast region is 249 MW and 70% of it is Mombasa County's demand. The transmission losses in high voltage network is 4.9%. Hence, the current power demand of Mombasa County is 166 MW. It is possible to calculate the power demand of Mombasa County by utilising the average annual growth rate of Kenya. As a result of the calculation, the power demand forecast of Mombasa County is shown in Table 11.4.2.

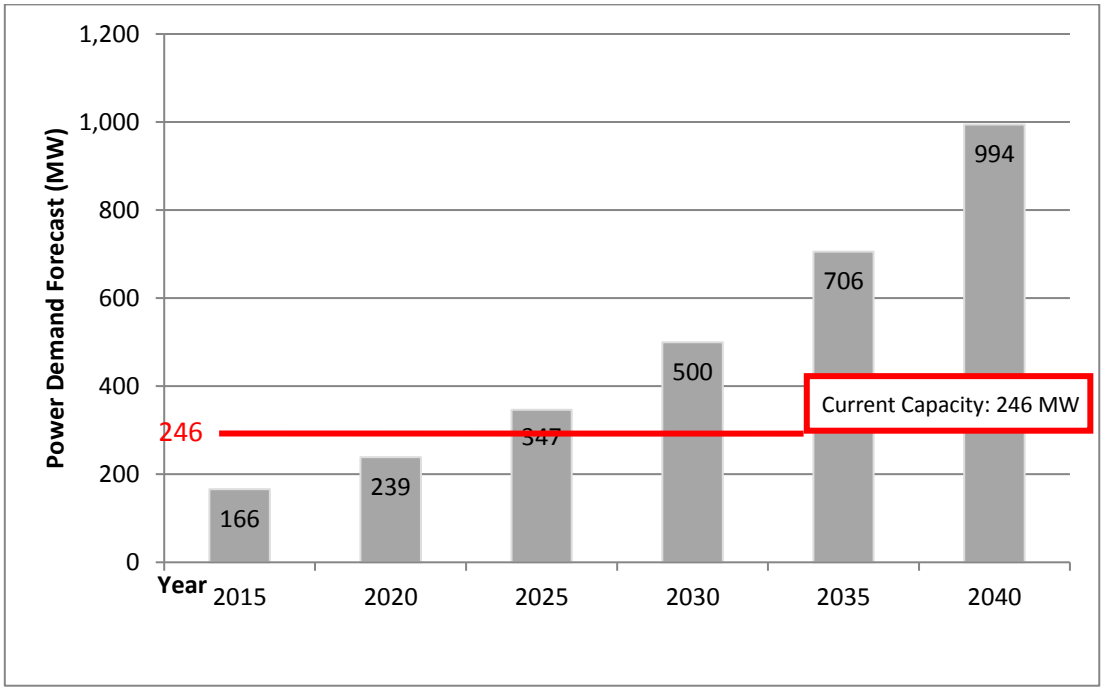
Table 11.4.2: Power Demand Forecast of Mombasa County

Year	2015	2020	2025	2030	2035	2040
Power Demand of Coast Region (MW)	249	358	521	750	1,060	1,494
Power Demand of Mombasa County (MW)	166	239	347	500	706	994
Average Annual Growth Rate (%)		7.5	7.8	7.6	7.1	7.1

Source: JICA Expert Team based on Power Generation and Transmission Master Plan 2016

With the power demand of Mombasa County as 166 MW, electricity is supplied from the national grid through Bulk Supply Point (BSP) substations. The current capacity of BSP substations in Mombasa County are: Kipevu Hill Top 132/33 kV-150 MVA, New Bamburi 132/33 kV-68 MVA, and Rabai 220/132/33 kV-90 MVA. Total capacity of the BSP is 308 MVA, equivalent to 246 MW. This forecast shows that the future power demand of Mombasa County by 2025 will be 347 MW and it will exceed

the current capacity of current BSP substations as shown in Figure 11.4.1. New BSP substations with transmission lines should be installed to meet the load demand of Mombasa County after 2020.



Source: JICA Expert Team

Figure 11.4.1: Power Demand Forecast of Mombasa County

11.4.2 Development Policy

From the demand and gap analysis and the study of the current conditions previously, four points are set for the development policy of the power sector to achieve the Development Vision and Structure Plan. This policy is to cater for the pillars of "High Quality of Life (Social and Culture)" and "Environment and Energy".

- Reliable and sufficient power supply
- Affordable and lowest possible cost
- Extension of the coverage of power supply for all areas of Mombasa County
- Encourage use of renewable energy sources

(1) Reliable and Sufficient Power Supply

Mombasa County has been facing challenges in meeting its growing energy demands via unreliable and unsufficient power supply: The reliability of the network and its compliance with the system requirements. It provides an assessment about how the power supply system would extend with the implementation of new Bulk Supply Point (BPS) susbstations and transmission lines. It will meet the needs of the power demand of the future projects, to support the quality of life and energy. This is the basic right and the foundation of future economy.

(2) Affordable and Lowest Possible Cost

It is very important for the distribution system to give the lowest cost. The solutions for distribution are proposed including methods of operation, upgrading of the grid, and building monitoring system to collect data.

Install new distribution transformers to reduce the radius of the power supply; upgrade the existing transformer capacity which operated overload; and expand the distribution grid into less densely populated areas with longer line lengths causing higher losses, are proposed. This may be partly offset by the loss reduction measures, and proper selection of conductor size, as well as the transformer in terms of efficiency, size, and location. In particular, it is important to locate the distribution transformers at the load centre and if possible keep the number to a minimum.

Modes of operation of electricity grid should be optimised based on the monitoring, inspection, calculating the optimal mode of operation. Short-term and medium-term solution measurement of the electrical parameters in a daily, weekly, and monthly basis. The long-term solution is to build a SCADA system for the power distribution grid.

Besides, the power losses in an electrical distribution network can be minimised by proper planning and designing of the lines, use of efficient equipment at both the distribution and consumer levels. In addition, there should be periodic maintenance, and replacing of malfunctioning and energy inefficient distribution equipment and parts.

(3) Extention of the Coverage of Power Supply for All Areas of Mombasa County

Access to electricity is particularly crucial to human and economic development. Currently, percentage of Kenya's population with access to electricity is 23%, Mombasa County is 75% of the citizens, and mainly in the three subcounties. Achieving the expected high demand growth will also require a significant investment in electrification projects across the whole of the county with adequate expansions of distribution grid. This is the basic right and the foundation of extending the coverage of power supply for all areas of Mombasa County.

Therefore, extension of the coverage of distribution grid for Likoni, Jomvu, and Kisauni to increase the percentage of population with access to electricity, is proposed.

This project includes a forecast of electricity demand for each of the counties and identifies the distribution infrastructure required to meet that demand, whilest achieving acceptable levels of power quality and reliability, based on well-established principles of least-cost planning.

(4) Renewable Energy Sources

The Government of Kenya has signed the Paris Agreement COP 21 (an international environmental agreement on climate change). Therefore, the development of renewable energies will help drive economic growth and help Kenya meet the obligations under the international climate change conventions.

To develop renewable energy sources in Mombasa County, it is recommeded to conduct small projects on renewable energy. These projects should be carried out by public funds, private funds with policy support from the County Government of Mombasa. The content of this project should be to install solar energy systems for street lighting in urban areas, and to install small solar energy, biomass energy in rural areas that do not have access to the electricity distribution networks.

11.4.3 Development Strategy

Four projects to be carried out by 2040 to achieve the development policy set for the energy sector are as follows:

Table 11.4.3: List of Projects

No.	Project	Term			Project Cost (USD in millions)	Possible Fund Source	New Project Proposed by JET	Possible Implementation Agency
		Short	Mid	Long				
1	**[Priority Project]** Development of Power Supply	●			72	ODA	●	Kenya Power
2	**[Priority Project]** Development of the Extension of the Coverage	●			80	ODA	●	Kenya Power
3	**[Priority Project]** Upgrade of the Current Distribution Network		●		55	ODA	●	Kenya Power
4	Development of Renewable Energy			●	10	Public	●	Mombasa County

Source: JICA Expert Team (JET)

These projects are divided into three categories. Priority projects are to be carried out for the power supply development and are to be completed by the year 2020. Meanwhile, other projects are to be implemented after 2020.

(1) Projects Necessary to Develop for Power Supply

As mentioned in Figure 11.4.1, the total capacity of the Bulk Supply Point (BSP) substations in Mombasa County is 308 MVA, equivalent to 246 MW. The future demand of Mombasa County will exceed the current capacity before 2025. Therefore, new substations and transmission lines should be installed to meet the requirements of the three subprojects below.

1. Rabai Power Source
2. Bamburi Power Source
3. 132 kV transmission line from Rabai Substation to Dongo Kundo Substation

The main objective of each subproject is as follows:

1. Rabai Power Source: Installation of 220/132 kV Rabai Substation with two power transformers (200 MVA) and 132/33 kV Rabai Substation with two power transformers (150 MVA).
2. Bamburi Power Source: Installation of 220/132 kV Malindi with two power transformers (150 MVA); transmission line 132 kV from Malindi to Bamburi with a length of 105 km and 132/33 kV Bamburi Substation with two power transformers (75 MVA).
3. 132 kV transmission line from Rabai Substation to Dongo Kundo Substation for the power supply of Dongo Kundo SEZ with a length of 26.5 km.

This project is related with the viewpoint of "High Quality of Life (Social and Culture)" in the Development Vision of Mombasa County.

The Mombasa SEZ is a special economic zone, which requires high reliability power supply comprising state of the art facilities. These facilities have to be operated without any power interruption, which is different from the many existing electrical facilities in Kenya. The estimated power demand of the Mombasa SEZ, growing from 37 MVA in the first year (2019) of operation to a total of 133 MVA (2030) for the whole Mombasa SEZ area. The power source is supplied from 400/220 kV Mariakani Substation through a 53-km of 220 kV transmission line from Mariakani S/S to Mombasa S/S. The tapping point of 400/220 kV Mariakani S/S is the stable power source for Mombasa SEZ when the 400 kV lines are the backbone of the national grid. The 33 kV distribution line from Mombasa SEZ S/S to the port and

all the other tenants through substation access road and port access road. The power will be supplied from Mariakani and a new substation will be developed in Mombasa SEZ.

The power supply facilities shall be constructed at the initial stage to provide sufficient power supply to the tenants.

(2) Extension of Power Distribution Network

The purpose of the extension of the distribution network is to provide power to the increasing power demand in the future and to provide sufficient power supply to all areas of Mombasa County. Extension of distribution power network to Likoni, Jomvu, and Kisauni by installation of new distribution substations and low voltage distribution grid at these subcounties will increase the percentage of population with access to electricity. That gives the ability to develop small and medium enterprises and individual business for households far from the centre. This project aims to upgrade the power supply and support the industry and citizen's life. In this sense, the project is related to the viewpoint of "High Quality of Life (Social and Culture)" in the Development Vision of Mombasa County.

(3) Upgrade the Current Power Distribution Network

The development objectives to upgrade the current power distribution network project are to improve the performance of the distribution network in providing quality and reliable electricity services, and to reduce the greenhouse gas emissions through demand side response and efficiency gains.

There are two components in the project. The first component is a system reinforcement to upgrade the current power distribution network. This component will cover the construction and reinforcement of the medium voltage (MV) and low voltage (LV) electricity distribution networks, including the installation of new distribution substations. These investments will help the distribution network to meet the load growth, address the load supply constraints due to distribution system congestion, reduce losses, and improve reliability and quality of power supply.

The second component is the introduction of smart grid technologies in the distribution. This component will focus on automation through introduction of supervisory control and data acquisition systems of electricity distribution network operations of and data collection. Supporting the first stage of the roadmap for smart grid technologies for power distribution in Mombasa County, this component will assist to increase efficiency, reliability, and effectiveness of the power systems and operations, and optimise distribution system configuration by providing real time data from both the supply and the demand side. In this sense, the project is related to the viewpoint of "High Quality of Life (Social and Culture)" in the Development Vision of Mombasa County.

(4) Development of Renewable Energy

Renewable energy is energy from the natural resources which are continuous and cannot be exhausted, such as solar, hydro, wind, geothermal, ocean, and biology. They are clean energy, environment-friendly product, and do not contribute to the warming of the global climate. However, all renewable energy sources are very difficult to produce in a large capacity and the initial investment cost is high. These subprojects should be carried out by public funds, as well as by private funds with the policy support from CGM.

Some solar energy stations, biomass and wind energy plants should be installed for the small area which need a low power demand, street lighting, and rural areas. In this sense, the project is related with the viewpoint of "Environment and energy" in the Development Vision of Mombasa County.

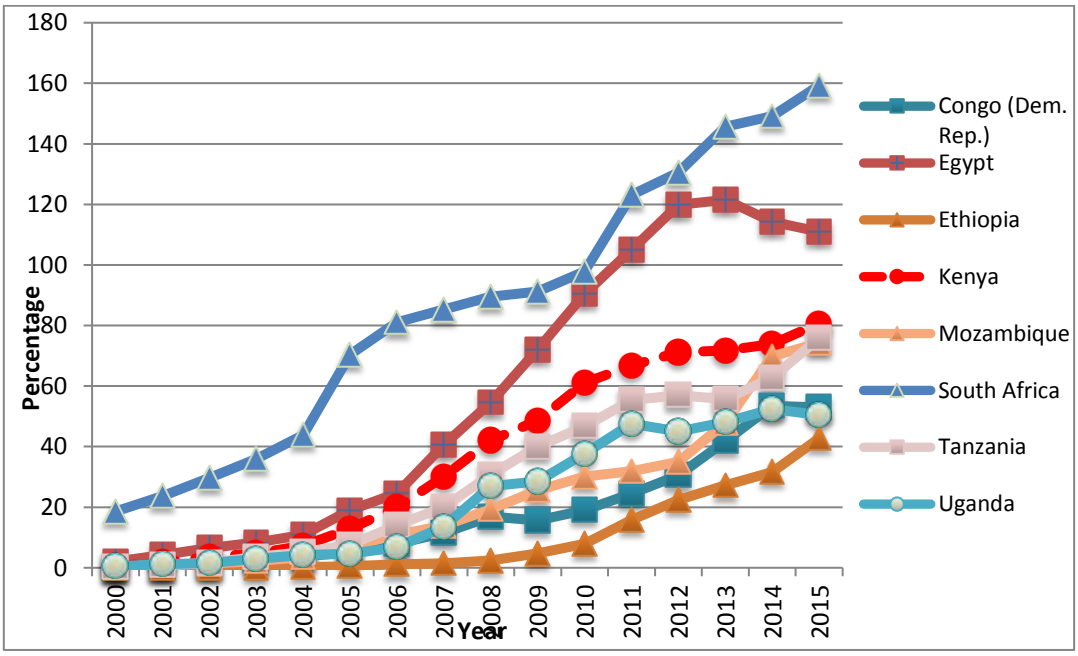
11.5 Telecommunication

11.5.1 Demand and Gap Analysis

In this section, demands for telecommunications, such as mobile telephone, internet use, internet broadband use and international bandwidth capacity, were calculated. Demand for telecommunications is calculated in consideration of the future population studied in this report and the world trends of the telecommunication sector.

(1) Mobile Telephone

According to the International Telecommunications Union (ITU) statistics, the mobile penetration ratio of some of the typical African countries is shown in Figure 11.5.1. In the statistics, the mobile penetration ratio of Kenya was 80.68% in 2015. The development of mobile penetration ratio in this group is divided into two main groups. The first group starts very fast in stages 2004-2005, including: South Africa and Egypt. The second group starts from the period of 2006, including Democratic Republic of Congo, Ethiopia, Kenya, Mozambique, Tanzania and Uganda. Of the second group, Kenya has the highest mobile penetration ratio. The growth rate of mobile penetration ratio in each country was nearly constant after the mobile penetration started to rise.



Source: JICA Expert Team based on ITU statistics

Figure 11.5.1: Mobile Phone Penetration Ratio of Some Typical African Countries

In addition, mobile penetration of G7 countries moved up by 31.52% points per decade as shown in Table 11.5.1. Applying this growth rate to calculate the mobile penetration ratio demand in Kenya, mobile demand is expected to grow as shown in Table 11.5.2.

Table 11.5.1: Penetration Ratio of Developed Countries between 2005 and 2015

Year	Canada	France	Germany	Italy	Japan	United Kingdom	United States
2005	52.76	78.26	94.55	121.86	75.98	108.59	68.32
2006	57.49	83.53	102.28	136.12	78.52	115.60	76.29
2007	61.47	88.98	115.14	150.96	84.35	121.10	82.06
2008	66.20	92.68	126.56	150.89	86.71	122.19	85.21
2009	70.55	92.10	126.23	149.51	91.32	123.95	88.62
2010	75.68	91.39	106.48	154.80	96.81	123.63	91.31
2011	77.83	94.08	109.66	158.15	104.27	123.60	94.44
2012	79.57	97.38	111.59	159.63	110.91	124.76	96.01
2013	80.61	98.50	120.92	158.82	116.32	124.61	97.08
2014	81.04	101.21	120.42	154.29	120.23	123.58	110.20
2015	81.93	102.61	116.71	151.32	125.05	125.75	117.59
Growth Rate (2015)-(2005) (%)	**29.17**	**24.35**	**22.16**	**29.45**	**49.07**	**17.16**	**49.27**
Average Growth Rate of the Decade (%)	**31.52**						

Source: JICA Expert Team based on ITU statistics

The current capacity of mobile operators is 62,800,000 and the estimated mobile subscribers are 37,715,944. With this capacity, the mobile subscriptions will exceed the current mobile operator's capacity before 2025 with 65,760,000 subscribers.

Table 11.5.2: Mobile Telephone Demand

Year	2015	2020	2025	2030	2040
Population	44,761,000	52,187,000	58,610,000	65,412,000	80,091,000
Mobile Penetration (%)	80.68	96.44	112.20	127.96	159.48
Estimated Mobile Subscribers	37,715,944	50,329,000	65,760,000	83,700,000	27,727,000
Mobile Operators Capacity	**62,800,000**				

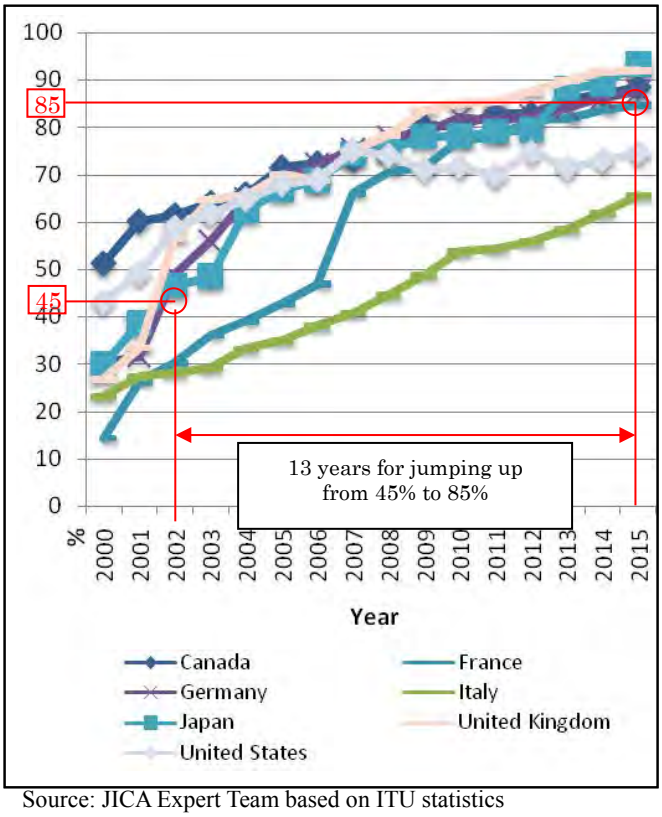
Source: JICA Expert Team based on ITU statistics and Annual Report 2014-2015 by CA

(2) Internet Use

Internet use penetration ratio in Kenya is increasing rapidly. According to the ITU, the proportion of internet users in Kenya was only 3.1% in 2005, and has reached 45.62% by 2015. The main reason is due to the affordable internet access devices, including smart phones and social networking applications as well as aggressive promotion, special offerings, and reduced tariffs launched by operators.

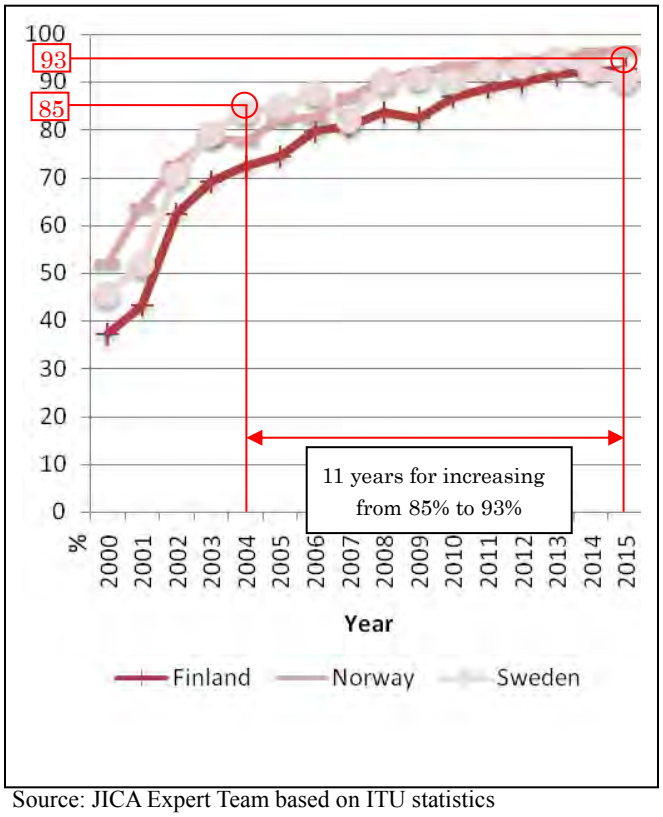
As shown in Figure 11.5.2, it took 13 years for the internet use penetration ratio to reach up to 85% from 45% in G7 countries. Furthermore, in Nordic Countries, where a much higher penetration ratio is seen, it took approximately 11 years for the ratio to rise from 85% to 93%.

Applying this growth rate to calculate the internet use penetration in Kenya, the demand is assumed as shown in Table 11.5.3. Following the trend of developed countries worldwide, the internet penetration ratio demand will reach 61% by 2020, 76% by 2025, 85% by 2030, and 93% in 2040.



Source: JICA Expert Team based on ITU statistics

Figure 11.5.2: Penetration of Internet Use of Developed Countries



Source: JICA Expert Team based on ITU statistics

Figure 11.5.3: Penetration of Internet Use of Nordic Countries

As shown in Table 11.5.3, it is expected that the majority of Kenya's population will use the internet by 2040. With reference to the increasing internet penetration ratio, the expansion of the international communication bandwidth capacity to be connected outward through undersea cable and satellite will be necessary.

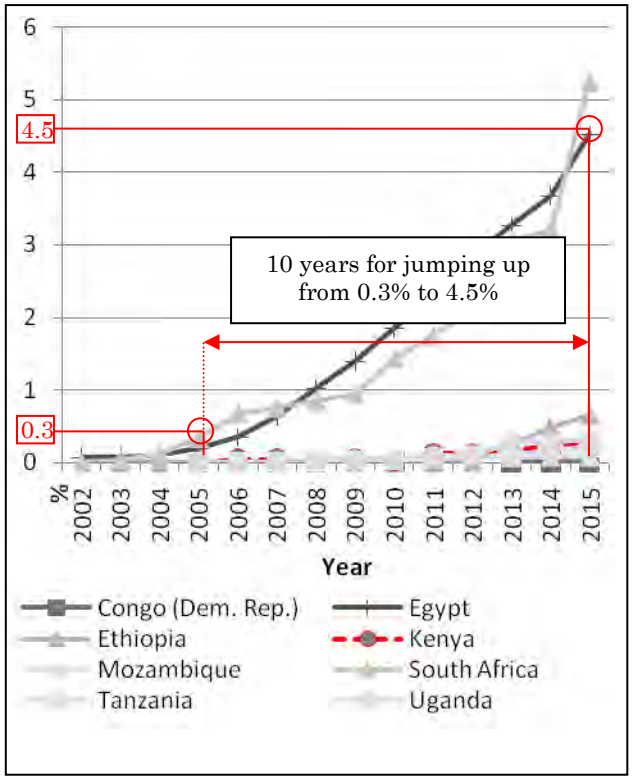
Table 11.5.3: Internet Use Demand

Year	2015	2020	2025	2030	2040
Population	44,761,000	52,187,000	58,610,000	65,412,000	80,091,000
Internet Penetration (%)	45.62	61	76	85	93
Estimated Internet User	20,420,000	31,834,000	44,544,000	55,600,000	74,485,000

Source: JICA Expert Team based on ITU statistics

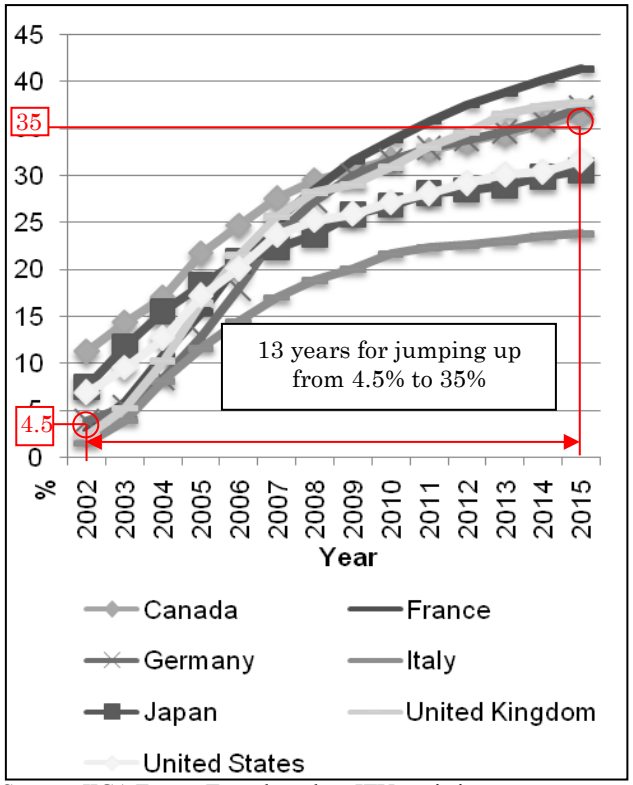
(3) Internet Broadband Use

Internet broadband use penetration ratio in Kenya is quite low. According to the ITU statistics, the internet broadband use penetration ratio of Kenya as of 2015 was only 0.3%. As shown in Figure 11.5.4, from 0.3%, it took ten years for the internet broadband use penetration ratio of Egypt to reach up to 4.5%. Furthermore, as G7 countries, where a much higher penetration ratio is seen, it took approximately 13 years for the ratio to rise from 4.5% to 35%. Applying this growth rate to calculate the internet broadband use penetration, the demand is assumed as shown in Table 11.5.4.



Source: JICA Expert Team based on ITU statistics

Figure 11.5.4: Penetration of Internet Broadband of Developed Countries



Source: JICA Expert Team based on ITU statistics

Figure 11.5.5: Penetration of Internet Broadband of Some Typical African Countries

Table 11.5.4: Internet Broadband Use Demand

Year	2015	2020	2025	2030	2040
Population	44,761,000	52,187,000	58,610,000	65,412,000	80,091,000
Internet Penetration (%)	0.3	2.1	4.5	16.2	35
Estimated Internet User	134,000	1,096,000	2,636,000	10,597,000	28,032,000

Source: JICA Expert Team based on ITU statistics

(4) International Communication Bandwidth Capacity

The international communications of Kenya are provided through undersea fibre optic cables and by satellite. Amongst the total international communication bandwidth capacity, the capacity of the undersea fibre optic cables accounts for more than 99.98% whilest the satellite communication has little share. The total international available bandwidth capacity is 1,669 Gbps in 2015 as seen in Table 11.5.5 below:

Table 11.5.5: International Available Bandwidth

No.	Name	Bandwidth Available
1	SEACOM Capacity (Gbps)	770
2	TEAMS Capacity (Gbps)	820
3	EASY Capacity (Gbps)	39
4	LION2 Capacity (Gbps)	39
	Total Undersea Bandwidth Capacity (Gbps)	**1,668**
5	Satellite Bandwidth Capacity (Gbps)	0.3
	Total Available Bandwidth Capacity (Gbps)	**1.669**

Source: JICA Expert Team based on Annual Report 2014 – 2015 by CA

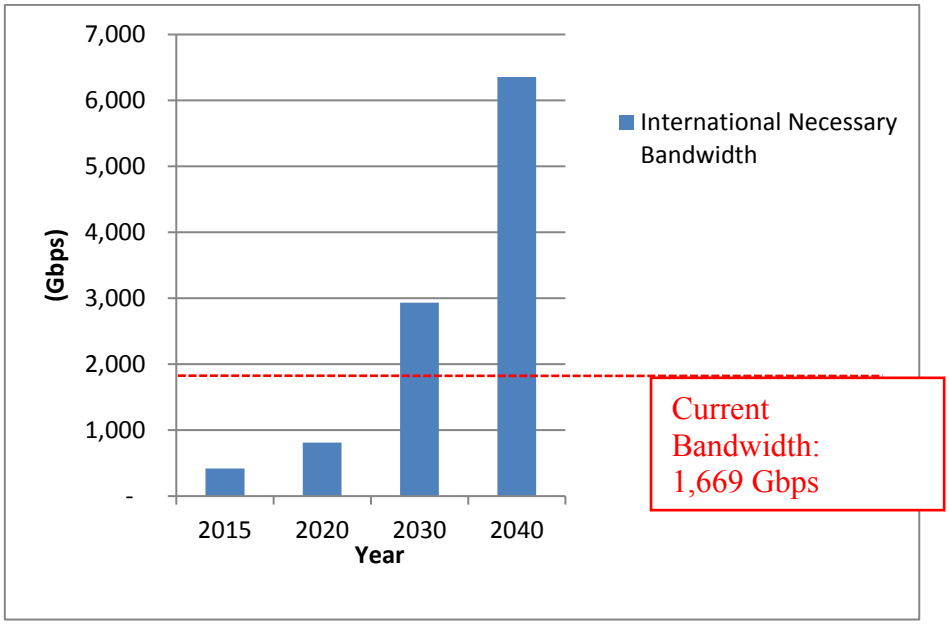
With the increase in the number of internet users, there is a need for the international communication bandwidth capacity to expand in order to provide a smooth internet connection for users. Demand for international communication bandwidth capacity is studied based on the following assumptions listed below. Table 11.5.6 shows the result of demand forecast for international communication bandwidth capacity.

Table 11.5.6: International Communication Bandwidth Capacity Demand

No	Items	Unit	2015	2020	2030	2040	Calculation
(1)	Population		44,761,000	52,187,000	65,412,000	80,091,000	
(2)	Internet User		20,419,968	31,834,070	55,600,200	74,484,630	
(3)	Internet User Ratio	%	45.62	61.00	85.00	93.00	
(4)	Broadband User Ratio	%	0.30	2.10	16.20	35.00	
(5)	Broadband User		134,283	1,095,927	10,596,744	28,031,850	(1)*(4)/100
(6)	Individual Data Use per Day	MByte	3,000	3,000	3,000	3,000	
(7)	Individual Data Use per Day	Mbit	24,000	24,000	24,000	24,000	
(8)	Total Data per Day	Gbit	3,222,792	26,302,248	254,321,856	672,764,400	(5)*(7)
(9)	**Necessary Bandwidth (Broadband User)**	**Gbps**	**37**	**304**	**2,944**	**7,787**	**(8)/24/60/60**
(10)	Narrowband User		20,285,685	30,738,143	45,003,456	46,452,780	(2)-(5)
(11)	Individual Data Use per Day	MByte	300	300	300	300	
(12)	Individual Data Use per Day	Mbit	2,400	2,400	2,400	2,400	
(13)	Total Traffic per Day	Gbit	48,685,644	73,771,543	108,008,294	111,486,672	(10)*(12)/1000
(14)	**Necessary Bandwidth (Narrowband User)**	**Gbps**	**563**	**854**	**1,250**	**1,290**	**(13)/24/60/60**
(15)	**Necessary Bandwidth (Internal)**	**Gbps**	**601**	**1,158**	**4,194**	**9,077**	**(9)+(14)**
(16)	Internal Connection Ratio		0.7	0.7	0.7	0.7	
(17)	**International Necessary Bandwidth**	**Mbps**	**421**	**811**	**2,936**	**6,354**	**(15)*(16)**
Assumption: Broadband subscription: Linear increase Individual data usage per day: 3,000 MByte (for broadband user) and 300 MByte (for narrowband user) International connection ratio: 0.7							

Source: JICA Expert Team based on Annual Report 2014 – 2015 by CA

As shown in Table 11.5.6, although the current available international communication bandwidth capacity for Kenya is 1,669 Gbps, the estimated international capacity will be 2,936 Mbps in 2030. This forecast shows that the international communication bandwidth capacity will exceed the current capacity before 2030 as shown in Figure 11.5.6.



Source: JICA Expert Team

Figure 11.5.6: International Communication Bandwidth Capacity Demand

11.5.2 Development Policy

Based on the study of the current conditions, the following policies for the development of the telecommunications in Mombasa County to achieve the development vision and structure plan is set up. This policy is conducive to the pillars of "High Quality of Life (Social and Culture)" and "Good Governance".

- Efficient, high-capacity ICT infrastructure
- Reliable and affordable mobile phone coverage
- Policy, regulation, and institution development
- Public service systems

(1) Efficient, High-capacity Communications Infrastructure

Mombasa County is the gateway to East Africa through the port of Mombasa. Connection to the National Optical Fibre Backbone Infrastructure (NOFBI) is based in Mombasa County. With this advantage, Mombasa County requires a robust communications infrastructure and reliable connectivity to improve the high quality of life. Furthermore, it contributes in operating and maintaining other sector infrastructures effectively and reasonably. To realise this, all communication infrastructure layers including the connection with NOFBI, the metro trunk communication network, data centre and the access network, which is an interface with users, need to be improved.

(2) Reliable and Affordable Mobile Phone Coverage

Mobile phone is a public infrastructure. Achieving full coverage to the remaining parts of the Mombasa County would be an immense and costly challenge and should not be attempted as that would not be sustainable. Therefore, Mombasa County shall administer the fund, construction, installation, and maintenance works conducted by the commercial operators. Thus, the public-private sector partnership should be improved to optimise telecommunications infrastructure development to provide sufficient mobile phone coverage demand for the Mombasa County.

(3) Policy, Regulation, and Institution Development

CGM is supposed to have the authority to consider and approve all development applications and grant all development permissions. Moreover, it is expected to control the use and development of land and buildings, and to have jurisdiction over the control of the use and development of land and infrastructure in the interests of proper and orderly development. For this reason, CGM is required to formulate and enforce the policy, regulations, and institutions when developing the telecommunications infrastructure.

(4) Public Service Systems

Integrating Information and Communications Technology (ICT) in public service systems is required to achieve good governance. Currently, Mombasa County is weak in the service delivery of applications. Although, the CGM has acquired applications such as the website and revenue collection, the application and uptake is low. Public Service Systems delivers a next generation of administrative services that enable the share and utilisation of information and data amongst the CGM and subcounties through computer network instead of the current administrative services conducted face-to-face through documents.

11.5.3 Development Strategy

Five projects to be carried out by 2040, to achieve the development policy set for the telecommunications sector, are as follows:

Table 11.5.7: List of Projects

No.	Project	Term			Project Cost (USD in millions)	Possible Fund Source	Possible Implementation Agency
		Short 2020	Mid 2030	Long 2040			
1	[Priority Project] Development of Optic Trunk Communication Network	●			6	ODA	Mombasa County
2	[Priority Project] Development of Mobile Phone Coverage in Mombasa County	●			11	PPP	Mombasa County/Operator
3	[Priority Project] Development of Mombasa ICT Centre with Data Centre		●		6	ODA	Mombasa County
4	Development of Comprehensive ICT Policy Environment		●		0.2	ODA	Mombasa County
5	Development of Public Service Systems		●		6.5	ODA	Mombasa County

Source: JICA Expert Team

These projects are divided into three categories. Priority projects are to be carried out for telecommunications infrastructure development and to be completed by 2020. Meanwhile, other projects are to be implemented after the year 2020.

The main objective of each project is as follows:

(1) Development of Optic Trunk Communication Network

Upgrading the optic fibre trunk network for the metro trunk communications and local access network is essential to solve the telecommunications infrastructure issues. Enhancement of communications network contributes not only to the improvement of internet user convenience but also to the introduction of the Intelligent Transport Systems (ITS), which will provide innovative services to

different modes of transport and traffic management and enable various users to be better informed whilest providing safer, more coordinated, and smarter use of transport networks.

ICT infrastructure is the basis upon which public service delivery shall be made possible. Mombasa County requires reliable and fast internet to enable ICT based public service delivery systems. Upgrading the optic fibre trunk network is important because the connection to fibre optic is the most reliable.

This project aims to strengthen the communication network between the urban areas and other regions in the county, and it addresses the viewpoint of "Vibrant Economy" in the Development Vision of Mombasa County.

(2) Development of Mobile Phone Coverage in Mombasa County

As mentioned in Section 5.3.3, mobile network is covered mainly in the centre of Mombasa County and the rural areas have lower coverage, which makes access to telecommunication services unequal. Therefore, development of mobile phone infrastructures to increase the coverage area and provide strong signal is needed. However, the operator's profit of improving the coverage is not high, therefore, the CGM should issue the policy of public investment for development of mobile phone coverage. In addition, the CGM should sign the binding agreement with the operator which requires the entire coverage area.

This project aims to strengthen the communication network between the urban areas and other regions in the county, and it addresses the viewpoint of "High Quality of Life (Social and Culture)" in the Development Vision of Mombasa County.

(3) Development of Mombasa ICT Centre with Data Centre

CGM, through the national treasury, is implementing a disaster recovery facility for data and systems as a part of the business continuity plan. This will ensure that the government services will be continuously provided even in the case of any disaster at the primary sites. This facility will also offer an environment for cloud computing to offer the services of CGM. Mombasa's ICT infrastructure currently does not meet the demand of the county. Therefore, the county government should develop an ICT centre with a Data Centre to ensure the security of the government data and applications.

Moreover, Mombasa County is a city in Kenya of undersea cables. Thus, this location is best for the international carriers to place their regional interconnection infrastructure and build the Mombasa County Data Centre for such services: E-Government, active directory services, mail services, file services, application services, backup and recovery services, and data securities.

A main purpose of this project is to build an ICT centre which can provide services such as E-Government services, education, learning centre, and community centre.

The project will build an ICT centre to help develop education and job skills for the government employees and citizen, moreover, the data centre will ensure the security of the government applications or enterprise. It addresses the viewpoint of "Good Governance" in the Development Vision of Mombasa County.

(4) Development of Comprehensive ICT Policy Environment

Mombasa County requires a policy and legal framework to deploy ICT fully. However, CGM lacks a comprehensive ICT policy and relevant laws. The existing policy is in the draft form and is not yet comprehensive. Furthermore, CGM is not alive to the fact that deploying ICT is capital intensive. As such, it has not developed a financing framework for ICT. This makes Mombasa County miss the

progressive and strategic engagements with its partners. In addition, CGM lacks a strategic roadmap to guide the investments in ICT.

Development of the comprehensive ICT policy environment for equal access to information technology should be in details to cover all the aspects on acquiring and deploying ICT, and should heavily align to the ICT policy. CGM also requires specific ICT laws.

This project aims to strengthen the communication network between the urban areas and other regions in the county, and it addresses the viewpoint of "Good Governance" in the Development Vision of Mombasa County.

(5) Development of Public Service Systems

CGM should seek to achieve the following objectives that touch on public service delivery systems. The CGM should implement interventions: (i) improve the public involvement and participation in county decisions; (ii) enhance public communication; (iii) provide limited information dissemination mechanisms to the general public; and (iv) develop the public point telecommunications services.

The main purpose of this project is the development of the Public Service Systems for guaranteeing the access of telecommunication services for all citizens through public point telecommunications services, especially in the rural areas in which deploying network infrastructure is difficult. Also, this project will assist the poor to have an access to the public telecommunications services on the basis of supporting rates of telecommunications services through providers of public telecommunications services. This project aims at strengthening communication network between urban areas and other regions in the county, and it addresses the viewpoint of "High Quality of Life (Social and Culture)" in the Development Vision of Mombasa County.

12. Social and Public Facility Development Plan

12.1 Housing

12.1.1 Demand and Gap Analysis

(1) Consideration in Quantity

Mombasa County will need about 359,000 housing units by 2040 to accommodate the growing population, which is calculated as shown in Figure 12.1.1. The additional housing demand will increase gradually, for example, about 35,000 by 2020 and 82,000 by 2025 (Figure 12.1.2), and therefore continuous and a volume of housing development is necessary in the future. When population distribution by area is considered, the areas around subcentres (Bamburi, Mtongwe, Dongo Kundu, Miritini, and Mwakirung) have higher demand for housing (Figure 12.1.3).

The population density of Mombasa County was 5,000 people/km^2 in 2015 and it is expected to increase steadily according to the rapidly growing population and to reach 10,500 people/km^2 in 2040 (Figure 12.1.1 and Figure 12.1.2). When it is compared to the current population density of other major cities, the current figure of Mombasa County is close to Tokyo (4,300 people/km^2) and London (5,500 people/km^2) (Figure 12.1.4), where land in the cities is highly utilised without unutilised vacant land. The population density of Mombasa County in 2040 will be close to Delhi (11,500 people/km^2) and Lagos (12,700 people/km^2), where high concentration of the population causes serious problems including traffic jam and air and water pollution due to difficulty of control.

■Forecasted Housing Demand by 2040

(2.41 million – 1.16 million) / 3.5 = **359,000**

Forecasted Population in 2040	Forecasted Population in 2015	Average Household Size Proposed by ISUDP	Housing Demand by 2040

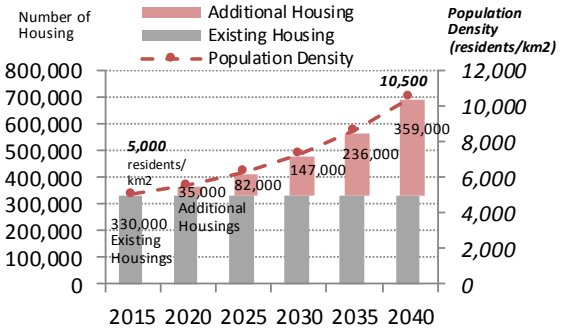
■Forecasted Population Density in 2040

2.41 million / 229.9 = **10,500 people/km^2**

Total Area (km^2) of Mombasa County	Population Density in 2040

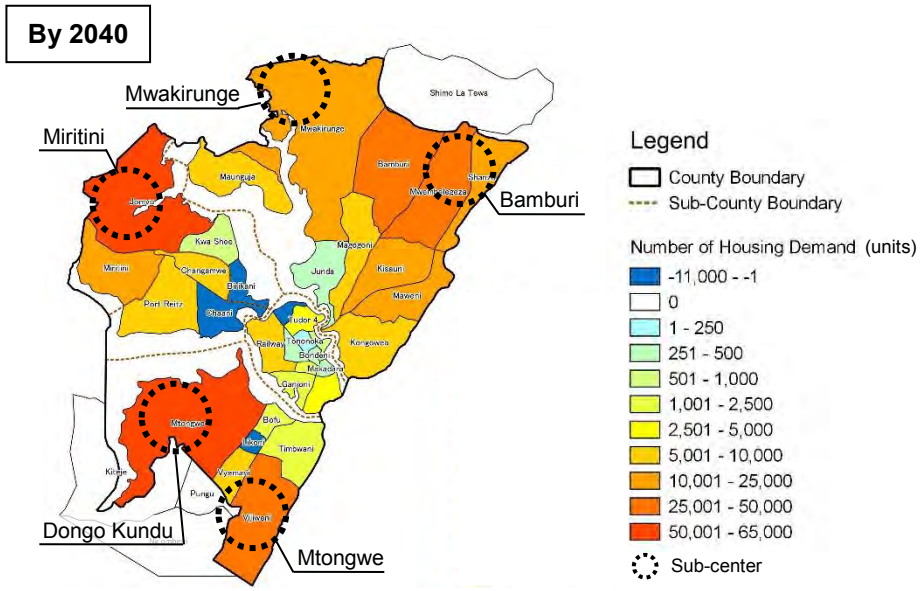
Source: JICA Expert Team

Figure 12.1.1: Calculation of Forecasted Housing Demand and Population Density in 2040



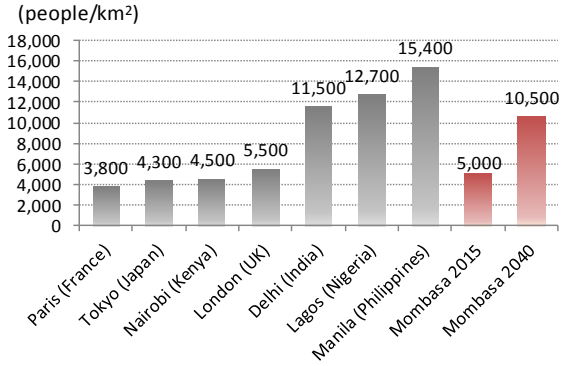
Source: JICA Expert Team

Figure 12.1.2: Future Housing Demand and Population Density



Note: Average number of household members is estimated at 3.5 people/household.
Source: JICA Expert Team

Figure 12.1.3: Number of Future Housing Demand by Area



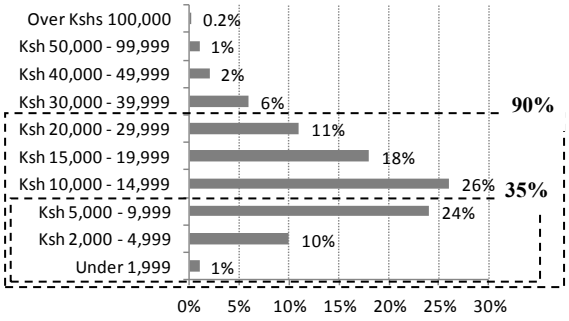
Source: New Geography, BBC and Kenya National Bureau of Statistics (2009)

Figure 12.1.4: Population Density in Major Cities

(2) Consideration in Quality

In addition to the population projection above, the following factors are to be considered:

a) Large Proportion of Lower Income: According to the household interview survey conducted by the Japan International Cooperation Agency (JICA) Expert Team in 2015, the condition of monthly expenditure of household in Mombasa County is shown Figure . The survey revealed that most households have few savings and the result for the expenditure has the same meaning as for income. It requires particular attention in considering housing type that 35% of household earns less than KES 10,000/month and 90% of household earns less than KES 30,000/month.



Source: Household Interview Survey in 2015 conducted by the JICA Expert Team

Figure 12.1.5: Monthly Expenditure of Household in Mombasa County

b) Large Proportion of Younger Workforce: When it comes to age distribution in Mombasa County, the share of working age population is larger than the other age groups (Figure 2.3.2 in Chapter 2 above). Because the population in their twenties is especially high, it is expected that a younger workforce is and will be migrating into Mombasa County and there will be high demand of housing for their family.

12.1.2 Development Policy

Mombasa County requires a large amount of housing supply in the future as mentioned above. The majority of future housing demand will still be for low and middle income groups, considering the current situation where most of the households are low and middle income groups and migrating young population seeking jobs in Mombasa County. Because society consists of a variety of supply and demand including those by low-income groups, and housing is a foundation for the life of the people, it is essential to fulfil the supply of housing for all of the population, including low-income groups, to support the society of Mombasa County. The sector vision of the housing sector is proposed as in Table 12.1.1. The development vision of "High Quality of Life (social and culture)" is linked closely to the sector vision of housing. To achieve the sector vision, the following development policies are proposed:

Table 12.1.1: Proposed Sector Vision and Development Policy of Housing Sector

Sector Vision	To ensure shelter for all with good living environment
Development Policy	a) Public housing supply support for low and middle income groups b) Promotion of private housing supply c) Control for proper living environment

Source: JICA Expert Team

a) Public housing supply support for low and middle income groups

There is a large demand to provide housing units to accommodate the rapidly growing population in Mombasa County, especially for low and middle income groups. An active public housing supply support for them is necessary to ensure shelter for all citizens. Publicly-operated housings and financial services are most effective support for them with little income and savings. There is the challenge of procuring funds to provide those supports. The County Government of Mombasa (CGM) currently provides and operates publicly-operated housings only by their county budget. The source of budget must be expanded. This master plan proposes the establishment of a housing public corporation dedicated for the purpose of housing supply. Appropriate system should be constructed where the public corporation can procure funds from several sources including the National Housing Corporation, two-step loan, private funds, and banks.

The main housing provider will still be private companies based on the current situation where Mombasa County provides only 3,000 housing units. Their involvement for housings for low and middle income groups is quite important. Mombasa County should encourage private companies to provide housing for low and middle income groups through various methods, taking advantage of each other's role and strengths including public-private partnership (PPP), giving incentive and making regulations. For example, a private company must provide budget for housing for low-income groups when they have housing projects for high-income groups. There is a need to establish such a system that can build numerous low-cost housing projects.

Construction of rental-type housing must also be encouraged. Although around 55% of the households live in rental housing in Mombasa County, rental housing should be constructed more because the rental style is generally easier for lower income groups and younger migrants to choose according to their financial condition and life planning than owning a house. According to the interview survey with some private developers in Mombasa County conducted by the JICA Expert Team, most of them commented high cost of land, construction materials, and finance from financial institutions who charge high interest rates as the main issues constraining rental housing development. Financial support by the housing public corporation is highly recommended.

b) Promotion of private housing supply

As mentioned above, the main housing provider in the future will still be private companies. To provide a large number of the additional housings in Mombasa County, it is important to create an environment with less obstacles for them. Lack of clarity on land tenure is one of the biggest issues in Mombasa County. The issue not only constraints the utilisation of land but also raises transaction cost by increasing approval process duration. The issue will need to be addressed as a priority. For example, database should be created and opened to citizens to encourage land transaction for private developers.

Private housing developers are facing financial constraints also. Some of them gave up housing construction due to financial reason including lack of funds to prepare construction material. It is recommended that financial support by the housing public corporation above will cover private developers as well as residents.

c) Control for proper living environment

Service facilities including commercial stores dealing in daily commodities, school, health centres, and parks should be allocated around the residential area. This policy aims to balance the socio-economic need for such activity and the environmental impact of the said activity in residential areas. Mixed use allows access to commercial activities in the proximity of the residences and reduces the need for commuting, which will increase quality of life of citizens.

It is highly recommended for creating and maintaining the proper living condition above to formulate regulations to control the location and design of buildings and guideline which defines necessary infrastructures in the surrounding area.

12.1.3 Development Strategy

(1) Development Strategy

To achieve the sector vision and implement the development policies, the following strategies are proposed:

In the short term, a Mombasa County housing development agency (social housing) will be established which will be the main body for public housing supply (Figure 12.1.6). Because of lack of enough funds in the first stage, existing public lands will be utilised to construct housing. Before the start of rapid and mass development in the future with population increase, laws, regulations and guidelines should be formulated and enforced. Capacity development for the operation of the regulations and efficiency of land administration are also necessary.

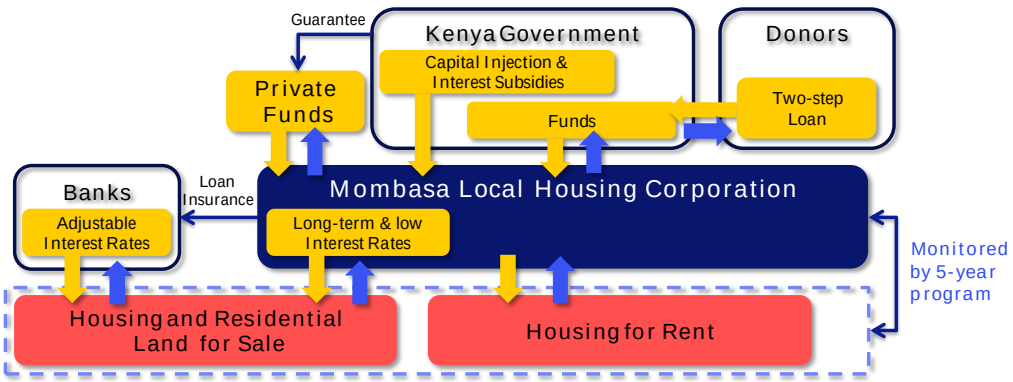
In the medium and long terms, publicly-operated housing will be constructed on private land and suburban areas. Government housing loan will also be provided. The source of financial resources should shift to Mombasa County itself so that Mombasa County can provide housings independently.

The strategies should be implemented with particular priority on the areas with high demand for housing, especially around the subcentres including Dongo Kundu, Miritini, and Bamburi.

- Short Term
    - Establishment of a Mombasa County housing development agency (social housing)
        - Making a housing construction plan (every five years)
        - Construction of publicly-operated housing on public land:
            - For middle and upper-low income:
                - Public offering to private developers

        - High rise for sale and rental
      - For middle and low income:
        - Support by donors and non-governmental organisations (NGOs)
        - Low rise for rental
    - Procurement of funds
      - Two-step loan
      - National Housing Corporation
  - Promotion of efficiency and transparency of land administration
    - Capacity development of the administration department
    - Digitisation of land tenure and records
  - Enforcement of laws, regulations, and guidelines
    - Housing-related laws for the public housing corporation
    - Formulation of zoning regulation and planning permission to achieve appropriate allocation of housing and facilities, which includes regulation for land use, building coverage ratio, floor area ratio, and height
    - Infrastructure development guideline

- Medium-Long Term
  - Enhancement of housing support by the Mombasa County housing development agency (social housing)
    - Construction of publicly-operated housing
    - Development of new town
      - Development of new town where infrastructures including access roads, water supply, and sewerage system are to be developed by the county government and housing including for low and middle income are to be developed by private developers.
      - Consideration on the system where private housing sector is required to construct housing including for low income if they construct more than a certain area
    - Government housing loan
      - Interest: Long term and low interest rate
      - Target: Mainly for middle and upper-low income groups
    - Procurement of funds
      - Revenue from mixed use
      - Loan and housing mortgage
      - Property tax
  - Promotion of efficiency and transparency of land administration
    - Digitisation of land tenure and records
    - Operation of land information publication system



Source: JICA Expert Team

Figure 12.1.6: Proposed Scheme of the Mombasa County Housing Development Agency (Social Housing)

(2) Development Project

Development projects of the housing sector are proposed in line with the development strategy. Table 12.1.2 lists the projects of the housing sector.

Table 12.1.2: Project List of Housing Sector

No.	Titles	Contents	Term	Priority
1	Establishment of a local housing corporation	・ Making housing construction plan (every five years) ・ Procurement of funds with two-step loan and National Housing Corporation	Short	★
2	Promotion of efficiency and transparency of land administration	・ Digitisation of land tenure and records ・ Capacity development of the administration department ・ Operation of land information publication system	Short/ Medium	★
3	Formulation of zoning regulation	・ Formulation of zoning regulation including regulations for land use, building coverage ratio, floor area ratio, and height ・ Implementation of the regulation	Short	★
4	PPP housing project	・ Re-planning and re-developing some of the old estates owned by Mombasa County, which includes Khadija Estate, Miritini green field, Shimo La Tewa Estate, Changamwe Estate, Tudor Estate, Mzizima Estate, Buxton Estate, Likoni Estate, and Nyerere Estate.	Short	
5	Establishment of government housing loan	・ Establishment of government housing loan with long-term and low interest rates for residents and developers	Medium	
6	Detailed planning for proposed new towns	・ Development plan of land use and housing infrastructures including access roads, water supply, and sewerage system ・ Regulation for private developers to include housing units not only for higher income, but also for low income	Medium /Long	
7	Low income housing project with utilisation of private developers	・ Consideration and implementation of the system where private housing sector shall construct housing units including lower income if they construct more than a certain area	Medium /Long	

Source: JICA Expert Team

12.1.4 Challenges for Implementation

The important points in implementing the sector plan, which is mentioned above, are summarised as follows:

- **Securing of financial resources**: Providing public housing mostly depends on financial resources. It is important to secure the following:
  - **Organisation design**: Establishment of a local public housing corporation as the main body for public housing supply is recommended. Its purpose, functions compared with Mombasa County and National Housing Corporation, amongst others, and housing supply method should be considered well.
  - **Five-year housing construction plan**: A plan including vision, target number of public housing supply, and living standards should be made. The plan should be revised every five years to catch up with the housing situation.
  - **Basic survey**: Housing interview survey should be periodically implemented to make the five-year plan. It should update basic information including number of household members, household income, space for a household, and cost for housing.
- **Development of institutional framework**: Institutional frameworks especially for housing supply and zoning regulation must be developed. The following should be considered:
  - **Related frameworks**: Related frameworks including both national and local ones must be checked so that new frameworks have proper linkage with them.

- **Private organization**: It is required for Mombasa County to decrease obstacles for private organisations to do housing business. Their situation and opinions should be widely obtained and considered.

- **Development of human resources**: This Mombasa Gate City Master Plan (MGCMP) proposes new functions by CGM about zoning regulation and land administration. To implement the policy and strategy, more skilled staff is required especially for the Department of Lands, Planning, and Housing of CGM. According to this MGCMP, personnel plan should be made, and necessary number of staff and skills should be prepared.

12.2 Education

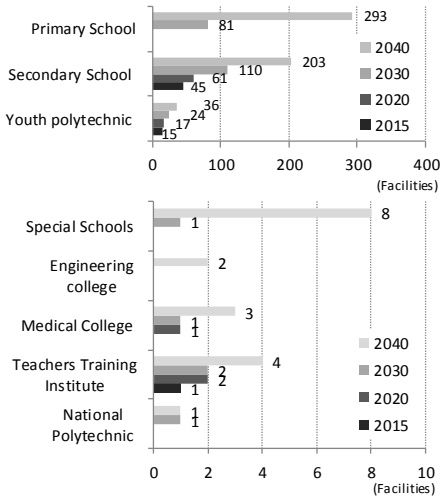
12.2.1 Demand and Gap Analysis

The necessary number of education facilities for the future population and the gap between the necessary number and existing available number are analysed based on norms given in the Physical Planning Handbook 2008 and norms estimated by the Integrated Strategic Urban Development Plan (ISUDP-Mombasa). The overall estimated gap in educational facilities in 2040 will be 293 facilities for primary school, 203 for secondary school, and 36 for youth polytechnic as shown in Table 12.2.1.

Table 12.2.1: Overall Estimated Gap in Educational Facility Numbers in 2040

Facility	One per catchment population	Future Demand	Current Availability	Gap in 2040
Primary School	3,500	689	396	293
Secondary School	8,000	302	99	203
Youth Polytechnic	60,000	40	4	36
Special Schools	100,000	24	16	8
General College	150,000	16	113	-
Engineering college	500,000	5	3	2
Medical College	500,000	5	2	3
Teachers Training Institute	500,000	5	1	4
National Polytechnic	1,000,000	2	1	1
University	1,000,000	2	8	-

Note: Population in 2040 is estimated at 2,413,000.
Source: Physical Planning Handbook 2008 Kenya and ISUDP-Mombasa

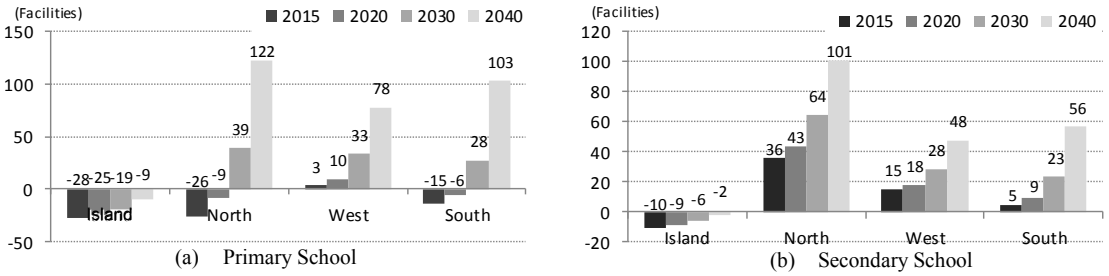


Source: Physical Planning Handbook 2008 Kenya and ISUDP

Figure 12.2.1: Gap of Education Facility Numbers by Phase

The gap of the estimated number by phase, in 2020, 2030, and 2040, is shown in Figure 12.2.1. The number of primary schools in the whole Mombasa County looks enough by 2020, but there is regional gap, and the development of facilities in suburban areas until 2020 is necessary as mentioned below. The development of secondary schools needs to be encouraged because there is a gap of 45 facilities even in 2015 and more demand is expected since secondary education is subsidised from 2008.

In terms of spatial coverage, most of the educational facilities are concentrated in Mombasa Island. Especially primary schools and secondary schools should be distributed equally in terms of commuting and safety of children. The gap of the estimated number of primary and secondary schools by area is shown in Figure 12.2.2. Development of new facilities of primary and secondary schools in Mombasa Island will not be necessary and demand for development in the other areas, especially in Mainland North, will be increased according to the growing population.



(a) Primary School (b) Secondary School

Note: North, West, South mean Mainland North, Mainland West and Mainland South, respectively.
Source: Physical Planning Handbook 2008 Kenya

Figure 12.2.2: Gap of Basic Education Facility Numbers by Area and Phase

It should be noted that the estimation above is just in terms of quantity. Development policy in quality terms should be considered for both basic education and higher education.

12.2.2 Development Policy

Education provides children with opportunities to fulfil their potential and is critical to all aspects of social development. The access to education in Mombasa County is, however, limited. Net enrolment rates of primary and secondary school in 2012 were 81% and 32%, respectively, although free primary education and subsidised secondary education have been introduced. These are mainly caused by poor access mode to schools, lack of facilities in their neighbourhood, and economic difficulties of households. In addition, according to the growing population, Mombasa County will require a number of basic education facilities and higher education facilities in the future, and the facilities should be allocated considering regional equality as mentioned above. At the same time, quality of education service should also be secured. The sector vision of education sector is proposed as shown in Table 12.2.2. The development vision of “Vibrant Economy” and "High Quality of Life (Social and Culture)" are linked closely to the sector vision of education. To achieve the sector vision, the following development policies are proposed:

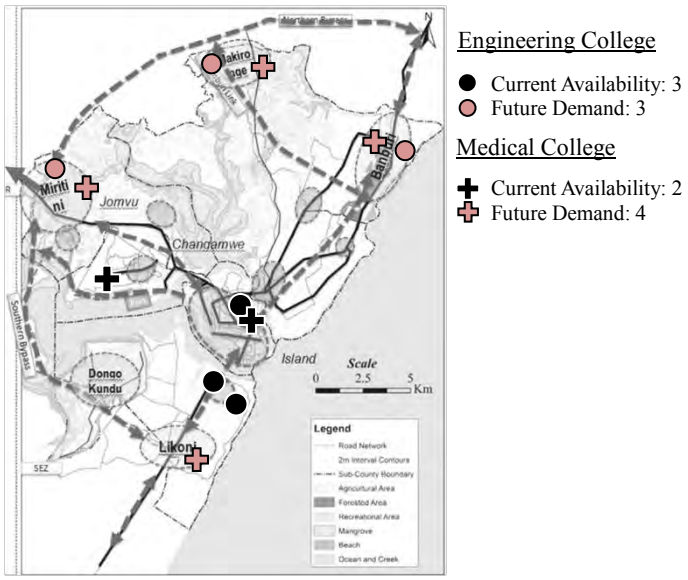
Table 12.2.2: Proposed Sector Vision and Development Policy of Education Sector

Sector Vision	To facilitate access to educational facilities to promote social inclusion and cohesion and facilitate quality of service
Development Policy	a) Good access with equitable distribution b) Security of service quality

Source: JICA Expert Team

a) Good access with equitable distribution

The number of education facilities in Mombasa County is concentrated in Mombasa Island. Based on the estimation that future population will grow outside Mombasa Island for the most part, it is necessary to allocate new education facilities mainly in the newly developed areas according to the population distribution. Basic education facilities should be developed in the neighbourhood of each residential area so that children's means of commuting and safety are secured. Higher education facilities should be developed at subcounty level to cover the demand of each area. For example, new engineering colleges and medical colleges are proposed to be allocated as shown in Figure 12.2.3 based on the location of the existing facilities.



Source: JICA Expert Team

Figure 12.2.3: Proposed Location of New Colleges

b) Security of service quality

In addition to the development in terms of number, service quality of education should be secured. Private sector accounts for a big part of basic education schools in Mombasa County, i.e., 77% in primary education facility and 65% in secondary education facility. Considering the limited public budget, increase of share of private schools is necessary to cover the estimated growing population. A number of private schools, however, have problems such as too small size of facilities and education contents focusing on studying for exam. The government should utilise the public schools with a minimum standard for private schools to secure education quality.

Regarding higher education, there is a need for more higher education and training courses which connect students and trainees directly with the industries that Mombasa County plans to upgrade as well as to increase job opportunity. Marine engineering, logistics, and business management are the prominent sectors to be encouraged for higher education in Mombasa County.

12.2.3 Development Strategy

(1) Development Strategy

To achieve the sector vision and implement the development policies, the following strategies are proposed. In the short term, securing quality of facilities and development of specific training course should be conducted with priority to take advantage of existing asset for saving cost and to upgrade Mombasa's economy. In the medium and long terms, new education facilities should be developed according to the new population distribution.

- Short Term
  - Formulation of minimum quality standard for private school
  - Rehabilitation of public pre-primary, primary, and secondary school
  - Development of specific training course for key industries of Mombasa County

- Medium-Long Term

  - Construction of new public pre-primary, primary, and secondary school
  - Development of higher education facilities in each subcounty

(2) Development Project

Development projects of the education sector are proposed in line with the development strategy. Table 12.2.3 lists the projects of the education sector.

Table 12.2.3: Project List of Education Sector

No.	Titles	Contents	Term	Priority
1	Formulation of minimum quality standard for private school	・ Formulation of minimum quality standard for private school including facility and curriculum ・ The quality standard should be designed so carefully with consultation of private sectors to minimise barrier for them to enter and operate	Short	★
2	Development of specific training course or college for key industries of Mombasa	・ Establishment of professional training course or college to provide needed skills for main sectors in Mombasa including marine engineering, logistics, and business management.	Short	★
3	Rehabilitation of public pre-primary, primary and secondary school	・ Rehabilitation of old public school facilities including development of class rooms and laboratory ・ Procurement of education equipment including desk and chair	Short/ Medium	
4	Construction of new public pre-primary, primary, and secondary school	・ Construction of new public pre-primary, primary, and secondary school according to population growth and cover area by public school	Short/ Medium /Long	
5	Development of higher education facilities in each subcounty	・ Development of new higher education facilities including engineering, medical, and teacher training colleges at each subcounty	Medium /Long	

Source: JICA Expert Team

12.2.4 Challenges for Implementation

The important points in implementing the sector plan, which is mentioned above, are summarized as follows:

- **Securing of budget**: According to the growing population in the suburban area, new education facilities must be developed. Especially, basic education facilities should be developed in the neighbourhood of new residential areas so that children can access easily and safely. It is required for CGM to make the budget plan and secure the budget.

- **Reduction of cost**: Because the budget is limited, cost should be saved with the following ideas:

  - **Utilisation of existing asset**: The existing education facilities and equipment should be utilised with rehabilitation.
  - **Utilisation of private sector with keeping quality**: Increase of share of private schools is necessary to cover the estimated growing population with limited public budget. CGM should utilise the public schools with a minimum standard for private schools to secure education quality.

- **Securing of human resources**: According to the increase of children and necessity of upgrading higher education, more number of teachers and more skilled staff are necessary in the future. CGM should consider to train more students in teachers' schools and each higher education organisation should recruit skilled staff accordingly.

12.3 Health

12.3.1 Demand and Gap Analysis

The necessary number of health facilities for the future population and the gap between the necessary number and existing available number are analysed based on norms given in the Physical Planning Handbook 2008, Kenya. The estimated gap in health facilities in 2040 will be one for city level hospital and 12 for district level hospital as shown in Table 12.3.1.

Table 12.3.1: Estimated Gap in Health Facility Numbers in the Future

Facility	One per catchment population	Current Availability	Gap (Necessary Number)			
			2015	2020	2030	2040
Level 5 City Level – Referral Hospital (Public and Private)	1,000,000	1	0	0	1	1
Level 4 District Hospital (Public and Private)	100,000	12	0	1	5	12
Level 3 Health Centre	30,000	39	0	4	17	41
Level 2 - Basic Health Sub Centre Nursing Homes	10,000	116	0	12	51	125
Level 1 - Dispensary/ Small Clinic with Chemist Shop	5,000	231	0	25	103	252
Women Hospital	500,000	0	2	3	3	5
Communicable Disease hospital	1,000,000	2	-1	-1	0	0

Note: Population in 2015, 2020, 2030, and 2040 are estimated at 1,156,000, 1,278,000, 1,670,000, and 2,413,000.
Source: Physical Planning Handbook 2008, Kenya

12.3.2 Development Policy

The quality of life is closely related to health condition. In addition, good health condition gives a positive impact on productivity and amount of labour force. On the contrary, health problems may increase the risk of poverty through lost earnings and increased health expenditure. Although the current overall number of health facilities by type in Mombasa County looks enough for the norms given in the Physical Planning Handbook, the facilities are not equally distributed and they are concentrated in Mombasa Island. The gap of service level should be balanced by establishing necessary health facilities, which should be matched with the appropriate assignment of qualified health workers as well. The sector vision of the health sector is proposed as shown in Table 12.3.2 to enhance the health status of the citizens. The development vision of "High Quality of Life (Social and Culture)" is linked closely to the sector vision of health. To achieve the sector vision, the following development policies are proposed:

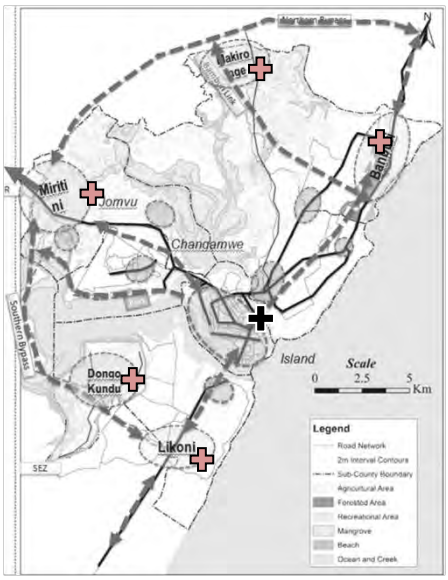
Table 12.3.2: Proposed Sector Vision and Development Policy of Health Sector

Sector Vision	To provide improved access to quality healthcare services through developed health infrastructure
Development Policy	a) Good access with equitable distribution b) Security of service quality

Source: JICA Expert Team

a) Good access with equitable distribution

The major health facilities and health equipment are concentrated in Mombasa Island, whilst the other subcounties have few health functions where population is larger and increasing. To catch up with the population growth trend, it is proposed to establish a referral hospital for each subcentre with priority to upgrade regional health service level (Figure 12.3.1). The referral hospitals should be developed in Bamburi, Miriti, and Dongo Kundu subcentres at first according to the current population and future rapid increase.



Source: JICA Expert Team

Figure 12.3.1: Proposed Location of Referral Hospitals

In terms of primary healthcare facilities, rehabilitation and expansion of existing health facilities should be conducted to utilise existing asset especially in the suburban area. In the medium and long terms, construction of new health facilities is necessary in new towns.

b) Security of service quality

Service quality of health service should be secured as well. In addition to recruitment of more health workers, regular training and capacity building of health workers should be conducted.

In the medium and long terms, specialised group-oriented facilities should be developed to respond to several kinds of demand including drug rehabilitation, old age care, physical and mental rehabilitation, and communicable disease from the estimated growing population, which will also relieve the pressure on general hospitals to some extent.

12.3.3 Development Strategy

(1) Development Strategy

To achieve the sector vision and implement the development policies, the following strategies are proposed. In the short and medium terms, the establishment of regional referral hospitals is prioritised. In addition, rehabilitation of existing health facilities and improvement of service level should be encouraged. In the medium and long terms, provisions of specialised group-oriented facilities should be developed.

- Short-Medium Term
  - To rehabilitate and expand existing health facilities
  - To establish referral hospitals and emergency medical services
  - To improve customer satisfaction and perception including training health workers and recruitment of more health workers
- Medium-Long Term
  - To ensure sufficient provisions for target group-oriented specialised facilities

(2) Development Project

Development projects of health sector are proposed in line with the development strategy. Table 12.3.3 lists the projects of the health sector.

Table 12.3.3: Project List of Health Sector

No.	Titles	Contents	Term	Priority
1	Rehabilitation and expansion of existing health facilities	・ Renovation of core public health facilities including constructing a modern maternity wing, dispensaries and laboratory	Short/ Medium	
2	Establishment of referral hospitals in each subcounty with emergency services	・ Establishment of new five referral hospitals (one in each subcounty) with emergency services	Short/ Medium	★
3	Training course for management level staff	・ Holding training course for management level staff in public hospital to upgrade technical and service level ・ Training course will be held regularly not only for management level, but also for every staff in the long term	Short/ Medium	
4	Establishment of medical facilities for special group	・ Establishment of medical facilities for special groups including drug rehabilitation, old age care, physical and mental rehabilitation, and communicable disease	Medium /Long	

Source: JICA Expert Team

12.3.4 Challenges for Implementation

The important points in implementing the sector plan, which is mentioned above, are summarised as follows:

- **Securing of budget**: This MGCMP proposes development of a regional referral hospital in each subcentre. The first hospital should be developed at Bamburi subcentre based on its current large population and estimated rapid increase. The development plan and budget should be prepared. In addition, primary healthcare facilities are necessary to support regional health. Rehabilitation and expansion of existing health facilities should be conducted to utilise existing asset. Construction of new health facilities is also necessary in new towns. Their budget should be planned and secured.

- **Expansion and training of human resources**: Service quality of health service should be secured. In addition to recruitment of more health workers, regular training and capacity building of health workers should be conducted.

13. Tourism Development Plan

13.1 Tourism Development Concept

Tourism in Mombasa County had grown up as mass tourism destination until the 1990s. The business relied on chartered flights and package tour with full-board or half-board basis, which implied that the leakage of tourism benefits to both national and regional economy is huge. In addition, natural resources such as beach and wildlife had been mainly utilised for tourism rather than cultural resources which contribute to generate interaction between visitors and local communities. Consequently, tourism contribution to local economy and communities was quite limited except for direct employment in accommodations and suppliers of raw materials.

The Mombasa Development Vision is proposed as "a premier gateway port city that upholds diversity and heritage", aiming to promote "port/logistics" and "tourism" hand in hand, as well as, to preserve tangible and intangible heritages. Tourism is one of the pillars to support local economy and to generate job opportunities to achieve the development vision. The tourism development vision is set up as "Revive Mombasa" which aims v-shaped recovery by breaking away with the previous conditions of just relying on mass tourism, meanwhile, utilising newly emerging opportunities. To achieve the development vision, the tourism development directions 1) to make Mombasa be a gateway of a tourism destination including neighbouring counties and 2) to diversify and add value on tourism destination of Mombasa County and neighbouring counties by utilising and preserving tangible and intangible heritages in Mombasa County are presented. According to the direction, the development concept is proposed hereinafter.

(1) Current Conditions

The Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis shown in Table 13.1.1 below summarises the current conditions of tourism sector in Mombasa County, observing internal factors, strength and weakness, as well as external factors, opportunities, and threats. The proposed development concept enhances its strength and utilises opportunities to differentiate Mombasa County and its surrounding areas as a tourism destination. The determined weakness and threats should be tackled by development policy.

Table 13.1.1: SWOT Analysis

Strength	Weakness
・ **Available functions of Mombasa as gateway** through international airport and port ・ Accumulation of existing accommodations ・ **Existence of natural tourism resources such as beautiful beach and coral reef** ・ Existence of cultural tourism resources derived from Mombasa history such as Old Town and Fort Jesus ・ Existence of tourism facilities and services ・ **Unique culture as** a centre of **Swahili Coast** ・ Already known as sun and sand destination in European market ・ Warm hospitality of local communities	・ **Heavy traffic conjunction between the airport and the city, as well as, within the city** ・ Deterioration of existing tourism facilities ・ **Less awareness of cultural heritages** ・ **Limited diversification of tourism products** ・ Limited efforts of updating skills of service providers ・ Lack of proper planning and monitoring ・ Lack of marketing and promotion plan ・ Limited promotion opportunities ・ Lack of proper distribution of tourist information ・ Unstructured tourism management system ・ Lack of proper coordination amongst stakeholders ・ Less prioritised budget allocation for tourism development ・ Garbage collection truck scattered within the city

Opportunities	Threats
・ Ongoing devolution process ・ Newly constructed highway and bridge may mitigate **not only heavy traffic conjunction but also accessibility between neighbouring counties** ・ Newly constructed berth for cruise ship ・ New investments such as MICE facility ・ **Diversification of natural and cultural tourism resources in collaboration with neighbouring counties** ・ A gradual increase in the growth of global tourism industry	・ **Security concern in the region** ・ A rapid decrease in the number of visitors due to the adverse travel advisories ・ Existing domestic, regional, and international competitors

Source: JICA Expert Team

In addition, through a series of discussions and site visits, the gaps between the basic conditions to move forward to development vision and the practice are recognised as mentioned below.

- The proposed developed vision shows clearly that Mombasa County has recognised that tourism as one of the most crucial sectors contributes to gain economic benefits and to preserve cultural and historical heritages. On the other hand, the budget to support and enhance tourism has not been allocated properly. According to the Capital Investment Plan of Integrated Strategic Urban Development Plan's (ISUDP-Mombasa's) Priority Projects covering the current three years, there are no tourism projects except one which is "to develop the Mombasa International Convention Centre (MICC) that requires more time and huge budget. One reason can be that tourism contribution to local economy has been limited due to the established system in which tourism had grown in the Mombasa County. Another reason can be that few people understand the total contribution of tourism including direct and indirect benefits.
- Local communities in Mombasa County have not recognised that tourism gives benefit to their livelihood. It was proven that nobody mentioned tourism issues in the public meeting which was organised even in the area along the north coast beaches where tourism has been active. Due to the lack of awareness, they tend to address social issues to be prioritised. It also influences the budget allocation of the county.
- There are currently 33 gazetted cultural sites and monuments that are maintained by the National Museum of Kenya (NMK) in Mombasa County. However, people noticed several sites such as Fort Jesus, Old Town, and some other few sites. Many people have never visited and known the history behind. Even though Mombasa Development Vision declares to preserve cultural heritages both tangible and intangible, as people do not know their values on the ground. This has led to the abundance and degradation of existing cultural heritages in Mombasa County in reality.
- Although the government adopted the policy of promoting domestic tourism, which was initially to fill in the gap caused by the decline of international arrivals in Mombasa County, some private sectors are reluctant to follow the new policy and tend to stick to their old-fashioned business, which just focuses on international market. According to the African Development Bank (2011), the middle-class population in Kenya stands at 44.9% of the total population and 34% of Africa's population. Fostering domestic and regional markets, which are relatively less affected by the adverse travel advisories, is very crucial to make the sector more stable and to safeguard it against bad effects caused by external factors. However, some of the private sectors have not recognised new emerging markets.

(2) Strength and Opportunities

1) Strengths

The area's major strengths and unique features that can lead to the area's comparative advantage in terms of tourism are:

- Available functions as a gateway city, which has an international airport and port;

- Accumulation of existing accommodations which vary from two to four stars, as well as, vacation hotels, town hotels, villas, cottages, and service apartments;
- Existence of natural tourism resources such as beautiful beaches and coral reef, as well as, cultural tourism resources located in Mombasa Island (Mvita) such as Old Town and Fort Jesus which derived from its own history;
- Existence of tourism facilities and services such as marine sports, museums, and man-made attractions;
- Unique culture as a centre of Swahili Coast;
- Already known as sun and sand destination in European market; and
- Warm hospitality of local communities.

2) Opportunities

The area possesses the following opportunities which enhance the strengths and unique features above:

- Ongoing devolution process which enables Mombasa County to develop and promote the county by their own capacity;
- Newly constructed highway and bridge, which improve the heavy traffic congestion within the Mombasa County and strengthen the connectivity with neighbouring counties;
- Newly constructed berth for cruise ship, which increases the number of excursionists:
- New investments such as Meetings, Incentives, Conventions, and Exhibitions (MICE) facility, which generate pull factor of new type of visitors; and
- Diversification of natural and cultural tourism resources in collaboration with neighbouring counties.

(3) Development Concept

In order to enhance the area's attractiveness and further strengthen its comparative advantages, development efforts should concentrate on building on the strengths and opportunities mentioned above.

1) Spatial Development Emphasis / Goals

- Spatially, development efforts should be focused largely on creating "tourist pull" beyond Mombasa County itself, an already established destination, towards the neighbouring counties such as Kilifi and Kwale, considering that:
- Each county has each attribute in terms of tourism resources. Mombasa County accommodates cultural heritages since it was developed as trade centre through its history. Kilifi and Kwale have rather strengths for natural resources such as white sand beaches, wildlife, and marine wildlife. Combining those different resources make the destination competitive.
- Heavy traffic congestion in Mvita (Island) resulted in limited linkage between Mombasa County and its neighbouring counties, although visitors arrive in Mombasa County through several entry points such as the Moi International Airport and Mombasa Port. The newly constructed highway will improve the connectivity amongst the counties.
- Construction of the Mombasa International Convention Centre (MICC) is already adopted as a public-private partnership (PPP) project. The spatial development will offer diversified tourism products for new types of visitors.

2) Product Development Emphasis / Goals

- **Revitalising cultural heritages in Mvita (Island)**: Revitalise cultural heritages in Mvita which adds value on developing destination for both excursionists and overnight visitors.

- **Extending existing product bases**: Extend the existing tourism products base areas, Mombasa County, and neighbouring counties, Kilifi and Kwale, which are judged as most effective, considering the different attributes of tourism resources which each county accommodates.
- **Tourism circuits**: Establish tourism circuits linking a variety of attractions to be developed as well as those existing attraction, developing more high quality visitor interpretation and facilitation. It will contribute to attract frequent visitors.
- **Meetings, Incentives, Conventions, and Exhibitions (MICE) promotion**: Actively further develop and promote MICE products with the area's unique incentive and seminar opportunities that are greatly appealing to the international market.
- **Mombasa landmark development**: Develop new tourism products which can be a landmark and represent Mombasa County such as integrated resort, aquarium, seafront walkways, and Mombasa Tower, in long term.

3) Target Market Emphasis / Goals

The development concept of each term and general directions of target market are described below.

In short term, it is recommended to penetrate domestic and regional markets which are currently emerging and relatively not sensitive with security issues. Meanwhile, by taking measures to improve the security conditions, the existing international market, especially the European market, will be revitalised.

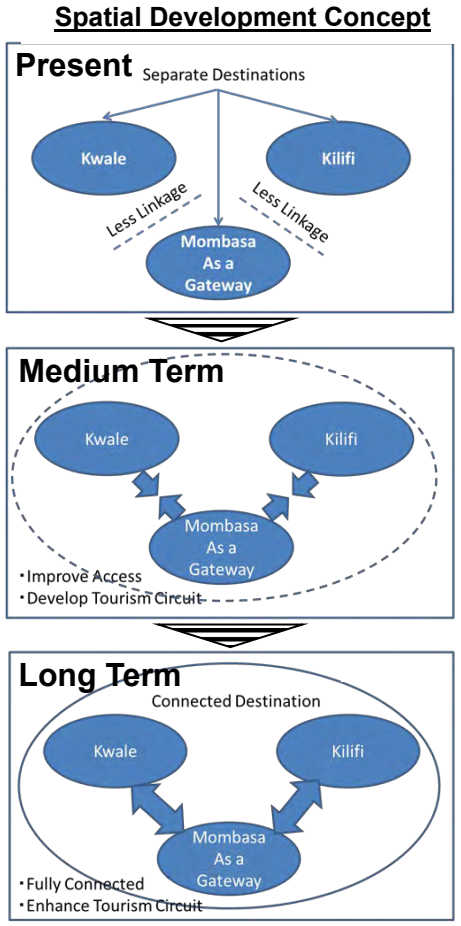
In medium term, based on the cultivated domestic and regional markets during the short term, domestic market is expanding more. The market in Africa is also expanding from regional to whole, following South Africa. In addition to the existing European market, new international markets such as new foreign MICE market and foreign ecotourism market are more explored.

In long term, efforts are taken to maintain domestic and African markets. Meanwhile, new emerging international markets are explored by offering new tourism products.

Table 13.1.2: Target Market (General Direction)

Period	Short Term (2020)	Medium Term (2030)	Long Term (2040)
Concept	Fill in the Gap	Boost the Sector	Prepare for Next Stage
Target Market (General Direction)	・ Penetrate the domestic market ・ Penetrate the regional market ・ Revitalise the existing international markets	・ Expand the domestic market ・ Expand from regional to African market ・ Explore new international markets	・ Maintain the domestic market ・ Maintain the African market ・ Explore new emerging international markets

Souce: JICA Expert Team



Product Development Concept

- Less tourism products are connected in-between
- Heavy traffic congestion from Mombasa to neighbouring counties
- Limited products which attract domestic and regional markets

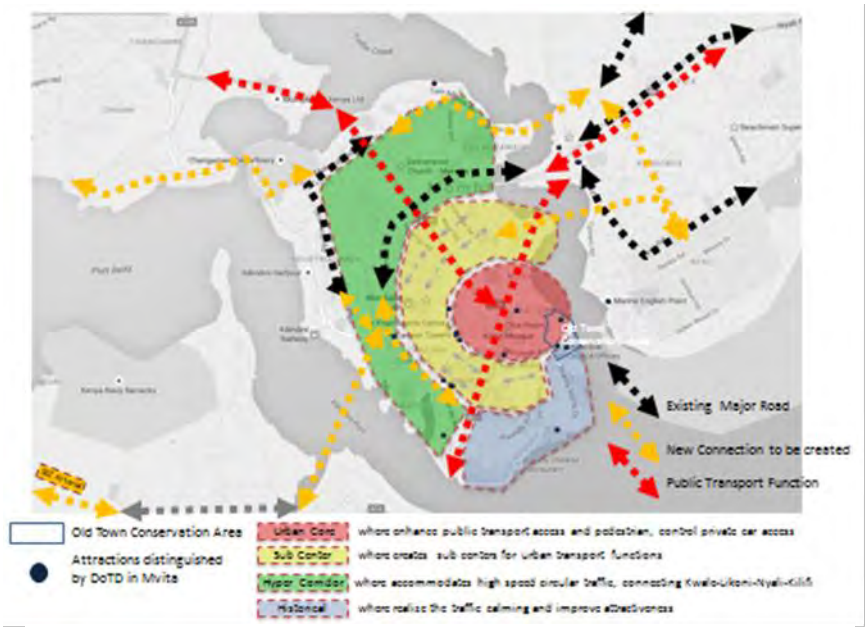
- Revitalise cultural heritages in Mombasa County to add value on developing a destination
- Create distinctive products in-between which are clearly differentiable from those offered elsewhere
- Develop tourism circuits which offer various kinds of experiences utilising natural and cultural heritages

- Offer rich experiences with natural and cultural heritages
- Establish tourism circuits linking multiple attractions in the connected destination, offering a variety of experiences
- Develop Mombasa landmark which strongly attract new types of visitors

Source: JICA Expert Team

Figure 13.1.1: Proposed Development Concept by Term

In order to revitalise Mvita as tourism destination, urban core area which includes Old Town, and historical area which includes old English colonial monuments will become core values of Mombasa County. In connection with the development of public transport function proposed as Figure , urban core area will be easily accessible from the Moi International Airport. An installment of simple mobility system within the area enables it to be pedestrian-friendly area to go around the historical



Source: JICA Expert Team

Figure 13.1.2: Proposed Spatial Development Concept in Mvita

monuments. The historical area should improve its attractiveness and the connection with urban core offer tourists more value.

13.2 Development Policy

In order to achieve the development concept, the following development policy is proposed:

(1) Infrastructure

- Coordinate with national authorities to input tourism development aspects into their infrastructure plan: National authorities have the mandate to construct national road network and to develop a port and its functions. Since accessibility is quite an important aspect to enhance tourism, it is essential to establish a mechanism to coordinate with national authorities to take into consideration regional priorities in their plan.
- Evaluate impacts of newly constructed infrastructure and to utilise the impacts to enhance tourism (e.g., Southern Bypass, berth for cruiseship): Infrastructure which will be newly constructed will affect the movement of visitors. For instance, once the Southen Bypass is completed, the accessibility from the Moi International Airport to southcoast beaches such as Shelly Beach and Diani Beach will become easier and enable visitors to avoid heavy traffic conjunction through Mvita (Island). A new berth for cruiseship should also be well utilised. To utilise these impacts in proper manner, measures should be planned and implemented in time.
- Developing Road A109 between Mvita and Tsavo National Park in order to improve the accessibility which supports the private sectors in the developmet of tourism products.
- Upgrading Road B8 between Lamu and Mombasa and Road A14 between Mombasa to Kwale
- Developing the transportation network into tourism core zone of Mvita for both residents and visitors.
- Developing public transport between Moi International Airport and Mvita.

(2) Product Development

- Develop tourism product development strategy: One of the short-term plans can be to enhance/maintain existing tourism sites/infrastructure, taking into consideration the market value of resources, accessibility, and linkage with other resources. In order to enhance the tourism of Mombasa County in connection with its neighbouring counties, it is necessary to agree with the development direction in collaboration with public and private sectors. The collaboration will be enhanced through the process of developinga strategy of tourism product development based on the needs of prioritised market, considering the perspective of short-, medium-and long-term plan.
- Determine tourism resources / sites and make priority on the utilisation: With consultation of relevant authorities such as NMK and Kenya Wildlife Service (KWS), it is necessary to determine potential tourism resources / sites in Mombasa County and make priority based on their values. After being prioritised, necessary development plan with small-scale infrastructure should be prepared in order to add more values on them.
- Enhance / maintain existing tourism sites / infrastructure: It is prioritised to rehabilitate the existing tourism site / infrastructure continuously in order to maintain the value of tourism assets and secure visitors' safety.
- Construction of small-scale infrastructure for designated sites by NMK and the Department of Tourism Development and Culture (DoTDC) such as Jomo Kenyatta Public Beach, Shelly Beach, Little Theatre Club, Mbaraki Pillar, and Kengeleni.
- Revitalisation of historic and cultural sites in tourism core zone of Mvita.
- Construction of the International Convention Center (MICE facilities) within Haller Park.
- Development of a Mombasa landmark in Mbaraki Waterfront.
- Revitalisation of walking tour in Old Town and development of city tour route in Mvita and tourism circuits connecting Mombasa County with its surrounding counties.

(3) Product Competitiveness

- Conduct proper marketing of Mombasa County as gateway city and its surrounding areas: The Department of Tourism Development and Culture (DoTDC) should fulfill the role of marketing Mombasa County as gateway city and its surrounding areas. Since Mombasa County has international airport and ports, visitors arrive and pass to Mombasa County. Mombasa County has a key role of distributing tourism information to enhance tourism not only in Mombasa County but also in its surrounding areas such as Kilifi and Kwale. Additionally, in order to access the international market, a collaboration with the Kenya Tourism Board (KTB) to provide proper information of tourism products is strengthened.
- Development of marketing strategy.
- Rebranding of Mombasa County as a gateway city.
- Establishment of a mechanism of collecting necessary statistics.
- Establishment of information centres at designated areas such as airport, Uhuru Garden, Nyali and Mama Ngina Drive
- Development of promotional materials and tools which cover not only Mombasa County but also Kilifi and Kwale.
- Upgrade the skills of tourism service providers: Service providers should know tourists' psychological needs and behaviour so updating their skills therefore is important. It enables them to offer products and services in a sustainable manner and to satisfy tourists. The satisfaction will motivate tourists to spend more, to visit the destination again, and to promote it by word of mouth in their region or country. DoTDC should collaborate with Utalii College in Mombasa County to develop proper curriculum for service providers and with Tourism Regulatory Authority (TRA) to establish a mechanism so that service providers upgrade their skills regularly.
- Involve local communities in tourism directly and indirectly: Local communities' direct involvement in tourism business contribute not only to generate direct income but also to empower community and build their pride and confidence in their own tradition and lifestyle. It supports to conserve indigenous culture and also preserve nature. Knowing tourists through interaction leads to the development of welcoming minds and friendly tourism destination. Developing culture tourism or community-based tourism is promoted. It also contributes to fill in the gap between tourism and local communities. Networking amongst local communities who are engaged in tourism businesses is necessary. It will promote more awareness within the communities and their active involvement in tourism.
- Raising local communities' awareness of tourism business opportunities by conserving the traditional culture in Old Town.
- Organisation of several events and festivals to raise awareness of traditional culture along Mama Ngina Drive.
- Development of a network amongst tourism business entrepreneurs to support each other in regional level.
- Coordinate with authorised entities: A coordination with authorised entities such as the National Museums of Kenya (NMK) and KWS is strengthened in order to know the exact values of cultural and natural assets and not to deteriorate their values. If necessary, measures to preserve them are taken.

(4) Institutional Framework

- Strengthen intercounty collaboration by enhancing tourism resources / products for Swahili Coast: Mombasa County and its neighbouring counties have their own strengths of tourism resources, therefore, combining these different and diversified tourism resources add more value on the products and offer a real taste of Swahili Coast to customers.
- Strengthen collaboration between public and private sectors in Mombasa County: The public sector's role in tourism development isto support private sector to develop better tourism products through activities such as improvement of basic infrastructure, proper marketing, and training for

service providers. A mechanism to collaborate and coordinate between public and private sectors is developed. Through developing a mechanism, public and private sectors reach a concensus on direction of tourism development in Mombasa County.

(5) Tourism Environment

- Coordinate with national government to secure safety and security conditions: Safety and security conditions are improved to revitalise tourism in Mombasa County. Mvita (Island) can be developed as tourists friendly destination by utilising Old Town including Fort Jesus, Mama Ngina Drive, and some other remaining cultural heritages.
- Develop clean town: To develop clean town creates the atmosphere of welcoming visitors. Visitors feel safe according to the fact that people clean and take care of their town by themselves.

13.3 Management Plan

The following tables and figures summarise a management plan which indicate steps to implement the development policy, in short, medium and long term.

Table 13.3.1: Target Market of Tourism Sector by Term

	Short Term (2020) Fill in the Gap	Medium Term (2030) Boost the Sector	Long Term (2040) Prepare for the Next Stage
Target Market	・ Penetrate the domestic market ・ Penetrate the regional market ・ Revitalise the existing international market	・ Expand the domestic market ・ Expand from regional to African markets ・ Explore new international markets	・ Maintain the domestic market ・ Maintain the African market ・ Explore new emerging international markets

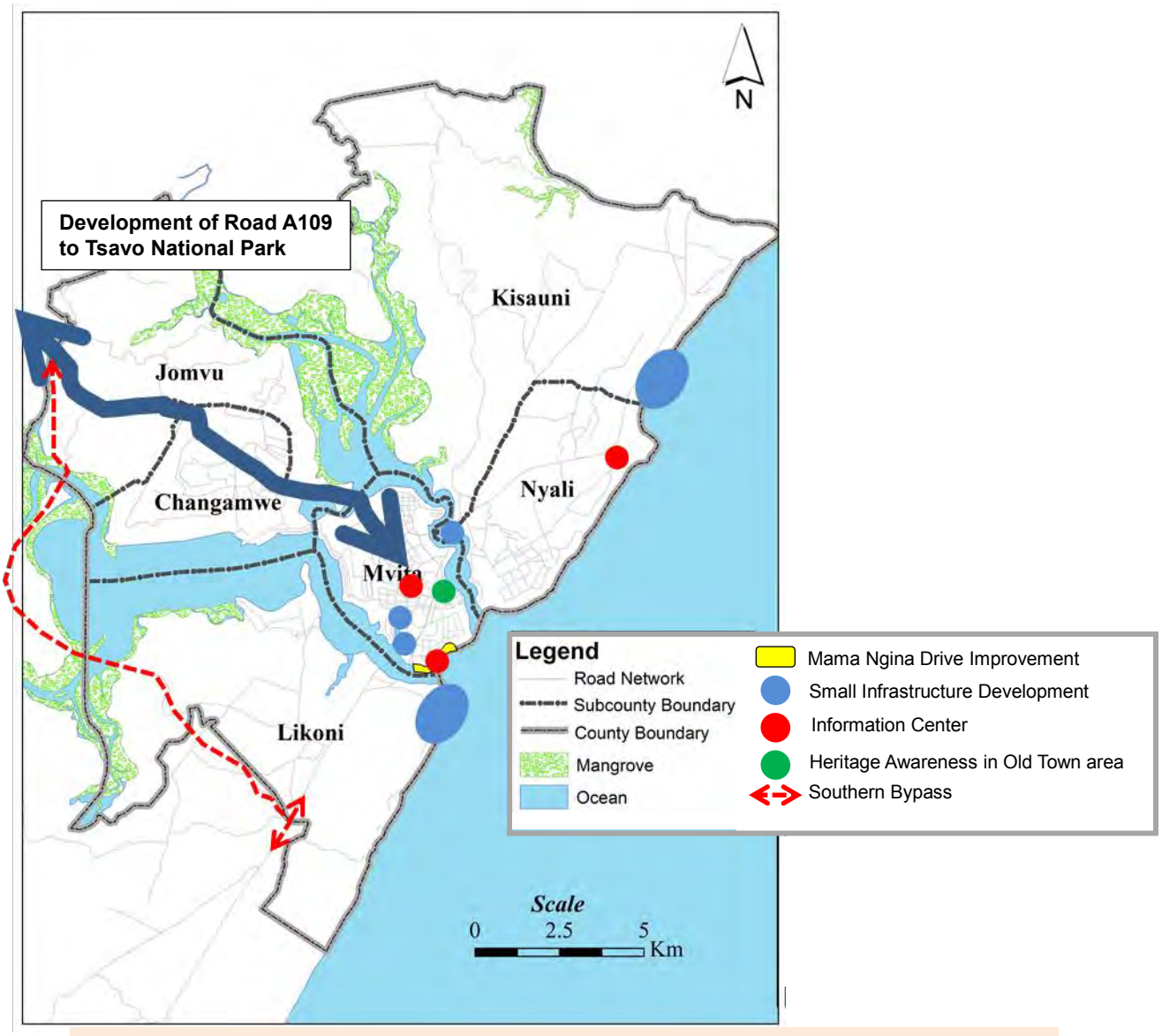
Source: JICA Expert Team

Table 13.3.2: Tourism Management Plan by Term

Category	Development Policy	Short Term (2020) Fill in the Gap	Medium Term (2030) Boost the Sector	Long Term (2040) Prepare for Next Stage
1. Infrastructure	· To input tourism development aspects into infrastructure development plan · To evaluate impacts of newly constructed infrastructure and to utilise the impacts to enhance tourism (e.g.: Southern Bypass, Northern Bypass)	· To coordinate with the national government to upgrade Road A109 from Mombasa to Tsavo National Park · To coordinate with relevant authority to develop a proper berth for enhancing cruise tourism	· To coordinate with relevant authority to upgrade Road B8 between Lamu and Mombasa, and A14 between Mombasa and Kwale to enhance Lamu-Kwale Corridor and regional connectivity · To create a safe, efficient, simple-to-use mobility and transportation network for both residents and visitors in Mvita	· To develop public transportation between Moi International Airport and Mvita · To maintain developed infrastructure and management
2. Product Development	· To develop tourism product development strategy in order to diversify tourism products	· To prioritise enhancing the value of cultural heritages (tangible and intangible) · To develop small-scale ecotourism products initiated by local communities, for instance, utilising Kaya and mangrove · To develop tourism product development strategy within the marketing strategy	· To diversity tourism products according to the developed strategy, for instance, walking tour traditional hotels, and traditional/seafood restaurant in Old Town, city tour to visit cultural heritages, and tourism circuits between Mombasa and surrounding areas · To review the tourism product development strategy	· To develop and improve tourism products according to the reviewed strategy
	· To determine tourism resources / sites and make priority on the utilisation · To enhance / maintain existing tourism sites / infrastructure	· To rehabilitate designated tourism sites within the gazette monumental sites by reviewing the existing rehabilitation plan such as Mama Ngina Drive · To distinguish potential tourism resources / sites to penetrate the next target markets such as MICE facilities · To construct small-scale infrastructure to enhance the value of existing tourism sites such as access road, parking, public toilet, signage, for instance, in Jomo Kenyatta Public Beach, Shelly Beach, Little Theatre Club, Mbaraki Pillar, and Kengeleni	· To develop distinguished potential tourism resources / sites such as rehabilitation of Old Town and construction of International Convention Centre within Haller Park · To develop a plan of new tourism sites to maintain the market	· To develop new tourism sites which can be a landmark and represent Mombasa and attract domestic and African markets (e.g.: Integrated resort, aquarium, seafront walkways, Mombasa Tower) · To revive cultural heritage buildings to modern tourism spots
3. Product Competitiveness	· To conduct proper marketing of Mombasa as gateway city and its surrounding areas	· To develop and implement the Mombasa Marketing Strategy including tourism product development strategy · To rebrand Mombasa and its surrounding counties · To coordinate relevant authorities to collect proper statistics which can justify budget allocation on tourism product development and promotion · To construct tourist information centers at designated areas such as in the airport, Uhulu Garden, Nyali and Mama Ngina Drive · To develop promotional materials and tools	· To review the marketing strategy regularly based on survey results · To strengthen the brand (awareness, recognitions, royalty) of Mombasa and its surrounding counties · To install regional tourism satellite account (TSA) recommended by the United Nations World Tourism Organisation (UNWTO) · To review promotional materials and tools	· To review the marketing strategy regularly based on survey results · To maintain the brand identity · To improve the quality of regional TSA · To renew promotional materials and tools

Category	Development Policy	Short Term (2020) Fill in the Gap	Medium Term (2030) Boost the Sector	Long Term (2040) Prepare for Next Stage
	・ To upgrade skills of tourism service providers	・ To develop a curriculum for raising tourism awareness of local communities ・ To develop a curriculum of lectures and training with Utalii College to upgrade the skills of tourism service providers ・ To coordinate with TRA to establish a mechanism that tourism service providers upgrade their skills regularly	・ To operate the established mechanism and review it	・ To continue the operation
	・ To enhance local communities' involvement in tourism directly and indirectly	・ To raise tourism awareness of local communities, for instance, in Old Town. ・ To promote local communities' involvement in tourism businesses / activities such as events and festivals along Mama Ngina Drive ・ To establish a mechanism to support community initiatives	・ To strengthen the network amongst local communities who are engaged in tourism businesses	・ To make the established network strong enough to support newly emerging local entrepreneurs
	・ To coordinate with authorised entities to enhance value of cultural heritages	・ To document the value of cultural heritages (tangible and intangible) for inscription and safeguarding ・ To demarcate the roles amongst relevant authorities to develop tourism sites	・ To utilise the developed documents for education to local communities and training to service providers ・ To coordinate interests of conflict amongst the relevant authorities	・ To utilise developed documents for education to local communities and training to service providers ・ To coordinate interests of conflict amongst the relevant authorities
4. Institutional Framework	・ To strengthen intercounty collaboration for enhancing tourism resources / products for Swahili Coast	・ To establish a regional committee for collective efforts to enhance tourism at the regional level	・ To prepare the committee to be institutionalised with proper budget	・ To establish an institution whose mission is to promote tourism at the regional level
	・ To strengthen collaboration between public and private sectors in Mombasa	・ To develop Mombasa marketing strategy in collaboration with the public and private sectors ・ To promote community involvement in the planning process of tourism development ・ To develop a mechanism that tax levy contributes tourism development	・ To establish an institution responsible for marketing Mombasa consisting of relevant stakeholders and lobbying measures for tourism development	・ To strengthen the institution financially and institutionally for effective marketing and tourism development
5. Tourism Environment	・ To coordinate with national government to secure safety and security conditions ・ To develop a clean town	・ To coordinate with the national government to take strong measures to improve safety and security conditions ・ To organise a campaign of cleaning Mombasa County ・ To coordinate with the Department of Water, Environment and Natural Resources and CBOs to establish a mechanism to clean the county	・ To maintain the safety and security conditions ・ To continue the activities to promote cleanliness of Mombasa	・ To maintain the safety and security conditions ・ To continue the activities to promote cleanliness of Mombasa

Source: JICA Expert Team

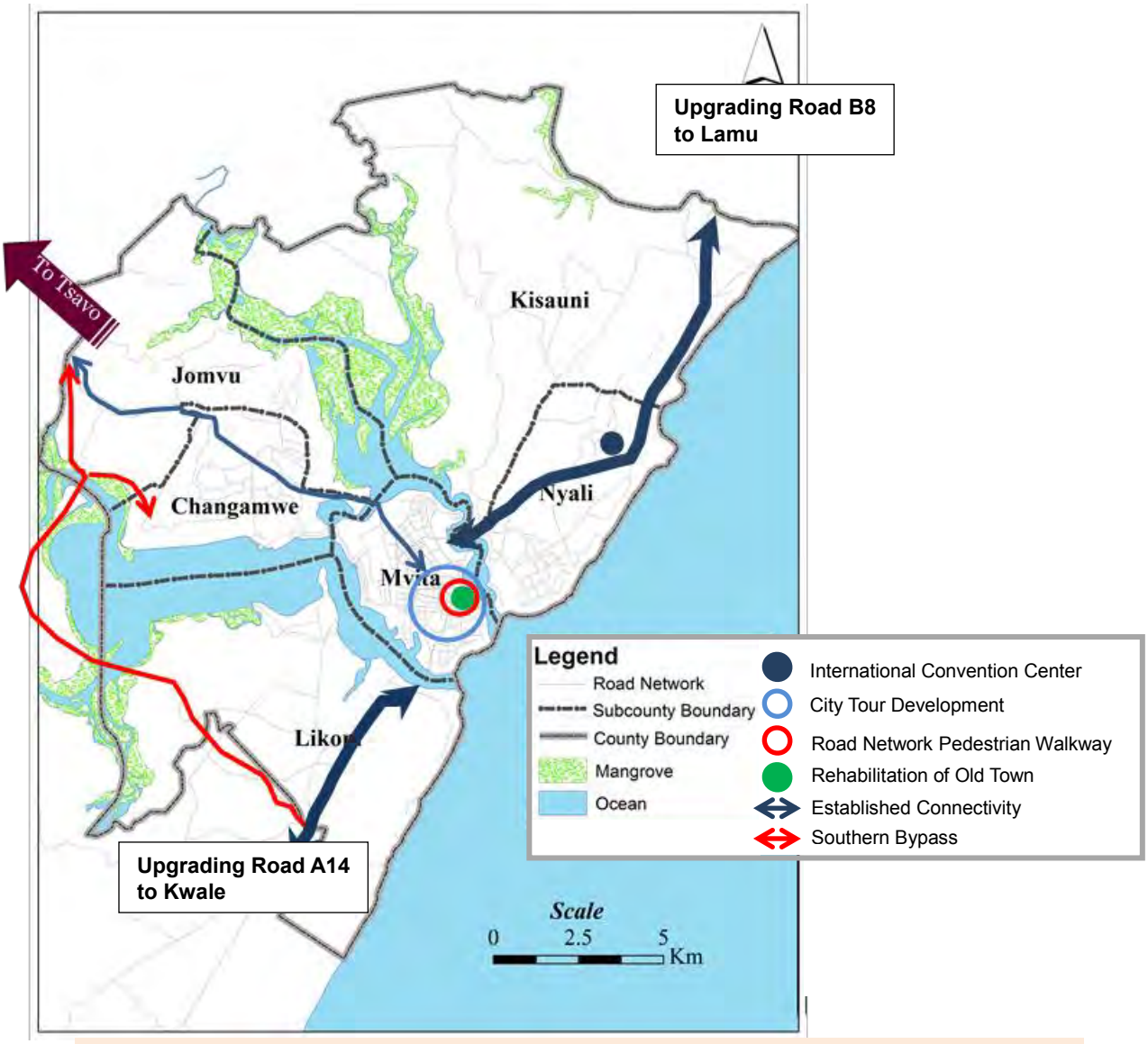


Necessary Actions (Fill in the Gap)

- Develop a marketing strategy including product development strategy in collaboration with public and private sectors
- Rebrand Mombasa and its surrounding areas
- Document the value of cultural and natural heritages
- Develop promotional materials and tools
- Collect statistical data
- Set up a mechanism to upgrade the skills of tourism service providers
- Raise tourism awareness of local communities
- Establish a regional committee to promote regional tourism
- Take measures to improve safety and security conditions
- Set up a mechanism to clean the county

Source: JICA Expert Team

Figure 13.3.1: Map of Tourism Management Plan until 2020 (Short Term)

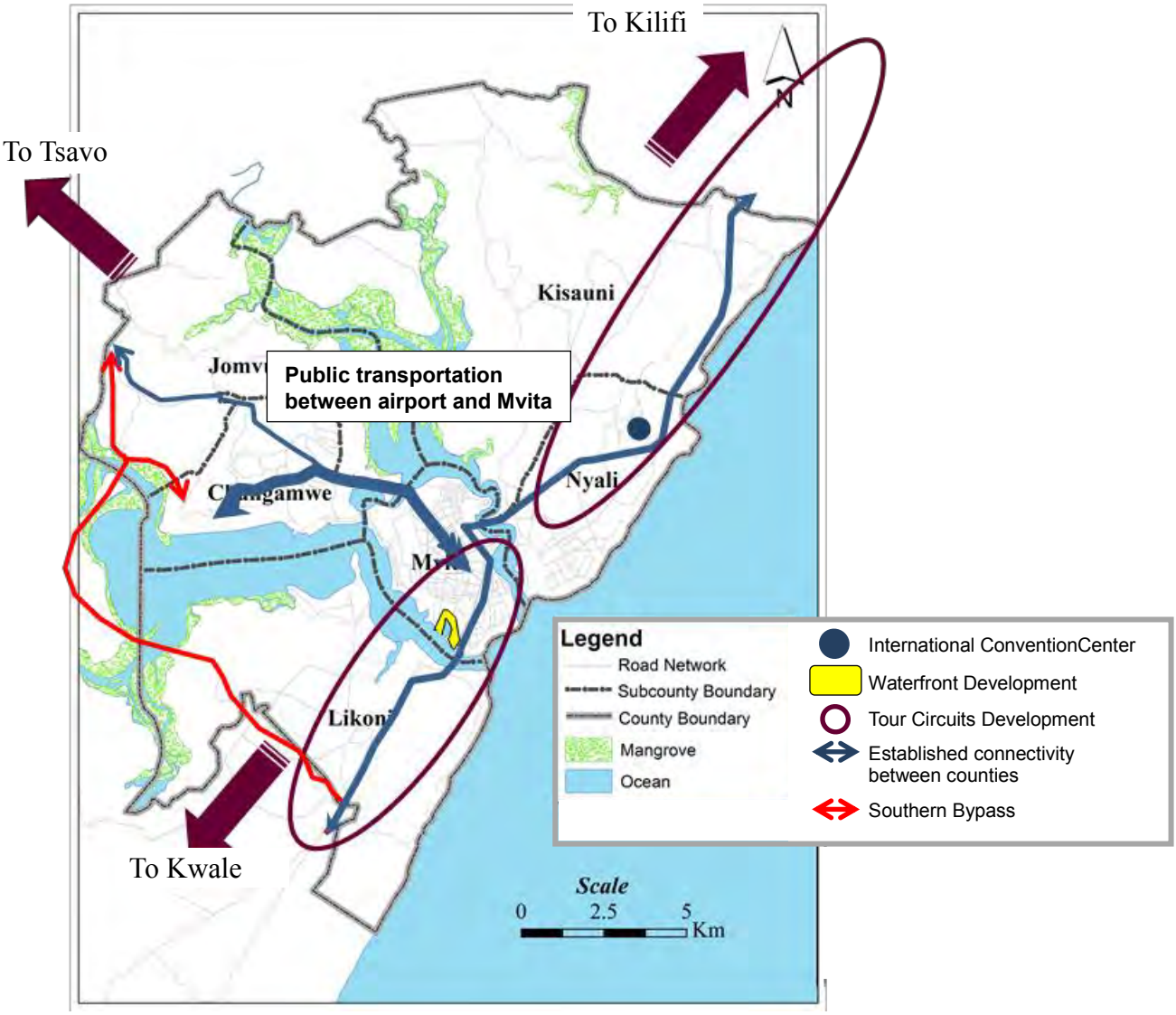


Necessary Actions (Boost the Sector)

- Implement a marketing strategy including product development in collaboration with the public and private sectors
- Strengthen the established brand of Mombasa
- Utilise documents of cultural and natural heritages for education
- Review promotional materials and tools
- Install regional tourism satellite account (TSA)
- Operate the established mechanism to upgrade the skills of tourism service providers
- Strengthen the network amongst local communities who are engaged in tourism businesses
- Prepare the regional committee to be institutionalised with proper budget
- Maintain safety and security conditions
- Continue activities to promote cleanliness of Mombasa

Source: JICA Expert Team

Figure 13.3.2: Map of Tourism Management Plan until 2030 (Middle Term)



Necessary Actions (Prepare for Next Stage)

- Review the marketing strategy and develop new products in collaboration with the public and private sectors
- Maintain the brand identity of Mombasa
- Continue the education of local communities about cultural and natural heritages
- Renew promotional materials and tools
- Improve the quality of regional TSA
- Continue to operate the established mechanism to upgrade the skills of tourism service providers
- Make the established network strong enough to support newly emerging local entrepreneurs
- Establish an institution whose mission is to promote tourism at the regional level
- Maintain safety and security conditions
- Continue activities to promote cleanliness of Mombasa

Source: JICA Expert Team

Figure 13.3.3: Map of Tourism Management Plan until 2040 (Long Term)

13.4 Infrastructure Management Plan

Mombasa County and its surrounding counties already exist as core tourist destination. Due to the adverse travel advisories and concerns on safety and security conditions, the number of visitors drastically decreased, however, their natural attractiveness has been already known for domestic and international visitors. Once the surrounding conditions are improved, more tourists will visit in the future. To prepare for this situation, infrastructure related to tourism has to be developed.

(1) Road

Road is one of the most important infrastructures for tourism. A well-developed road network facilitates easy movement of tourists.

The Tsavo National Park is one of the national parks which is easily accessible from Mombasa County. The typical "beach and bush" tour which attracts many tourists can be developed by linking Tsavo National Park and Mombasa. However, Road A109 which serves as connection in-between is terrible due to the current construction of railways between Mombasa and Nairobi, and heavy traffic congestion caused by trucks.

To develop this road is firstly prioritised. Secondly, it is important to develop a safe, efficient, simple-to-use mobility and transportation network in Mvita (Island) in order to revitalise and utilise the existing cultural heritages at the most. Thirdly, a road connecting Lamu to Kwale is also necessary to be upgraded for comfort and safety.

(2) Water Supply

Secure, clean, and sufficient drinking water is indispensable for tourism development. Development of appropriate water supply should therefore be implemented in parallel with tourism development.

Mombasa County does not possess any surface water sources and therefore, it heavily depends on water sources from outside the county for its potable needs. The water is received from Mzima Springs, Baricho Wellfield, Marere Springs, and Tiwi Wellfield. Apart from these, the county also sources its water from 452 shallow wells spread across the entire county, three permanent springs, four water pans and a number of borewells operated by private investors, non-governmental organisations (NGOs) and community-based organisations (CBOs). The water from these sources is saline, just meeting the acceptable levels.

Expanding the capacity through the development of new water resources is necessary to cover the water demand in the near future. Thus, the development of Mwache Dam and water treatment facilities for Mombasa County is indispensable at the start.

Construction, operation, and maintenance of water supply facilities should be undertaken by the public sector to ensure adequate quality and quantity of drinking water. The cost for operation and maintenance should be financed by water consumers based on water consumption volume.

(3) Sewage Treatment

Development of sewage facilities is very important not only to maintain hygiene of the surrounding area of dwellings and rest facilities, but also to protect the natural environment, especially the quality of water (surface and ground water).

The county has two wastewater treatment plants (WWTPs) located in Kizingo and Kipevu. Kizingo WWTP is located within the Mombasa Island where there is a golf course - between the State House and Galaxy Restaurant (Chinese Restaurant). Kizingo Treatment Plant collapsed 20 years ago. And due

to absence of functional sewerage system on the Mombasa Island, some of the residents empty effluent into the Indian Ocean without treatment. Kipevu WWTP is located in Mainland West (Changamwe). It serves residents of Changamwe, Port Reitz, Magongo, and Jomvu

Considering the present sanitation situation, investors in accommodation and rest facilities within the development area should install sewage facilities such as septic tank in their properties, and operate and maintain these facilities properly avoiding pollution and contamination of groundwater. The public sector should take responsibility for regular examination of the quality of water discharged from each tank.

(4) Electric Supply

Electricity is essential for tourists' stay in accommodation/rest facilities and for the operation/maintenance of machines installed in these facilities. Thus, a stable electric supply is required for the tourism development.

In Mombasa County, the percentage of population who has access to electricity is 75%, mainly in Mvita Subcounty, Nyali Subcounty, and Jomvu Subcounty. The remaining subcounties are not yet fully covered by the power grid.

Electricity should be provided to the development area from the existing electricity service network.

(5) Telecommunications

Telecommunication facilities such as telephone, fax, and internet are very important for tourism promotion such as sending information and acquisition of guests. Moreover, people who plan to travel and tour operating companies use telecommunication in collecting tourism information. It is also very convenient for visitors to communicate to their families and friends.

Mobile network is covered mainly at the centre of Mombasa County such as Mvita Subcounty, Jomvu Subcounty, and Nyali Subcounty. The rural areas have lower coverage. After the completion of Southern Bypass construction within three years, tourists flow to Likoni Subcounty is expected to increase. Since the mobile coverage in Likoni Subcounty is currently very low, measures should be taken.

To install public wifi supports to stimulate tourists' movement. The first priority will be around Fort Jesus, Old Town, and its surrounding areas. The second will be along Mama Ngina Drive, especially, around the area for various kinds of events. DoTDC has a project to construct information centres around Uhuru Garden and Nyali area, it is better to install wifi in these tourism information centres.

Shared antenna towers are proposed to be operated and maintained by local governments such as Mombasa County or a third party partially funded by public sources.

13.5 Proposed Projects

Table 13.5.1 below shows the proposed projects.

Table 13.5.1: Proposed Projects

Project Title	Implementation Organisation	Phasing		
		Short	Mid	Long
Capacity Development for Marketing and Promotion ・ Objective: To develop the capacity of DoTDC under partnership with private sector for marketing and promotion of Mombasa as a gateway city and its surrounding areas ・ Expected Outcome: A mechanism of destination marketing and promotion of Mombasa and its surrounding areas will be established. ・ Place: Mombasa County and its surrounding areas	DoTDC	X		
Capacity Development on Tourism Statistics ・ Objective: To develop the capacity of DoTDC to collect tourism statistical data which will support to justify budget allocation for tourism sector ・ Expected Outcome: A basic structure to install tourism satellite account (TSA) will be established. ・ Place: Mombasa County	DoTDC	X		
Developing Road A109 from Mombasa to Tsavo National Park ・ Objective: To improve the link between Mombasa and Tsavo National Park which is one of the accessible and attractive national parks ・ Expected Outcome: One of the most popular "bush and beach" tours will be revitalised ・ Place: Road A109 between Mvita and Tsavo	KURA DoTDC	X		
Developing a safe, efficient, simple-to-use mobility and transportation network in the tourist core zone in Mvita (Island) ・ Objective: To develop a pedestrian walkway in Old Town and green walk way to connect historical and cultural sites ・ Expected Outcome: Tourist-friendly destination will be developed. It will contribute to prolong tourists' stay and increase tourists' expenditure ・ Place: Mvita (Island)	DoT&I DoTDC		X	
Upgrading Road B8 between Lamu and Mombasa and Road A 14 between Mombasa to Kwale ・ Objective: To improve the connectivity from Lamu to Kwale, so called Swahili Coast ・ Expected Outcome: Strong value for tourism as Swahili Coast will be developed ・ Place: Road B8 and A14 between Lamu to Kwale along the coast	KURA DoTDC		X	
Public Wifi Installation ・ Objective: To stimulate tourists' movement towards information centres and tourism attractions ・ Expected Outcome: Word of mouth promotion by tourists will be strengthened through various kinds of social networking services ・ Place: Each information centre, Old Town, and Mama Ngina Drive	MOICT CA	X	X	
Cultural Heritage Restoration ・ Objective: To revitalise unique cultural heritages derived from its own history for tourism ・ Expected Outcome: Local community will benefit to provide tourism services by utilising their own cultural heritages ・ Place: Old Town and other cultural heritages registered by NMK	DoTDC		X	X
Development of Mwache Dam and water treatment facilities ・ Objective: To improve access to fresh water ・ Expected Outcome: Secure, clean, and sufficient drinking water will be supplied ・ Place: Mwache Dam	MWS	X	X	X

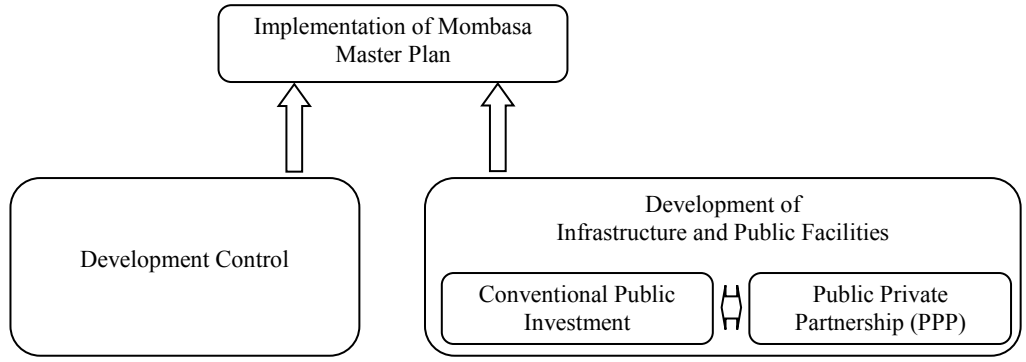
Note: Short term in 2017~2020, Middle term in 2021~2030, and Long term in 2031~2040
Source: JICA Expert Team

14. Urban Management Plan

14.1 Overview

This section covers human resource issues with some focus on development control and infrastructure development, the two wheels in implementing the master plan. The Public Private Partnership (PPP) is an important tool to facilitate infrastructure development.

There are two components to implement the master plan: 1) Development control and 2) Development of infrastructure and public facilities. Infrastructure development has two approaches, namely: 1) Conventional public investment and 2) PPP. Figure 14.1.1 shows the components and approaches of the master plan implementation.



Source: JICA Expert Team

Figure 14.1.1: Component and Approaches of Master Plan Implementation

(1) Development Control

Land development and building permission is in this category. The private and public sectors (central and county) have many construction works, which might have a significant impact on the urbanisation of the Mombasa County. Controlling land and building development, in line with the land use plan and relevant laws and codes, are the essential tasks of the county government. The current situation of this topic is discussed in Section 6.2 Urban Development Control of the previous chapter.

(2) Public Investment for Services and Infrastructure

The construction of infrastructure and public facilities using the county government's budget is in this category. However, County Government of Mombasa (CGM) has a very limited development budget. Infrastructure development in CGM can be funded by the central government or even by some donors.

(3) Private Investment for Public Facilities

Public Private Partnership (PPP) generates incentives for private companies to engage in construction and/or operation of public infrastructure and facilities. PPP is becoming more and more popular but very few officers at the county level are accustomed to this method.

Thus, human resource and institutional enhancement for the development control and PPP could have significant effects on the master plan implementation.

14.2 Regulation and Guideline for Urban Management

The legal framework, current and proposed regulations, and controlling methodology are all described in Section 6.2 Urban Development Control of this report. This urban management system is reasonable and commonly practised in many other countries. However, from the other point of view, current and prospective regulations and guidelines are too sophisticated that it might not be easy to apply to the real situation and enforce with the current task force of CGM. Proposals concerning the regulations are mentioned in this section, and proposals of institutional and human resource are made separately in the later sections.

(1) Localisation of Regulations

Basically, the county has no significant problems with the regulations and guidelines for urban management if they are only strictly applied and observed. Since it is difficult for the ordinary people to fully observe the rules and regulations, there shall be a localisation of the regulations. For example, there are slums and traditional village type settlements in the CGM area. Regulations of access road, set back, building plan, materials, land ownership, and property tax cannot be applied in the current situation in a short-term period. Thus, CGM needs to customise some regulations and prepare a guideline that can be strictly applied to the urban symptom of Mombasa. Localised regulations and guidelines could improve the densely populated settlements or slums, step by step.

(2) Development Control of Fringe Area

Mombasa City centre is within the commuting range from its neighbouring counties. The urban growth of Mombasa County is formulating a metropolitan area around the territory of CGM. If there are smaller commercial buildings along the main roads that connect Mombasa County to its surrounding counties, transportation capacity would be significantly disturbed. In order to prevent the disorderly sprawl of the built area, planned urbanisation idea together with zoning policy should be applied to the fringe area of the CGM territory. CGM should clearly share the future vision of the metropolitan area with its neighbouring counties. Also, development control sections of the relevant counties should have a close corporation for a well-planned urbanisation.

14.3 Organisation Enhancement Plan

14.3.1 Implementing Organisation of the Master Plan

The county government is not capable enough to implement the prospective master plan which comes with many priority projects and programmes. This is because of the significant vacancies in their proposed organogram, as well as the insufficient capacity of the current officers and staff. In addition, filling the entire vacancies with enough qualified personnel is extremely difficult.

It is recommended for the county government to set up a committee/board to manage the implementation of this master plan. Although, it does not have to organise a separate task force to carry out individual priority project. Priority projects shall be managed by the concerned department as an ordinary task. If all the posts in the approved organograms are fully filled by qualified officers and staff, each department can manage rather big projects. Exceptionally, in case of big priority project being implemented, a separate project team shall be organised in the county.

The county government faces a critical financial problem. A treasury rule of the county states that labour cost should be less than 35% of the total expenses. However, current labour cost ratio is nearly half of the annual budget. With this restriction, new qualified officers cannot be easily recruited. The Planning Division requires 20 planners (currently, they only have one planner), and the Building and Architecture Division requires 24 building inspectors (currently, only three inspectors are assigned).

The county is employing a significant number of unskilled labourers. Discharging them and securing funds for the employment of more qualified officers, could be a basic strategy of personnel allocation. Although, the strong labour union might not allow the local government to do such thing.

Proposals of Section 14.2.3 include some quick remedies, as well as fundamental strategies, for the enhancement of the work force of the county government. Also, some of the proposed actions below can be applied to the entire CGM and some of the proposals are focused on development control.

14.3.2 Items of Capacity Development

In order to enhance the capacity of urban development control, CGM needs a capacity development in the following items. These required capacities can be built or obtained through the approaches explained in Section 14.3.3.

(1) Basic Knowledge on Building

Building inspectors and their chief have no academic background in building or architecture. This hinders a smooth understanding of building application and effective on-site guidance to agent architects and planners acting for the developers and building owners. Ideally, building inspectors should have a license in architecture. If not, at least a diploma in architecture or a building engineering course should be required.

(2) Knowledge on Urban Planning and Infrastructure

Once the proposed urban master plan is approved and applied, land use plan for the entire city area and infrastructure development become important factors of urban control. New land development, building construction, and change of use should follow the land use regulation. Besides, the existing and expected buildings on the proposed infrastructure sites should be strictly regulated or cancelled. However, currently, building inspectors are not involved in the urban planning process and they have very limited knowledge on the upcoming urban master plan. Building inspectors should understand the importance of land use control, as well as the infrastructure development, so that they can explain and advocate the urban master plan of CGM to the stakeholders.

(3) Coordination Amongst Departments and Utility Institutes

Development applications are handled by the building inspectors, however, it needs comments from relevant departments and sections such as planning, architecture, engineering, health, fire, and property tax. At the moment, application is operated online but comments are collected on paper. Since the departments of CGM are scattered all over the Mombasa Island, communication amongst departments takes time and is not efficient.

Concerning the urban utility such as water, power, and telephone, these are strategic tools to control the illegal development. Coordination between development permission and utility connection can significantly enhance the motivation of the land developers and building owners to follow the legal procedures.

(4) Prevention and Adjustment of Illegal Development

Even though there is a significant number of illegal developments and buildings that exist and are planned for construction, CGM is unable to consistently enforce the law or control illegal developments. In addition to the insufficient number of building inspectors, CGM lacks efficient communication lines with the police and public prosecutor's office to enable the exposure of illegal developments and buildings. Therefore, it is not realistic to prosecute dozens of law offenders at once. However, punishing an offender can be a good lesson for others.

(5) Community Awareness of Development Rules

CGM needs the capacity to conduct effective campaign to enhance peoples' awareness on development rules. Only certified planners and architects can apply development permission on behalf of the development and building owners. This means that ordinary citizens who are not in contract with these professionals, build houses and buildings for small business without any legal procedures. Densely built up areas without permission tend to be fragile against disasters (fire, storm, and inundation), and are not accessible by emergency and service vehicles (fire engine, police car, ambulance, and solid waste truck), making it unsanitary and exposed to many other problems. This situation exposes their own lives to danger.

14.3.3 Framework of Organisation Enhancement Plan

Table 14.3.1 shows the framework of the organisation enhancement for the implementation of the Mombasa Master Plan.

Table 14.3.1: Framework of Organisation Enhancement Plan

Objective	Relevant organisations are enhanced for the implementation of Mombasa MP
Target Group	Main: Departments and sections engaged in the master plan implementation Sub: All the other departments and sections of CGM
Target Year	1) Short-term: 5 years, 2) Mid-Term: 10 years, 3) Long-term: 15 years
Approach	a) Efficiency improvement of development control (short-term) b) Building bigger work force on less budget (short-term) c) Enhancement of the current human resources (short to mid-term) d) Recruitment of professional, skilled officers and staff (mid to long-term) e) Community participation for area management (short to mid-term) f) Outsourcing of public services (mid to long-term) g) Privatisation (long-term)

Source: JICA Expert Team

14.3.4 Proposed Approaches to Enhance the Organisation

Considering this situation, the JICA Expert Team proposes the following improvements to enhance the organisation for the master plan, as well as for the development control implementation:

(1) Efficiency Improvement of Development Control (Short-term)

Computerisation is a major approach for this issue. For example, land and building development application is now submitted through an online platform. This changed the working efficiency in handling the application documents and drawings. Another improvement would be setting up a comprehensive Geographic Information System (GIS) laboratory. Development control can be more efficient with appropriate investment for space, equipment and manning to make good use of GIS. This laboratory is also effective to manage land registration and rate (tax), public facilities and housing, and infrastructure development. A comprehensive GIS laboratory facilitates the consistency in handling public services by different departments.

(2) Building Bigger Work Force for Less Budget (Short-term)

The GIS Section of the Planning Division has just one GIS engineer, although, it has ten interns from different universities. They learned GIS at school and came to the county government to apply what they studied to practical work. Universities give credit for this internship work as part of their educational programme.

This internship system can be applied to the other subjects as well. Students of engineering, urban and transportation planning, building structure, and building code should be interested in practical work taking place in the local government. Comprehensive agreements between the county government and universities should be arranged for the mutual benefit and stable student supply.

(3) Enhancement of the Current Human Resource (Short to Mid-term)

Salary level of the county officers is much smaller than that of the private sector, even if the person has the same capacity. The consequence is that not all county officers are qualified or educated enough. For example, the three building inspectors who are engaged in development permission are not diploma/degree holders of building/architecture education. Re-education and refreshment learning to catch up to the current academic topics can enhance the capacity of the current work force.

(4) Recruitment of Professional, Skilled Officers and Staff (Mid to Long-term)

Even though the financial capacity of the county is not good enough to employ more qualified and skilled officers, efforts to build sufficient force should be made continuously. Decentralisation of the public administration is clearly mentioned in the new constitution. Various resources are being transferred from the central to the county governments. In order to be able to allocate appropriate funds for the recruitment of professional or skilled officers, continuous efforts should be made in the following:

a) Improvement in collecting ratio of land rate (tax), rent of public properties, and business permission
b) Reduction of unskilled labours

(5) Community Participation for Area Management (Short to Mid-term)

It is often observed in some countries that community organisation takes care of their area, which substitutes parts of public services and urban management. If community-based organisations (CBOs) handle public services, the local government can reduce its workload. Consequently, the county can assign more personnel to prioritised issues such as development control. The size of the community can be a small neighbourhood with dozens of household or people living in the area of an elementary school. Some examples of community participation are as follows:

a) Community Building Agreement (Short to Mid-term)

   The Physical Planning Act and Building Code of some countries, such as the United States of America (USA) and Japan, advocate community building agreement. This is a rule of building which is applied to a specific area. Land and building owners of an area can agree on stricter building rules than those enforced by the public regulations. A community can register their building agreement to the local government, and building inspectors add the agreement upon conventional building code. Thus, if a development application does not follow the agreement, the inspector will refuse to approve the application. However, community residents usually observe the agreement for their own benefit. Supposed, zoning of Nyali area allows building

construction of less than 15 m high, and if the local community agrees to make it less than 10 m high, the stricter one prevails as the new rule. Since residents feel responsible of the rule and watch over each other, so there is a less possibility of a rule of violence in the area.

b) Community Work

A community can be well-organised if they work for the betterment of their area. Items that a community can take action of may be, but not limited to, as follows:

- Agreement and monitoring of building and planning
- Local solid waste collection and coordination of waste deposit
- Cleaning and greening, as well as pest control, of the area
- Monitoring and reporting faults of public facilities and infrastructure to the county
- Road crossing assistance for school children at commuting time
- Transmission of information from county government
- Cooperation with police for better security
- Training of disaster volunteer rescue team
- Consensus building (for or against) county's projects that involve the community
- Holding various events for socialising

Communities have significant potential to work for themselves and reduce workload of the local government. To begin with, CGM shall find existing practices and honour them to encourage additional followers.

(6) Outsourcing of Public Services (Mid to Long-term)

As reviewed in Section 6.1.1 Current Situation, the vacancy rate in each department's organogram is so big, that it might not be filled forever. Outsourcing is one of the key issues to operate the local government with a smaller work force. Since the terms of reference (TOR) and organogram of each department is defined in a written document, outsourcing procedure may need a change of acts, by-laws and regulations. Therefore, this action is proposed as a mid to long-term plan. However, some outsourcing examples, including the current practices, are as follows:

a) Officers Training

The county government has no particular training organisation but instead, it sends its officers to the Kenya School of Government and other educational/training institutes and shoulders the tuition fees. Since the training section was not provided in the local government, this is a typical idea of outsourcing. The county government saves labour cost in officers' training by using programmes available outside the local government. However, interaction between the county government and training institutes should be enhanced in terms of training needs assessment, curriculum design and evaluation.

b) Technical Assistance of Development Partners

The county government can outsource some planning and study works, such as the master plan and feasibility study preparation of specific infrastructure developments. Department officers work with the experts of the World Bank, UN-Habitat, JICA, etc., as counterpart personnel. Thus, the work load of the officers has been much reduced. This is also a kind of outsourcing operation of public works. Technical assistance is for free and on-the-job trainings (OJT) are effective as well.

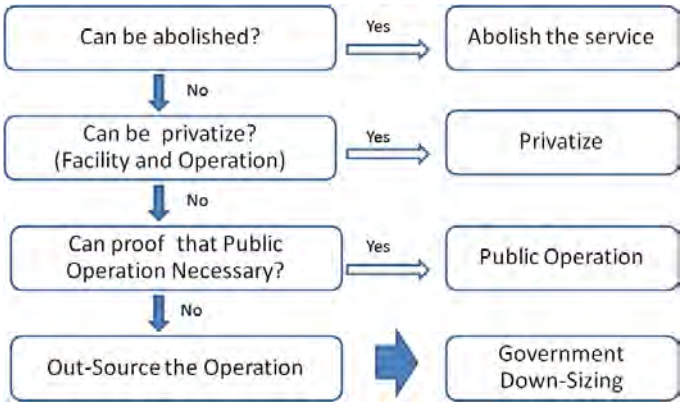
c) Establishment of Public Corporation

The county government could establish new public corporations to undertake these outsourcing works. Public corporations should be under the control of the county government but are

financially independent from the local government. County government may dispatch unskilled labourers to the public corporations so that their salary will not come from the county's account. Examples of public services that the Department of Land, Planning and Housing should consider outsourcing are as follows:

- Fee collection activity for rented houses and leased lands
- Examination of development permission

Figure 14.3.1 shows the flow chart used for the judgment if a specific service can be privatised or outsourced.



Source: JICA Expert Team

Figure 14.3.1: Flow Chart to Examine Privatisation and Outsourcing

(7) Privatisation (Long-term)

There are three major revenues to the county government: 1) tax and levy, 2) subsidy of the central government and 3) fee of services. The third category is a public business which may have competitors in the private sector. These businesses are often targeting lower income class and charging affordable amount of money. For example, public housing should at least be considered for potential privatisation.

The county government could establish new public or semi-corporations or companies to manage these businesses. As the biggest shareholder, the county government can control these businesses. Some of the abundant unskilled workers shall be dispatched to the new companies. These unskilled workers will now then be out of the pay roll system of the county government. For example, the County Housing Corporation manages public housing. In cooperation with CGM, it manages the housing business in a financially independent way. Since this corporation is outside of the local government, the existing housing unit can reduce its posts significantly. CGM may offer public land to the corporation so that housing price becomes affordable to the lower income segment. Of course, actual privatisation needs detailed analysis, planning and consensus.

14.4 Human Resource Development Plan

Human resource development for the existing officers and staff is a very important approach to make a stronger and more effective county government since the severe financial circumstance will not allow recruiting new officers. The easiest way to improve the work force capacity is to employ a lot of capable persons but because of the abovementioned reason, this strategy cannot work for the county government.

14.4.1 Framework of Human Resource Development Plan

Table 14.4.1 shows the framework of the organisation enhancement for the implementation of the Mombasa Master Plan.

Table 14.4.1: Framework of Human Resource Development Plan

Objective	Human resource is developed for the implementation of the Mombasa MP
Target Group	Main: CGM officers and staff engaged in the master plan implementation
Target Year	Short-term: 5 years (all the approach shall be implemented in a short-term period)
Approach	a) Design of career path for each officer. b) Collaborative course design with existing training institutes. c) Comprehensive cooperation with universities. d) Sharing of seminars, trainings and meeting information through the internet media. e) Trainings for development partners. f) Training for the central government, especially for PPP.

Source: JICA Expert Team

14.4.2 Proposed Approaches to Develop Human Resources

Considering this situation, the JICA Expert Team proposes the following improvements to develop the capacity of the current officers and staff for the master plan implementation:

(1) Design of Career Path for Each Officer (Short-term)

A needs assessment of the human resource development should come before taking any improvement action. The public sector of Kenya, including Mombasa County, has 14 job groups or grades (from A to R) for the officers and staff as shown in Table 14.4.2.

As the grade of an officer/staff rises, his/her salary and position also goes up. In order to step up the job groups, officers/staff should pass an examination. In addition to that, professional officers should grade up their status defined by the professional associations.

Majority of the county officers and staff are more or less motivated for their own capacity development to get a better position and higher wage. Therefore, the Department of Public Service should encourage the county employees to plan their own career paths rather than deciding their career plan by the top-down approach. Menu of career paths and alternatives of capacity development methods should be clarified as a Career Planning Guideline for the employees.

Table 14.4.2: Job Groups and Promotion Ranges

Job Group	Support Staff	Clerical Level	Professional/ Manager Level
A			
B			
C			
D			
E			
F			
G			
H			
I			
J			
K			
L			
M			
N			
O			
P			
Q			
R	Department Director Class		
S	Chief Officer Class		

Source: Department of Public Service, CGM

(2) Collaborative Course Design with Existing Training Institutes (Short-term)

There are several educational/training institutes that are receiving county staff as students such as:

a) Kenya School of Government, Mombasa Campus
b) Technical University of Mombasa
c) Mombasa Technical Training Institute

They often provide evening classes which are convenient to the officers on active services. Training/ education term for certificate and diploma course differs from a few weeks to three years. However, the curricula of these courses are not often prepared with close consultation with the county government.

Officers of each profession (lawyer, medical doctor, nurse, teacher, accountant, architect, engineer, etc.) have different career paths and different training needs. Therefore, the Public Service Department or even each department of the county should ask the training institutes to conduct a training needs assessment, collaborative course design and joint training evaluation. This approach will make the training more effective and practical for the participants to apply what they learn to the real world.

(3) Comprehensive Cooperation with Universities (Short-term)

The setting of Mombasa County is changing rapidly in terms of society, economy, engineering, environment, and politics. Cooperation with universities is a recommended strategy to catch up with the trend of the times, and consequently, to manage the public services in better ways. The county government has to make a comprehensive agreement with the universities of relevant fields. Prospective agreement items are as follows:

a) Professors to be assigned as members of relevant administrative committees;
b) Professors to be lecturers in seminars of the county;
c) County officers are invited as part-time lecturers to the universities;
d) Universities set topics of under/post graduate study on Mombasa urban issues;
e) Mombasa County accepts students as interns (for degree credits);
f) Universities accept officers on study leave on specific urban issue; and
g) County and universities jointly prepare courses on specific urban issues of Mombasa County.

Interns mentioned in item e) above is a good occasion for matching the future potential employer and the employee. Interns also contribute to the enhancement of the county's work force in a part-time basis.

(4) Sharing of Seminars, Trainings and Meeting Information Through the Internet Media (Short-term)

Many seminars, workshops, explanatory meetings are organised by the public and/or private sector in Mombasa County, Nairobi and its neighbouring counties. The county also often holds various useful meetings. These are very good occasions to learn and exchange views and opinions. However, information of these events is delivered to limited personnel through a limited channel. One of the methods to facilitate better information sharing is through Information Technology (IT). Mailing List, Short Message System (SMS), and Social Network System (SNS) for training. Facebook and other internet media can disseminate variety of information with minimum workload. It is recommended to organise a training/seminar information sharing system with the most available internet media in Mombasa County. Internet training is also a significant alternative. English language fluency of Kenyan officers is a great advantage in accessing the training programmes through the internet. If the Department of Public Service prepares an accreditation system for these trainings, it will enhance the motivation of the officers and staff.

(5) Trainings for Development Partners (Short-term)

Developing partners such as World Bank, UN-Habitat, JICA, etc., have been working with the county government. These organisations provide seminars/trainings to the counterpart officers of the county. Programmes may include lectures of expert consultants, on-the-job training (OJT) such as technical transfer through daily works, theme specific training in Kenya or in other country, scholarship, and internship. These trainings often come with project of development partners and well corresponding to the specific technical topics and administrative issues.

(6) Training for the Central Government, Especially for PPP (Short-term)

PPP Unit supported by the World Bank is an organisation of the central government and is facilitating PPP at the central and county levels. PPP Unit offers comprehensive PPP facilitation services including capacity development of the county personnel such as the following:

a) Seminars for ten model counties from September 2016 (including Mombasa County)
b) Preparation of PPP manual
c) Advice to training institute
d) Dispatching of Transaction Advisor
e) Consulting of specific projects
f) Implementation of feasibility study

Very limited people have practical knowledge of the PPP and no training/educational institute offers a PPP course. The best way to develop human resource of the PPP in the county government is to accept assistance from the PPP Unit to its full extent. Introduction actions that the county should take are as follows:

a) Identification of PPP project candidates
b) Identification PPP concerned officers for the project implementation
c) Consulting to PPP Unit

In order to avoid confusion, it is recommended for the county government to use only the PPP methodology that is based on the rules and regulations of the PPP Unit. For example, if other development partner undertakes a feasibility study (F/S) of a prospective PPP Project, the county government should make a detailed coordination with the PPP Unit, since the PPP Unit has the authority to approve the PPP project/s in Kenya.

15. Strategic Environmental Assessment (SEA) and Public Engagement

15.1 Introduction

In Kenya, strategic environmental assessment (SEA) is mandated by law for every strategic decision: policy, plan, and programme. Besides, SEA embeds, in its operation, clear impact assessment and development objectives critical to streamlining sustainability goals in the policy plan and programme. This is the value addition to the strategic decision that SEA seeks to deliver through clearly articulating the social and environmental impacts that are occasioned by the interaction of the master plan under preparation and the receiving environmental and social baseline, and providing appropriate safeguards. Through SEA for Mombasa Gate City Master Plan, social and environmental impacts have been identified and appropriate mitigating measures were proposed. Likewise, SEA by design is a highly iterative and consultative process and Public Engagement and Information Disclosure Program has been embedded as a salient feature of this SEA.

This chapter discusses the SEA process and outlines the Public Engagement and Information Disclosure Program deliberately designed to satisfy the high threshold for public participation under the prevailing institutional and legal framework. The Environmental Management and Coordination Act (including regulations) and SEA Guideline specify the procedure for undertaking SEA; whereas, the Physical Planning Act, County Government Act, and Urban Areas and Cities Act specify public engagement and consultation during the development planning processes. Public comment/input resulting from public engagement and information disclosure and implemented as part of this SEA is discussed. Additionally, the comment/input is integrated into the master plan as illustrated in Table 15.4.4. The SEA process, therefore, provides the general framework for streamlining social and environmental safeguards into the master plan, in this case, the strategic decision.

15.2 Strategic Environmental Assessment Approach

15.2.1 Overview

In Kenya, there is a SEA Guideline titled "National Guideline for Strategic Environmental Assessment 2012" (hereinafter referred to as the SEA Guideline in Kenya) and the authority in charge is the National Environment Management Authority (NEMA).

The 74-page guideline indicates 1) Outline of SEA, 2) Stages and Steps for Undertaking SEA at Policy, Plan and Program Level, 3) Stage 1: Establish the Need and Context for the SEA, 4) Stage 2: Implementing the SEA, 5) Stage 3: Informing and Influencing Decision Making, and 6) Stage 4: Monitoring and Evaluation.

According to NEMA, at least ten SEAs have been conducted in Kenya to date.

15.2.2 Legal Framework on Strategic Environmental Assessment

NEMA is established based on "The Environmental Management and Coordination Act, 1999". The act states that "The object and purpose for which the Authority is established is to exercise general supervision and coordination over all matters relating to the environment and to be the principal instrument of Government in the implementation of all policies relating to the environment." (in Article 9 (1).

Under the national government, the focal point is the Ministry of Environment, Water, and Natural Resources (MEWNR) which has a Finance and Administration Department, Directorate of Environment, Directorate of Natural Resources, and Kenya Meteorological Department. MEWNR also has NEMA, Kenya Water Towers Agency (KWTA), Kenya Wildlife Service (KWS), Kenya Forest Service, and Kenya Forest Research Institute (KEFRI) as semi-autonomous government agencies under the ministry.

Regarding SEA, "The Environmental (Impact Assessment and Audit) Regulation, 2003" states that:

> "Strategic environment assessment" means the process of subjecting public policy, programmes, and plans to test for compliance with sound environmental management; (Article 2, in Part I)
> Lead agencies shall, in consultation with the Authority (in this case NEMA), subject all proposals for public policy, plans, and programmes for environmental implementation to a strategic environmental assessment to determine which ones are the most environmentally friendly and cost effective when implemented individually or in combination with others. (Article 42(1) in Part VI)
> The Government and all the lead agencies shall in the development of sector or national policy, incorporate principles of strategic environmental assessment. (Article 42(3) in Part VI)
>
> The SEA Guideline in Kenya was established in 2012. To obtain the approval of SEA from NEMA, licensed environmental expert shall carry out the assessment work. There are three kinds of licenses, namely:
>
> Associate Experts
> Lead Expert
> Firm of Experts

Both "Associate Experts" and "Lead Expert" are licensed individual persons and "Lead Expert" is senior level. "Firm of Experts" is a license for the consulting firm.

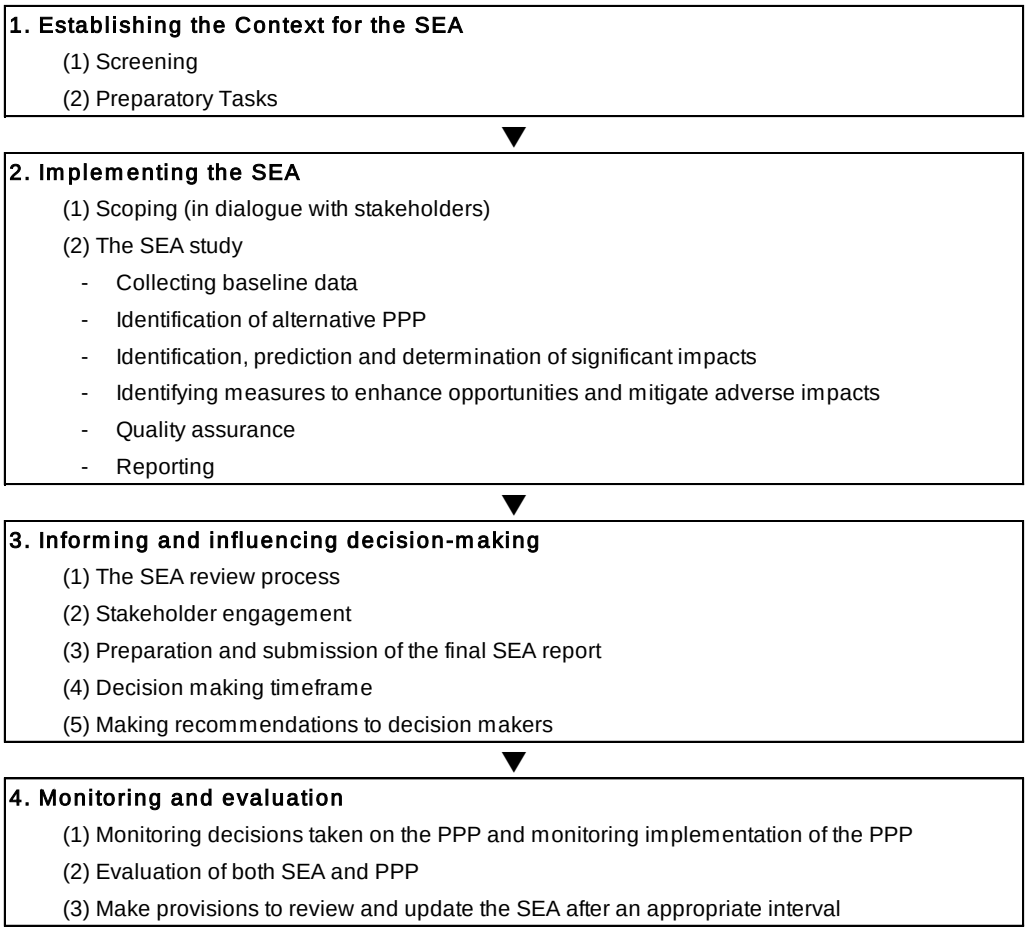
For the implementation of SEA in Kenya by Kenyan local consultant firm, the firm shall have "Firm of Experts" license and the team leader of local consultant team shall have "Lead Expert" license.

15.2.3 Proposed Strategic Environmental Assessment Approach

SEA will be implemented following the SEA Guideline in Kenya and "JICA's Guidelines for Environmental and Social Considerations, 2010".

For implementation of SEA, a local consultant having necessary licences issued by NEMA has been appointed as subcontractor (SEA consultant in SEA Guideline in Kenya) and the kick off meeting was held on September 29, 2015. The officers of County Government of Mombasa (CGM) Team, members of the Japan International Cooperation Agency (JICA) Expert Team, and the SEA Consultant attended the meeting.

The procedure of the implementation of SEA is shown in Figure 15.2.1 below.



Source: NEMA (Kenya), 2012

Figure 15.2.1: Implementation Procedure of SEA in Kenya

Detailed approach and procedure shall be proposed as Scoping Report of SEA and implemented after the approval of NEMA.

15.2.4 SEA Training Workshop

Besides the activities for implementation of SEA, SEA training workshop was conducted for three days from July 29 to 31, 2015 in Nairobi.

This training workshop was mainly for officials of CGM and the purpose was to share the experience of SEA and master plan formulation in the Nairobi Integrated Urban Development Master Plan (NIUPLAN).

The workshop consisted of four modules, namely: “Module I: Why SEA”, “Module II: SEA, and NIULAN SEA Process”, “Module III: Public Engagement and Information Disclosure” and “Module IV: Application of SEA for Mombasa Gate City Master Plan”. Lectures were given by officials from NEMA and Nairobi City County Government (NCCG).

Ten officials from Mombasa County attended the training workshop. The officials from Mombasa County were trained on SEA, experience of NIUPLAN, and public engagement through lecture and discussion.

15.2.5 Progress of SEA

1) Progress of Approval Process

Based on the procedure stipulated in the regulations, scoping report shall be approved by NEMA after the screening process and then detailed study can be implemented following the approved report.

The CGM and the SEA Consultant prepared the scoping report based on the result of the first round of stakeholder meeting (SHM), which was held on October 28, 2015 and submitted to NEMA. The approval letter was issued on February 24, 2016. SEA Consultant prepared the Draft SEA Report and submitted to NEMA on November 14, 2016. The Draft SEA Report underwent public review and other statutory reviews before being finalised and the Final Report submitted to NEMA for approval.

2) Further Schedule of SEA and Related Activity

The schedule for SEA approval and related activity is shown below.

January 2016: Validation Workshop
January 2017: Submission of SEA Final Report to NEMA
January 16 to 27, 2017: Civic Education Program

The Draft Final Report of the Master Plan was finalized based on the comments collected at the stakeholder meetings, civic education, public review, validation workshop, and master plan seminar.

15.3 Public Engagement and Information Disclosure

15.3.1 Proposed Design of Stakeholder Engagement

1) Stakeholder and Focused Group Meetings

At the detailed SEA study stage, 19 stakeholder meetings will be conducted as listed below. The expected number of participants is around 50 in each meeting:

First Round: one time only
Second Round: six times in total: to be conducted in all six subcounties, namely: Changamwe, Jomvu, Kisauni, Nyali, Likoni, and Mvita
Third Round: six times in total in all the six subcounties
Stakeholder Meeting for Key Group: six times in total:
Two times each for

a) Group A: Women Groups, Elderly Groups, Youth Groups, Persons living with Disability, Children Groups, Community-based Organisations (CBOs), Faith-based Organisations (FBOs), Non-Governmental Organisations (NGOs), Residents Associations, and
b) Group B: Professional Associations, Business Associations (Formal and Informal), Implementing and Regulatory Agencies, Learning Institutions (Universities), Mombasa County Executive, Mombasa County Assembly

One time each for

c) Neighbouring Counties (Top/Middle level Officers in Kwale and Kilifi), and
d) Technical Stakeholders for Environment (Seashore Line, Mangrove, Waste Management, Wastewater)

The purpose of the stakeholder meetings is shown in Table 15.3.1 below.

Table 15.3.1: Purposes of Stakeholder Meetings

Meetings	Purpose
First Meeting	To focus the study by identifying the main issues for analysis and discussion Project Explanation Clarification of Lead Agency Clarification of Entire Process and Schedule Clarification of Scope
Second Meeting	Alternative discussion Policy and Institutional Issues Assessing Baseline Situation and Environmental Impacts Source of Information for the Study Development Vision and Structure Plan
Third Meeting	Presentation of draft of the master plan (available draft at the timing of meeting) Discussion on the draft

Source: JICA Expert Team

Additionally, other activities for public engagement are planned/already conducted and include the following:

2) Civic Education

This is designed to afford various stakeholder ample opportunities to interact with the master plan and provide comments. The civic education is planned for two weeks (ten working days); January 16-27, 2017, where the Mombasa Gate City Master Plan will be on display at the Treasury Squares Offices of the County Government of Mombasa for comment. Alongside the output of the master plan, top essays and art from children will be displayed. All visitors will have an opportunity to comment or provide inputs into the master plan before it is finalised and approved.

3) Essay and Art Competition

The purpose is to engage the elementary school children in Class 4-8 and elicit their comments/input through participation in essay and art competitions. The competition is managed by the County Government of Mombasa with partners in the education sector. Top essays and art will be displayed alongside the master plan during the Civic Education Program in January 2017. A report compiling the essay and art comments will also be considered as input into the master plan process.

4) MGC MP Website

To enhance stakeholder engagement and provide information on the master plan process, a dedicated website was launched in October 2015 and is accessible at http://www.gatecitymp.mombasa.go.ke/. The website contains information and materials on events and tasks relevant to the master plan preparation process.

5) Advertisement and Public Notices

Advertisements and public notices are arranged in various media to provide notice to the public and other stakeholders on events relevant to the master plan process. The media used include: posters, radio, newspaper, and MGC MP website. The purpose is to enable those interested ample time to plan and attend the events.

15.3.2 Stakeholder and Focused Group Meeting

1) First Round SHM

The first stakeholder meeting, as part of the activity "Implementing the SEA" in Figure 15.2.1, was held on October 28, 2015 in Mombasa County as well as the launching of the dedicated website for eliciting stakeholder input into the formulation of Mombasa Gate City Master Plan- gatecitymp.mombasa.go.ke. At the SHM, more than 160 participants attended the meeting.

2) Second Round SHM

The second round of SHM was held in March 2016. The purpose of this round of meetings is listed below:

- Confirm current situation
- Discuss and finalise draft development vision and draft structure plan
- Discuss structure plan alternatives
- Disclose relevant information about the master plan process

At the meeting, the necessity of additional meetings was observed by CGM because of high interest especially regarding land acquisition for the planned road/bridge (Likoni) and the size of area of the subcounty (Kisauni). CGM is planning to have additional meetings as part of the second round. The additional meetings were not held as of April 23, 2016, and still in the process at CGM.

The location, date, and agenda (example) of SHM #2 are shown in Table 15.3.2 and Table 15.3.3 below. More than 600 participants attended the meetings.

Table 15.3.2: Location and Date (SHM completed, to be implemented)

Date	Subcounty	Venue	Number of Participants
15th March, 2016	Nyali	Frere Town Hall	107
16th March, 2016	Jomvu	Mikindani Social Hall	135
17th March, 2016	Changamwe	Changamwe Social Hall	140
21st March, 2016	Mvita	Tononoka Social Hall	52
22nd March, 2016	Likoni	Likoni CDF Hall	158
23rd March ,2016	Kisauni	Kisauni Baptist Primary School	86

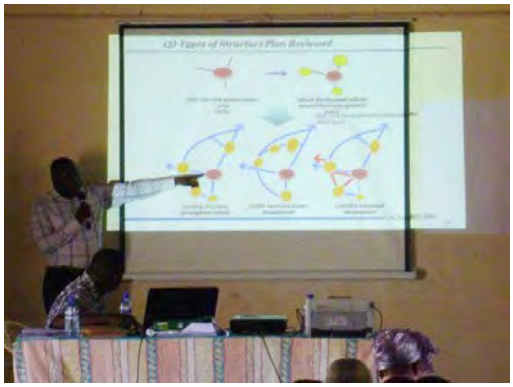
Source: JICA Expert Team

Table 15.3.3: Agenda of SHM #2 (Example)

Time	Subcounty	In-Charge
8:30-	Arrival and registration of participants Introduction of participants and climate setting	SEA Consultant
	Opening remarks	CGM
9:45-	Presentation of the master plan	CGM
	Presentation of SEA	SEA Consultant
11:00-	Refreshments	SEA Consultant
11:30-	Question and answer session	CGM / SEA Consultant
13:00-	Opinion survey	JET
	Closing remarks	CGM
	Guests leave at their own pleasure	All

Note: CGM: County Government of Mombasa/ JET: JICA Expert Team
Source: JICA Expert Team

The photographs of the meetings are shown in Figure 15.3.1 below.


Presentation by Official of CGM (1)


SHM #2 in Nyali (March 15)


SHM #2 in Changamwe (March 17)


SHM #2 in Likoni (March 22)

Source: JICA Expert Team

Figure 15.3.1: Photographs of SHMs #2

The major comments given at the meeting are listed below:

Overall vision

- Proposed vision is excellent.
- Address the challenges that caused failure of the 1971 Master Plan to ensure that mistakes are not repeated.
- Conduct more public forums to disseminate information on the master plan and also receive comment/increase public awareness.
- Increase awareness of the master plan process by engaging all groups and interests.
- Where is the budget for implementing the Mombasa Gate City Master Plan now under preparation?

Economy

- A proper resettlement plan is necessary before any residents or people be displaced; right procedure, fair and just compensation, etc. is necessary.
- Address land issues, security of tenure, absentee landlords, expired leases, etc.
- Forceful eviction of residents due to container freight station (CFS) expansion, i.e., Interpol and Focus. Also bypass construction at Chaani and airport at Mbokoni.
- Prioritise agriculture for people to produce food.
- Cooling facilities for storing fish as support to fishermen who are currently incurring losses.

Quality of Life

- How is security addressed in the master plan?
- “Inclusive” planning (e.g., for persons living with disability and youth)

- Provide poverty reduction measures in the master plan
- Upgrade informal settlements by providing transport and infrastructural facilities.
- Water scarcity
- Poor public health and sanitation
- Lack of provision for people living with disability especially in transport, buildings, public health and sanitation, e.g., toilets
- Rehabilitate pedestrian walkways to cover manholes and ditches. The manholes and ditches are to be blamed for a number of accidents involving pedestrians.

Governance

- Improve coordination between the national and county governments. Poor coordination might affect the implementation of the projects to be proposed in the master plan
- Coordinate with Kenya Ferry Service, Kenya Ports Authority, Kenya National Highways Authority (KENHA), and other agencies in planning and management of Mombasa County
- Where is the land use policy and development control policy?

Environment / Energy

- Environmental issues: dust from construction of roads and other infrastructure facilities, deforestation/destruction of forests especially of mangrove, and Kayas (note: mangroves provide breeding sites for fishes)
- Environmental pollution
- Address flooding due to poor storm water drainage
- Garbage strewn on the road reserves and dump site occasionally causes bad odour, fire accidents, and also hazardous to children, etc.

In addition to this, some of the stakeholder meetings for key groups were also conducted to share the recent progress of the master plan and also to share information.

- SHM for Kilifi County: July 19, 2016 at Kilifi County Office (23 attendants)
- SHM for Kwale County: Postponed due to unavoidable reason
- SHM for Key Stakeholders in Mombasa County: July 21, 2016 at Pride Inn Hotel (67 attendants)

3) Third Round SHM

The third round of stakeholder meetings was held in September 2016. The purpose of this round of meetings is listed below.

- Presentation of draft master plan (available draft at the timing of meeting)
- Discussion on the draft

The location, date, and agenda (example) of SHMs #3 are shown in Table 15.3.4 and Table 15.3.5 below. The JICA Expert Team received around 50 to more than 500 participants per meeting. More than 1,800 participants attended the meetings in total.

Table 15.3.4: Location and Date of SHMs #3

Date	Subcounty	Venue	Number of Participants
September 13, 2016	Changamwe	Chaani Social Hall	225
September 15, 2016	Jomvu	Kwa Shee Social Hall	244
September 20, 2016	Kisauni	Moonlight Social Hall	555
September 21, 2016	Mvita	Tononoka Social Hall	55
September 22, 2016	Nyali	Frere Town Hall	340
September 27, 2016	Likoni	Likoni Social Hall	446

Source: JICA Expert Team

Table 15.3.5: Agenda of SHMs #3 (Example)

Time	Subcounty	In-Charge
9:00-	Arrival and registration of participants	SEA Consultant
	Introduction of participants and climate setting	CGM
9:30-	Presentation of the master plan	CGM
	Presentation of SEA	SEA Consultant
11:00-	Question and answer session	CGM / SEA Consultant
11:45-	Opinion survey	SEA Consultant
	Closing remarks	CGM

Note: CGM: County Government of Mombasa
Source: JICA Expert Team

The photographs of the meetings are shown in Figure 15.3.2 below.

Banner at Changamwe (September 13, 2016)


SHM #3 in Jomvu (September 15, 2016)


SHM #3 in Kisauni (1)(September 20, 2016)
Hall Full of Participants


SHM #3 in Kisauni (2)(September 20, 2016)
CGM Officials Answering Questions from those Present


SHM #3 in Likoni (1)(September 27, 2016)
CGM Official Answering Questions


SHM #3 in Likoni (2) (September 27, 2016)
Hall Full of Participants with some following Proceedings from Outside The Hall

Source: JICA Expert Team

Figure 15.3.2: Photographs of SHMs #3

No objection to the principles of the master plan was observed. Similar to the comments received at the second round of the stakeholder meetings, comments and requests on the issues on economy, quality of

life, governance, and environment/energy are observed since these meetings are good opportunity to appeal to CGM.

In September 2016, the following meetings are also conducted for the same purpose as SHMs #3:

- SHM for Taita Taveta County: September 14, 2016 at Lavender Garden Hotel (27 attendants)
- SHM for Kwale County: Cancelled due to unavoidable reason
- SHM for Kilifi County: September 28, 2016 at Kilifi County Office (17 attendants)
- SHM for Key Stakeholders in Mombasa County: September 29, 2016 at Bliss Hotel (47 attendants)

The photographs of the meetings are shown in Figure 15.3.3 below.

Meeting at Taita Taveta County (September 14)
Presentation by MGC Official

Meeting at Kilifi County (September 28)
Presentation by SEA Consultant

SHM for Key Stakeholders (1) (September 27)
MP Presentation by CGM Official

SHM for Key Stakeholders (2) (September 29)
Nairobi City County Official Sharing Experience with the Participants on Implementation of NIUPLAN

Source: JICA Expert Team

Figure 15.3.3: Photographs of SHM for Other County/Key Stakeholders

15.3.3 Civic Education

"Civic Education" is stipulated in "County Government Act, 2012". The act states "(1) The principles of civic education to be promoted — (a) empowerment and enlightenment of citizens and government; (b) continuous and systemic engagement of citizens and government; and (c) values and principles of devolution in the Constitution." in Article 98 in Part X. Civic education program is under the responsibility of county governments.

In "the Physical Planning Act (Rev. 2010)", public notification is stated; however, description regarding how public participation or public consultation should be conducted is not specified/outlined.

On the terms of reference (TOR) for SEA consultant selection, the SEA consultant (local consultant) shall provide assistance to CGM for the implementation of the civic education program. For the civic

education purpose, an exhibition program for two weeks will be implemented by CGM. The SEA consultant will assist the implementation.

15.3.4 Essay and Art Competition

The "Essay and Art Competition" for primary schools in Mombasa County will be conducted in January 2017. The theme of the competition is "Mombasa Tutakayojivunia" (Meaning in English: "Mombasa we will be proud of'). The competition is hosted by the County Government of Mombasa. Pupils in Class 4 to 8 are eligible for the "Art" competition and those in Class 7 to 8 are eligible for the "Essay" competition. Awarded essay and art will be displayed during the Civic Education Program. The poster material used for promotion of the Essay and Art Competition in the County Schools is shown in Figure 15. 3.4 below.

Source: County Government of Mombasa

Figure 15.3.4: Poster for Essay and Art Competition

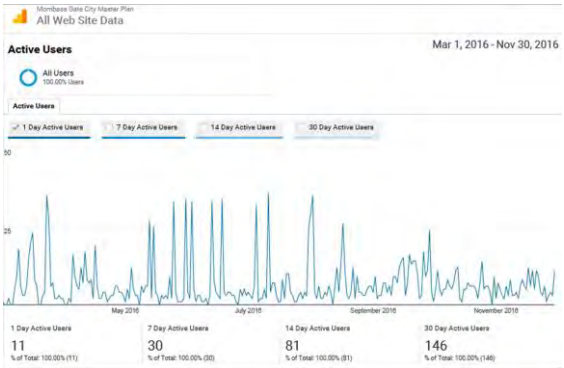
15.3.5 MGC MP Website

As stated in 15.2.1, the website of this master plan was launched and can be accessed at http://gatecitymp.mombasa.go.ke/. This website provides information of events relevant to the master plan formulation, e.g., stakeholder meetings, and also prepared materials relevant to this master plan, e.g., report and presentation materials. The top page of the website as of September 26, 2016 is shown in Figure 15.3. below. Figure 15.3.6 shows the user statistics of the website

as of November 30, 2016 with high number of users from March to September 2016 when stakeholder meetings were conducted.

Source: JICA Expert Team

Figure 15.3.5: Website of Mombasa Gate City Master Plan



Source: JICA Expert Team

Figure 15.3.6: Website User Statistics

15.3.6 Advertisement and Public Notice

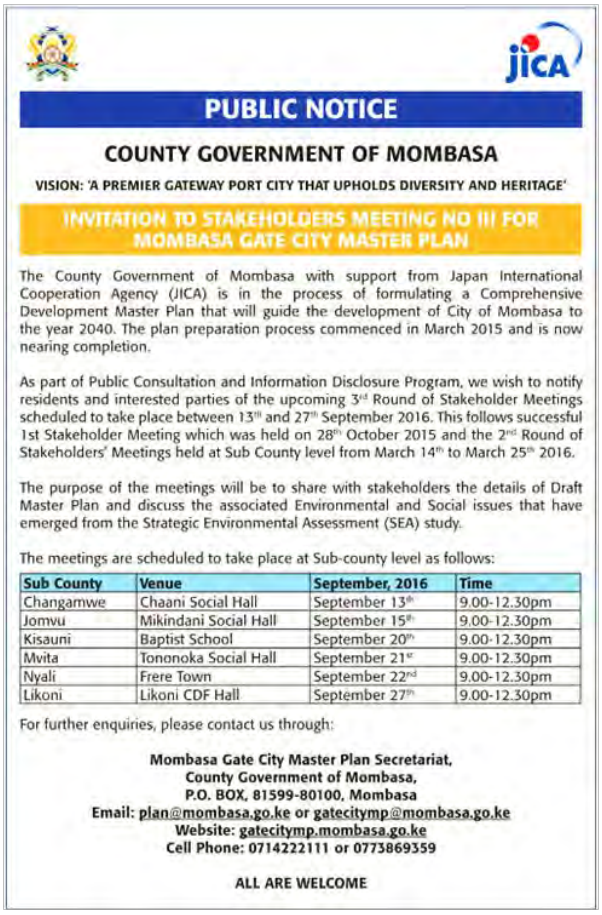
Prior to the stakeholder meetings and civic education program, CGM and the SEA Consultant advertise the events through various media. The summary of method and quantity are shown in Table 15.3.6 below:

Table 15.3.6: Summary of Advertisement

Event	Method	Detail
SHMs #2	Newspaper	Twice on English Newspaper "The Standard" on March 9, 2016 in English (B/W printing) "The Standard" on March 14, 2016 in English (Colour printing)
	Radio	Eight times of advertisement (Four times each in Kiswahili and in English) "Pwani FM" at 7:30 am on March 11, 2016 in Kiswahili "Pwani FM" at 12:30 pm on March 11, 2016 in English "Pwani FM" at 4:00 pm on March 11, 2016 in Kiswahili "Pwani FM" at 7:30 pm on March 11, 2016 in English "Pwani FM" at 7:30 am on March 14, 2016 in Kiswahili "Pwani FM" at 12:30 pm on March 14, 2016 in English "Pwani FM" at 4:00 pm on March 14, 2016 in Kiswahili "Pwani FM" at 7:30 pm on March 14, 2016 in English
	Poster	A3 size colour posters describing the venue, time and purpose of SHMs II were posted at meeting venues and their environs (8 no posters) as well as at JET office and CGM offices (Land, Planning, and Housing offices, County Assembly offices and Governor's office).
SHMs #3	Newspaper	Twice on English Newspaper "The Standard" on September 13, 2016 in English (Colour printing) "The Daily Nation" on September 19, 2016 in English (Colour printing)
	Radio	Four times of advertisement (Twice each in Kiswahili and in English) "Pwani FM" at 7:45 am on September 12, 2016 in Kiswahili "Pwani FM" at 9:15 am on September 12, 2016 in English "Pwani FM" at 7:45 am on September 19, 2016 in Kiswahili "Pwani FM" at 9:15 pm on September 19, 2016 in English
	Poster	A3 size colour posters describing the venue, time and purpose of SHMs III were posted at meeting venues and their environs (8 no posters) as well as at JET office and CGM offices (Land, Planning, and Housing offices, County Assembly offices, and Governor's office).
	Banner	A large poster displaying meeting venues and time was printed and displayed at all meeting halls during SHMs III as shown in Figure 15.3.2.
Civic Education	Newspaper	(To be reported)
	Radio	(To be reported)
	Poster	(To be reported)

Source: JICA Expert Team

One of the advertisements for SHMs #3 published on a newspaper is shown in Figure 15.3.7 below.



PUBLIC NOTICE

COUNTY GOVERNMENT OF MOMBASA

VISION: 'A PREMIER GATEWAY PORT CITY THAT UPHOLDS DIVERSITY AND HERITAGE'

INVITATION TO STAKEHOLDERS MEETING NO III FOR MOMBASA GATE CITY MASTER PLAN

The County Government of Mombasa with support from Japan International Cooperation Agency (JICA) is in the process of formulating a Comprehensive Development Master Plan that will guide the development of City of Mombasa to the year 2040. The plan preparation process commenced in March 2015 and is now nearing completion.

As part of Public Consultation and Information Disclosure Program, we wish to notify residents and interested parties of the upcoming 3rd Round of Stakeholder Meetings scheduled to take place between 13th and 27th September 2016. This follows successful 1st Stakeholder Meeting which was held on 28th October 2015 and the 2nd Round of Stakeholders' Meetings held at Sub County level from March 14th to March 25th 2016.

The purpose of the meetings will be to share with stakeholders the details of Draft Master Plan and discuss the associated Environmental and Social issues that have emerged from the Strategic Environmental Assessment (SEA) study.

The meetings are scheduled to take place at Sub-county level as follows:

Sub County	Venue	September, 2016	Time
Changamwe	Chaani Social Hall	September 13th	9.00-12.30pm
Jomvu	Mikindani Social Hall	September 15th	9.00-12.30pm
Kisauni	Baptist School	September 20th	9.00-12.30pm
Mvita	Tononoka Social Hall	September 21st	9.00-12.30pm
Nyali	Frere Town	September 22nd	9.00-12.30pm
Likoni	Likoni CDF Hall	September 27th	9.00-12.30pm

For further enquiries, please contact us through:

Mombasa Gate City Master Plan Secretariat,
County Government of Mombasa,
P.O. BOX, 81599-80100, Mombasa
Email: plan@mombasa.go.ke or gatecitymp@mombasa.go.ke
Website: gatecitymp.mombasa.go.ke
Cell Phone: 0714222111 or 0773869359

ALL ARE WELCOME

Source: The Standard (September 13, 2016). NB: Some of the venues were changed in short notice due to coordination challenges with local conveners

Figure 15.3.7: Advertisement on Newspaper

15.4 Analysis of Structure Plan Alternatives

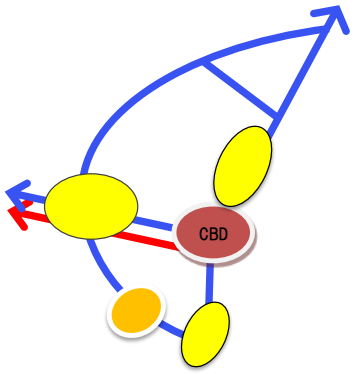
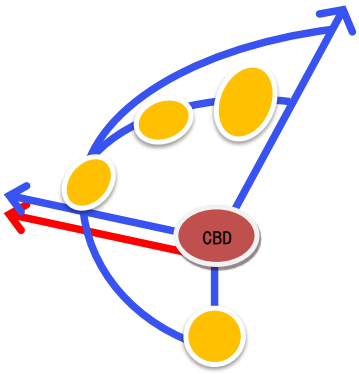
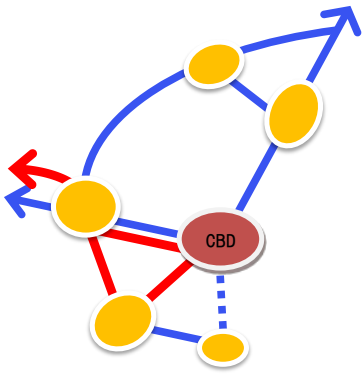
15.4.1 Outline

At the SHMs #2 and SHMs #3, these three options are presented as structure plan alternatives as shown in Figure 15.4.1.

In "Trend Development", intervention on urban management is minimal and only forms ring structure by connecting bypass and radial road.

In "Northwest Corridor Development", undeveloped area is considered as a priority area for development and also special functional area development along the ring road. However, there is no major shift in land use for existing urban areas.

In "Southwest Corridor Development", Northern Economic Corridor links are strengthened and logistics and local transport are to be separated. Land use and structure in island and other existing urban areas are reorganised.

Trend Development (Minimum Intervention)	Northwest Corridor Development (Double Ring Road Development)	Southwest Corridor Development (Logistics Oriented Development)
		
・ Trend development is considered, which only forms ring structure by connecting bypass and radial road (coastal road, Bamburi link). ・ Intervention on urban management is minimal.	・ Undeveloped area is considered as a priority area for development. ・ Double ring road in Mainland North and West is formed (bypass and inner ring road) (following the idea of ISUDP-Mombasa). ・ Special functional areas are developed along ring road (sub-centres). ・ There is no major shift in land use for existing urban areas.	・ Northern Economic Corridor links are strengthened and logistics and local transport are separated. ・ Sub-centres are developed mainly along the Northern Economic Corridor to support logistics condition. ・ Land use and structure in Mombasa Island and other existing urban areas are reorganized.

Source: JICA Expert Team

Figure 15.4.1: Structure Plan Alternatives

15.4.2 Analysis

Regarding the above three structure plan alternatives, the compound matrix is shown in Table 15.4.1. In "Trend Development", most of the issues, which mean evaluation factor, will not be significantly changed from the current situation.

Basically, more negative impact on natural resources may be brought by the development activities. However, other than natural resources, some positive impact might be expected if improvements are brought by the activities, e.g., proper zoning, safety, amenity, efficient use or less consumption of energy by better infrastructure.

In "Northwest Corridor Development", more land for development will be available and the issues of illegal settlement and land encroachment will be mitigated. However, issues currently existing in the developed area will still remain since there is no major shift in land use for existing urban areas.

In "Southwest Corridor Development", environmental improvement will be observed in residential area and local transport route since logistics is to be separated. One of the major reasons causing serious problems in the urban area is heavy traffic movement of logistics, and the problems include traffic jams, air pollution, vibration, and traffic safety issues. The reorganisation of land use and structure in Mombasa Island and other existing urban areas is a big challenge; however, it is necessary to solve most of the issues happening in such areas, e.g., land issue, road network, and traffic jam, housing, sanitation, etc.

More specific analysis should be implemented at each project level after the components of plan are finalised and project specific issues are identified.

Table 15.4.1: Compound Matrix for Structure Plan Alternatives

	Natural Resources					Socio-Cultural Issues							Economic Issue				Institutional			
Evaluation Factor	Water body pollution	Erosion	Deforestation	Ecosystem conservation	Flooding	Waste management	Traffic congestion	Noise/vibration	Air quality	Illegal settlement	Improvement of urban safety and amenity	Land encroachment	High unemployment	Poor accessibility to markets / or business district due to traffic jams	Poor road network	Low income	Urban development control	Urban development promotion system (private sector)	Public participation / public awareness	Information Disclosure System
Trend Development *(bypass and radial road)*	-	-	-	-	-	-	+	?	?	-	-	-	-	-	-	o	-	-	?	?
Northwest Corridor Development *(Development in undeveloped area and special function area along ring road)*	-	-	-	-	-	-	+	?	?	+	+	+	+	+	+	o	o	O	+	+
Southwest Corridor Development *(Separation of logistics and local transport, and reorganized of land use and structure)*	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	o	+	O	+	+

Note: +: Likely to be positive / -: Likely to be negative / o: likely to be neutral / ?: Uncertain
Source: JICA Expert Team

15.5 Stakeholder Comment/Input and Integration into Mombasa Gate City Master Plan

15.5.1 Stakeholder Comment by Sector

The comments were collected from various stakeholders during public engagement and information disclosure program of the Mombasa Gate City Master Plan. In Table 15.5.1 below, the comments have been organised per sector.

Table 15.5.1: Stakeholder Comment by Sector

Sector	Stakeholder Comment
Land Use and Informal Settlements	・ How to address land rights for poor? ・ Avail land/space for social facilities: health, education, recreational areas, etc ・ Consider Voi as a satellite town for Mombasa in the master plan ・ Incorporate open space policy in master plan
Transport	・ Improve road network and condition in Mwakirunge area ・ What are possible measures in place to promote water transport in the island/county. Explore possible collaboration with Kilifi County in the area of water transport? ・ Development of the port should be in tandem with the development of the county and coordination between Kenya Ports Authority and County Government of Mombasa should be prioritized
Infrastructure (Physical and Social)	・ How does the master plan address the acute water shortage in Mombasa County? Is water desalination prioritized as possible source of water to address the water shortage? ・ Provide facilities for persons living with disability and also make the existing infrastructure friendlier ・ Address poor drainage in the county ・ Address poor solid waste management and improve handling of waste at Mwakirunge dumpsite ・ Address the increased insecurity incidences ・ Address the poor state of social facilities: health, education, recreation, etc. ・ What measures has the master plan adopted to promote alternative sources of energy, e.g., solar power and how the master plan addresses the issue of high electricity tariffs for domestic users?

Sector	Stakeholder Comment
	・ Social infrastructure development is key, but how does the master plan address the poor quality of service offered at these facilities?
Tourism Development and Culture	・ Some heritage sites are rundown and gradually disappearing, for example, Kaya Shonda. What is the policy of the master plan with regard to such sites and how can they be rehabilitated for the benefit of the residents and visitors? ・ Mombasa County and Taita Taveta County share a big tourism ecosystem that can be utilized for the benefit of both counties. What measures are in place to foster such partnerships?
Economy	・ Mombasa County has a high unemployment rate. Will the master plan promote cottage industries to expand employment opportunities for the youth? ・ How does the master plan address the high unemployment rate? ・ Promote partnership between the counties of Mombasa and Taita Taveta in agriculture (food processing), environmental conservation, and mining
Governance	・ There is need for civic education to sensitize the public on the master plan ・ What is the cost of implementing the master plan? ・ How does the master plan address the issue of corruption and land grabbing? ・ Address the coordination challenges between county departments and also between the county and national government to promote implementation of the master plan ・ Make the preparation and implementation of the master plan inclusive; youth, women, children, poor, persons living with disability, etc. ・ Address unfairness in employment ・ Ensure fair compensation for residents affected by big infrastructure projects ・ Secure political goodwill for implementation of the master plan ・ Promote partnership between the counties of Mombasa and Taita Taveta ・ Prepare a Capital Investment Plan to guide the implementation of Mombasa Gate City Master Plan

Source: JICA Expert Team, prepared based on SHM comments

15.5.2 Stakeholder Comment by Subcounty

A total of 12 meetings were conducted at the subcounty level (Changamwe, Jomvu, Kisauni Mvita, Nyali and Likoni) and the comments collected are shown in Table 15.5.2 below.

Table 15.5.2: Stakeholder Comments by Subcounty

Subcounty	Comment
Changamwe	・ There is a need for more civic education for the master plan so that residents understand it instead of just rubber-stamping it. Provide ample time for public input into the draft master plan. Do not rush the public review process of the master plan. ・ How much would the master plan cost and where is the source of the funds? ・ Will new elected members in the next election (2017) continue with the implementation of the plan given that it is a long term with a target year of 2040? How will the implementation of the Mombasa Gate City Master Plan be coordinated? ・ Reclaim grabbed land in Changamwe sub county.
Jomvu	・ How does the plan protect the poor in terms of securing their land rights? ・ Address the lack of recreational facilities in Jomvu Subcounty. ・ Where is land/space for social facilities: health, education, playgrounds, recreation, etc? ・ How far has the county government gone with the implementation of the master plan? Poor coordination between County Executive Committee Members and local leaders a major impediment. ・ Provide land in Jomvu Subcounty to set up schools for people living with disability. ・ Involve youth in the plan preparation process and also provide for them in the master plan. ・ Develop infrastructure friendly to persons living with disability. Ferry not friendly to such persons. Also key is facilities such as playgrounds, transport channels, etc. for use by persons living with disability. ・ Address the high electricity tariffs for domestic consumers. This is hindering economic development of the locals.
Kisauni	・ Address poor drainage especially in Manyani and Junda areas of Kisauni Subcounty ・ Improve management of waste at Mwakirunge dumpsite; waste spills over into residential areas affecting health of residents. ・ Improve road network and road condition in Mwakirunge area. ・ Address unfairness in employment opportunities. ・ Create more opportunities to absorb the expanding labour force in the subcounty.

Subcounty	Comment
	・ Fair compensation should precede evictions of residents to pave way for road and big infrastructure developments. ・ Address insecurity in the subcounty.
Mvita	・ The master plan needs to have clear timelines for implementation. ・ Is there political good will to implement the master plan? ・ There was a proposal to extend county boundaries – is this still going to happen especially with the growing opposition from Kilifi and Kwale counties? ・ There is a need for the master plan to boost water and energy supply, security, and also provide social amenities. ・ Whether waste recycling has been considered as a strategy in management of solid waste? ・ Address the serious water scarcity in Mombasa County?
Nyali	・ Provide facilities for use by persons living with disability. ・ Ensure fairness in employment during implementation of the plan. ・ Provide social facilities: health, education, recreation; playgrounds, sports equipment, etc. ・ Control alcohol and drug abuse; how liquor licenses are issued. ・ Address the high insecurity in the area ・ Develop and support cottage industries to expand employment for the youth. For example, Bombolulu workshops have been abandoned when they can be rehabilitated to help expand employment opportunities for the youth. ・ Ensure infrastructure facilities exist for use by persons living with disability in both planned and existing developments.
Likoni	・ Residents of Mwangala area affected by the construction of the Dongo Kundu by-pass are yet to be compensated while the project is ongoing. ・ There is no water supply in Shonda area of Shika Adabu ward. ・ Rehabilitate and protect heritage sites such as Kaya Shonda. ・ Address the high unemployment rate amongst the youth in Likoni subcounty. ・ Address the insecurity in the area. ・ Improve the poor condition of social facilities: healthcare, education, recreational (including playgrounds, social halls, etc.)

Source: JICA Expert Team, prepared based on SHM comments

15.5.3 Comment by Key Group

As part of the implementation of public engagement and information disclosure program for master plan formulation, seven meetings for key groups were conducted and comments were collected as shown in Table 15.5.3 below. These comments have been grouped by key groups and include meetings at neighbouring counties of Taita Taveta, Kilifi, and also meetings of key groups held at central location at Mombasa County.

Table 15.5.3: Comments by Key Group

Key Group	Comments
Taita Taveta County	・ Promote use of water transport in the master plan ・ What measures are being considered by the master plan for compensating or resettling persons likely to be affected by the implementation of priority projects, i.e., AGT? ・ How is the County Government of Mombasa approaching the issue of solid waste management? ・ How does the master plan address acute water shortage in Mombasa County? ・ Is Mombasa County looking into alternative sources of energy such as solar power? ・ Is Mombasa County experiencing geological pressure (e.g. sinking of the island) due to the ongoing massive developments? ・ Does the master plan consider Voi Town as a satellite of Mombasa County? ・ Mombasa County and Taita Taveta County should partner in tourism promotion especially in the area of regional tourism and research. ・ Taita Taveta County is in the process of establishing a college to focus primarily on agriculture. Other areas of possible cooperation with Mombasa County include food processing, environmental conservation, mining, and capacity building.
Kilifi County	・ How to bridge the gap between the Mombasa Gate City Master Plan vision and reality (existing situation)?

Key Group	Comments
	・ Currently, Mombasa City has no discernible structure making it inefficient. Mainland North is isolated from the rest of the city. Master plan can develop West Mainland as commercial and industrial hub, South Mainland as commercial and residential and to complement the Mombasa Island's land use. ・ Where is the Capital Investment Plan? How much will the plan cost to implement? ・ Explore possible collaboration in the area of water transport and solid waste management with Kilifi County.
Key Group	・ Consider water transport network in the island. ・ Incorporate open space policy in Mombasa Gate City Master Plan. ・ Social infrastructure is important like health, schools, etc., but the key here is the services offered. Focus is on the quality of services too. ・ There is no enforcement of existing laws and regulations. The Mombasa Gate City Master Plan and regulations therein might suffer the same fate. ・ Water supply is a key issue in Mombasa. Only about 30% of demand is met. To improve, explore desalination of sea water, etc. ・ How do the priority projects been selected. Any Cost Benefit Analysis to justify why they are preferred over others? ・ Port should develop alongside the city of Mombasa and just as well, Mombasa City should consider port development in the development agenda. ・ Formulation of the master plan is only 15% of the work, realizing the plans or priority projects is 85%. For implementation, it is always a challenge to achieve consensus. Nairobi City County Government has developed a Strategic Plan to Guide City Development 2015-2025 where NIUPLAN has been anchored. This provides a firm implementation framework for the priority projects selected. ・ How to ring fence the Mombasa Gate City Master Plan against election cycles and politics. ・ County Assembly of Mombasa is critical in the final approval of the master plan. Sensitization of the members of the assembly is therefore necessary during the master plan preparation process to facilitate approval of the master plan when it is finalized and presented to the county assembly.

Source: JICA Expert Team, prepared based on SHM comments

15.5.4 Integration of Comments into the Master Plan

All comments collected during public engagement process as mentioned in Tables 15.5.1, 15.5.2, and 15.5.3 above are integrated into the Mombasa Gate City Master Plan. The comments were collected from various activities under the public engagement program and then grouped in two categories: "primary" and "secondary" comments. "Primary" comments relate directly to the scope of this master plan and have been fully integrated into the master plan whereas "Secondary" comments relate indirectly but with relevance to efficient implementation of the master plan. 'Secondary' comments will inform the Social and Environmental Programme of SEA for Mombasa Gate City Master Plan.

The comments are considered through the development vision (including pillars), structure plan, sectoral policy, and projects. How the individual comments are integrated in the master plan is shown in Table 15.5.4 below.

Table 15.5.4: Integration of Comments into Master Plan

Sector	Stakeholder Comment	How the comment is integrated into the master plan
Land Use and Informal Settlements	・ How to address land rights for poor?	・ Prioritized preparation of detailed plans to address land rights of the poor.
	・ Avail land/space for social facilities: health, education, recreational areas, etc.	・ The Framework Plan for addressing space allocation for various land uses including social facilities and open spaces.
	・ Consider Voi as a satellite town for Mombasa in the master plan	・ Strengthening Mombasa County through the various strategies and actions proposed in the Master plan will inadvertently positively affect Voi as one of the towns along the Northern Corridor.

Sector	Stakeholder Comment	How the comment is integrated into the master plan
	・ Incorporate open space policy in the master plan	・ The formulation of zoning regulations for effective and efficient management of county land resource. This will help reduce congestion and help in allocation of necessary facilities for a high quality of life such as open spaces, recreation areas, etc.
Transport	・ Improve road network and condition in Mwakirunge area	・ Road Development Program preparation (2020-2040) to deliver the urban network in mainland regions. ・ Adoption of efficient structure plan for Mombasa County, Southwest Corridor Development (Logistics Oriented Development). This structure seeks to strengthen regional and urban network as well separate logistics transport and logistics transport.
	・ Mombasa County and especially the Mombasa Island are uniquely positioned as a sea port and the start of the Northern Corridor but water transport has not been considered in the master plan. What measures are in place to promote water transport and take advantage of the abundant waterways in the county? Explore possible collaboration with Kilifi County in the area of water transport.	・ Water transport is proposed in the master plan and is linked/coordinated with other modes of transport. Likewise, as a measure to support tourism development in the coastal region, water transport is considered as one of the promotion measures.
	・ Development of the port should be in tandem with development of the county and coordination between Kenya Ports Authority and County Government of Mombasa should be prioritized.	・ Integration of the Port Master Plan with Mombasa Gate City Master Plan.
Infrastructure	・ Mombasa is considered a water scarce county and currently faces acute water shortage. What measures does the master plan proposed to address this problem?	・ Development of Mwache Multi-purpose Dam is seen as short and medium term measure to meet water demand in Mombasa County. Additionally, the master plan proposes rehabilitation and extension of water supply system to improve coverage of water supply
	・ Mombasa County has a lot of sea water that can be utilized to improve water supply situation in Mombasa. Does the master plan consider desalination of sea water as a viable alternative to improve on water supply?	・ The master plan recognizes the acute water shortage in Mombasa County and proposes appropriate development policy for the same as above. Desalination of sea water is identified as one of the options for improving water supply, but not prioritized.
	・ Provide facilities for persons living with disability and also make the existing infrastructure friendlier.	・ The master plan as framework plan provides for inclusive development and recognizes persons living with disability as key stakeholders in the implementation of the master plan projects. Their specific needs will be considered in implementation of the projects and the master plan recommends existing infrastructure to accommodate the specific needs of persons living with disability
	・ Address poor drainage in the county	・ The strategy is to prioritize construction of drainage along existing paved roads to improve drainage system in Mombasa. Projects proposed: construction of drainage along existing paved roads, regular cleaning of existing drainage to avoid flooding, and preparatory survey of controlled discharge of rainwater.
	・ Address poor solid waste management and improve handling of waste at Mwakirunge dumpsite	・ Provision of waste collection and transportation vehicles to ensure prompt collection and transportation of solid waste from residential and commercial areas ・ Decommission of dumping sites (Mwakirunge, Shonda, Kibaraani) and construction of new sanitary landfill sites to minimize the current environmental impacts and develop environmentally friendly waste disposal system.

Sector	Stakeholder Comment	How the comment is integrated into the master plan
		・ Capacity development for 3R to reduce volume of waste disposed at landfill sites. ・ Development of 3R system.
	・ Address the increased insecurity incidences.	・ The master plan seeks to improve the urban condition of Mombasa County by efficient structure plan and transportation plan.
	・ Address the poor state of social facilities, e.g., health, education, recreation, etc.	・ Development vision for social infrastructure development; good access with equitable distribution and securing quality of service.
	・ What measures has the master plan adopted to promote alternative sources of energy, e.g., solar power and also how the master plan addresses the issue of high electricity tariffs for domestic users.	・ The development policy for the power sector: ensure reliable and sufficient power at affordable tariff. Priority projects include development of renewable energy sources for example solar power, wind, etc.
	・ We appreciate the critical role social infrastructure plays in fostering healthy living but our concern is with the poor quality of service at these facilities.	・ Development policy for social infrastructure development; good access with equitable distribution and securing quality of service.
Tourism Development and Culture	・ Some of heritage sites are rundown and gradually disappearing, for example, Kaya Shonda. What is the policy of the master plan with regard to such sites and how can they be rehabilitated for the benefit of the residents and visitors.	・ The master plan proposes cultural heritages restoration (of 33 gazetted sites) as one of the priority projects to be implemented within the medium term to offer new type of high value tourism products and strengthen the uniqueness of Mombasa County as a tourism destination.
	・ The counties of Mombasa and Taita Taveta share a big tourism ecosystem that can be utilized for the benefit of both counties. What measures are in place to foster such partnerships?	・ The master plan proposes capacity development for marketing and promotion of tourism for Mombasa County and surrounding areas as a priority project to be implemented in the short term. This is aimed at promoting collective efforts of relevant stakeholders in the coastal region (including neighbouring counties) in tourism promotion.
Economy	・ Mombasa County has a high unemployment rate. Master plan needs to promote and support cottage industries to expand employment opportunities for the youth.	・ The master plan has identified development of specific training courses for key industries of Mombasa including marine engineering, logistics, business management, etc. as key project to be implemented in the short term to provide the needed skills and increase job opportunity towards creating a vibrant economy. The master plan also prioritizes service sector: tourism, logistics, and information and communications technology (ICT) as priority drivers of Mombasa County's economy to 2040.
	・ How does the master plan address the high unemployment rate?	・ The master plan is an improvement framework for the urban condition and aims at making the various sectors competitive such as industry, tourism, business, etc. The master plan expects the economy to grow to gross regional domestic product (GRDP) growth rate of 7% supported mainly by service sector: tourism, logistics, and ICT.
	・ Promote partnership between the counties of Mombasa and Taita Taveta in agriculture (food processing), environmental conservation, and mining.	・ The master plan proposes strategic partnership amongst the stakeholders across all sectors of development. This will reduce on duplication and concentrate efforts in reducing the transaction costs and promote the development of agriculture, conservation, and mining sectors.
Governance	・ There is a need for civic education to sensitize the public on the master plan.	・ Civic Education is planned for January 2017 to enhance awareness on master plan and facilitate collection of comment.
	・ What is the cost of implementing the master plan?	・ Priority projects have been prepared and cost estimated in the master plan. Where the cost is not included, further studies have been proposed.

Sector	Stakeholder Comment	How the comment is integrated into the master plan
	・ How does the master plan address the issue of corruption and land grabbing?	・ The master plan has identified promotion of transparent urban management such as comprehensive GIS laboratory that promotes infrastructure development, urban facility development, and land use control as a priority project to be implemented in the short term. This will also improve efficiency of public administration and enhance cooperation and consistency among departments and units by using common data and information. ・ The master plan also recognizes this as a crosscutting issue and recommends necessary action by all relevant stakeholders to address it.
	・ Address the coordination challenges between county departments and also between the county and national governments to foster implementation of the master plan.	・ The master plan will utilize the existing coordination structure of the county government (and national government) and where this is not efficient; propose improvement mechanism to facilitate implementation of the master plan.
	・ Make the preparation and implementation of the master plan inclusive: youth, women, children, poor, persons living with disability, etc.	・ The master plan preparation is stakeholder based where all types of stakeholders (including youth, women, children, poor, persons living with disability, etc.) are engaged and their views considered in the formulation process. This will also apply in the implementation stage where enough care is considered to involve all likely 'project affected persons' ・ The master plan has also identified comprehensive cooperation with universities for the benefit of the County Government of Mombasa through transfer of knowledge, theory, and technology as a priority project in strengthening urban management function.
	・ Address unfairness in employment	・ Out of scope but the relevant department of county government is advised to ensure fair employment policy.
	・ Ensure fair compensation for residents affected by big infrastructural projects	・ Project level consideration including EIA and specific compensation will be argued after the master plan stage.
	・ Secure political goodwill for the implementation of the master plan.	・ The master plan will be subjected to public review and will be debated in the county assembly before being approved. This will make the master plan a statutory document and mandates the executive wing of the county government to implement it. The county assembly will also play an oversight role on the implementation process.
	・ Promote partnership between the counties of Mombasa and Taita Taveta.	・ The master plan proposes strategic partnership amongst the stakeholders across all sectors of development for efficient development of the region. This will reduce duplication and related costs.
	・ Prepare Capital Investment Plan to guide the implementation of Mombasa Gate City Master Plan.	・ The master plan has identified priority projects with estimated costs (since this is missing, further studies are proposed). This will guide arrangement for implementation budget.

Source: JICA Expert Team, prepared based on SHM comments

16. Priority Projects and Priority Areas

16.1 Priority Projects

16.1.1 Selection of Priority Projects

Priority projects are selected from each sector through working group discussion by considering the importance of achieving the four pillars of development vision for Mombasa County 2040: Pillar 1: Vibrant Economy, Pillar 2: High Quality of Life, Pillar 3: Good Governance, and Pillar 4: Environment and Energy. Relationship between the four pillars of development vision and priority projects is summarised below.

Vibrant economy can be achieved mainly through the improvement of Northern Corridor related transport and tourism development. High quality of life can be achieved through the improvement of urban infrastructure, provision of social facilities, and promotion of tourism which focuses on culture and heritage. Good governance can be achieved through the improvement of urban management including human resources and organisation/regulation improvement. Environment and energy can be achieved through wastewater management, drainage improvement, and solid waste management.

Priority projects are compiled for transport sector, urban infrastructure, social and public facility, tourism, and urban management as mentioned from the next section. Table 16.1.1 below lists the priority projects.

Table 16.1.1: List of Priority Projects

Sector	No.	Priority Projects	Implementation Schedule	Pillars of Vision
Transport	T1	R3: Mombasa Gate Bridge Bridge	Middle Term	Pillar 1: Vibrant Economy
	T2	R2: Second Nyali Bridge	Middle Term	Pillar 1: Vibrant Economy
	T3	Northern Bypass Road Construction Project	Short Term	Pillar 1: Vibrant Economy
	T4	Mombasa Southern Bypass Road (MSBR) Construction Project	Short Term	Pillar 1: Vibrant Economy
	T5	M6: Missing Link Improvement (Railway)	Short Term	Pillar 1: Vibrant Economy
	T6	R1: Shimanzi – Kipevu Link	Short Term	Pillar 1: Vibrant Economy
	T7	CD-1 Road Development Programme Preparation (2020-40); Consulting Services	Short Term	Pillar 1: Vibrant Economy Pillar 2: High Quality of Life
	T8	P1 Mass Rapid Transit (MRT) Ferry-VOK-City Mall Line, Loop Line	Middle/Long Term	Pillar 1: Vibrant Economy Pillar 2: High Quality of Life
Urban Infrastructure	I1	Rehabilitation and Extension Project of Water Supply System (Water Supply)	Short Term	Pillar 2: High Quality of Life
	I2	Development of Mwache Multipurpose Dam (Water Supply)	Short/Middle Term	Pillar 2: High Quality of Life
	I3	Rehabilitation Project of Existing Waste Water Treatment Plant (Sewerage and Drainage)	Short Term	Pillar 2: High Quality of Life Pillar 4: Environment and Energy
	I4	Rehabilitation and Extension Project of Sewerage System (Sewerage and Drainage)	Short Term	Pillar 2: High Quality of Life Pillar 4: Environment and Energy

Sector	No.	Priority Projects	Implementation Schedule	Pillars of Vision
	I5	Construction of Drainage along Existing Paved Roads (Sewerage and Drainage)	Short/Middle Term	Pillar 2: High Quality of Life Pillar 4: Environment and Energy
	I6	Provision of Waste Collection and Transportation Vehicle (Solid Waste Management)	Short Term	Pillar 2: High Quality of Life Pillar 4: Environment and Energy
	I7	Capacity Development for Solid Waste Management (Solid Waste Management)	Short Term	Pillar 2: High Quality of Life Pillar 4: Environment and Energy
	I8	Decommission of Dumping Sites and Construction of New Sanitary Landfill Sites (Solid Waste Management)	Short/Middle Term	Pillar 2: High Quality of Life Pillar 4: Environment and Energy
	I9	Provision of Waste Collection and Transportation Vehicles and Construction of Transfer Stations (Solid Waste Management)	Short/Middle Term	Pillar 2: High Quality of Life Pillar 4: Environment and Energy
	I10	Construction of Hazardous Waste Disposal Facility (Solid Waste Management)	Short/Middle Term	Pillar 2: High Quality of Life Pillar 4: Environment and Energy
	I11	Capacity Development for 3R Activities (Solid Waste Management)	Middle Term	Pillar 2: High Quality of Life Pillar 4: Environment and Energy
	I12	Development of Power Supply (Power)	Short Term	Pillar 2: High Quality of Life
	I13	Extension of Power Distribution Coverage (Power)	Short Term	Pillar 2: High Quality of Life
	I14	Upgrade the Current Distribution Network (Power)	Middle Term	Pillar 2: High Quality of Life
	I15	Development of Optic Trunk Communication Network (Telecommunication)	Short Term	Pillar 1: Vibrant Economy
	I16	Development of Mobile Phone Coverage in Mombasa County (Telecommunication)	Short Term	Pillar 2: High Quality of Life
	I17	Development of Mombasa ICT Centre with Data Centre (Telecommunication)	Middle Term	Pillar 3: Good Governance
Social and Public Facility	S1	Establishment of a Mombasa County Housing Development Agency (Social housing) (Housing)	Short Term	Pillar 2: High Quality of Life
	S2	Promotion of Efficiency and Transparency of Land Administration(Housing)	Short/Middle Term	Pillar 2: High Quality of Life
	S3	Formulation of Zoning Regulation (Housing)	Short Term	Pillar 2: High Quality of Life
	S4	Formulation of Minimum Quality Standard for Private School (Education)	Short Term	Pillar 2: High Quality of Life
	S5	Development of Specific Training Course for Key Industries of Mombasa (Education)	Short Term	Pillar 2: High Quality of Life
	S6	Establishment of Referral Hospitals in Each Subcounty with Emergency Services (Health)	Middle Term	Pillar 2: High Quality of Life
Tourism	TS1	Project of Capacity Development for Marketing and Promotion for Mombasa County and Surrounding Areas	Short Term	Pillar 1: Vibrant Economy Pillar 2: High Quality of Life
	TS2	Project for Capacity Development on Tourism Statistics in Mombasa County	Short Term	Pillar 1: Vibrant Economy Pillar 2: High Quality of Life
	TS3	Cultural Heritages Restoration	Middle Term	Pillar 1: Vibrant Economy Pillar 2: High Quality of Life

Sector	No.	Priority Projects	Implementation Schedule	Pillars of Vision
Urban Management	U1	Setting Up a GIS Laboratory	Short Term	Pillar 3: Good Governance
	U2	Comprehensive Cooperation with Universities	Short Term	Pillar 3: Good Governance
	U3	Organisational Strengthening for Urban Management	Short Term	Pillar 3: Good Governance

Note: Short Term: -2020, Middle Term: 2021-2030, Long Term: 2031-2040
Source: JICA Expert Team

Since the annual budget of the County Government of Mombasa (CGM) is USD 100 million, amongst which development budget is USD 42 million and routine budget is USD 68 million, the fund for implementing priority projects has to be secured including public, private, and development partners. In addition, priority in terms of area and sector has to be examined in order to allocate the fund efficiently.

16.1.2 Priority Projects for Transport Sector

Priority projects for transport include eight projects as shown in the following tables:

Table 16.1.2: Mombasa Gate Bridge (Likoni Bridge)

a) Project title	T1: R3: Mombasa Gateway Bridge (Likoni Bridge)
b) Background	A French group proposed an elevation bridge, but it has risk of technical fault, blocking channel traffic. A Chinese group proposed a long elevated coastal road connection. A Japanese group (Japan International Cooperation Agency (JICA)) conducted a thorough engineering study in 1984, with bridge and tunnel options. The other Japanese group (Ministry of Economy, Trade and Industry (METI)) proposed an arch bridge structure with a thorough engineering study. The Kenya National Highway Authority (KeNHA) and JICA are conducting further feasibility study in 2016. So far, the proposed alignment is close to the Mtongwe Ferry alignment, by Mweza Creek and connected to A14. The Navy facility will be a barrier to the approach in the special economic zone (SEZ) internal corridor.
c) Objective	Realise an alternative route for motorised traffic at the Likoni Ferry Crossing, materialise an alternative route for freight transportation route to/from Kilindini Port District to Upcountry via the Mombasa Southern Bypass Road (MSBR), create the hyper corridor for regional wide traffic connecting Nyali and Kilifi.
d) Expected benefit	Expect to form transport structure to mitigate congestion in Changamwe and promote development of SEZ in Dongo Kundu. See Chapter 10.4.1.(2) for its effects on traffic diversion analysed by STRADA.
e) Components	Construction of a channel crossing bridge with 500-600 m width channel with busy vessel navigation. The M5-3 (Hypercorridor Development), M10 (Hypercorridor Intersection Improvement), and S1 (Southern Bypass – Mombasa Gate Bridge approach (A14 Bypass, 4km)) could be integrated. i) Feasibility study and financial arrangement ii) Design and procurement phase iii) Implementation (Construction supervision) iv) Operation and assessment
f) Responsible organisation	Implementing agency: KeNHA Related agency: Kenya Ports Authority (KPA), CGM
g) Status	F/S, design (JICA)
h) Commitment by donors	No commitment for construction
i) Cost	USD 700-900 million
j) Possible fund source	Japan Yen Loan
k) Implementation schedule	Middle Term; by 2030
l) Challenges for implementation	Land resettlement issue

Source: JICA Expert Team

Table 16.1.3: Second Nyali Bridge

a) Project title	T2: R2: Second Nyali Bridge
b) Background	The Kenya Urban Roads Authority (KURA) proposal is for connecting congested link roads to the central business district (CBD) on Mombasa Island, avoiding the Kongowea focal point. It was originally proposed by a French group, KURA and the Ministry of Finance prepared the feasibility study with engineering aspects in 2015, suggesting a Private Finance Initiative (PFI) implementation scheme tolling on users, announcing it as a Design Build Finance Operate (DBFO) project in early 2016. The study considers necessary relocations in Nyali.
c) Objective	To form a large ring road covering Kongowea and Mombasa Island's peripheral areas, avoiding major pedestrian traffic hubs, divert highly concentrated traffic demand at the Nyali Bridge, and utilise the function of the Nyali Bridge for regional traffic which had been funded by JICA in 1970.
d) Expected benefit	See Chapter 10.4.1.(2) for its effects on traffic diversion, and Chapter 10.5.1 for traffic congestion alleviation at Nyali Crossing.
e) Components	Construction of a channel crossing bridge with 300-400 m width channel from Kisauni Road in Mombasa Island and Kongowea District in Nyali District. i) Feasibility study and financial arrangement ii) Design and procurement phase by DBFO criteria iii) Implementation (Construction and supervision) by private finance initiative (PFI) investors iv) Operation by PFI investors and handover
f) Responsible organisation	Implementing agency: Kenya Urban Roads Authority (KURA) Related agency: PFI investor, CGM
g) Status	F/S completed
h) Commitment by donors	No commitment for construction
i) Cost	Need to refer for KURA's feasibility study
j) Possible fund source	PFI Investment
k) Implementation schedule	Middle Term; by 2030
l) Challenges for implementation	Financial source is not secured

Source: JICA Expert Team

Table 16.1.4: Northern Bypass Road

a) Project title	T3: Northern Bypass Road Construction Project
b) Background	KeNHA conducted the feasibility study on the Northern Bypass in 2015, with the World Bank (WB) financial support, which recommended the Route C alignment as best option amongst the three candidate alignments. The bypass will connect A109 Miritini in Jomvu District and Northern Mtwapa in Kilifi. The bypass has a Bamburi Link.
c) Objective	To divert through traffic from Kilifi County and Bamburi District to Upcountry. The traffic to/from cement industry in Bamburi and Kilifi will be directly influenced by the project. The congestion at Nyali Crossing will be alleviated by the project.
d) Expected benefit	Diverting transport from coming to urban areas which mitigate congestion in the island and Changamwe/Miritini. See Chapter 10.4.1.(1) for its effects on traffic diversion in 2020
e) Components	Construction of a 10-km 4-lane road between Miritini and Mwakirunge, and 10-km 2-lane road for other sections. i) Financial arrangement by the World Bank and KeNHA ii) Design and procurement phase iii) Implementation (Construction and supervision) iv) Operation and maintenance
f) Responsible organisation	Implementing agency: KeNHA
g) Status	F/S, design (WB) completed
h) Commitment by donors	No commitment for construction
i) Cost	USD 400-500 million
j) Possible fund source	PFI Investment
k) Implementation schedule	Short Term; by 2020
l) Challenges for implementation	Financing for construction

Source: JICA Expert Team

Table 16.1.5: Mombasa Southern Bypass Road

a) Project title	T4: Mombasa Southern Bypass Road (MSBR) Construction Project
b) Background	This bypass road project will connect the isolated Kwale County and Mombasa Likoni District to the Northern Economic Corridor (19.8 km), as well as provide high capacity road link to the new container terminal (Berth 20-21) as Kipevu Link section (5.7 km). The implementation programme specifies that the project will be completed by 2020. JICA funding has been applied to the project.
c) Objective	To divert through traffic from Kwale County to Upcountry. SEZ development and Dongo Kundu Port in Mombasa will be connected with the MSBR link.
d) Expected benefit	Expect to promote development of SEZ in Dongo Kundu. See Chapter 10.4.1.(1) for its effects on traffic diversion in 2020
e) Components	Construction of a 4-lane full access control highway, for 19.8 km as MSBR and 5.7 km as Kipevu Link. i) Financial arrangement by JICA and KeNHA ii) Design and procurement phase iii) Implementation (Construction and supervision) iv) Operation and maintenance
f) Responsible organisation	Implementing agency: KeNHA
g) Status	Construction/Design (JICA)
h) Commitment by donors	JICA
i) Cost	USD 400-500 million
j) Possible fund source	Official development assistance (ODA)
k) Implementation schedule	Short Term; by 2020
l) Challenges for implementation	Compensation for Phase 2

Source: JICA Expert Team

Table 16.1.6: Missing Link Improvement

a) Project title	T5: M6: Missing Link Improvement (Railway)
b) Background	Level crossing development connecting Lumumba Rd and Moi Avenue, behind the central railway station. See Chapters 10.3.2 and 10.3.3
c) Objective	Provide outer ring road function in the island road network, alleviate the traffic congestion in the CBD area and realise “traffic calming” ultimately.
d) Expected benefit	Improve traffic flow in Mombasa Island and support promotion of efficient land use. See Section 10.5.4 for details.
e) Components	i) Coordination with stakeholders for the implementation scheme including security coordination, ii) preliminary/basic design, iii) procurement, iv) construction (site clearance, pre-fabricated pavement installation, finishing), and v) operation
f) Responsible organisation	Implementing agency: KURA, KeNHA Related agency: Police. KRC owns the land.
g) Status	Proposed by MGCMP
h) Commitment by donors	No commitment for construction
i) Cost	Less than USD 3 million
j) Possible fund source	National Government
k) Implementation schedule	Short Term
l) Challenges for implementation	Financing is not confirmed. Negotiation with KRC for crossing station.
Image, Drawings: see Section 10.5.4	

Source: JICA Expert Team

Table 16.1.7: Shimanzi – Kipevu Link

a) Project title	T6: R1: Shimanzi – Kipevu Link
b) Background	No alternative connection between Mombasa Island and the Mainland West.
c) Objective	As a simple solution, a 200m level stretch of road can be developed from the Shimanzi Oil Terminal internal road to the Port Exclusive Road, and it can be used to give temporary accessibility to the customs-bonded area (a concern of KPA) Divert through traffic between Nairobi – Shimanzi/Kilindini industrial area in the island to the MSBR/Kipevu Link, which will alleviate the severe congestion of traffic at the Changamwe and Jomvu junctions, the initial section of the Northern Economic Corridor. See Chapter 10.3.1.
d) Expected benefit	Divert logistic transport which will mitigate congestion in Changamwe/Miritini See Chapter 10.5.2.(3) for its effects on traffic diversion.
e) Components	i) Coordination with stakeholders for implementation scheme including security coordination, ii) preliminary/basic design, iii) procurement, iv) construction (site clearance, pre-fabricated pavement installation, finishing), and v) operation

f) Responsible organisation	Implementing agency: Kenya Ports Authority (KPA) Related agency: CGM, KeNHA, KRA
g) Cost	Less than USD 3 million
h) Status	Proposed by MGCMP
i) Commitment by donors	No commitment for construction
j) Possible fund source	National Government
k) Implementation schedule	Short Term; until opening of the Kipevu Link (Yen-Loan funded project) in 2018.
l) Challenges for implementation	Negotiation with KPA for utilising the land
Image, Drawings: see Figure 10.3.1	

Source: JICA Expert Team

Table 16.1.8: Road Development Programme Preparation (2020-40)

a) Project title	T7: CD-1 Road Development Programme Preparation (2020-40); Consulting Services
b) Background	Small road ratio in the Mainland Region to accommodate future traffic, as explained in Chapter 4.6.1
c) Objective	・ Create the Road Development Programme, including the three-year sub programmes for 2020-30 and 2030-40. ・ Establish monitoring organisation of the road development programme with the Plan-Do-Check-Act (PDCA) scheme ・ Identify and plan target road sections for further development, including A109 New Malindi and Old Malindi Rd., Kengeleni (Mwakirunge) Rd., and Mtongwe-Sherry Beach Rd. specified in the plan (see section 10.3.9).
d) Expected benefit	Materialise the urban road network in mainland regions. See Chapter 10.3.5 for benefit and further objective.
e) Components	See Chapter 10.3.5 for routine assessment activities for PDCA 1) 1st phase; provide 3-4 international experts for initial establishment of the organisation and preparation of the road development programme for the initial 1st year. 2) 2nd phase; provide 2-3 international experts and 3-4 local experts for monitoring capacity development activities for 2-3 years.
f) Responsible organisation	Implementing agency: CGM Local offices of KeNHA, KURA, KeRRA,
g) Cost	For consulting services, less than USD 3 million in total
h) Status	Proposed by MGCMP
i) Commitment by donors	No commitment for implementation
j) Possible fund source	Technical assistance
k) Implementation schedule	By FY 2017, the 1st phase consulting service should be started.
l) Challenges for implementation	Dispatching expert
Image, Drawings: see Figures 10.3.7, 10.3.8	

Source: JICA Expert Team

Table 16.1.9: MRT Ferry-VOK-City Mall Line, Loop Line

a) Project title	T8: P1 MRT Ferry-VOK-City Mall Line, Loop Line
b) Background	High dependency on the inefficient *matatu* transport system. Not much road network to accommodate public transport system on surface road level.
c) Objective	To build elevated passenger services as core of passenger service network.
d) Expected benefit	Separating logistics transport and regional transport to promote efficient transport system. See Chapter 10.4.1 (2) for expected numerical benefit in 2030 in the transport network.
e) Components	・ The multi-core urban structure needs mass rapid transit (MRT) to connect core centres, Ferry-Digo-Kongowea-Bombolulu alignment. The Moi-Makupa-Airport Corridor will be another candidate for MRT preparation. ・ Initial section Ferry-VOK (7 km) for middle term, and loop section for Moi, Rail Station/Saba Saba will be added as long term. ・ Exclusive elevated structure, with state-of-the-art rail services including automated guideway transit (AGT), monorail, etc. See Chapter 10.5.5 for detailed components
f) Responsible organisation	Implementing agency: National Government (MOTI)
g) Cost	Approximately USD 500-700 million for the initial section
h) Status	Proposed by MGCMP
i) Commitment by donors	No commitment for construction
j) Possible fund source	Japan Yen Loan
k) Implementation schedule	For operation of the initial section (7 km) will be commenced by 2030 (middle term) For other section, should be started by 2040 (long term)
l) Challenges for implementation	Financing
Image, Drawings: see Figure 10.3.9	

Source: JICA Expert Team

16.1.3 Priority Projects for Urban Infrastructure

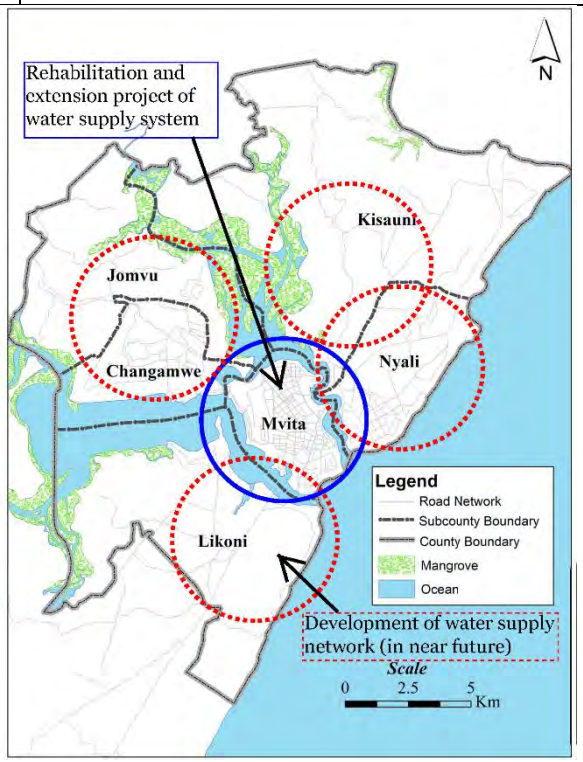
Priority projects for urban infrastructure consist of water supply, sewerage and drainage, solid waste, power supply, and telecommunication.

(1) Water Supply

Priority projects for water supply include two projects as shown in the following tables:

Table 16.1.10: Rehabilitation and Extension Project of Water Supply System

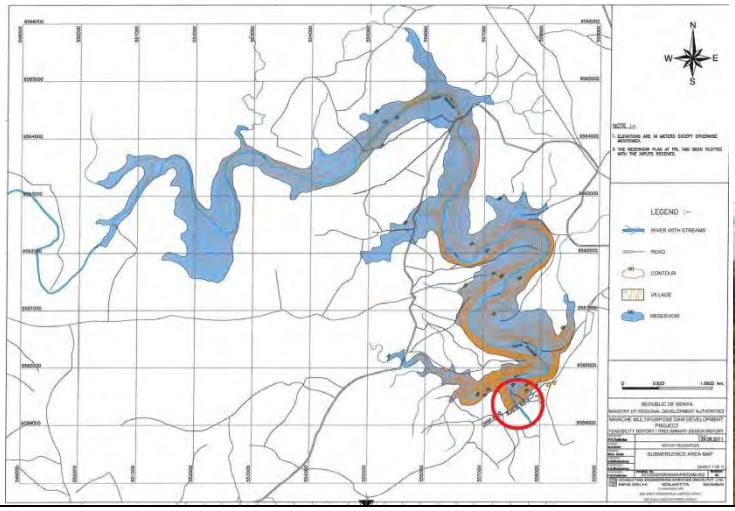
a) Project title	I1: Rehabilitation and Extension Project of Water Supply System
b) Background	・ Currently, the coverage rate of all water sources is only 30% for the water demand ・ Water demand will moreover increase by population growth with urban development ・ It is necessary to develop a covered area of water supply and to rehabilitate old pipe lines for reduction of non-revenue water (NRW) ・ The Water Supply Master Plan for Mombasa and Other Towns was planned in 2012
c) Objective	To improve water supply system in Mombasa
d) Expected benefit	・ Improvement of financial management by repairing old pipelines for reduction of NRW ・ Implementation of comfortable living with increasing coverage of water supply distribution network ・ Reservation of public health and socioeconomic activity
e) Components	Pipeline network: About 500 km, Pump station: 5 points
f) Responsible organisation	Cost Water Services Board (CWSB)
g) Cost	USD 10.6 million
h) Status	Preliminary design
i) Commitment by donors	WB (Rehabilitation, pipe for Likoni, Mainland West)
j) Possible fund source	France Development Agency (Agence Française de Développement: AFD)
k) Implementation schedule	Short Term (2016-2020)
l) Challenges for implementation	Land availability



Source: JICA Expert Team

Table 16.1.11: Development of Mwache Multipurpose Dam

a) Project title	I2: Development of Mwache Multipurpose Dam (Coastal Region Water Security and Climate Resilience Project)
b) Background	・ Currently, the coverage rate of all water sources is only 30% for the water demand ・ Water demand will moreover increase with population growth together with urban development ・ It is clear that the immediate gap between the needs and the availability is massive ・ Development of water sources is strongly required ・ The proposed project would have three components: ➢ C1- Mwache Dam and Related Infrastructure ➢ C2- Kwale County Development Support ➢ C3- Project Management
c) Objective	To develop a water source to meet water demand in Mombasa
d) Expected Benefit	・ Continuous service of 24 hours per day will be supplied ・ Water quality will comply with the World Health Organisation (WHO) guidelines for drinking water ・ Water supply volume required for urban development with industry and commerce will be secured
e) Components	Mwache Dam: Total 186,000 m^3/day (to Mombasa: 145,838 m^3/day), Related infrastructure, etc.
f) Responsible organisation	・ Ministry of Environment, Water and Natural Resources ・ Water supply (50%), general water, sanitation and flood protection sector (25%), public administration- water, sanitation and flood protection (15%), irrigation and drainage (10%)
g) Status	Design (WB), Construction (December 2017)
h) Commitment by donors	WB (Design and construction)
i) Cost	USD 200 million
j) Possible fund source	International Development Association (IDA) - World Bank
k) Implementation schedule	Short/Middle Term (2016-2025)
l) Challenges for Implementation	No major challenge



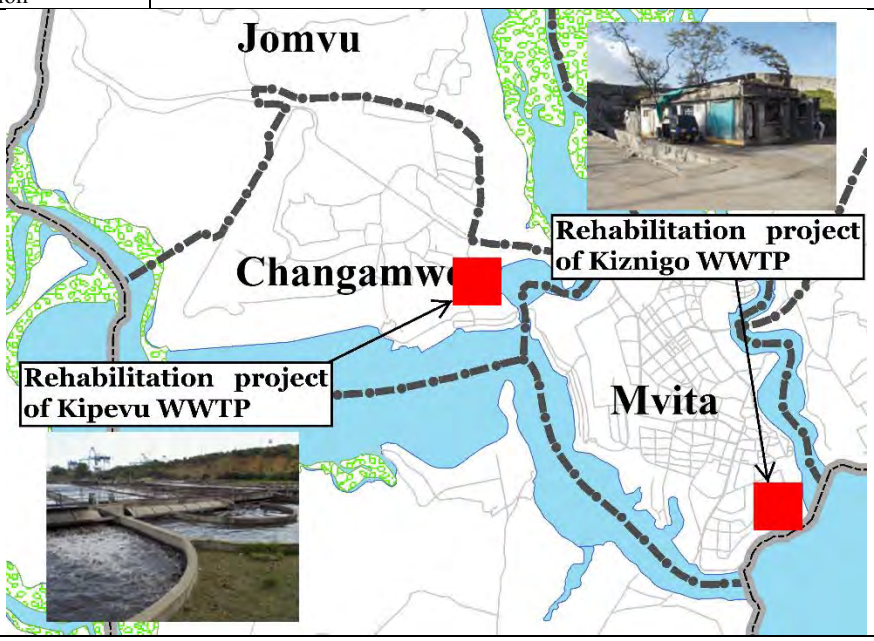
Source: JICA Expert Team

(2) Sewerage and Drainage

Priority projects for sewerage and drainage include three projects as shown in the following tables:

Table 16.1.12: Rehabilitation Project of the Existing Waste Water Treatment Plant

a) Project title	I3: Rehabilitation Project of Existing Waste Water Treatment Plant
b) Background	・ Currently, only 15% of the total population within the county is served by the sewerage system ・ The county has two wastewater treatment plants (WWTPs) located at Kizingo and Kipevu ・ Kizingo WWTP has collapsed and is currently non-functional ・ Kipevu WWTP has a design capacity of 17,100 m^3/day, but rehabilitation and upgrading the work of facilities are required
c) Objective	To improve the WWTP
d) Expected benefit	・ Comply with effluent water quality standards ・ Effect on environmental improvement by analysis of water quality at sea or river ・ To mitigate the high priority problems associated with sanitation, public health, and environment
e) Components	Kizingo WWTP:10,000 m^3/day, Kipevu WWTP:17,100 m^3/day
f) Responsible organisation	Implementing agency: Cost Water Services Board (CWSB), Mombasa Water and Sewerage Company (MOWASCO)
g) Status	Kipevu bidding for rehabilitation work No activity for Kizingo
h) Commitment by donors	Kipevu (WB)
i) Cost	USD 7.6 million
j) Possible fund source	International Development Association (IDA) - World Bank
k) Implementation schedule	Short Term (2016-2020)
l) Challenges for implementation	Financing



Source: JICA Expert Team

Table 16.1.13: Rehabilitation and Extension Project of Sewerage System

a) Project title	I4: Rehabilitation and Extension Project of Sewerage System
b) Background	・ Currently, only 15% of the total population within the county is served by the sewerage system ・ Due to the old sewer reticulation system, the sewer system is dilapidated, broken, blocked or partially blocked.
c) Objective	To improve the sewerage system in Mombasa
d) Expected benefits	・ To arrest the existing poor management of waste water is to rehabilitate the existing sewerage system as a short term measure. ・ To reduce sewer leakages
e) Components	Existing sewers in Mainland West and Mombasa Island
f) Responsible organisation	Implementing agency: Coast Water Services Board (CWSB), Mombasa Water and Sewerage Company (MOWASCO)
g) Status	Master plan by the World Bank, Design in Mikindani
h) Commitment by donors	No commitment for construction
i) Cost	USD 3.9 million
j) Possible fund source	International Development Association (IDA) - World Bank
k) Implementation schedule	Short Term (2016-2020)
l) Challenges for implementation	Financing


Source: JICA Expert Team

Table 16.1.14: Construction of Drainage along the Existing Paved Roads

a) Project title	I5: Construction of Drainage along the Existing Paved Roads
b) Background	・ Currently, storm water drainage covers only 10% of the total area and 25% of total population of Mombasa. ・ The existing drainage length is about 60 km and the drainage length currently under construction is about 30 km. ・ Almost 92% of the existing roads do not have storm water drainage. ・ On urban development in the future, storm water drainage is important to collect and dispose the runoff water due to rainfall.
c) Objective	To improve the drainage system in Mombasa.
d) Expected benefits	・ To provide drainage along the existing paved roads (without drainage) and limit the damage due to flooding within Mombasa County. ・ To remove the encroachment of drains in the market area. ・ To control the discharge of rainwater against development of large-scale land and housing in the future (e.g., Rainwater infiltration facilities, regulation of management for the controlled discharge of rainwater)
e) Components	Drainage along the existing paved roads: 684 km
f) Responsible organisation	Implementing agency: Department of Transport and Infrastructure of County Government of Mombasa (CGM)
g) Status	34 km is done by the World Bank (WB), 16 km by CGM
h) Commitment by donors	No commitment for construction of the rest of the area
i) Cost	USD 24.6 million
j) Possible fund source	Own budget or WB
k) Implementation schedule	Short / Middle Term (2016-2030)
l) Challenges for implementation	Financing, progress is slow, 4 km/year
 	

Source: JICA Expert Team

(3) Solid Waste Management

Priority projects for solid waste management include six projects as shown in the following tables.

Table 16.1.15: Provision of Waste Collection and Transportation Vehicle

a) Project title	I6: Provision of Waste Collection and Transportation Vehicle
b) Background	Some collection and transportation vehicles often break down and require to be repaired since they are old. Accordingly, due to inadequate capacity of collection and transportation, much solid waste remains uncollected in the residential areas.
c) Objective	・ Replacement of old vehicles ・ Improvement of vehicles management
d) Expected benefit	It would contribute to stable public service for waste collection and transportation and "Prompt collection and transportation from residential and commercial areas".
e) Components	・ Purchase of new collection vehicles to replace the old ones ・ Purchase of maintenance equipment facilities including washing bay ・ Training for vehicle maintenance staffs
f) Responsible organisation	County Government of Mombasa (CGM)
g) Status	Tender for equipment is planned in 2017/2018 (CGM finance) Training in 2017/2018
h) Commitment by donors	No commitment for construction
i) Cost	1) Provision of vehicles: USD 2,000,000
j) Possible fund source	Official Development Assistance (ODA), CGM, Deutsche *Gesellschaft für Internationale Zusammenarbeit* (GIZ)
k) Implementation schedule	FS: From 2017 to 2018 DD and Preparation of bid documents: from February to October 2018 Bid Process: From November 2018 to February 2019 Procurement: From March to November 2019 Operation: From December 2019
l) Challenges for implementation	Financing

Source: JICA Expert Team

Table 16.1.16: Capacity Development for Solid Waste Management

a) Project title	I7: Capacity Development for Solid Waste Management
b) Background	The current solid waste disposal is not well managed.
c) Objective	To develop 3R system to reduce the volume of waste disposed at the landfill sites.
d) Expected benefit	It would contribute to the overall development vision to be a premier gateway port city by managing the waste.
e) Components	1) Preparation of action plans for short term based on the master plan. 2) Analysis and improvement of current collection and transportation system. 3) Preparation of waste discharge manual for each kind of waste generators. 4) Planning and implementation of awareness and sensitisation programme and revitalisation of cooperation with stakeholders. 5) Training programme for government staffs and operation and maintenance (O&M) staffs
f) Responsible organisation	Implementing agency: County Government of Mombasa (CGM) Related agency: National Environment Management Authority (NEMA) Mombasa Office and the private sector
g) Status	Some works were done by CGM (policy and law)
h) Commitment by donors	No commitment for construction
i) Cost	USD 5,000,000
j) Possible fund source	Official Development Assistance (ODA)
k) Implementation schedule	From July 2017 to June 2020
l) Challenges for implementation	Secure consistency with the policy of CGM, financing, human capacity, coordination with related organisations

Source: JICA Expert Team

Table 16.1.17: Decommission of Dumping Sites and Construction of New Sanitary Landfill Sites

a) Project title	I8: Decommission of Dumping Sites and Construction of New Sanitary Landfill Sites
b) Background	The existing dumping sites have huge environmental impacts such as serious air pollution and pollution of water bodies. People are complaining to County Government of Mombasa (CGM); and the National Environmental Committee ordered CGM to close the dumping site.
c) Objective	To minimise the current environmental impacts and develop environment-friendly waste disposal system.
d) Expected benefit	It would contribute to the "development of environment-friendly waste disposal system".
e) Components	1) Construction of two new sanitary landfill sites in Kisauni and Likoni Shonda. ➢ Project areas: 100 ha and 50 ha ➢ Procurement of operation and maintenance (O&M) machinery and equipment such as weigh bridge, heavy machinery, and monitoring equipment ➢ Construction or improvement of access roads 2) Decommission of the existing dumping sites in Kisauni, Mwakirunge, and Likoni Shonda. ➢ Decommission area: 10 ha, 10 ha and 5 ha ➢ O&M equipment such as monitoring equipment
f) Responsible organisation	Implementing agency: CGM
g) Status	Proposed by MGCMP
h) Commitment by donors	No commitment
i) Cost	1) New sanitary landfill sites: USD 105,000,000 2) Decommission of dumping sites: USD 25,000,000
j) Possible fund source	・ Official Development Assistance (ODA)
k) Implementation schedule	・ FS: From July 2017 to January 2018 ・ Loan appraisal: November 2017 ・ Selection of consultant for DD and CS: March 2018 to February 2019 ・ DD and preparation of bid documents: from March 2019 to February 2020 ・ Bid process: From March 2020 to January 2021 ・ Construction, procurement and test operation: a) From February 2021 to January 2023 b) From February 2023 to January 2024 ・ Operation, maintenance and monitoring: c) From February 2023 ・ From February 2024
l) Challenges for implementation	Availability of land for landfill site, supporting infrastructure (access)

Source: JICA Expert Team

Table 16.1.18: Provision of Waste Collection and Transportation Vehicles and Construction of Transfer Stations

a) Project title	I9: Provision of Waste Collection and Transportation Vehicles and Construction of Transfer Stations
b) Background	Waste collection service of CGM does not cover the whole area of the county especially the mainland such as Likoni and Kisauni areas. Thus, more wastes are scattered on the roadsides and empty lands in the mainland. Some people burn and bury wastes by themselves. The current system is inefficient.
c) Objectives	・ To develop efficient waste collection and transportation system. ・ To expand the coverage area for waste collection service of CGM.
d) Expected benefit	It would contribute to a "prompt collection and transportation from the residential and commercial areas".
e) Components	1) Construction of a new transfer stations at VOK and in Jomvu or Changamwe. 2) Provision of collection and transportation vehicles.
f) Responsible organisation	Implementing agency: CGM
g) Status	Site for transfer stations identified but not secured
h) Commitment by donors	No commitment for construction
i) Cost	1) Construction of transfer station: USD 5 million 2) Provision of vehicle: USD 7.5 million
j) Possible fund source	Official Development Assistance (ODA)

k) Implementation schedule	FS: From January 2020 to June 2020 DD and Preparation of bid documents: from July 2020 to March 2021 Bid Process: From April to July 2021 Construction and Procurement: From August to October 2022 Operation: From November 2022
l) Challenges for implementation	Land acquisition

Source: JICA Expert Team

Table 16.1.19: Construction of Hazardous Waste Disposal Facility

a) Project title	I10: Construction of Hazardous Waste Disposal Facility
b) Background	Total capacity of the existing incinerators is not sufficient to dispose all hazardous wastes. Some hazardous wastes are disposed at the dumping sites.
c) Objective	Proper disposal of hazardous waste
d) Expected benefit	It would contribute to the overall development vision by controlling hazardous wastes.
e) Components	1) Construction of a new incinerator (Disposal capacity: 100 waste-ton/day) 2) Purchase of O&M equipment 3) Training of O&M staffs 4) Development of enforcement and supervision system of waste generators
f) Responsible organisation	Implementing agency: CGM Related agency: NEMA Mombasa Office
g) Status	Proposed by MGCMP, Team is formed
h) Commitment by donors	No commitment for construction
i) Cost	USD 40,000,000
j) Possible fund source	Official Development Assistance (ODA)
k) Implementation schedule	・ FS: From July 2017 to January 2018 ・ Loan appraisal: November 2017 ・ Selection of consultant for DD and CS: February 2018 to January 2019 ・ DD and Preparation of bid documents: from February 2019 to November 2019 ・ Bid process: From December 2019 to November 2020 ・ Construction, procurement and test operation: From December 2020 to June 2023 ・ Operation: From July 2023
l) Challenges for implementation	Land acquisition

Source: JICA Expert Team

Table 16.1.20: Capacity Development for 3R Activities

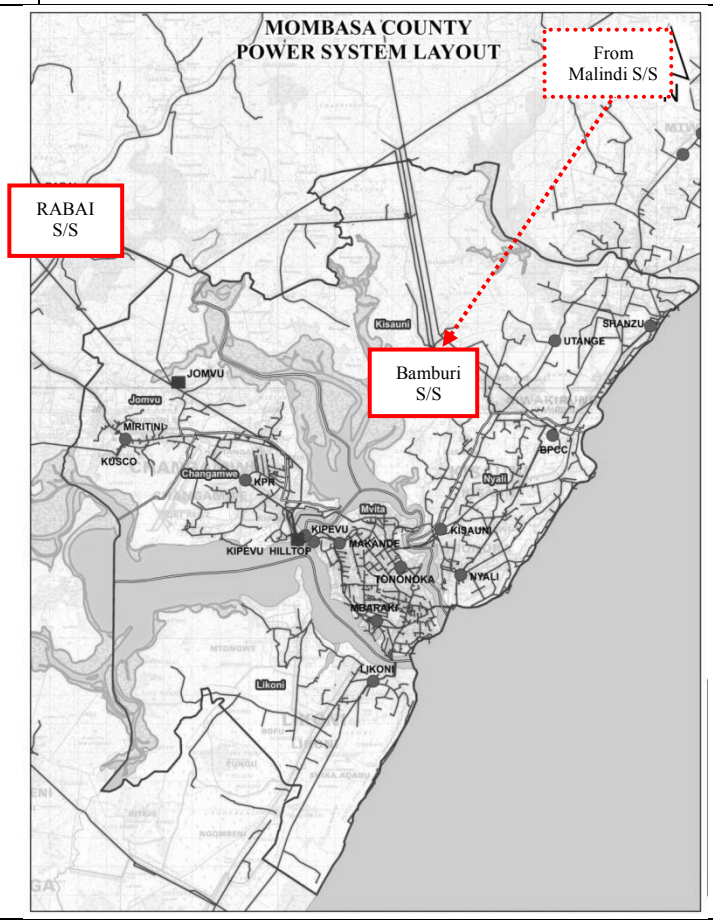
a) Project title	I11: Capacity Development for 3R Activities
b) Background	・ Collected resources such as plastics, metals, and papers informally by waste pickers and private companies. ・ The County Government of Mombasa (CGM) has not conducted 3R activities and there is no recycling facility.
c) Objective	To develop 3R system to reduce the volume of waste disposed at the landfill sites
d) Expected benefit	It would contribute to the overall development vision by reducing waste.
e) Components	1) Selection of 3R methods through discussion with the stakeholders. 2) Construction of recycling facilities such as materials recovery facility (capacity: 100 ton/day) and composting plants (100 ton/day). 3) Development of 3R systems. 4) Awareness and sensitisation programme to stakeholders. 5) Monitoring of 3R systems.
f) Responsible organisation	Implementing agency: CGM Related agency: NEMA Mombasa Office
g) Status	Planning/preparatory stage
h) Commitment by donors	No commitment for implementation
i) Cost	USD 5,000,000
j) Possible fund source	Official Development Assistance (ODA)
k) Implementation schedule	From January 2021 to December 2024
l) Challenges for implementation	Land availability, financing

Source: JICA Expert Team

(4) Power Supply

Table 16.1.21: Development of Power Supply

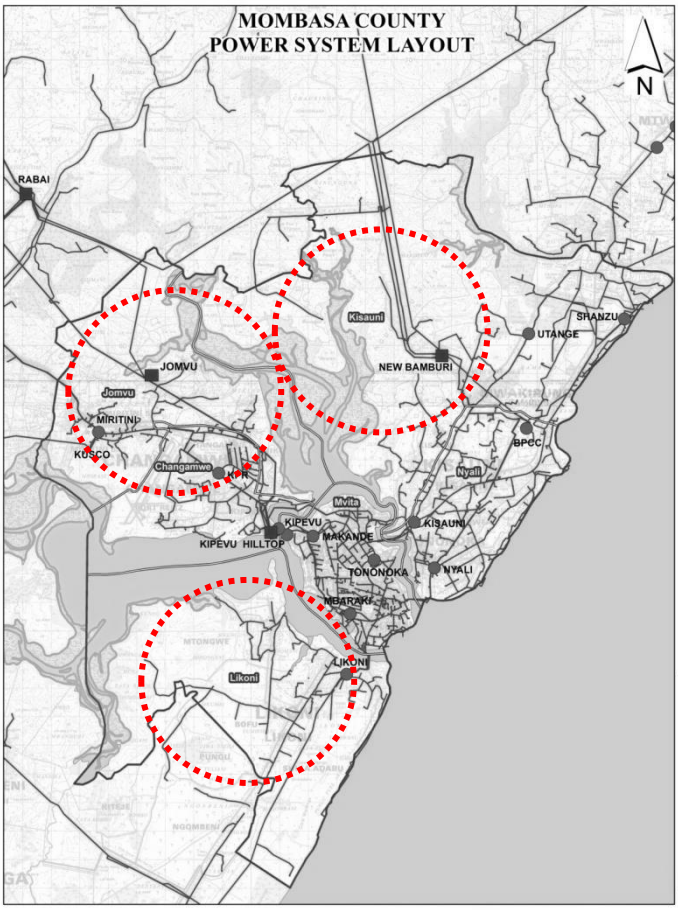
a) Project title	I12: Development of Power Supply
b) Background	The power demand forecast of Mombasa County shows that the future power demand will exceed the current capacity of current Bulk Supply Point (BSP) substations. New substations with transmission lines should be installed to meet the requirement.
c) Objective	New substations and transmission lines should be installed to meet the future demand requirement.
d) Expected benefit	・ Ensure the demand of power supply for Mombasa County. ・ This project is related with the viewpoint of "high quality of life (Social and culture)" in the development vision of Mombasa County.
e) Components	・ Rabai Power Source: Installation of 220/132 kV Rabai Substation with two (02) power transformers 200 MVA; and 132/33 kV Rabai Substation with two (02) power transformers 150 MVA. ・ Bamburi Power Source: Installation of 220/132 kV Malindi with two (02) power transformers 150 MVA; transmission line 132 kV from Malindi to Bamburi with the length of 105 km; and 132/33 kV Bamburi Substation with two (02) power transformers 75 MVA. ・ 220 kV transmission line from Mariakani Substation to Dongo Kundu Substation for power supply of Mombasa SEZ with length of 50 km.
f) Responsible organisation	Kenya Power
g) Status	Planning for connection to Mombasa SEZ is ongoing (JICA)
h) Commitment by donors	No commitment for construction
i) Cost	USD 72 million
j) Possible fund source	Official Development Assistance (ODA), partially by JICA
k) Implementation schedule	Short Term (2020)
l) Challenges for implementation	Planning, resettlement



Source: JICA Expert Team

Table 16.1.22: Extension of Power Distribution Coverage

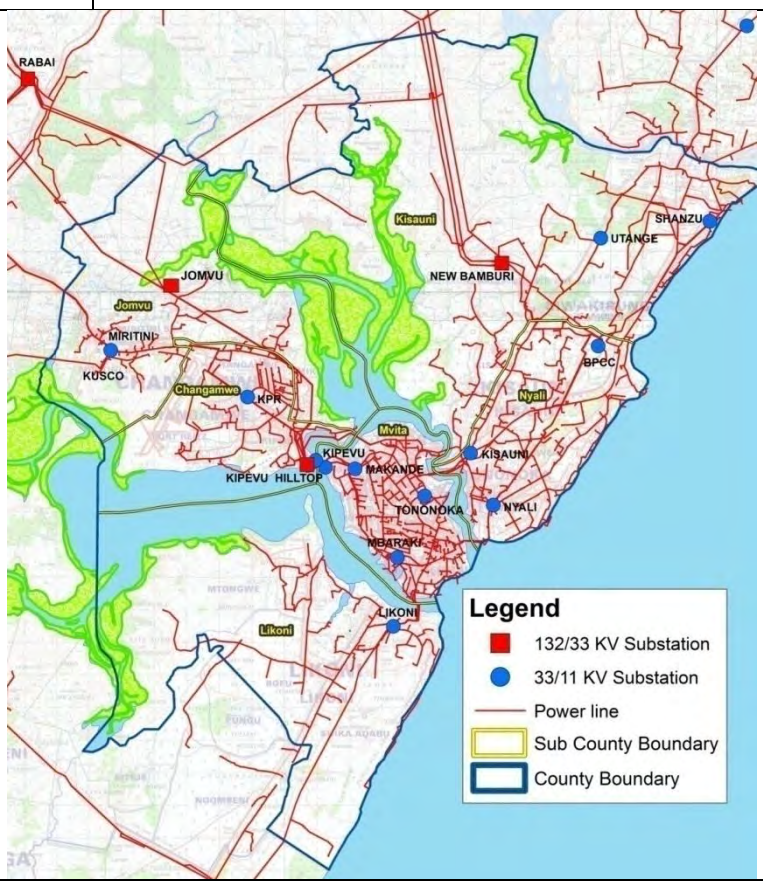
a) Project title	I13: Extension of Power Distribution Coverage
b) Background	In Mombasa County, the percentage of population access to electricity is 75%, mainly in Mvita Subcounty, Nyali Subcounty, and Jomvu Subcounty. The remaining subcounties are not yet fully covered by power grid.
c) Objective	To ensure sufficient power supply to all areas of Mombasa County due to increasing power demand in the future.
d) Expected benefits	・ This project gives the ability to develop the small and medium enterprises and individual business households far from the centre. This project aims to upgrade the power supply and supports the industry and citizen's life. ・ In this sense, the project is related with the viewpoint of "High quality of life (Social and culture)" in the development vision of Mombasa County.
e) Components	Extension of distribution power network to Likoni, Jomvu, and Kisauni by installation of new distribution substations and low voltage distribution grid at these subcounties.
f) Responsible organisation	Implementing agency: Kenya Power, Kenya Transmission Company (KETRACO)
g) Status	Proposed by MGCMP
h) Commitment by donors	No commitment for construction
i) Cost	USD 80 million
j) Possible fund source	Official Development Assistance (ODA)
k) Implementation schedule	Short Term (2020)
l) Challenges for implementation	Financing, land availability



Source: JICA Expert Team

Table 16.1.23:Upgrade the Current Distribution Network

a) Project title	I14: Upgrade the Current Distribution Network
b) Background	The distribution network as medium voltage and low voltage is old and deteriorated. The wooden poles are degraded in power distribution network. Most are rusted and unable to withstand the weight of the overhead line leading to failure and installation of more lines to develop the grid.
c) Objective	Improve the performance of distribution network in providing quality and reliable electricity services, and to reduce greenhouse gas emissions through demand side response and efficiency gains.
d) Expected benefit	・ This project will help the distribution network to efficiently meet load growth, address load supply constraints due to distribution system congestion, reduce losses, and improve reliability and quality of power supply. ・ In this sense, the project is related to the viewpoint of "high quality of life (social and culture)" in the development vision of Mombasa County.
e) Components	There are two components to the project. The first component is system reinforcement by upgrading the current power distribution network. This component will cover construction and reinforcement of medium voltage (MV) and low voltage (LV) electricity distribution networks, including installing new distribution substations. Second component will focus on automation, through introduction of supervisory control and data acquisition systems, of electricity distribution network operations and data collection.
f) Responsible organisation	Implementing agency: Kenya Power
g) Status	Proposed by MGCMP
h) Commitment by donors	No commitment for construction
i) Cost	USD 55 million
j) Possible fund source	ODA
k) Implementation schedule	Middle Term (2030)
l) Challenges for implementation	Financing



Source: JICA Expert Team

(5) Telecommunication

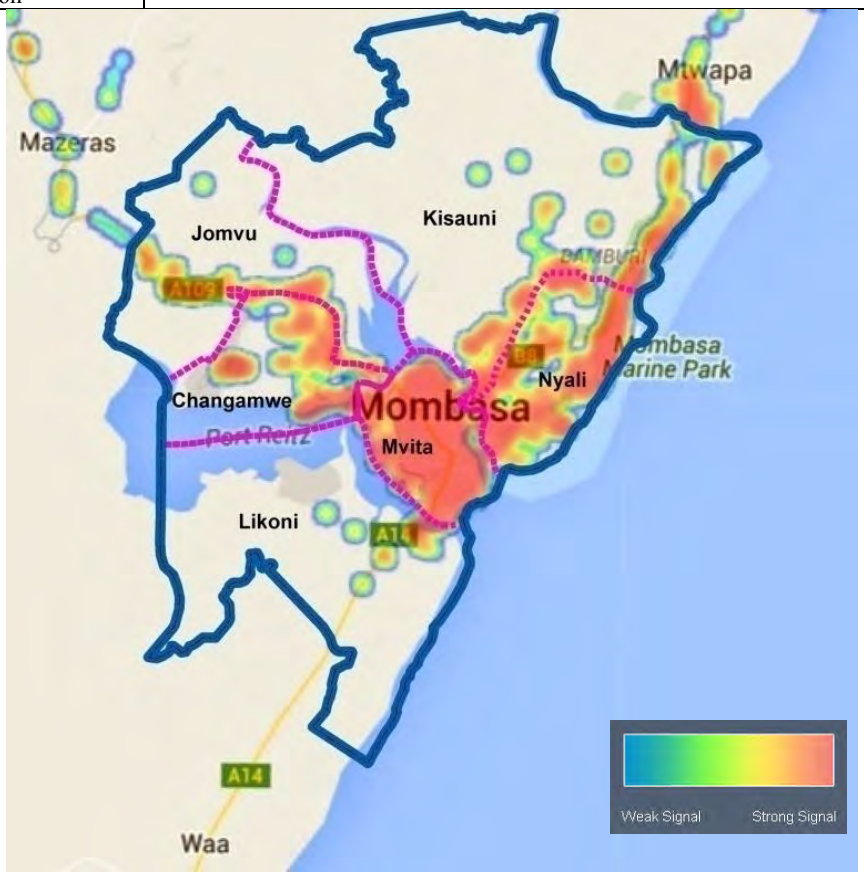
Table 16.1.24: Development of Optic Trunk Communication Network

a) Project title	I15: Development of Optic Trunk Communication Network
b) Background	Currently, the Mombasa County uses fibre network with speed of 60 Mbs for Multi-Protocol Label Switching (MPLS) on wide area network (WAN). The general public is also connected heavily on their mobile devices. However, some still have feature phones with no internet connectivity thus, cannot access the internet. Others live in areas that are not served by the national power grid thus, moderate demand is experienced in such areas e.g., Mwakirunge. The county's 600 machines on the network share the 60 Mbs due to financial constraints. However, they would seek to achieve 120 Mbs or more
c) Objective	Upgrading the fibre optic trunk network for the metro trunk communications; and local access network is essential to solve the telecommunications infrastructure issues.
d) Expected benefit	This project aims at strengthening the communication network between urban areas and other regions in the county, and it addresses the viewpoint of "vibrant economy" in the development vision of Mombasa County.
e) Components	Upgrading the existing fibre optic trunk network
f) Responsible organisation	Implementing agency: CGM Related agency: Information and Technology (ICT) Authority, Ministry of Information and Communication
g) Status	National government is implementing the policy.
h) Commitment by donors	WB
i) Cost	USD 6 million
j) Possible fund source	WB, national government, CGM
k) Implementation schedule	Short Term (2020)
l) Challenges for implementation	Coordination with private provider and national government for providing infrastructure. Wayleaves construction to put cable.

Source: JICA Expert Team

Table 16.1.25: Development of Mobile Phone Coverage in Mombasa County

a) Project title	I16: Development of Mobile Phone Coverage in Mombasa County
b) Background	The mobile network is covered mainly in the centre of Mombasa County and the rural areas have lower coverage.
c) Objective	Percentage of mobile phone coverage in Mombasa County increases up to 100%.
d) Expected benefit	This project aims at strengthening the communication network between urban areas and other regions in the county which makes the access to telecommunication services become equal. This project is related with the viewpoint of "high quality of life (Social and culture)" in the development vision of Mombasa County.
e) Components	Install new Base Transceiver Station (BTS) in Likoni, Jomvu, Kisauni, and Changamwe subcounties.
f) Responsible organisation	Implementing agency: Operators
g) Status	Proposed by MGCMP
h) Commitment by donors	No commitment for construction
i) Cost	USD 11 million
j) Possible fund source	PPP
k) Implementation schedule	Short Term (2020)
l) Challenges for implementation	Coordination with the operator and Aviation Authority (tower)



The Current Mobile Network Coverage in Mombasa County

Source: JICA Expert Team

Table 16.1.26: Development of Mombasa ICT Centre with Data Centre

a) Project title	I17: Development of Mombasa ICT Centre with Data Centre
b) Background	Mombasa's ICT infrastructure currently does not meet the demand of the county.
c) Objective	The county government should develop ICT centre with data centre to ensure security of government data, applications and develop the potential, ability of all government employees and citizen.
d) Expected benefit	The project will build an ICT centre to help develop education, job skills for government employees and citizen, moreover, the data centre ensures security of government applications or enterprise. It addresses the viewpoint of "good governance" in the development vision of Mombasa County.
e) Components	Build the Mombasa County Data Centre with services: E-Government, active directory services, mail services, file services, applications services, backup and recovery services, data securities, etc. The ICT centre can provide services such as E-Government services, education, learning centre, and community centre.
f) Responsible organisation	Implementing agency: CGM
g) Status	Proposed by MGCMP
h) Commitment by donors	No commitment for construction
i) Cost	USD 6 million
j) Possible fund source	ODA
k) Implementation schedule	Middle Term (2030)
l) Challenges for implementation	Coordination with the private sector for providing infrastructure

Source: JICA Expert Team

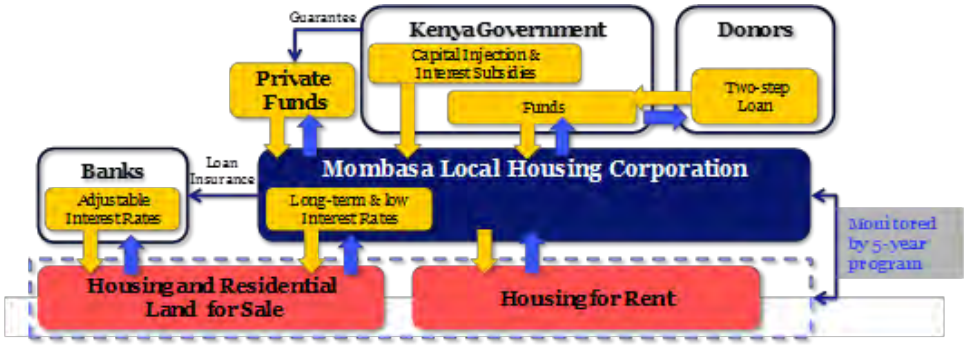
16.1.4 Priority Projects for Social and Public Facility

Priority projects for social and public facility below are compiled for housing, education, and health.

(1) Housing

Table 16.1.27: Establishment of a Mombasa County Housing Development Agency (Social Housing)

a) Project title	S1: Establishment of a Mombasa County Housing Development Agency (social housing)
b) Background	・ There is a large demand to provide housing units to accommodate the rapidly growing population in Mombasa, especially for low- and middle-income groups. ・ An active public housing supply support for them is necessary to ensure shelter for all citizens. Publicly-operated housing and financial services are most effective support for those with little income and savings. There is the challenge of procuring funds to provide such support. The County Government of Mombasa (CGM) currently provides and operates publicly-operated housing only through county budget. The source of budget must be expanded. ・ A public housing corporation dedicated to the purpose of housing supply with funds from several sources is required.
c) Objectives	・ To ensure shelter for all citizens. ・ Making appropriate system where the public corporation can procure funds from several sources including the National Housing Corporation, two-step loan, private funds and the banks.
d) Expected benefit	Increase of public housing supply support for low- and middle-income groups
e) Components	・ Making housing construction plan (every five years) ・ Construction of publicly-operated housing ・ Procurement of funds with two-step loan and the National Housing Corporation ・ Government housing loan
f) Responsible organisation	Implementing agency: Department of Lands, Planning and Housing, CGM Related agency: Private sector
g) Status	Proposed by MGCMP
h) Commitment by donors	No commitment for implementation
i) Cost	USD 1 million
j) Possible fund source	Kenya Government, donors and private funds
k) Implementation schedule	2017-2019
l) Challenges for implementation	Organisation design, development of institutional framework, secure financial resources, and development of human resources



Proposed Scheme of the Mombasa County Housing Development Agency (social housing)

Source: JICA Expert Team

Table 16.1.28: Promotion of Efficiency and Transparency in Land Administration

a) Project title	S2: Promotion of efficiency and transparency in land administration
b) Background	・ The main housing provider in the future will still be the private companies. ・ To provide a large number of the additional housing units in Mombasa County, it is important to create an enabling environment for the private sector. Lack of clarity on land tenure is one of the biggest issues in Mombasa County. The issue not only constraints the utilisation of land, but also raises transaction cost by increasing the duration of approval process. The issue will need to be addressed as a priority.
c) Objective	・ To promote efficiency and transparency in land administration
d) Expected benefits	・ Business environment with less obstacles for private developers ・ Provision of a large number of additional housing units in Mombasa County
e) Components	・ Digitisation of land tenure and records ・ Capacity development of the Administration Department ・ Operation of land information publication system
f) Responsible organisation	Implementing agency: Department of Lands, Planning and Housing, CGM
g) Status	Cleaning of record and new valuation roll for rating (draft), digital topographic map for 2015
h) Commitment by donors	No commitment for implementation
i) Cost	USD 0.5 million
j) Possible fund source	CGM
k) Implementation schedule	2018-2027
l) Challenges for implementation	Geographic information system (GIS) lab is not available, capacity to operate

Source: JICA Expert Team

Table 16.1.29: Formulation of Zoning Regulation

a) Project title	S3: Formulation of Zoning Regulation
b) Background	・ Population density of Mombasa in 2040 will be 10,800 people/km^2, which is much higher than the current density (4,800 people/km^2) and other major large cities; London (3,800), Paris (4,300), and Tokyo (5,500). High density area should be planned with public transport station and basically necessary facilities for enjoyment of life. ・ It is necessary not only the future urban plan but also implementation method (zoning regulation) to control future development.
c) Objective	・ To control the type of residential development ・ Effective, efficient, and prudent management of the county land resource
d) Expected benefit	Decrease traffic jam and allocation of necessary facilities for enjoyment of life in proximity with high quality of life
e) Components	・ Update of zoning maps ・ Formulation of regulations
f) Responsible organisation	Implementing agency: Department of Lands, Planning and Housing, CGM
g) Status	Under formulation of zoning regulation and map
h) Commitment by donors	No commitment for implementation
i) Cost	USD 150,000
j) Possible fund source	CGM
k) Implementation schedule	2016-2018
l) Challenges for implementation	Development of human resources capacity, development of institutional framework

Source: JICA Expert Team

(2) Education

Table 16.1.30: Formulation of Minimum Quality Standard for Private Schools

a) Project title	S4: Formulation of Minimum Quality Standard for Private School
b) Background	Development of private schools for primary and secondary education is necessary to cover the increased future population. However, there is no standard for facility and curriculum for private schools.
c) Objective	To improve the quality of education in the private schools.
d) Expected benefit	Improvement of access to basic education with high quality of life
e) Components	・ Collection of opinions from stakeholders ・ Formulation of quality standard for private schools ・ Strengthening license process
f) Responsible organisation	Department of Education and Children, CGM National government
g) Status	Proposed by MGCMP
h) Commitment by donors	No commitment for implementation
i) Cost	USD 90,000
j) Possible fund source	CGM
k) Implementation schedule	2016-2018
l) Challenges for implementation	Proper implementation of licensing in coordination with related agencies, coordination with national government (quality assurance section), county education board, private schools, and other stakeholders.

Source: JICA Expert Team

Table 16.1.31: Development of Specific Training Course for Key Industries in Mombasa County

a) Project title	S5: Development of Specific Training Course for Key Industries in Mombasa County
b) Background	Since both visions of education sector; Kenya Vision 2030 and Mombasa County, place great emphasis on the need to create entrepreneurial skills and competencies and the link between education and labour market, there is a need for more higher education and training courses which connect students and trainees directly with the industries the county plans
c) Objective	To establish professional training course / college to provide the needed skills of the main sectors in Mombasa County including marine engineering, logistics, and business management
d) Expected benefit	・ Provision of needed skills ・ Improvement of productivity ・ Upgrade of industries ・ Increase of job opportunity towards vibrant economy
e) Components	・ Construction, furnishing and equipping of an expansion to the existing college / university to help establish training programmes ・ Construction, furnishing and equipping of professional training college
f) Responsible organisation	Department of Education and Children, CGM
g) Status	Proposed by MGCMP
h) Commitment by donors	No commitment for implementation
i) Cost	USD 5 million (USD 1 million for five colleges in the first phase 2018-2023)
j) Possible fund source	CGM with donor support
k) Implementation schedule	2016-2020
l) Challenges for implementation	Proper implementation of licensing in coordination with related agency, coordination with the national government (quality assurance section) and county education board for programme development, and other stakeholders.

Source: JICA Expert Team

(3) Health

Table 16.1.32: Establishment of Referral Hospitals in Each Subcounty with Emergency Services

a) Project title	S6: Establishment of Referral Hospitals in Each Subcounty with Emergency Services
b) Background	Although the population in Mainland North, West, and South is increasing and is higher than the Mombasa Island, there are few hospitals in the mainland areas.
c) Objective	Improvement of access to health services for all citizens.
d) Expected benefit	Improvement of access to health services for all citizens with high quality of life.
e) Components	To upgrade and/or construct one referral hospital in each subcounty other than Mvita. To procure fully-equipped ambulances and emergency medical rooms for every referral hospitals.
f) Responsible organisation	Department of Health, CGM
g) Status	Level 4 hospital construction: Kisauni, Marimani, Mtongwe, Shrkadabu, Changamwe Ambulance is available
h) Commitment by donors	No commitment for construction
i) Cost	USD 10 million (USD 2 million for five hospitals)
j) Possible fund source	CGM
k) Implementation schedule	2018-2028
l) Challenges for implementation	Land availability, financing for equipment to improve services, and human resources on medical service. Jomvu is not covered due to land issue.

Source: JICA Expert Team

16.1.5 Priority Projects for Tourism

Priority projects for tourism consist of the following three projects:

Table 16.1.33: Project of Capacity Development for Marketing and Promotion for Mombasa County and its Surrounding Areas

a) Project title	TS1: Project of Capacity Development for Marketing and Promotion for Mombasa County and its Surrounding Areas
b) Background	Tourism in Mombasa and its surrounding coastal region had grown relying on charter flights and package tours mainly from the European market. In other words, it was marketed and promoted by the external source market, not by Kenyans. Consequently, Mombasa County and its surrounding coastal region provide them its abundant tourism resources such as wildlife and beautiful beaches, however, the benefits from tourism to local economy and communities have been quite limited. It led to the separation of local communities who should have been the hosts and tourists, as well as, between public and private sectors.
c) Objective	The Department of Tourism Development and Culture (DoTDC) of Mombasa County has a mandate to promote the destination, which is distinguished according to the devolution process. However, its capacity of developing new tourism products, promoting Mombasa County and its surrounding coastal regions as unique destination, and coordinating relevant stakeholders is limited. It is recognised that there are huge awareness gaps between tourism and local communities. Additionally, there are little consensus between public and private sectors on the direction of tourism development in Mombasa County as a tourist destination. It is essential to develop a mechanism to enhance tourism in Mombasa through promoting collective efforts of relevant stakeholders.
d) Expected benefit	Mombasa County Development Vision aims to preserve and utilise tangible and intangible heritages through promoting tourism. So far, marketing and promotion activities were conducted by external source markets and focused on promoting natural assets such as wildlife and beaches. Tourism products which utilise cultural assets would benefit the local communities; and local economy has never been promoted by external source market. By enhancing the capacity of marketing and promotion, Mombasa County will be able to develop and promote new tourism products which utilise and preserve available heritages. It will support to achieve the development vision.
e) Components	1) Marketing strategy and promotion plan are developed through public and private sector participation. 2) The capacity of diversifying tourism products is developed. 3) The capacity of promoting Mombasa County is enhanced. 4) An organisation or a mechanism that coordinates with the private sector as well as its surrounding counties in terms of marketing and promotion is established.

f) Responsible organisation	Implementing agency: The Department of Tourism Development and Culture (DoTDC) Related agency: Private sector, Kenya Tourism Board, tourism fund
g) Status	Proposed by MGCMP
h) Commitment by donors	No commitment for implementation, approached to WB
i) Cost	USD 3 million
j) Possible fund source	Technical assistance
k) Implementation schedule	From 2017 to 2020
l) Challenges for implementation	Capacity of personnel, finance Mombasa County Tourism Board (gazette) is not functioning yet.

Source: JICA Expert Team

Table 16.1.34: Project for Capacity Development on Tourism Statistics in Mombasa County

a) Project title	TS2: Project for Capacity Development on Tourism Statistics in Mombasa County (2017-2020)
b) Background	Tourism is regarded as one of the pillars to enhance economy in both the national level and county level. However, the budget for tourism development has not been prioritised, due to the lack of justification to allocate the budget. The Department of Tourism Development and Culture (DoTDC) of Mombasa County started its efforts to collect the statistical data in collaboration with the National Bureau of Statistics in Mombasa County and other related authorities, however, the DoTDC found it difficult to collect proper and precise information.
c) Objective	Statistical data which clearly show tourism contribution to enhance local economy and to generate employment opportunities enable the DoTDC to justify proper budget allocation for tourism development. The United Nations World Tourism Organisation (UNWTO) has recommended a methodology, namely; Tourism Satellite Account (TSA). It aims to develop capacity to collect necessary information, to compile and utilise them for planning, in accordance with the measurement of TSA.
d) Expected benefit	The Mombasa Development Vision aims to promote “port/logistics” and “tourism”. In order to achieve the vision, proper budget allocation is indispensable. However, it tends to prioritise to solve social issues than to enhance development. In terms of tourism, there is a lack of proper indications that will evaluate the contribution of tourism industry in the economy. Developing a mechanism to collect necessary statistical data supports to achieve proper budget allocation.
e) Components	1) A mechanism is developed to collect statistical data and to utilise those data for tourism development planning. 2) Tourism statistics manual is developed. 3) Tourism statistics data system is established.
f) Responsible organisation	Implementing agency: The Department of Tourism Development and Culture (DoTDC), Related agency: Kenya National Bureau of Statistics in Mombasa County
g) Status	Planning
h) Commitment by donors	No commitment for implementation
i) Cost	USD 2.5 million
j) Possible fund source	Technical assistance
k) Implementation schedule	From 2017 to 2020
l) Challenges for implementation	Need coordination with the industry and trade department to enhance the capacity

Source: JICA Expert Team

Table 16.1.35: Cultural Heritages Restoration

a) Project title	TS3: Cultural Heritages Restoration
b) Background	There are currently 33 gazetted cultural sites and monuments managed by the National Museum of Kenya (NMK) in Mombasa County. However, people notice several sites such as Fort Jesus, Old Town, and some other few sites. Many people have never visited and known the history behind. Although Mombasa County Development Vision declares to preserve cultural heritages both tangible and intangible, local communities do not know their values on the ground. It has led to the abundance and degradation of existing cultural heritages in Mombasa County.
c) Objective	Cultural heritage restoration offers new type of high-valued tourism products and strength the uniqueness of tourism destination, since those heritages are derived from its own history. It contributes to differentiate the destination from other competitors.
d) Expected benefit	The documentation about cultural heritages helps to educate local communities to understand their values. High-valued tourism products which utilise restored cultural heritages generate source of income by developing a mechanism to operate them by local communities. The education and utilisation raise the awareness of the value of cultural heritages and lead to conserving those heritages.
e) Components	1) Values of cultural heritages are documented to distinguish sites and monuments to be utilised or conserved. 2) The literature of cultural heritages is utilised for education of local communities and service providers. 3) The distinguished sites and monuments for utilisation are restored. 4) The management system of the restored cultural heritages by local community is developed.
f) Responsible organisation	Implementing agency; The Department of Tourism Development and Culture (DoTDC) Related agency: National Museum of Kenya (NMK)
g) Status	Implement as selected site. Tendering and design stage for Mama Ngina Drive, some are in the planning stage
h) Commitment by donors	French government shows interest in Fort Jesus. No commitment
i) Cost	USD 10-20 million
j) Possible fund source	Grant Programme
k) Implementation schedule	From 2020 to 2025
l) Challenges for implementation	Need to coordinate with NMK because most sites belong to NMK

Images

Shigar Fort, Pakistan

Tsumago, Japan

Kashan, Iran

Source: JICA Expert Team

16.1.6 Priority Projects for Urban Management

From the category of urban management, two priority projects are proposed.

Table 16.1.36: Setting Up a Geographic Information System (GIS) Laboratory

a) Project title	M1: Setting Up a GIS Laboratory
b) Background	The County Government of Mombasa (CGM) has started introducing Geographic Information System (GIS). The Planning Division has a GIS engineer and prepares the new zoning (land use plan) and relevant regulations. Basic data such as ortho-photo (aerial photo with geo-reference), base geography, existing land use, and cadastral information are needed. GIS can be applied to many fields of public administration such as; a) Levy and revenue management using GIS asset inventory, etc., b) Handling cadastre map for land title registration, subdivision with its history, c) Management of county's public facilities and housing, d) Physical planning, zoning and development control, e) Infrastructure development and maintenance, and f) Improvement of slum and informal settlements. Some of the professional officers are well aware of the necessity to introduce GIS for public management. However, very little investment has been made for GIS so far.
c) Objective	The purpose of setting up a comprehensive GIS laboratory is to improve the efficiency of public administration and enhance the cooperation and consistency amongst departments and units by using common data and information.
d) Expected benefit	Amongst the four pillars of the proposed development vision, comprehensive GIS laboratory contributes to good governance. With accurate information and data management system of GIS, the following two important tasks can be achieved: ・ Transparent urban management which promotes infrastructure development, urban facility development, and land use control. ・ Preservation and utilisation of heritage through land use management and tourism promotion.
e) Components	GIS laboratory prepares and keeps the most up-to-date data in the main server. Relevant department officers (GIS correspondents) access to the main server via intranet and process data for their public services. GIS engineers coordinate GIS usage and give consultation to departments and units. In order to put the above idea into practice, this project implements the following three components: <u>Component 1　Physical setting</u> ・ Allocation of office space for the GIS laboratory with furniture; ・ Procurement of main server with intranet system. Work stations (PCs) and GIS software in the laboratory as well as in the relevant departments; and ・ GIS software shop is expected to supply basic consulting services. <u>Component 2　Personnel Assignment</u> ・ GIS engineers (from one →three) ・ GIS correspondents of relevant departments and units (concurrent assignment of existing staff) ・ Intern students who has GIS operation skills (attached either to GIS laboratory or relevant departments) <u>Component3　GIS Training</u> ・ Training of interns to familiarise to the county's GIS and available data; ・ Training of GIS correspondents of relevant departments on how to use GIS for practical work; and ・ Trainers are in-house GIS engineers and consultant of GIS software shop.
f) Responsible organisation	・ Planning Unit, Department of Land, Planning, and Housing (for setting up) ・ GIS Laboratory of the Planning Division(for operation) ・ Relevant departments and units of the county (for practical use)
g) Status	Proposed by MGCMP
h) Commitment by donors	No commitment for implementation
i) Cost	Project cost is KES 21 million for the first three years with the following breakdown: <u>Component 1</u>　Physical Setting KES 6 million ・ KES 6 million for server, PC, power back-up, and furniture for initial investment. ・ Office rent is excluded. <u>Component 2</u>　Personnel Assignment KES 9 million ・ Wages of two additional GIS engineers KES 3 million x 3 years = KES 9 million <u>Component 3</u>　GIS Training KES 6 million

	・ 20 GIS correspondents of relevant departments x 10 days x KES 3,000 = KES 6 million ・ Intern training is conducted internally without any cost
j) Possible fund source	County's own budget Some possibility to get fund from development partner(s)
k) Implementation schedule	Project period is 36 months Component 1 Physical Setting ・ From 1st to 3rd month Component 2 Personnel Assignment ・ From 1st to 36th month Component 3 GIS Training ・ Concentrative training from 4th to 6th month for correspondents of relevant departments ・ Additional training for newly assigned correspondents and interns from 7th to 35th month Evaluation Evaluation of the achievement in 36th month
l) Challenges for implementation	Coordination with concerned agency

Source: JICA Expert Team

Table 16.1.37: Comprehensive Cooperation with the Universities

a) Project title	M2: Comprehensive Cooperation with the Universities
b) Background	Setting of Mombasa County is changing rapidly in terms of society, economy, engineering, environment, politics, etc. It needs recent theory and technology for better public services and urban management. However, the university side has not always been implementing the studies that are useful to resolve realistic urban problem. Cooperation amongst these two sectors can improve the quality of public services as well as the academic contribution to the society.
c) Objective	This comprehensive cooperation aims for mutual benefit of the county and the universities.
d) Expected Benefit	Amongst the four pillars of the proposed development vision, comprehensive cooperation with the universities contributes to good governance. Both parties can get significant benefit. For the county, it can improve public administration with recent knowledge, theory, and technology. For the university side, they can recognise real urban issues as practical study topic. Internship offers the county some supplemental work force, also it facilitates happy job placement of the students.
e) Components	Potential cooperation components are mentioned below. These items can be reduced or added with mutual consultation. ・ Professors are assigned as members of relevant administrative committees. ・ Professors make lecturers in seminars of the county. ・ County officers are invited as part-time lecturers to the universities ・ Universities set topics of under/ post graduate study on Mombasa County urban issues. ・ Mombasa County accepts students as interns (for degree credits). ・ Universities accept officers on study leave on specific urban issue. ・ County and universities jointly prepare courses on specific urban issues of Mombasa County.
f) Responsible organisation	・ Department of Public Service (for comprehensive agreement) ・ Relevant departments (for practical cooperation)
g) Status	Proposed by MGCMP
h) Commitment by donors	No commitment for implementation
i) Cost	・ All the components can be carried out as ordinal administration work. Thus, no particular cost is required
j) Possible fund source	No fund is required
k) Implementation schedule	Project period is 36 months ・ Nomination of a couple of model universities (1st to 3rd month) ・ Preparation of action plan and agreement document (4th to 6th month) ・ Implementation of action plan (7th to 35th month) Evaluation of the achievement (36th month)
l) Challenges for implementation	Securing sustainability of training, coordination with the national government (quality assurance section), and county education board for programme development.

Source: JICA Expert Team

Table 16.1.38: Organisational Strengthening for Urban Management

a) Project title	M3: Organisation Strengthening for Urban Management
b) Background	Urbana management should be managed both by public sector and other stakeholders such as the private sector and community. County Government Act and Urban Areas and Cities Act mandate the establishment of aboard for urban management. In addition, community involvement, in close collaboration with the public sector, is essential. The project aims to strengthen government organisation and community organisation for urban management.
c) Objective	Government organisation and community organisations are strengthened/established and contribute to the improvement of urban management.
d) Expected benefit	・ To control land use as planned. ・ To accelerate implementation of MGCMP. ・ To reduce the burden of public sector.
e) Components	・ Analyse the needs of urban management. ・ Identify the roles and tasks of government organisation and community organisation in urban management. ・ Prepare regulation necessary for urban management (development standard, detailed plan and zoning regulation, synchronisation with e-permit, land, TOD). ・ Select priority in tasks of community organisation (cleaning, constructing small-scale infrastructure) ・ Conduct pilot projects in selected tasks for urban management
f) Responsible organisation	Department of Lands, Planning, and Housing, CGM
g) Status	Proposed by MGCMP
h) Commitment by donors	No commitment for implementation
i) Cost	USD 5 million
j) Possible fund source	Technical assistance (TA) from partner organisations
k) Implementation schedule	Short Term (2016-2020)
l) Challenges for implementation	Institution

Source: JICA Expert Team

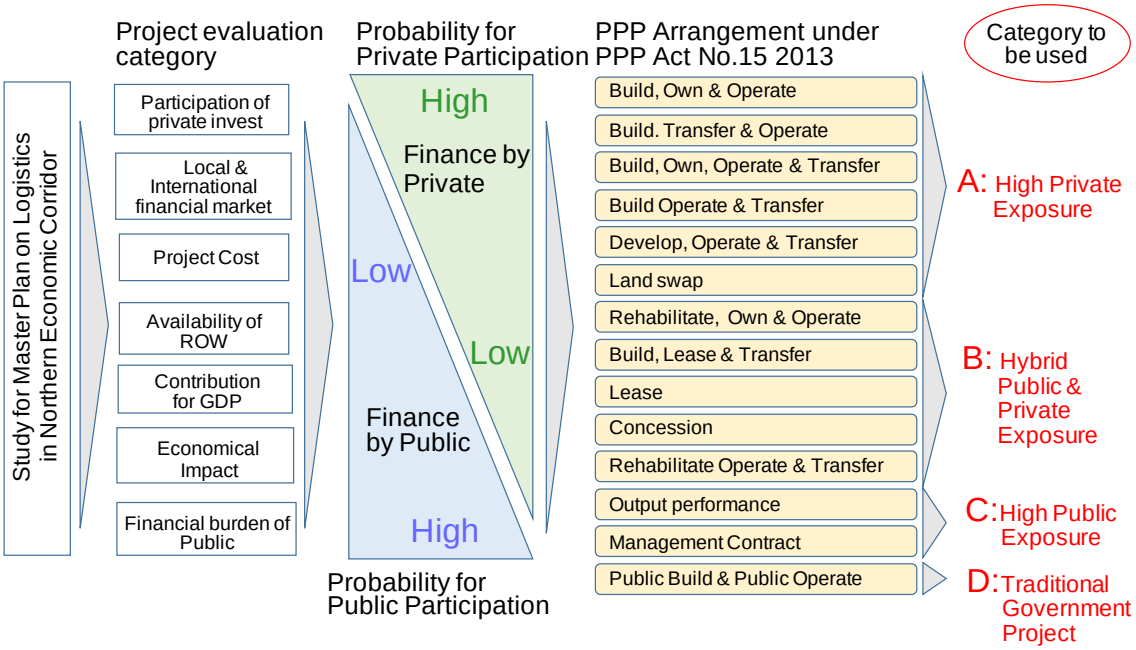
16.2 Priority Projects to be Implemented by Public Private Partnership (PPP)

16.2.1 Classification of PPP Arrangement under PPP Act No.15 2013

(1) Selection Methodology of PPP Arrangement based on PPP Act No.15 2013

Given the information of the projects proposed for Mombasa Gate City Master Plan (MGCMP), this section aims to classify the selection principle and important aspects for its implementation.

Thirteen types of PPP arrangements were specified in the "Second Schedule of PPP Act No.15 2013". In the absence of detailed feasibility study for the "Suggested Priority Projects" under the Master Plan of Mombasa Gate City, the selection of appropriate PPP arrangements has been considered as shown in Figure 16.2.1. Seven pillars are specified as evaluation categories. Each pillar will be weighed as "High, Medium, and Low" by the probability of private participation and/or probability of public participation. Since the determination of 13 types of PPP arrangements requires deep feasibility studies, similar characteristic arrangements have been bound into categories. Finally, three categories for PPP arrangement (A, B, and C) and one category for traditional government project (D) were adopted for the analysis of priority projects. In order to reflect the given information into consideration uniformly as much as possible, simplified multi-criteria matrix evaluation methodology has been adopted to address the appropriate category of implementation scheme.



Source: JICA Expert Team

Figure 16.2.1: Classification of PPP Arrangement Under PPP Act No. 2013

The PPP arrangement specified in PPP Act has been categorised into the following four areas as shown in Figure 16.2.1 above.

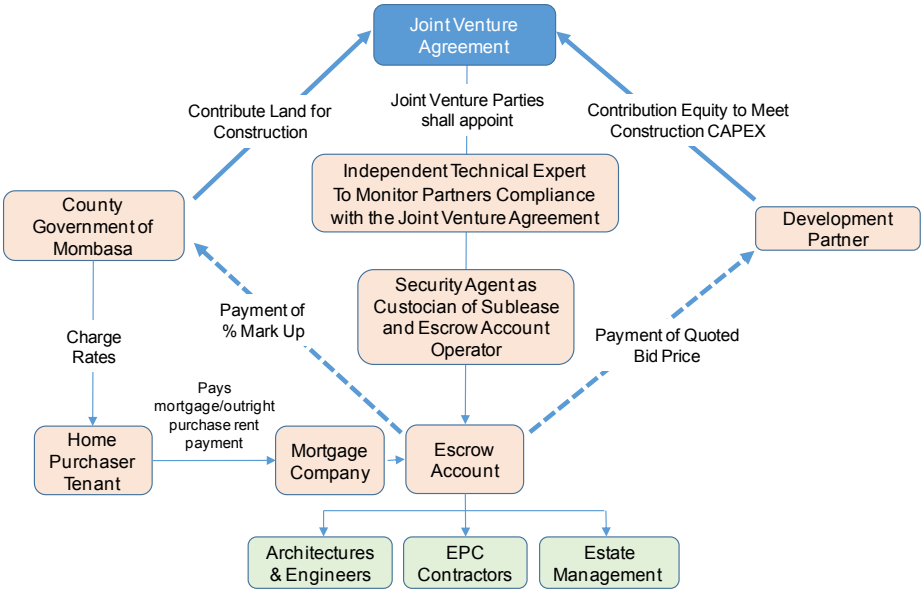
- A: High Private Exposure consists of BOO, BTO, BOOT, BOT, DOT, and LS;
- B: Hybrid Public and Private Exposure consists of ROO, BLT, Lease, Concession and ROT;
- C: High Public Exposure consists of OP, MC, and conventional public work is categorised as;
- D: Traditional Government Project

(2) Alternative PPP Arrangement for Housing Project by the County Government of Mombasa

The County Government of Mombasa (CGM) has initiated the alternative PPP arrangement other than what is specified in PPP Act No. 15 for its housing development recently. The concept is similar to Build Own Operate/Build Own Operate Transfer (BOO/BOOT) within the category A of High Private Exposure PPP Arrangement as shown (1) above. The difference is that the private developer sell (=transfer) the objectives (housing) to the buyer not to the Contracting Authority within a term.

The mechanism is that:

a) CGM contributes the land for the housing development. (See Note 1 below)
b) CGM invites the international developers tagged with domestic developer (collectively called as Developer) for bid to enter a Joint Venture (JV) Agreement.
c) Developer carries out the design and construction by its own finance.
d) Developer sells the housing unit by the price agreed in the JV Agreement within certain years.
e) Other stakeholders such as independent technical expert, security agent, escrow account, mortgage company, etc., are shown in Figure 16.2.2 below.



Source: CGM

Figure 16.2.2: Joint Venture Scheme for Housing Project

The subleases or sectional titles for the developed units shall be registered in the name of the developer and will only be transferred to the eventual house buyers upon payment of the full purchase price of the unit. CGM will collect a certain amount of annual rental fee from house buyers as long as they live in. Thus, CGM will be able to generate a certain amount of fee revenue for a long time in the future.

(Note 1: Any plot owned by a private individual in the planned development area shall be acquired by CGM or bartered with completed unit. The biggest and unknown issue is that whether land owner can agree to sell or barter the plot with completed unit or not. County Government of Mombasa (CGM) shall be utmost sensitive to this unpredictable condition precedent.)

(3) Financial Implications

Under any category in (1) above, the financing structure for PPP project may require a certain government support not only to make the project viable but also to encourage the private sector. In the Republic of Kenya, under the annuity financing model, contractors will access loans guaranteed by the state from banks, enabling them to design, construct, and maintain the roads. The treasury will repay the loans in equal instalments (annuity) over certain years, starting from the time the road section is completed.

a) Government Fund

- The government will allocate funds for road annuity programme in the budget every year to be sent to an escrow account or dedicated fund. The following are available for the enhancement measures in Kenya:
  - Availability payment system
  - Viability gap fund
  - Annuity payment
  - Transportation tax and/or levy
  - Fuel tax

b) Beneficiary Payment Scheme

- Beneficiary payment systems for the infrastructures have been varied in Mombasa County. Apart from the current policy and situations of CGM, a beneficiary payment system for the various infrastructures, transportation systems will be valuable for sustainable management and maintenance not only for the financial aspects but also for the enlightenment of the users. The income from beneficiary payments may be insufficient to cover the required repayment and dividend for special purpose company (SPC) and the government, in case at the starting time due to political pressure and economical affordability. Looking at 2040, however, careful consideration for this would be one of the efficient financial implications for the priority projects in Mombasa Gate City.

c) External Funding by the Government of Japan

- The Government of Japan has provided measures to support PPP projects in finance under the development country provided that the Japanese company shall invest into SPC. The application of such external funding will make the PPP projects more viable and feasible for private investors from Japan. Those schemes include the following:

  - Viability Gap Funding(VGF) Yen Loan
  - Equity Back Financing(EBF) Yen Loan
  - Two-step Loan
  - PPP Infrastructure; Standby Yen Loan Credit Line

(Source; http://www.jica.go.jp/activities/schemes/finance_co/about/ppp.html)
(Source;http://www.microsofttranslator.com/bv.aspx?ref=SERP&br=ro&mkt=en-WW&dl=en&lp=JA_EN&a=http%3a%2f%2fwww.jica.go.jp%2factivities%2fschemes%2ffinance_co%2fabout%2fpp.html)

16.2.2 Qualitative Evaluation and Selection of PPP Arrangement for Priority Projects

(1) Purpose of Qualitative Evaluation and Selection of PPP Arrangement

The specification of the work for the Mombasa Gate City Project has described urban development, infrastructures, environmental issues, and any restraints/issues/remarks on the proposed development. Priority areas and priority projects shall be analysed with budgetary implications to the public sector which revenue forecast would not be optimistic in 2030 and 2040 (Integrated Strategic Urban Development Plan (ISUDP-Mombasa). It will be, therefore, indispensable to evaluate the probability of participation of private sector for these priority areas and projects. Subsequently, the selection of PPP arrangement will become the indication of the financial responsibility between public and private sectors. This sector aims to contribute the CGM that suggested evaluation/ selection of PPP Arrangement will be taken into account of realisation.

(2) Background of the Proposed Methodology

Priority Project Area and Project Lists are stated at various chapters in this Mombasa Gate City Master Plan (MGCMP). The lists include the analysis of many aspects, i.e., sector and category, location, description of the project, implementation schedule, capital investment cost, and so on. However, envisaged demand focus or expected number of users is left for future detailed feasibility study once the project is lift on the table. Also appropriate fares, tariffs, and/or tolls are not available as the nature of this master plan. At this stage, the Proposed Qualitative Evaluation Methodology can be sufficient to identify the category of PPP arrangement under macroscopic considerations by the following reasons:

- The aim of the master plan is for the public to fully realise the size of the project with time, monetary aspects, and expected benefits of society;
- Qualitative Evaluation Methodology has been used at the preliminary stage of study of PPP candidate project by the private investors, although the format and style are dependent on the companies.
- If the candidate of PPP project passed the preliminary checkpoints by the management of the company, the private sector commences the feasibility study from the low level (a little cost) to gradually severe level (significant cost).
- Public sector could carry out the similar process as private sector with reference to their budgetary focus (revenue and expenditure) and grant of the central government.
- Public sector can select the priority area and priority project rationally.

(3) Scoring Methodology

Scoring methodology consists of the following steps:

1) Prerequisite consideration

- This scoring methodology is to judge the probability of private participation through financing.
- To encourage private sector to participate as much as possible to any categories.
- Reasonable substances to be collected through concerned business fields as scoring in the evaluation items.
- Probability of beneficiary payment in reference to the regulations and custom of Mombasa County and Kenya.
- Contribution to gross domestic product (GDP) and economic impact are normally medium to high.
- Financial burden to public is a result of probability of private investment and availability of financial market, namely, the public will be a preserver.
- Despite the amount of project cost, in case of high probability of private finance for investment and loan, to gain a score "0", and as the probability goes down, a score turns into negative up to "-5".
- Scoring result represents the knowledge as reasonable as possible at the time of editing without any guarantee.

2) Specifying the evaluation items

- Seven pillars as shown in Figure 16.2.1above are picked as the most important items for PPP projects concerning the stakeholders. The seven pillars are:

  a) Probability of Participation of Private Investor
  b) Availability of International and Local Financial Markets
  c) Probability of Beneficiary Payment
  d) Level of Contribution to GDP
  e) Level of Importance to Economic Impact
  f) Level of Financial Burden to Public
  g) Cost is Highly Relying on the Public

3) Specifying the methodology for evaluation

- Detailed description and general information surrounding the project, the score will be determined based on item a) above.

4) The word of qualitative evaluation to turn into figures

- The qualitative evaluation of "High", "Medium", "Low", and "None" will be initially evaluated as qualitatively then it will be turned into figures of 5 to 0, respectively. This is to make clear for the boundary of PPP category.

a) Usual qualitative evaluation case

・ Conversion figure is shown in Table 16.2.1 below.

Table 16.2.1: Conversion of Qualitative Evaluation to Scores

Item	Conversion of qualitative evaluation to score			
Description for qualitative evaluation and applicable score	Probability to occur and/or contribute for item 1 to 5		Probability to occur and/or contribute for item 6 & 7	
	Qualitative Evaluation	Score	Qualitative Evaluation	Score
	High	5	None	0
	Medium	3	Low	-1
	Low	1	Medium	-3
	None	0	High	-5

Source: JICA Expert Team

b) Points added qualitative evaluation based on the participation of Japanese firms

・ In case of utilisation of the menu of 16.2.1(3) c) External Funding by the Government of Japan, scores may be increased as the participation of Japanese Company in equity of SPC. In particular, evaluation Pillar 1. Probability of participation of private investor and Pillar 2. Availability of financial market, will obtain higher score. Consequently, Pillar 3. Probability of beneficiary payment also may hike the score due to lower capital expenditure (CAPEX) by yen loan.
・ Earned sum of scores will specify the category of PPP Arrangement as Table 16.2.2.

Table 16.2.2: Classification of Category

Item	Classification of category	Score
Category classified by score	Category A (High Private Exposure)	SUM≧16
	Category B (Hybrid Public & Private Exposure)	SUM≧ 9
	Category C (High Public Exposure)	SUM≧ 2
	Category D (Conventional Government Project)	SUM < 1

Source: JICA Expert Team

・ Qualitative evaluation by description is shown in Table 16.2.3 below.

Table 16.2.3: Example of Evaluation Methodology by Description

	Example for scoring of each project and Evaluation. Suggested PPP Arrangement for Implementation Scheme by Simplified Multi-Criteria Analysis (Project cost is considered as reference only)						
Project Name	1. Probability of Participation of Private Investor	2.Availability of International and Local Financial Market	3.Probability of Beneficiary Payment	4.Level of Contribution to GDP	5 Level of Impotance to Economic Impact	6.Level of Financial Burden to Public	7 Cost is highly rely on Public or on Private
Project 1	High	High	High	Medium	High	None	None
Project 2	High	Medium	Medium	Medium	High	Low	Low
Project 3	Medium	Medium	Medium	Medium	High	Medium	Low
Project 4	Medium	Low	Medium	Medium	High	Medium	Medium
Project 5	Low	Low	Medium	Medium	High	High	Medium
Project 6	Low	Low	Low	Medium	High	High	Medium
Project 7	None	None	Low	Medium	High	High	High
Project 8	None	None	None	Medium	High	High	High

Source: JICA Expert Team

- Table 16.2.4shows the example of evaluation methodology using the converted figure.

Table 16.2.4: Score for Qualitative Evaluation

	Example for scoring of each project and Evaluation. Suggested PPP Arrangement for Implementation Scheme by Simplified Multi-Criteria Analysis (Project cost is considered as reference only)							Evaluation Result	
Project Name	1. Probavility of .Participation of Private Investor	2.Availability of international and Local Financial Market	3.Probability of Beneficiary Payment	4.Level of Contribution to GDP	5 Level of Impotance Economic Impact	6.Level of Financial Burden to Public	7 Cost is highly rely on Public or rely on private	SUM (1-6)	Suggested Category for PPP Arrangement
Project 1	5	5	5	3	5	0	0	23	A
Project 2	5	3	3	3	5	-1	-1	17	A
Project 3	3	3	3	3	5	-3	-2	12	B
Project 4	3	1	3	3	5	-3	-3	9	B
Project 5	1	1	3	3	5	-5	-4	4	C
Project 6	1	1	1	3	5	-5	-4	2	C
Project 7	0	0	1	3	5	-5	-5	-1	D
Project 8	0	0	0	3	5	-5	-5	-2	D

Source: JICA Expert Team

- Sum of each project will be converted to categories as shown in the figure using the definition of classification table.

5) Each priority project will be scored

- All priority projects will be evaluated despite the nature of the project. Should any projects be inappropriate for this evaluation methodology, then such will be omitted from the summary sheet.

(4) Summary of Priority Projects Score and Subsequent PPP Arrangement on Each Sector under (A) "Usual Qualitative Evaluation Case"

The summary of the result of the evaluation and selection of all priority projects is shown in Table 16.2.5.

Table 16.2.5: Implementation Plan of Priority Projects (Unit KES in millions)

Reference Number	Business Sector	No.	PPP Category				Total
		Amount	A	B	C	D	
1	Road	No.	0	0	0	2	2
		Amount	0.0	0.0	0.0	600.0	600.0
2	Port	No.	0	0	0	0	0
		Amount	0.0	0.0	0.0	0.0	0.0
3	Tourism	No.	0	0	0	3	3
		Amount	0.0	0.0	0.0	550.0	550.0
4	Telecommu nication	No.	0	0	0	0	0
		Amount	0.0	0.0	0.0	0.0	0.0
5	Railway	No.	0	1	0	1	2
		Amount	0.0	70,000.0		300.0	70,300.0
6	Housing	No.	0	0	0	1	1
		Amount	0.0	0.0	0.0	15.0	15.0
7	Education	No.	0	0	1	1	2
		Amount	0.0	0.0	500.0	9.0	509.0
8	Health	No.	0	0	1	0	1
		Amount	0.0	0.0	10,000.0	0.0	10,000.0
9	Water	No.	0	0	0	4	4
		Amount	0.0	0.0	0.0	24,670.0	24,670.0
10	Power	No.	0	0	0	0	0
		Amount	0.0	0.0	0.0	0.0	0.0
11	Urban Managemen	No.	0	0	0	3	3
		Amount	0.0	0.0	0.0	21.0	21.0
12	Solid Waste	No.	0	0	0	6	6
		Amount	0.0	0.0	0.0	14,950.0	14,950.0
13	Total	No.	0	1	2	21	24
		Amount	0.0	70,000.0	10,500.0	41,115.0	121,615.0
A- High Private Exposure consists of BOO, BTO, BOOT, BOT, DOT and LS							
B- Hybrid Public & Private Exposure consists of ROO, BLT, Lease, Concession and ROT,							
C- High Public Exposure consists of OP, MC							
and conventional public work is categorized as;							
D- Traditional Government Project							

Source: JICA Expert Team

In general, Private Initiative PPP arrangement for these projects appears hard whilst conventional public work has been recognised more likely. This represents some difficulties for the participation of private sector into the infrastructure business. Obvious remarks from Table 16.2.5 are summarised as follows:

- Category A represents 0% of the total project cost whilst the rest (100%) shall be burden of the public sector.
- Category B represents 58% of the total cost. However, a mass transit system under the category will be implemented by means of public finance and operation and maintenance (O&M) including rolling stocks will be supplied by the private sector.
- The costs of other priority projects will be borne by the public sector.
- Thus, CGM shall be required to raise a massive amount of investment finance.
- Additional revenue stream will be necessary as suggested in ISUDP-Mombasa. (Source: 2) Alternative Scenario (Specific Interventions) of 10.3.4 County's Local Revenue Projections)

In order to activate the PPP scheme for the necessary infrastructure, the following measures are recommended for further considerations:

a) To seek possible methodologies for the encouragement of private sector.
b) To strengthen and widen the financial resources of the public sector.
c) PPP arrangement shall be flexible in design for cooperation amongst the public, private, and financier.
d) Public relations for the contracting authorities, private sectors, financial institutions, and people/society shall be deeply developed for better understanding of PPP scheme.

16.2.3 Classification of Priority Projects by Term

The summary of result of evaluation will be further analysed by timeframe of short (now to 2020), middle (2021 to 2030), and long (2031 to 2040).

Table 16.2.6: Implementation Term of Priority Projects (Unit KES in millions)

Business Sector	No. / Amount	Short	Medium	Long	Total
Road	No.	2	0	0	2
	Amount	600	0	0	600
Port	No.	0	0	0	0
	Amount	0	0	0	0
Tourism	No.	2	1	0	3
	Amount	550	0	0	550
Telecommunication	No.	0	0	0	0
	Amount	0	0	0	0
Railway	No.	1	1	0	2
	Amount	300	70,000	0	70,300
Housing	No.	1	0	0	1
	Amount	15	0	0	15
Education	No.	2	0	0	2
	Amount	509	0	0	509
Health	No.	0	1	0	1
	Amount	0	10,000	0	10,000
Water	No.	3	2	0	5
	Amount	2,210	22,460	0	24,670
Power	NO.	0	0	0	0
	Amount	0	0	0	0
Urban Managemnt	No.	3	0	0	3
	Amount	21	0	0	21
Solid Waste	No.	2	3	0	5
	Amount	700	14,250	0	14,950
Total	No.	16	8	0	24
	Amount	4,905	116,710	0	121,615

Source: JICA Expert Team

16.2.4 Recommendable Key Aspects for the Contracting Authority and PPP Node

(1) Tendency of Responsibility between Contracting Authority and Private Investor for PPP Project

The CGM has to realise the priority area and priority projects suggested in Mombasa Gate City Master Plan (MGCMP). Furthermore, they shall be consecutively implemented as short, middle, and long terms with institutional activities.

The Integrated Strategic Urban Development Programme (ISUDP)-Mombasa has recommended to utilise the vigor, power, and financial ability of the private sector.

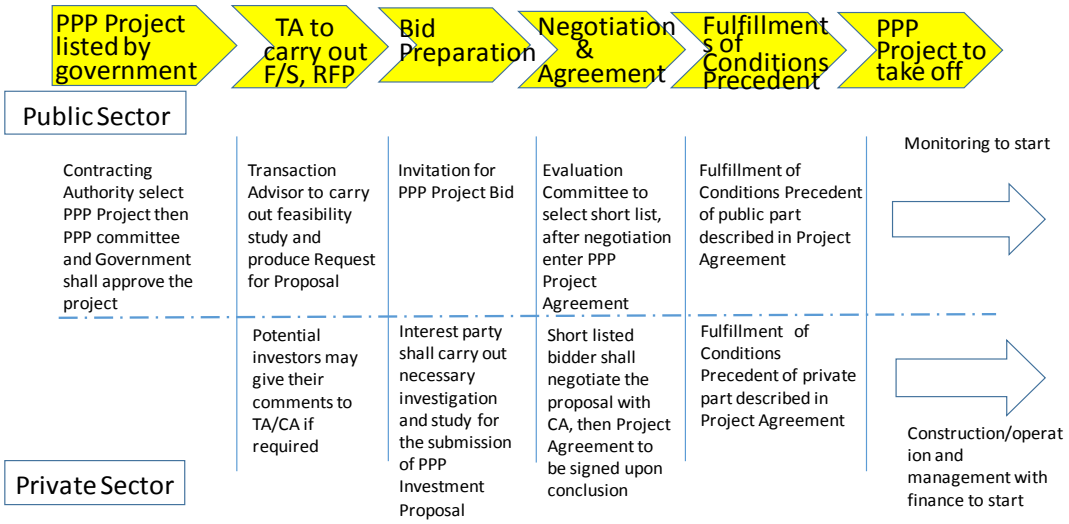
- Private sector participation in the implementation of proposed projects.
- Prioritising and phasing of investment.
- Increasing user charges for water and other urban services.
- Imposing new taxes.
- Partnership with private developers---where the county is not able to provide adequate services to the people of Mombasa County then initiatives such as PPP may be considered. And these may be in provision of utilities such as water, roads, slaughter houses, hotels, solid waste management, etc.

The symbiosis between the CGM and private sector is indispensable to realise the priority projects in the future according to ISUDP-Mombasa. In order to stir up the eagerness of the private sector, the range of responsibility of private sector shall be defined as clearly as possible. Essential points for the definition are the conditions for relationship between two sectors which shall be flexible based on the characteristics, necessity of the projects, and merit of CGM, eliminating the bureaucratic judgment.

(2) Recommendable Preparatory Considerations for the PPP Project Agreement

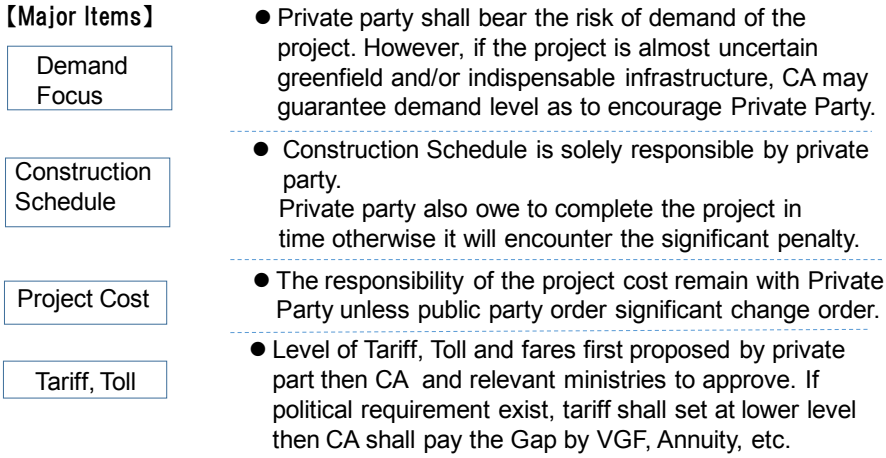
The process of PPP project procurement is shown in Figure 16.2.3. Contracting Authority shall provide the set of bid documents which will be followed by the investors/bidders.

In the documentation required in the process, PPP project agreement shall be the constitutional document for the PPP project. Third Schedule of PPP Act No. 15 2013 specified items to be described in the rights and obligations of the public and the private parties in the project agreement. These items, however, have been written for the indication of incidents only, therefore, the Third Schedule does not provide the extent of responsibility for the public and private parties neither quantitatively nor qualitatively.



Source: JICA Expert Team

Figure 16.2.3: Guidance for Successful PPP Project Agreement



Source: JICA Expert Team

Figure 16.2.4: Recommended Key Factors for the Contracting Authority and PPP Node

Amongst the many PPP projects around the world which have been under planning, negotiation, and/or implementation stages, it is said that a number of projects are in abeyance for financial closure or dispute amongst the parties during the execution stages. Reasons of such incidents are due to the misunderstanding and discrepancy of interpretation of the PPP agreement by the parties. Therefore, the PPP project agreement shall be designed to be able the parties to perform accordingly so that highly indispensable PPP project can take off successfully.

(3) Recommendations for the Performable PPP Project Agreement

In this section, the major agenda for the smooth dispatch of PPP project will be presented in consideration of mutual understanding amongst parties. It is recommended that the PPP agreement shall be contracted as clearly as possible to avoid any disputes which arise from ambiguous interpretation of the clauses at the time of procurement and/or negotiation stage. Under the PPP Act, the Contracting Authority shall procure the Transaction Advisor (TA) to produce the feasibility study and request for proposal which includes technical requirement, financial configuration, and a draft project agreement. The request for proposal may include the conditions that non-conforming bids shall be rejected in order to maintain the impartiality and policy of the Contracting Authority for accountability.

The recommendation of the section focuses on the items of "Conditions Precedent", which shall be the most significant conditions to start the rights and obligations of the parties.

Conditions Precedent shall be the conditions which shall be performed by the public and private parties within the agreed time limit stipulated in the project agreement. The project agreement usually shall become null and void in case of failure of achievement by either party. The conventional issues are mutual compromise for further extension of limit for the fulfilment to Conditions Precedent as the failure of the original fulfilment limit. By this compromise, the parties may be condemned for its non-accountability unless a clear reason exists.

Table 16.2.7: Guidance to Success Three Major Items for Conditions Precedent

No	Items of Conditions Precedent	3rd Schedule of PPP Act 2013	Obligation of Public Part	Obligation of Private Part
1	Delivery of right-of-way, land and utilities	Items 3 and 4	All of the land shall be delivered to SPC utilities and shall made available	
2	Juristic entity to carry out PPP project has been registered under Kenyan laws	N.A.		Special purpose company (SPC) shall be registered
3	Shareholder Agreement shall be entered into effect. A copy of Shareholder Agreement has been available to CA	N.A.		Shareholders of SPC shall sign the Shareholder Agreement
4	Specified amount of equity of SPC to be paid up in the bank account	N.A.		Shareholder of SPC shall pay in the amount they committed
5	Loan agreement has been signed and a copy of LA is available	Item 8		All debt amount shall be included in the loan agreement
6	Project security (i.e., bank guarantee, etc.) has been submitted to CA	Item 20		Bond and any guarantee shall be submitted to CA
7	Conditions of contract with EPC has been completed	N.A.		The copy of contract document to be submitted
9	Permit, licenses, approval, etc., to carry out PPP projects by private party are available	Item 6	CA shall coordinate with relevant authorities to furnish permit, licenses, and approval to SPC	
10	Any incentives to private have been granted	N.A.	CA shall coordinate and obtain the incentives to SPC	
11	Financial support of the government shall be given to the private entity	N.A.	CA shall coordinate to obtain the government support to SPC	
12	Procurement of insurance has been completed	Item 13		Insurance to cover the construction, O&M

Source: JICA Expert Team

16.2.5 Suggested Remarkable Aspects for the County Government of Mombasa on PPP Project

(1) General and Political Domain

CGM has applied four PPP projects to PPP Unit in 2015. Progress of such projects is as follows:

- No. 41. Mombasa Solid Waste Management: This is already on course and is on the tendering stage to invite the private sectors for bidding for building a waste recycling plant. Priority project lists of master plan (M/P) include this project.
- No. 53. Mombasa International Convention Centre (MICC): The location for construction is already available. It will be built within the Mombasa Agricultural show grounds.
- Both No. 13 the Integrated Marine Transport System and No. 62 the Multilevel Car Park Facility have not commenced yet. To ease traffic congestion, the Integrated Marine Transport System (IMTS) and Car Park shall be prepared for further process with PPP Unit.

(2) Technical Domain

According to the discussion with the PPP Unit, there exist a number of reasons for the slow progress of realisation of PPP projects in the PPP programme. Amongst them, the competence of the Contracting

Authority, which shall be the responsible institution of CGM for the implementation of PPP projects, shall be strengthened through active capacity building.

(3) Legal Domain

As described in Item 16.2.1 (2), CGM shall coordinate with the national government for the JV structure methodology for a housing project. Although CGM has the authority to compulsory condemn the private plot, further land readjustment law/regulation may be useful for cooperation in the progress of land reformation with private owner.

(4) Financial Domain

The summary of PPP arrangement for the priority projects of the master plan are shown in

Table 16.2.8.

Table 16.2.8: Revenue Stream of CGM 2015-2035

Business as usual. Financial Performance Projection (in KES in millions)					
Revenue Sources	2015	2020	2025	2030	2035
Transfer from the National Treasury (4.1% per annum)	4,500	4,847	5,222	5,626	6,060
Own Revenue (4.2% per annum)	2,248	2,592	3,005	3,476	4,072
Loan and Donor Aid	_	_	_	_	_
Total Revenue (4.15% per annum)	6,748	7,439	8,227	9,102	10,132
Expenditure (2.0% per annum)	6,749	7,451	8,430	9,308	10,277
Surplus/Deficit	-1	-12	-203	-206	-145

CGM needs finance for short, medium and long term according to priority project					
Required CAPEX by M/P		Short		Medium	Long
Amount	0	-4,905	0	-116,710	0
Surplus/Deficit (CGM + Priority Project)	-1	-4,917	-203	-116,916	-145
Accumulate	-1	-4,918	-5,121	-122,037	-132,077

Note: Figures of priority projects do not include power and telecommunication as of September 26, 2016
Source: ISUDP-Mombasa and JICA Expert Team

Table 16.2.8 shows the combined result with revenue stream of CGM and required cost for short-, middle-, and long-term priority projects for the master plan. It is apparent that the huge amount of financial gap could be focused. (Note: Any additional revenue streams are not included.)

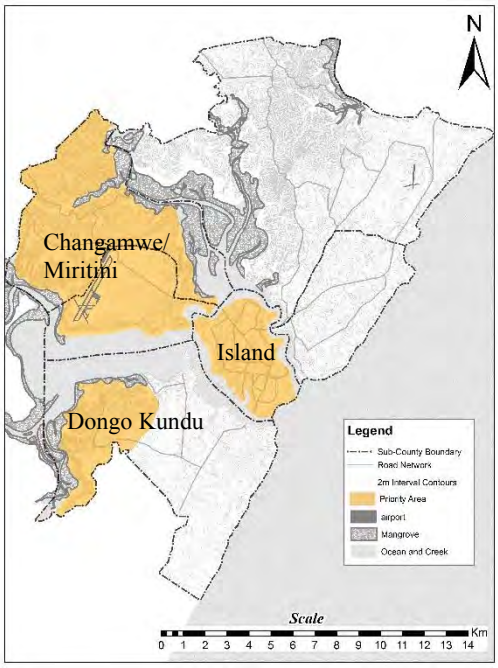
For the suggested remarkable aspect, the CGM shall prepare the vehicles to fill up these financial gaps. ISUDP-Mombasa also presented “Alternative Scenario (Specific Interventions)” as reference of legal framework for additional revenue streams by County Finance Bill 2014. ISUDP-Mombasa suggested the specific interventions for review to adjust such as land rate, user fees and charges, heavy commercial vehicle in Mombasa County, liquor licensing, and parking. The PPP arrangement for housing in Mombasa County as stated in Section 16.2.1 (2) is to gain additional revenue as specific interventions. In addition to the above, external funding may be an alternative funding mechanism.

16.3 Priority Areas

16.3.1 Selection of Priority Areas

The structure plan and land use plan show the development direction of the entire Mombasa County. Priority areas are selected to show the detailed plan covering land use concept and urban development projects, including some priority projects proposed for each sector, in achieving the development vision and the Southwestern Corridor for the structure plan. Selection criteria are set as follows:

- The area has an important role in achieving development vision and strategically important for forming the structure plan.
- The areas where problems are considered severe, and raised in sector analysis.
- The area that is strategically important to strengthen the "Southwestern Corridor" in the structure plan.
- The area where improvement is expected to contribute to urban conditions as well as Northern Economic Corridor conditions.



Source: JICA Expert Team

Figure 16.3.1: Priority Areas

The Mombasa Island and Changamwe/Miritini, which are considered as significant areas, are selected as priority areas through the working group discussion, and land use plan in details and urban development projects are proposed in the areas.

The Mombasa Island is considered as symbol of Mombasa County, where functions of the area have to be reorganised to address congestion. Changamwe/Miritini is strategic to improve logistic transport.

In addition, Dongo Kundu is identified as a priority area for SEZ development, which is considered as strategic development for industry development as well as improving logistics conditions.

Development standard for urban development is proposed to be applied for areas currently undeveloped and needs to promote urbanisation to develop subcentres.

16.3.2 Detailed Plan and Urban Development Project Formulation Method

Detailed land plan and urban development projects in the priority areas are prepared based on the following steps:

- **Identification of urban factors**: Urban factors are composed of promotion factor, preservation factor, and public facility. Promotion factor is an activity that promotes development including commercial and business, and transport development. Preservation factor is to identify the area and functions that should be preserved, which link to control the area. Some projects and priority projects proposed are also integrated in the priority areas.
- **Formulation of development concept**: Based on the urban factors, development concept is proposed.
- **Formulate urban management strategy**: Urban management strategy shows how the promotion factor and preservation factor should be managed.

- **Formulation of land use concept**: Based on the urban factors and urban management strategy, land use concepts are proposed including land use classification and its management measures including activities allowed and activities not allowed.
- **Formulation of urban development projects**: Urban development projects are proposed to realise the concept and urban management strategy.

16.3.3 Detailed Plan and Urban Development Project in the Island

(1) Urban Factors

Urban factor is identified for transport and spatial development, and the results of identification are summarised below.

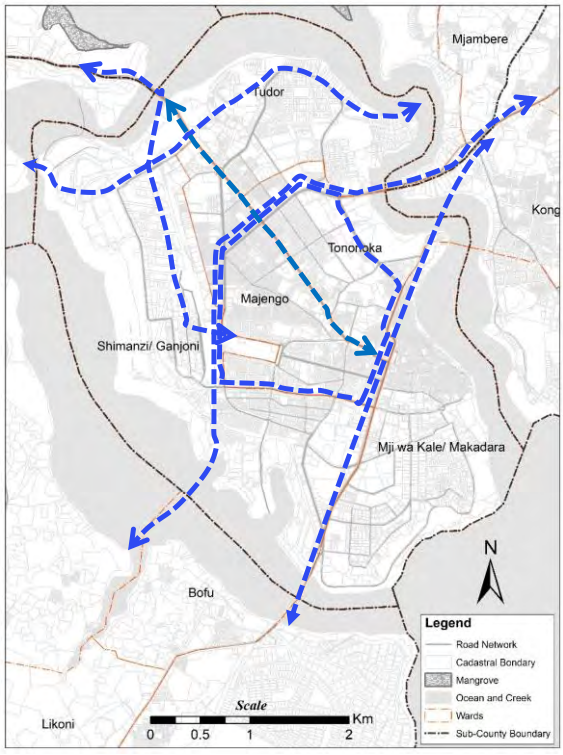
Factors for transport are identified as follows:

- Strengthening of road linkage: Designation of arterial road, connection of missing link, strengthening of network within the island and mainland.
- Development of public transport: Development of circular network, strengthening of the network with the mainland.

Factors for spatial development are identified as follows:

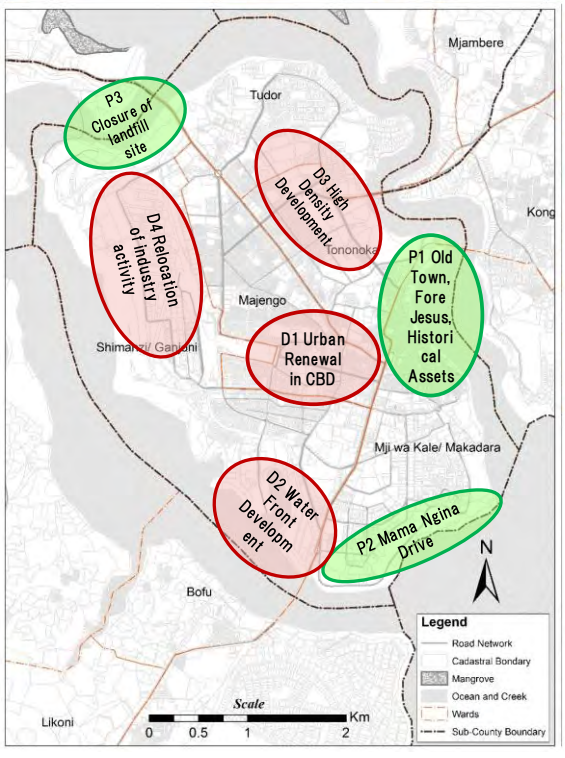
- Development factor: Urban renewal in CBD, waterfront development in Mbaraki, high density residential development, and relocation of industry activity.
- Preservation factor: Old Town, Fort Jesus, historical and cultural assets, Mama Ngina Drive, closure of Kibarani land fill site and use for public parks.

Urban factors are shown in Figure 16.3.2 and Figure 16.3.3 below.



Source: JICA Expert Team

Figure 16.3.2: Urban Factor (Transportation)



Source: JICA Expert Team

Figure 16.3.3: Urban Factor (Spatial Development)

(2) Development Concept

Development concept is set as follows:

- Development Vision: Revitalise urban functions and create attractive urban environment of Mombasa Island.
- Objectives:
  - To promote commercial and business activities as a centre of Mombasa County;
  - To improve the quality of urban living environment; and
  - To preserve and utilise historical and cultural heritages for tourism and for residents.

(3) Urban Management Strategy

Urban management strategy is proposed to show how promotion strategy, preservation strategy, and public facility strategy are managed. Urban management strategy is compiled in Table 16.3.1 below.

Table 16.3.1: Urban Management Strategy

Items		Urban Management Strategies
Promotion Strategies	Development Corridor	・ Provide high-capacity to promote commercial and business and apartment development based on Transit Oriented Development (TOD) concept (LRT, BRT). ・ Enforce building height to create cityscape with continuous skyline along major transport corridor.
	Commercial and Business Cores	・ Provide adequate capacity to promote commercial and business development. ・ Create a buffer zone between the core and its surrounding residential areas and administration area from the viewpoint of traffic impact. ・ Enforce building height to create cityscape with continuous skyline. ・ Enforce parking regulation.
Preservation Strategies	Cultural and Heritage Sites	・ Enforce low-rise building in the surroundings to preserve historic cityscape along the eastern end of Mombasa Island including Old Town and Mama Ngina Drive.
	Natural Condition	・ Preserve coastal area and mangrove area.
	Residential Area	・ Create low-rise commercial and residential areas for tourism activities. ・ Create the buffer zone between the surrounding commercial area from the viewpoint of traffic impact and calming.
Public Facility Strategies		・ Secure the space for public facility development such as park, school, and public service. ・ Strengthen the transport network. ・ Relocate or re-organise logistics functions including Container Freight Station (CFS) and Inland Container Depot (ICD).

Source: JICA Expert Team

(4) Land Use Concept

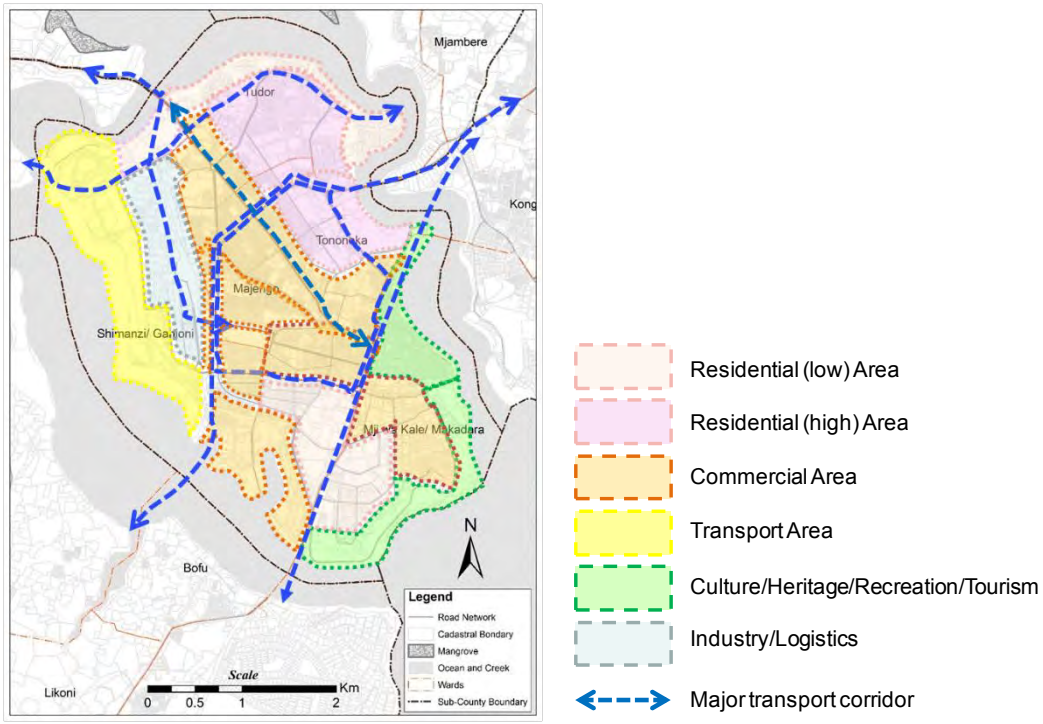
Land use classification and land use plan are proposed to show development guidance as shown in Table 16.3.2.

Table 16.3.2: Proposed Land Use Classification in the Island

	Land Use Classification	Concept	Allowed	Not Allowed
1	Residential (Low)	To provide high quality residential environment.	・ Low-rise buildings ・ Parks ・ Administration (public service)	・ Large-scale commercial activity ・ High-rise building ・ Division of plot ・ Industry, warehouse ・ Restaurant, bar, nightclub ・ CFS/ICD
2	Residential (High)	To provide residential area with high density.	・ Low- to high-rise buildings ・ Large-scale commercial activity	・ Industry, warehouse ・ Bar, night club ・ CFS/ICD
3	Commercial	Considered as mixed use to create business environment like CBD.	・ Commercial activity ・ Administration ・ High rise buildings	・ Industry, warehouse ・ CFS/ICD
4	Culture/Heritage/Recreation/Tourism	To preserve and utilise cultural and historical heritages. Cityscape is controlled through façade protection and prohibits building demolition.	・ Low-rise houses ・ Parks ・ Restaurant, bar, hotels ・ Public facilities	・ Large-scale commercial activity ・ High-rise building ・ Division of plot ・ CFS/ICD
5	Transport	Designated for logistics and transport activities.	・ Terminals ・ CFS/ICD	・ Industry ・ Activity involves chemical and flammable items
6	Industry / Logistics	To provide space for industry and logistics activities.	・ Manufacturing ・ Warehouse ・ CFS/ICD	-

Source: JICA Expert Team

Each land use is allocated in the Mombasa Island as shown in Figure 16.3.4 below.



Source: JICA Expert Team

Figure 16.3.4: Detailed Plan for Mombasa Island

(5) Urban Development Projects

Urban development in Mombasa Island is proposed to achieve and to manage development concept in the island. Urban development projects are proposed from the point of view of revitalising urban functions, preserving and utilising historical and cultural heritages for tourism and recreational purpose, and to add value to transport-related facilities. Some of the projects proposed in each sector are also recognised. Major projects are proposed as shown in Table 16.3.3.

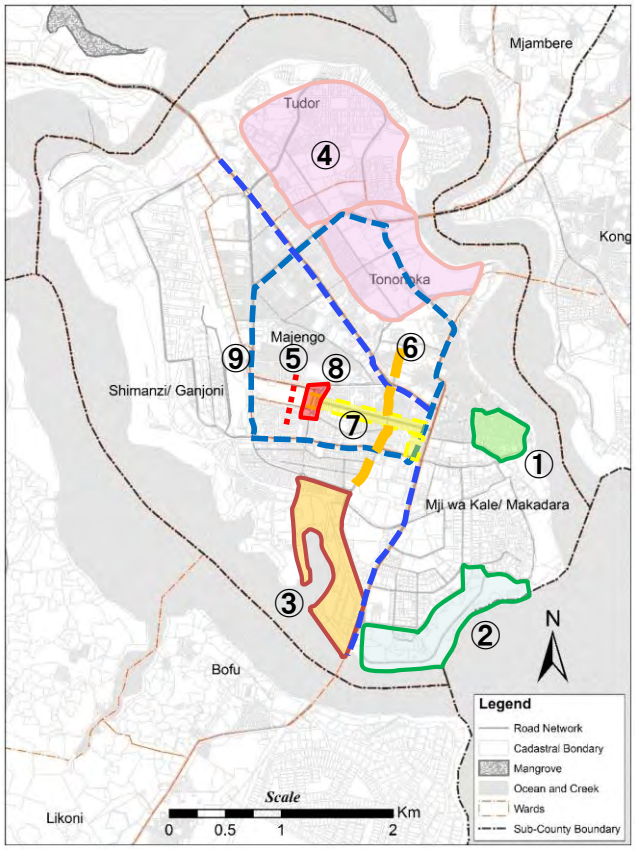
Table 16.3.3: Urban Development Projects in Mombasa Island

	Project	Description
1	Old Town Renovation (16.7 ha)	Objective: To improve the environment of old town and utilise heritage for tourism development, which expects to support "Cultural Heritage Restoration" proposed in tourism sector. Components: ・ Renovation of historic buildings ・ Pedestrian way improvement ・ Tourist signboard development ・ Cityscape code development
2	Mama Ngina Drive Improvement (53.7 ha)	Objective: To provide open space for Mombasa people and to strengthen the attractiveness of the heritage site. Components: ・ Improve the park with pedestrian way, car parking ・ Cityscape code development (height control)
3	Mbaraki Waterfront Development (52.6 ha)	Objective: To renovate the Mbaraki Port area for commercial and residential development to strengthen urban function. Components: ・ Shopping complex with restaurant, cinema, amusement ・ Hotel and apartment for mid to high range ・ Waterfront park or deck ・ Passenger ship terminal ・ Ferry terminal
4	Residential Renovation (217.4 ha)	Objective: To increase the density of the residential area and to provide comfortable residential environment. Components: ・ Redevelopment of residential area ・ Provide urban amenity including parks
5	Missing Link Improvement	Objective: To improve accessibility in the island through connecting the missing link around the station area (also proposed in the transport sector) Components: ・ Level crossing creation (No flyover needed as the railway is not busy) ・ Will accommodate the Mombasa Gate Bridge approach here.
6	Off-street Parking Development, Street Beautification	Objective: To create an attractive environment for pedestrians and automobiles. Components: ・ Applying fringe parking policy (create a difference in parking tariff and enhance traffic calming in the city) ・ Footpath environment improvement (subsidy to create continuous balcony in the fringe parking district)
7	Station and CBD Linkage Improvement (Transit mall development)	Objective: To renovate road for multi-functional use to strengthen the attractiveness of CBD. Components: ・ To renovate Haile Selassie Road connecting Station to Digo Road. ・ Close streets to motor traffic and convert into pedestrian-only road
8	Terminal Development (4.7 ha)	Objective: To renovate the station area to strengthen urban function. Components: ・ Terminal development through land redevelopment. ・ Multi-modal transport: rail, long distance bus, *matatu* ・ Land development: Hotels, shopping complex

	Project	Description
9	Pedestrian Way Improvement	Objective: To provide comfortable conditions for pedestrians along the arterial road in the island. Components: ・ To provide user-friendly pedestrian way. ・ Improve pavement, install trees, benches, and provide temporary parking space.

Source: JICA Expert Team

The location of the projects is shown in Figure 16.3.5 below.



Source: JICA Expert Team

Figure 16.3.5: Urban Development Projects in the Island

16.3.4 Detailed Plan and Urban Development Project in Changamwe / Miritini

(1) Urban Factors

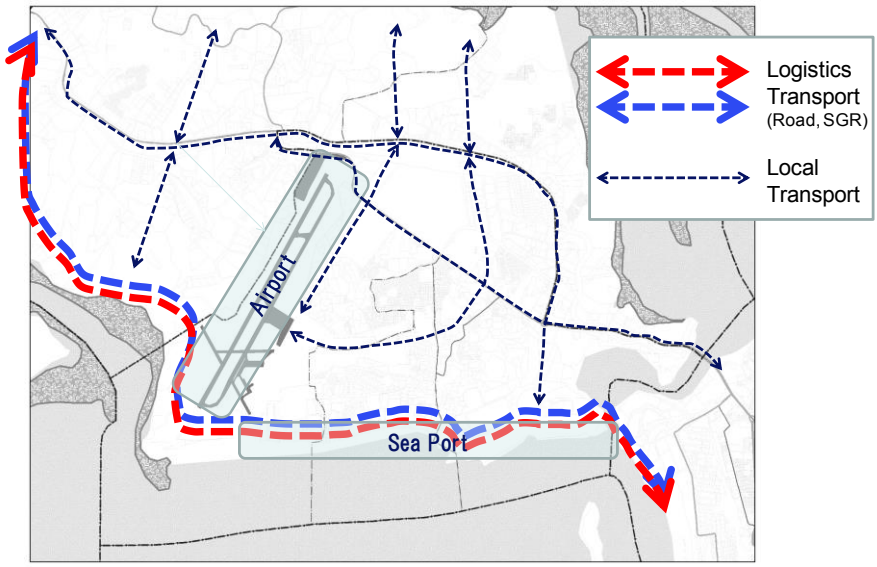
Urban factor is identified for logistics/transport and spatial development, and the results of identification are summarised below.

The factors for logistic and transport are identified as follows:

- Diverting logistics/transport: Kipevu Link, Southern Bypass, Standard Gauge Railway (SGR), and port expansion
- Re-structuring port-related activity: Relocation of CFS/ECD.
- Improving road network crossing Mombasa Road

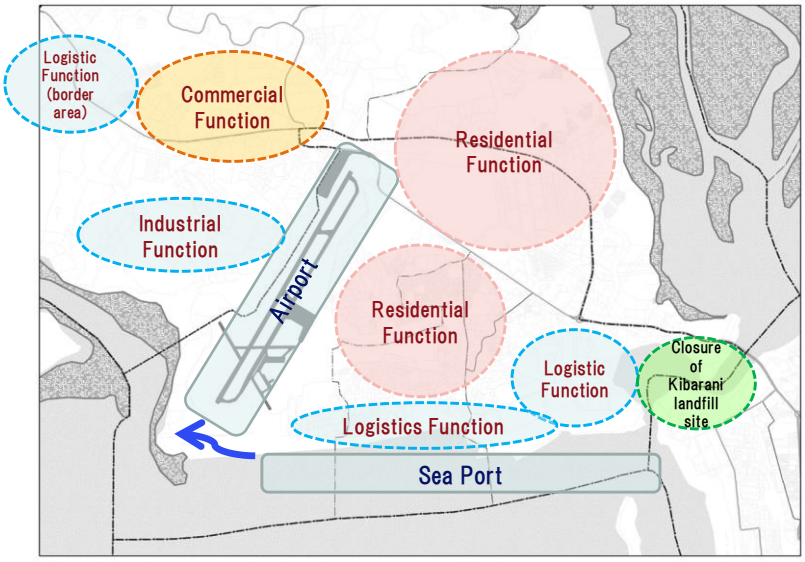
The factors for spatial development are identified as follows:

- Development factor: Commercial area development, separating logistics function and commercial/residential function.
- Preservation factor: Securing residential environment, managing Kibarani Landfill site, and improving the environment of Makupa.



Source: JICA Expert Team

Figure 16.3.6: Urban Factor (Transportation)



Source: JICA Expert Team

Figure 16.3.7: Urban Factor (Spatial Development)

(2) Development Concept

Development concept is set as follows:

- Development Vision: To promote efficient logistics transport and to provide comfortable residential environment.
- Objectives:

- To divert logistics transport to Kipevu Link and to concentrate logistics functions (CFS) in designated areas.
- To assure acceleration of diversifying logistics traffic to different directions such as Kipevu Link and Mombasa Gate Bridge.
- To improve the quality of urban living environment through separation of logistics function and residential function.
- To improve natural environment in Makupa and Tudor Creek.

(3) Urban Management Strategy

Urban management strategy is proposed to show how promotion strategy, preservation strategy, and public facility strategy are managed. Urban management strategy is compiled in Table 16.3.4 below.

Table 16.3.4: Urban Management Strategy

Items		Urban Management Strategies
Promotion Strategies	Development Corridor	・ Port and logistics functions are concentrated in the port and logistic area. ・ Provide industry area in Miritini.
	Commercial and Business Core	・ Provide adequate capacity to promote commercial and business development.
Preservation Strategies	Natural Condition	・ Preserve coastal area and mangrove area.
	Residential Area	・ Create mid- to high-rise commercial and residential area in Mikindani and Changamwe. ・ Restricting disturbing factors including CFS, warehouse, and industry.
Public Facility Strategies	Transport	・ Separating logistic-related transport and urban-related transport. Logistics-related transport is diverted to Kipevu Link and SGR. Urban-related transport is using Mombasa Road. ・ Relocate or re-organise logistics function including CFS and ICD to industry/logistics area.
	Landfill Site	・ Closure of Kibarani landfill site and use for public purpose.

Source: JICA Expert Team

(4) Land Use Concept

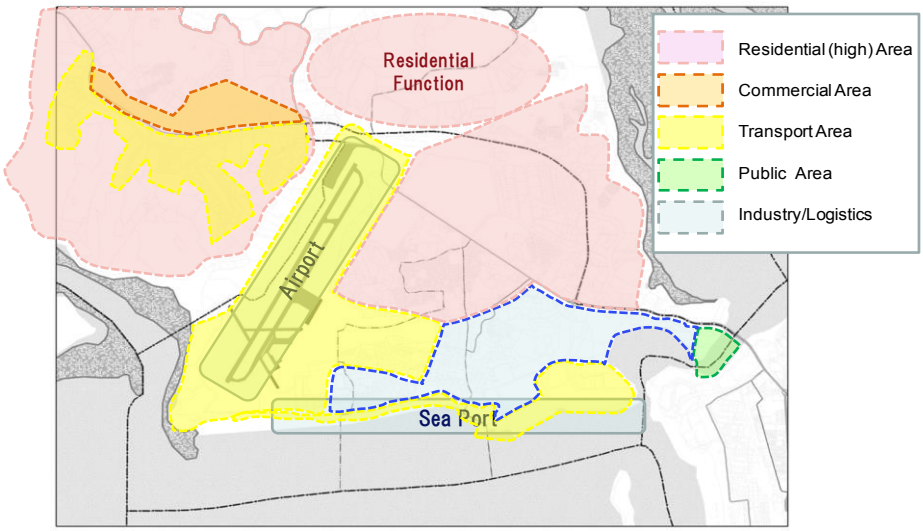
Land use classification and land use plan are proposed to show development guidance as shown in Table 16.3.5.

Table 16.3.5: Proposed Land Use Classification in Island

	Land Use Classification	Concept	Allowed	Not Allowed
1	Residential (High)	To provide residential area with high density	・ Low- to high-rise buildings ・ Small-scale commercial activity ・ Restaurants	・ Industry, warehouse ・ Bar, night club ・ CFS/ICD
2	Commercial	Considered as mixed use to create business environment like sub centre	・ Commercial activity ・ Restaurant, bar, nightclub ・ Administration ・ High-rise buildings	・ Industry, warehouse ・ CFS/ICD
3	Public	To utilise Kibarani landfill site for public purpose	・ Parks ・ Public facilities	・ No private activity ・ Division of plot ・ CFS/ICD
4	Transport	Designate for logistics and transport activity	・ Terminals ・ CFS/ICD ・ Port, SGR	・ Industry ・ Activity involves chemical and flammable items
5	Industry / Logistics	To provide space for industry and logistics activity	・ Manufacturing ・ Warehouse ・ CFS/ICD	

Source: JICA Expert Team

In addition to the land use classification proposed above, aviation restriction around Moi Airport area and extension of runway. Height and land use controls are applied.



Source: JICA Expert Team

Figure 16.3.8: Detailed Plan for Changamwe/Miritini

(5) Urban Development Projects

Urban development in Changamwe/Miritini is proposed to achieve and to manage development concept. Urban development projects are proposed from the viewpoint of separating logistics and commercial/residential functions.

Major projects are proposed as shown in Table 16.3.6.

Table 16.3.6: Urban Development Project in Changamwe/Miritini

	Project	Description
1	Closure of Kibarani Landfill Site	Objective: To close Kibarani landfill site for public purposes, which is also proposed in the solid waste management sector. Components: ・ Closure of Kibarani landfill site ・ Develop public facilities such as parks and recreational facility.
2	Relocation of Logistics Function to Transportation Area	Objective: To relocate CFSs and other logistics function to transport area for better land use. Components: ・ Integrated delivery operation for CFS/ECT (proposed as traffic management project for freight) ・ CFS termination, modification into multi-function facilities (proposed as traffic management project for freight)
3	Social Facility Development	Objective: To improve social conditions (education and health) in the mainland, which aims to support development of the Northern Economic Corridor. Components: ・ Development of specific training course for key industries of Mombasa. ・ Establishment of referral hospitals in each with emergency services.

Source: JICA Expert Team

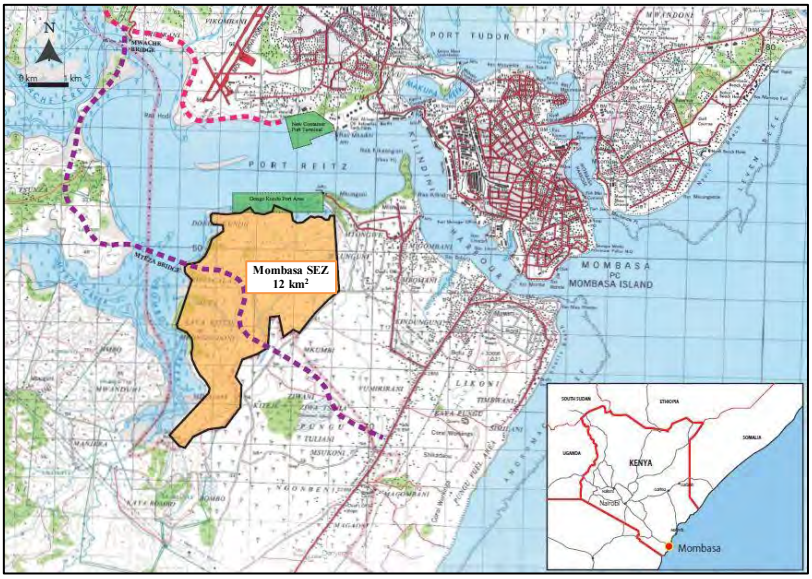
16.3.5 Mombasa SEZ at Dongo Kundu

The planned Mombasa SEZ is located at Dongo Kundu area in Mombasa County, next to Mombasa Island in the opposite shore of Mombasa Port. The total area is 12 km^2 (1,200 ha). The JICA has supported the formulation of Master Plan for the Mombasa SEZ and considered one of the priority

projects in Mombasa County. Outline of the SEZ master plan is prepared based on the Final Report of "Project on Master Plan Development of Mombasa Special Economic Zone (JICA, 2015).

(1) Project Target Area

The planned SEZ is located in Dongo Kundu of Mombasa County, next to Mombasa Island in the opposite shore of Mombasa Port. The total area is 12 km^2 (1,200 ha).

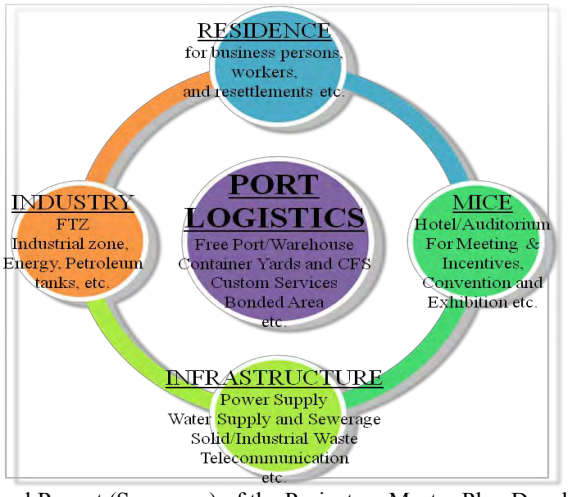


Source: Final Report (Summary) of the Project on Master Plan Development of Mombasa Special Economic Zone (JICA, 2015)

Figure 16.3.9: Location of the DongoKundu-SEZ

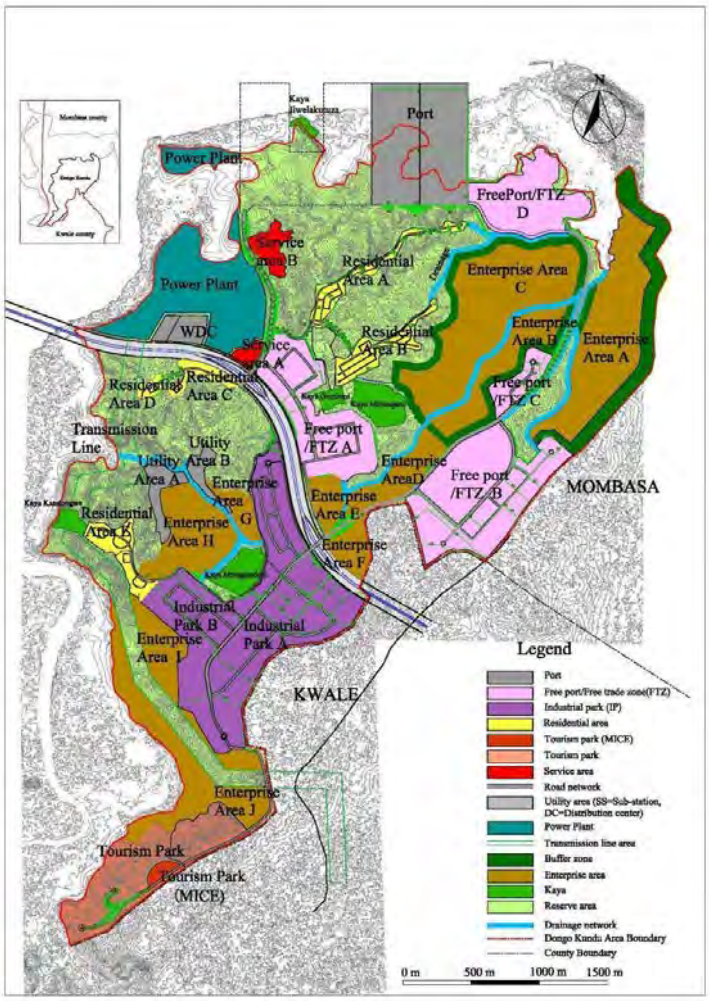
(2) Development Concept

The Mombasa SEZ in Dongo Kundu is a port-based SEZ located on the opposite side of Mombasa International Port, which is the only deep seaport in the region, functioning as the logistics gate of East Africa Community (EAC) and its surrounding areas. This SEZ will be developed in full utilisation of its advantageous location as a proxy to the international port. The development concept of the SEZ will be the "Logistics and Trade HUB for Kenya and the Northern African Region".



Source: Final Report (Summary) of the Project on Master Plan Development of Mombasa Special Economic Zone (JICA, 2015)

Figure 16.3.10: Component of the SEZ Development



Source：Final Report (Summary) of the Project on Master Plan Development of Mombasa Special Economic Zone (JICA, 2015)

Figure 16.3.11: Land Use Plan of Mombasa SEZ (Alternative 1)

(3) Planned Component

To fully utilise the indigenous advantage of proximity to the international port, a logistics industry base such as Free Trade Zone (FTZ), industrial park, as well as energy base should be introduced in the Mombasa SEZ at Dongo Kundu. In addition, residential and tourism functions are recommended to create an integrated SEZ. Infrastructure, including power supply, water supply, waste treatment, and telecommunication, should be necessary for attracting investors.

(4) Land Use Plan

Land use includes port, free port, free trade zone, industrial parks, residential, tourism, utilities and others.

(5) Infrastructure Development

Infrastructure includes land reclamation, road network and transport, port facility, power supply system, water supply system, drainage system, solid waste management, and telecommunication system.

(6) Construction Cost

The total construction cost of public infrastructures including public (internal) infrastructure, port, and external infrastructure is estimated at USD 386.6 million.

(7) Impacts on Mombasa

Mombasa SEZ in Dongo Kundu will become a trigger to modernise the manufacturing sector in Mombasa County. The SEZ will diversify the current industrial base in Kenya by attracting new business and firms into the country whilst also creating new employment and empowering local industrial human resource skills. The Net Present Value (NPV) of the total cost over the project period is estimated at USD 364.9 million, but the project is expected to bring high yield of benefits to the people of Mombasa County at NPV USD 2,133.9 million, with the economic internal rate of return (EIRR) at 37.94%. The major impacts are as follows:

a) **Accommodate Various Economic Activities**: To create the centre of diversification, SEZ will accommodate various economic activities (e.g., manufacturing, logistics, commerce, services, etc) to create a synergy and new business opportunities).
b) **Forward and Backward Linkages**: As an economic growth trigger, SEZ will forward non-traditional businesses mainly promoted by foreign direct investments (FDI) to the backward businesses consisted of local business societies by creating new domestic value chain.
c) **Creating Logistics HUB for the EAC and Beyond**: SEZ will bring incentives to import/export and transhipment businesses to develop as a regional gateway and become the logistics hub.
d) **Rapid Economic Growth**: SEZ will contribute to the rapid economic growth of Mombasa which also becomes economic growth trigger of the region as well as the nation by creating more job opportunities and utilising domestic resources.
e) **Integrated and Efficient Logistics Services**: Integrated and efficient logistics service will be achieved by establishing one-stop centre to create new business opportunities and value chains for market expansion.
f) **Engagement Opportunity of Non-Traditional Industries**: To promote the rise of non-traditional industries by increasing FDI, SEZ will prepare incentives and create a world-class business environment in bringing and adopting new technologies.

16.3.6 Development Standard for Large-scale Development

Development standard is considered as supplement of zoning policy, aims to provide condition for development, which satisfy the minimum standard for development. Development standard can be used for the selected development such as large-scale development, land use that attracts inflow of people such as commercial, and public facilities.

Currently, development application is reviewed without clear standard since zoning policy is under preparation. Development application is reviewed one by one or case by case. In order to promote the realisation of land use plan and promote fair evaluation of development application, particularly in the undeveloped area, development standard has to be developed. Contents to be included in the development standard are summarised as shown in Table 16.3.7 below.

Table 16.3.7: Ideas for Development Standard

Objective: Development standard is used for proper evaluation of development application, providing guidance for applicants to provide necessary condition for development in securing sound development, which contributes to improve urban condition.	
Contents	**Ideas of Criteria**
Development plot	・ Condition for division of land
Proper location of public facilities: public facilities	・ Education facility (per pop): kindergarten, elementary school, junior high school. ・ Health care (per pop): community health care, drug stores ・ Public and government facilities: administration, meeting halls
Road	・ Connecting to road outside ・ Road in the development site: local road (width: 11 m with sidewalk), Neighbourhood road (width: 3 m)
Safety design: flood control, fire prevention	・ Water hydrant: Commercial area: 1 hydrant within every 80 radius, Residential area: 1 hydrant within every 100 radius. ・ Building set back of road.
Environmentally sound development	・ Green buffer zone for size of development area ➢ 1~1.5 ha: 4 m ➢ 1.5~5 ha: 5 m ➢ 5~15 ha: 10 m ・ Protection of heritage
Proper design of water supply and sewerage system including water resources	・ Satisfy the demand for residential and commercial use
Parks: require minimum park area	・ Parks: ➢ Neighbourhood park: 1 for every 250 population, 250 m^2, ➢ District park: 1 for every 2,500 population, 1,250 m^2
Car parking	・ Mandating development of car parking space, particularly new development area and commercial area where large volume of traffic is expected. ➢ 1 car space for every 60 m^2 shopping centre, 1 car parking for every 100 m^2 for office space.

Source: JICA Expert Team

16.4 Action Plan

One of the key elements of the implementation of MGCMP is to realise the land use plan and improve transport and logistics. In addition to priority projects and priority area development, action plans are prepared for land use implementation and transport/logistics development.

16.4.1 Action Plan for Land Use Plan Implementation

(1) Basic Strategy on Land Use Implementation

Implementation of land use plan is essential to form urban structure and realise the development vision. Since the local government is in transition stage and the capacity of the county government is weak to execute land use plan, regulation and organisation have to be strengthened in the short term (~2020), as outlined in the priority project (Table 16.1.30). Regulation includes zoning regulation, development standard, and strengthening of development permit through synchronisation of "E-Permit". Organisation includes strengthening of public sector through the establishment of board mandated in the relevant acts and strengthening of community organisation.

(2) Regulation

Zoning regulation shows the building control for land use categories to control the development in securing urban functions. Such items include building use, building volume (floor area ratio, building coverage ratio, building height), setback from the street, access, and other conditions necessary for development control. Zoning regulation should be developed based on the land use plan. If the control is necessary in the specific areas, land use should be divided and zoning regulation should be prepared to satisfy the condition.

Development standard, as shown in Section 16.3.6, is the guidance for evaluation application for development. Development standard can be prepared for selected areas depending on the needs of the area. Development standard for re-allocation of logistics and industry functions from Mombasa Island to the mainland has to be developed including the incentives.

Strengthening of development permit through synchronisation of "E-Permit": CGM has started applying E-Permit although development permission is processed through internet and digital data. E-Permit should be strengthened to provide information necessary for permission process including land use plan, zoning regulation, and development standard. One of the important points for synchronisation is to provide information to residents and developer so that stakeholders can understand the rule and permission process will be transparent. The website developed should also be utilised to provide the information.

(3) Organisation

Strengthening of urban management of CGM: The County Government Act and Urban Areas and Cities Act is mandated to establish a board for urban management. Since there is no intersectoral management body in CGM, the board which can coordinate concerned organisation has to be developed in the early stage of implementation. Through strengthening of public sector, role and responsibility in land use control, infrastructure development, and community engagement (public relations) have to be clearly defined.

Strengthening of community organisation: MGCMP has to be understood by the community, and sustainable community involvement needs to be secured not only to improve community awareness but also reducing the burden of public sector in terms of financial and manpower capability. Some tasks of urban management (area specific rule management) have to be managed by the community. CGM has

to support developing and strengthening of community group. Through community organisation strengthening, role of the community, and relationship between public and community have to be clearly defined.

16.4.2 Action Plan for Transport Sector Implementation

(1) Action Plan for Transport Development

Table 16.1.1 shows the programme of transport development. The left column shows projects proposed in Chapter 10, with project codes, and the bar charts at the centre in the present period of implementation. The projects are classified by key stakeholders. The first group is composed of major pipelined projects, then it goes to projects for KRA, KPA, road authorities, railway companies, the National Transport and Safety Authority (NTSA), and county government.

(2) Physical Infrastructure Development

The major actions are related to infrastructure development, shown as black bars. The major pipelined projects on the top of the table are infrastructure development, which constitute major structures of future Mombasa County. These will be completed by/around 2020.

The implementation of Shimanzi Kipevu connection (R1) by KPA should be closely synchronised with the opening of Kipevu Link, to maximise the utilisation of benefits derived from the new link investment by JICA.

The other road infrastructure projects are mainly implemented by the road authorities, KeNHA, KURA, and KeRRA. Most projects have been programmed to be finished by 2030, as middle term projects. The programme shows the feasibility study activity on the Mombasa Gate Bridge Project, funded by JICA.

The minor upgrade of island network and traffic management with the code M would be implemented during 2018-2025, as short/middle term projects under the management of the county government.

MRT/BRT project would be initiated by the county government from 2017, which needs a continuous programme with 10-15 years to finalise its network development. It needs support from KRC.

The road development programme for suburb region is a hybrid programme of physical and institutional development, which will need long period until 2040.

(3) Management and Institutional Approaches

The major actions are related to institutional development, shown as rubric bars. The major actions for institutional arrangement are summarised in Chapter 10.6, as “Kick off” activities.

The traffic management projects with code TM are mainly programmed with red bars. The CFS improvement, freight traffic efficiency improvement under KPA and KRA are programmed as prioritised projects in the short term. The projects under NTSA for *matatu* and *tuktuk* regulations need quick implementation similarly. The parking management project, partnership with freight operators for the county government should be implemented in the short term.

The road development programme for suburb region shall be initiated during 2017-2020, to develop the programme itself and organise the monitoring functions with major stakeholders. The initial project could be implemented by JICA’s grant assistance.

Table 16.4.1: Comprehensive Action Plan for Transport Infrastructure

	2016	2017	2018	2019	2020	2021-25	2026-30	2031-35	2036-40	Notes	source
Major Ongoing Projects											
Kipevu Link (South BP PKG1)										started May18-2015, 24Month, expected to open Dec 2017	KeNHA
Southern ByPass PKG2/3										will start Mar-2016, 48Month, expected to open Mar 2020	The engineer
Northern Bypass										Feasibility study has finished	
SGR										by 2017, before June 2017	website
MPDP											
Port Expansion Berth 20-21										opened in March2016, but operator is not yet hired.	Port MP FR
Port Expansion Berth 22										construction 2017-2019	Port MP FR
Port Expansion Berth 23										construction by 2020-2023	Port MP FR
Dongokundu Multipurpose Port D2 / SEZ										construction by 2025	Port MP FR
Pipelined Projects											
A109 widenings										Mombasa/Magongo	KeNHA
Flyovers										Chamgamwe/Miritini	KeNHA
KRA/Financial											
Earmarked fund preparetion											
CFS improvement											
Low utility CFS closing										find low use CFS and close, move the container to new berth	
Integration of CFS/ECT										Integration of pick-up traffic with ECT &CFS	
Multipurpose CFS development										approve Processing function	
Decrease of number of documents											
ICT application on document control											
Kipevu Link Open											
KPA											
Special corridor Shimanji - Kipevu Link											
Scope/FS/Deregulation of control											
Design/construction for simple intervention											
Design for exclusive road											
Mbaraki Terminal conversion											
Tractor exchange practice											
Container Consolidation for Export Cargo											
Sea&Air Service Promotion											
KeNHA/KURA											
Ring Roads in Island											
Mombasa Gate Bridge		F/S by JICA									JICA F/S
Second Nyali Bridge											
Outer Ring Road											
Southern Bypass Extension										MSA-NRB express super-highway	
KRC/RVR/SGR Operator											
Intercity bus terminal integration at KRC station											
BRT Development											
	2016	2017	2018	2019	2020	2021-25	2026-30	2031-35	2036-40	Notes	source
NTSA											
Matatu Route Revision											
Shift to Higher-Capacity Vehicles											
Capacity Building for Matatu Operators											
Regulation of tuktuk, creation of standing areas											
County Gov.											
Multi modal function / Station development											
Beautification of Haile Selassie Road / Car free											
One-way regulation											
Service/Collector roads improvement											
Missing link improvement (Railway)											
Missing link improvement (Sports park)											
Digo car-free areas											
Off-street parking development, street beautifications											
Hyper corridor intersection improvement											
MRT Developmet											
Pre-F/S and F/S											
BD/Procurement											
TOD/POD											
Construction - 1st phase											
Construction - 2nd phase											
BRT Development											
Water transport services along the Nyali Channel											
Parking Management Improvement											
Pedestrian bridge installation											
Traffic lights system improvement											
Agreement with private freight operators											
Area pricing											
Freight parking area development										Miritini & Gate 18	
FS/Design											
Construction											
Monitoring Authority Development										with JICA Technical Assistance scheme	
Road Development Program											
Preparation / legislation										with JICA Technical Assistance scheme	
Initial implementation										with JICA Technical Assistance scheme	
1st 10 years plan (2020-2030)										covers R4-R9, N1-N14, W1-W12, S1-S11	
2nd 10 years plan (2030-2040)										covers R4-R9, N1-N14, W1-W12, S1-S11	

Source: JICA Expert Team

17. Conclusion and Recommendation

17.1 Conclusion

(1) Conclusion of MGCMP

The Mombasa Gate City Master Plan (MGCMP) covers development vision, structure plan, subcentre development, transport development, urban infrastructure, social and public facility development, tourism development, and urban management. Through the process of master plan formulation, several series of technical working group, lectures, and stakeholder meetings were conducted. In addition, priority projects are proposed.

The JICA Expert Team has transferred technology on six themes, i.e., land use, urban management, socio-economy, road and public transportation, infrastructure, and social facilities, to the counterparts through daily discussions, working group meetings, and stakeholder meetings to formulate the master plan.

Expected impacts of the master plan are summarised below.

- MGCMP shows the development direction and measures of Mombasa County in 2040, which can be shared amongst stakeholders.
- Development vision is proposed for Mombasa County to become "A premier gateway port city that upholds diversity and heritage", as a gateway city in the Northern Economic Corridor in the Eastern African Region.
- In addition to strengthen the function of Mombasa Island, subcentre system is proposed to promote sound development in suburb and to promote efficiency of logistics as gateway to the Northern Economic Corridor.
- Economic corridor which connects Mombasa Island, Mainland West, Mainland North, and Mainland South will contribute to improve logistics for the Northern Economic Corridor and promote economic activities in Mombasa County.
- Land use plan shows development direction and control measures which are expected to reduce uncontrolled development, particularly in the mainland.
- Development of subcentres strengthens urban and social services in the mainland
- Infrastructure and social services are proposed in the mainland where service level is low.
- Priority projects are proposed, which should focus on the areas where urban function has to be strengthened and population increase is high, and have to consider efficient utilisation of resources including financial and human resources.
- Technology transfer conducted through MGCMP formulation is expected to be utilised for the implementation and revision of MGCMP.

(2) Challenges for Implementation

The population in Mombasa County is expected to be 2.4 million in 2040 which is 2.2 larger than the current population. Population in some zones (Likoni, Bamburi) will grow to more than ten times the current population. MGCMP proposes projects to realise the vision of Mombasa County for 2040. However, Mombasa County is likely to face challenges during the implementation of the plan and how

to surmount such challenges need to be recognised as part of the implementation process. Technical aspect, institutional and legal aspect, as well as financial aspect have to be well understood. Amongst them, the most important aspect is the initiative and commitment of the County Government of Mombasa (CGM) for active coordination amongst the stakeholders. The following are the expected challenges for implementation:

- Coordinating mechanism: Implementation requires coordination in many forms. Coordination amongst CGM, local stakeholders, national government, and within CGM itself is necessary. Coordination between CGM and national government is important for physical infrastructure because mostly the implementing agency's priority project is at the national level. Sustainable coordination mechanism has to be established.
- Monitoring system: Monitoring system is important in MGCMP implementation. Monitoring and evaluation of MGCMP implementation and the responsible department have to be clearly defined. Monitoring system should include budget, members, and activity schedule (annual plan, middle-, long-term plan), through which priority in MGCMP has to be clarified so that the first step to be taken can be shared amongst the stakeholder.
- Finance: A large amount of fund is necessary for implementing priority projects and promoting land use control. Since the financial capacity of CGM is limited, funds necessary for development have to be secured including the national budget, development partner fund, and private sector fund.
- Institution: Land is one of major challenges for land use control and for physical development. Land tenure has to be secured, which is particularly important to promote housing development through securing land ownership and promoting rental housing. Development permit, which secures smooth development process, is another challenge for promoting social facilities and infrastructure. Regulation and guidelines related to infrastructure and facility development and urban management have to be strengthened. In addition, an urban area management board which manages sectoral/cross cutting issues has to be developed.
- Human capacity: Human capacity of Mombasa County is key in project implementation. Capacity of Mombasa County's staff for urban management has to be strengthened by utilising educational institutions and technical assistance from international partners.
- Priority: As mentioned above, population increase is large in some zones, particularly in Likoni and Bamburi. Infrastructure/social facility development and detailed plan have to focus on the area where population increase is high.

In addition, challenges for major sectors are addressed as follows:

1) Transport

- Constraints:
  - Transport sectors are managed by a variety of institutions including Kenya Revenue Authority (KRA), Kenya Port Authority (KPA), road and traffic authorities (Kenya National Highways Authority (KeNHA), Kenya Urban Roads Authority (KURA), Kenya Rural Roads Authority (KeRRA)), traffic management authority and regulation authority (Police, National Transport and Safety Authority (NTSA)), Kenya Railways Corporation (KRC), and CGM which is the owner of MGCMP and a key player in the implementation. Coordination amongst concerned institutions is a challenging task, but CGM has to take an initiative in coordination.
  - Transport development is composed of road, public transport, and traffic management. All of which have to be implemented together to secure synergy of each approach.
  - Public transport is one of the highlights to improve passenger transport and freight transport. Comparison of transportation modes (bus, bus rapid transit (BRT), automated guideway transit (AGT), light rail transit (LRT), Metro) was conducted based on capacity, cost,

technical, and operational aspects. The transportation mode to be utilised in Mombasa has to be investigated further prior to execution.
- Relocation and improvement of Container Freight Station/Empty Container Terminal (CFS/ECT) requires legal improvement with support of KRA through which function of CFS/ECT should be modified.
- Transport development requires a huge fund and the funding source has to rely on the national government and/or international partners.

- Goal/Impact:

  - Provide appropriate transport mode to reduce congestion generated from logistics activities and regional traffic.
  - Legal improvement will improve CFS/ECT activities.
  - Transport sector is properly managed by CGM.

- Implementing agencies:

  - As mentioned in the constraints, transport sector is managed by a variety of institutions. CGM has to take initiative and facilitate those institutions by establishing a monitoring organisation.
  - After the devolution, CGM is able to operate the public transport. Strengthening of CGM which manage transport sector as a whole has to be investigated.

2) Water Supply/Sewerage

- Constraints:

  - One of major constraints of water supply is water resources. Mwache Dam is under construction to supply water. Even though the water from Mwache Dam will be supplied to Mombasa County, with the development of the Mombasa Special Economic Zone (SEZ) and the increased population in Mombasa County, the supply of water is short for future demand. Additional water resources have to be investigated together with the reduction of Unaccounted for Water (UFW) by improving the operation and water pipes.
  - Coordination amongst concerned institutions, i.e., Coastal Water Services Board (CWSB), Mombasa Water Supply and Sanitation Services Company (MOWASSCO).

- Goal/Impact:

  - Improved water supply is expected to provide safe water to general public and to the industry.
  - Mombasa SEZ can operate by the water supplied from Mwache Dam supported by the World Bank (WB) and French Development Agency (Agence Française de Développement: AFD). However, development of other water sources like borehole is required for the initial stage of Mombasa SEZ.

- Implementing agencies:

  - The Coast Water Services Board (CWSB) and Mombasa Water Supply and Sanitation Services Company (MOWASSCO) play a key role in water supply. MOWASSCO has to manage water supply to the general public and also to Mombasa SEZ.

3) Power

- Constraints:

  - Power supply is enough but the substation and transmission line have to be improved for efficient power supply.

- Power will be supplied to general public as well as to Mombasa SEZ.

- Goal/Impact:
  - Power is efficiently provided to the general public and to Mombasa SEZ.

- Implementing agencies:
  - Since the implementing agency is Kenya Power, CGM has to coordinate with them for provision of substation and transmission line.

4) Solid Waste Management

- Constraints:
  - The new landfill site cannot be finalised due to aviation restriction by the Kenya Civil Aviation Authority (KCAA). CGM should coordinate with KCAA for selection of the site.
  - Access and transfer station have to be developed together with landfill site for efficient operation.

- Goal/Impact:
  - Proper solid waste management will stop the current serious environmental pollution and will not affect the environment of Mombasa County.

- Implementing agencies:
  - CGM should take initiative in new landfill site development.
  - The National Environment Management Authority (NEMA) should support the technical and legal aspects.

5) Housing (Establishment of Housing Corporation)

- Constraints:
  - Progress of housing development is slow mainly due to land and financial issues.
  - Securing land is difficult because of encroachment. Land issue has to be clarified for accelerating housing development.
  - Facility and infrastructure have to be developed to serve estate development (water supply and sewerage).
  - Functions and relationship between the National Housing Corporation and Mombasa County's housing development agency (social housing) have to be clarified through development of local regulations and guidelines on housing development.

- Goal/Impact:
  - Housing projects will be accelerated through proper management.
  - Provide houses for low to middle income people.

- Implementing agencies:
  - CGM plays a key role in establishing the Mombasa County's housing development agency (draft) and coordinating with the National Housing Corporation (NHC).

17.2 Recommendation

It is recommended that CGM implements MGCMP to achieve the development vision, land use plan, and infrastructure/social facilities. In order to ensure smooth implementation of the master plan, the following recommendations are proposed below:

(1) Securing Implementation of Planned Development

Some projects included in the MGCMP are already in the planning or design stage, which are considered a base for forming urban structure, improving the conditions of logistics of the Northern Economic Corridor, and economic development. CGM, together with the Kenyan Government have to secure the implementation of these projects, particularly these projects which formed the Southwest Corridor (Logistics Corridor) have to be monitored carefully.

- Mombasa Gate Bridge: Mombasa Gate Bridge, which connects Mombasa Island and Mainland South, plays an essential function in forming the Southwest Corridor, and is expected to divert logistics transport from Mombasa Road and Kipevu Link (a part of the Southern Bypass) and to contribute to support development of Dongo Kundu SEZ by connecting the SEZ to logistics facilities (port, warehouse, and roads).
- Southern Bypass: Southern Bypass connects Mainland South and Mainland West and passing through Dongo Kundu SEZ, which contributes to the development around Likoni area.
- Dongo Kundu SEZ: Dongo Kundu SEZ is a port-based SEZ located on the opposite side of the Mombasa International Airport. The development concept of the SEZ is to be a logistics and trade hub of Kenya and the Eastern African Region. SEZ will be locomotive of economic development in Mombasa County, which can be fully functional if connected to Mombasa Gate Bridge and Southern Bypass.

(2) Transport Demand Harmonisation

The growing traffic demand for freight and passenger can be handled with proper investment and traffic management as proposed in the MGCMP. Usually, large transport investment projects will require 15 to 20 years to be realised, and the first steps are quite important. The traffic management program also requires institutional harmonisation.

- Elevated Mass Transit Function: As shown in the simulation, development of the elevated mass transit function with road development will realise an efficient transport environment. The initial analysis suggests that i) some equity assistance by the national government can assure the operability without subsidy, and ii) private operators can be involved to enhance operation and maintenance (O&M) efficiency. Further feasibility analysis can be implemented with the Japan International Cooperation Agency (JICA) grant.
- Road Development in Suburb with Quantity Target: The MGCMP suggested to request to JICA a grant technical assistance program to establish the road development program scheme with proper long-term monitoring and assessment. The technical assistance can cover the program development for road as well as technology transfer in road maintenance, capacity building in transport, as needs of CGM.
- Coordination amongst Agencies: Several traffic management projects are proposed in the MGCMP, each of which will not cost much, but will require proper design, implementation program, and coordination with other agencies. The MGCMP suggested necessary initial actions in coordination with other agencies, in the section of "Institutional Arrangement –Way Forward"

(3) Strengthening of Urban Development Management (Implementation of Master Plan)

Strengthening of urban development management capacity of CGM is essential for the MGCMP implementation. Regulations and guidelines necessary for development and control have to be developed, including land management, land use control, and infrastructure management.

- Develop Regulations and Guidelines:

  Infrastructure and social facility development, and land use control have to be implemented under related regulations and guidelines. Regulations and guidelines necessary for development and control have to be developed, including land management, land use control, and infrastructure management.

- Develop an Urban Management Board:

  Urban management is considered a cross-cutting matter. In order to strengthen the cross-cutting matter, an Urban Management Board has to be established in CGM.

- Develop Monitoring System

  Monitoring system is designed to show plan and action for MGCMP, which is composed of Key Goal Indicator, Plan (action to be taken), Do (activity conducted and to be conducted), Check (feedback, challenges), Action (challenges and countermeasures for the next step). Monitoring system should also include budget, responsible organisations, and schedule (annual plan, middle- to long-term plan).

(4) Sustainable Stakeholder Involvement

Sustainable urban development requires active stakeholder involvement in many ways, amongst them are: community building agreement and changing the socioeconomic pattern of general public. Community and concerned organisations were involved in the master plan formulation process through stakeholder meetings and information disclosure through website created as a part of the requirement in the County Government Act. The connection between CGM and the community has to be maintained. Thus, in addition to strengthening CGM organisation, Mombasa County has to encourage stakeholder's involvement and develop a mechanism which secures sustainable connection between CGM and the community.

In addition, since most of the priority projects have to be implemented with the support of the national government, CGM has to build close relationship with the concerned agencies in the national government.

(5) Environmental and Social Consideration

For the formulation of the MGCMP, the strategic environmental assessment (SEA) was conducted through which environmental and social impacts on the master plan implementation were investigated and mitigation measures are proposed. In addition, a series of stakeholder meetings was conducted. For the implementation of the master plan, recommendation in the SEA report has to be incorporated to minimise the negative impact.

(6) Revision of MGCMP after Ten Years

Since the environment of urban development is changing every year, in order for the MGCMP to be practical, challenges of the plan have to be reviewed, and the MGCMP has to be revised based on the updated situation. The following matters should be reviewed in ten years:

- Population framework: New census data will be available in ten years. Population change by zones has to be reviewed to capture the population movement and urbanisation. Based on the new population, land use control, infrastructure, and urban facility have to be reviewed and revised. Population trend in neighbouring counties also has to be monitored to examine the position of Mombasa County in the Coastal Region.
- Infrastructure development: As mentioned in (1) of conclusion, large-scale development such as transport and SEZ has a large impact on MGCMP implementation. Progress of large-scale development has to be monitored.
- Progress of MGCMP implementation: Land use plan, priority for each sector and priority projects are proposed in the MGCMP. Realisation of land use plan and implementation of priority projects should be reviewed. If realisation and implementation are not as planned, causes should be investigated and countermeasures should be proposed. The following items should be reviewed and revised:

    - Land use plan: Based on the new population date, population density, and increase rate have to be reviewed, and land use plan has to be adjusted to urbanisation and new population data.
    - Road development: Road development management program, composed of PDCA (Plan Do Check, Action), is proposed. PDCA should be reviewed to revise the management program.
    - Water supply: Water demand based on population trend and economic activity has to be reviewed. In addition, water resources have to be monitored to examine the supply side.
    - Sewerage: Planned capacity of sewer, coverage area, and wastewater treatment have to be reviewed based on the population trend.
    - Drainage: Drainage capacity has to be reviewed based on change in conditions including land use, urbanisation, and climate change.
    - Solid waste management: Volume of generated waste, solid parameters (collection rate, final disposal rate), condition of waste collection/transport, 3Rs, industrial waste, hazardous waste, financial and human resources management.
    - Housing: Demand and supply of housing development should be reviewed. Demand should be reviewed based on new population trend. Supply should be reviewed based on housing supplied, and measures to accelerate housing development should be examined.
    - Tourism: After the opening of the Southern Bypass and Northern Bypass, regional tourism demand will be changed drastically.

- Progress of devolution: Devolution which came into force in 2013 is expected to be fully operational, upon which authority, human capacity, and finance of Mombasa County have to be strengthened. The condition of CGM ha to be reviewed. In addition, establishment and operation of the board mandated in the Urban Areas and Cities Act, from the point of view of financial and human capacity, has to be reviewed.

Appendix

Formulation of Traffic Demand Model (APPENDIX)

1 Overview

In the following chapter, the major output will be a traffic demand model for the existing case (2015).

Traffic demand modeling has two major parts: (i) production of an initial model of observed traffic, and (ii) production of four-step demand model to reproduce the observed results.

The observed traffic model is produced as follows:

- A transportation network model is produced, a simplification of the entire road network into key roads.
- O-D matrices are produced by manipulating the data from traffic surveys (TVS survey) and household interview surveys (HIS survey).
- The O-D matrices are assigned to the network model using modeling software (JICA STRADA), with resulting outputs of traffic flows, congestion rates, etc.

The four-step model of traffic demand model is produced as follows:

- **Pre-Step:** A model of Trip Production for the entire study area, for predicting the total number of trips/day.
- **Step 1:** A Trip Generation and Trip Attraction model, for predicting the number of trips by purpose (home, work, school, others) to/from any given zone.
- **Step 2:** A Trip Distribution model, for matching origins and destinations (O-D) of those trips generated/attracted in Step 1.
- **Step 3:** A Modal Split model, for distributing O-D trips from Step 2 amongst the different transport modes.
- **Step 4:** Trip Assignment, inputting the O-D trips from Step 3 into the traffic network.

As explained later in the chapter, these steps are performed on “internal trips”, and not on “external trips” or freight movement.

2 Reproducibility and Quality of Model

In generating the transportation network model, a variety of simplifications and assumptions have to be made. For example, at present, there is a low availability of roads (e.g., design capacity, road condition, average operating speeds, etc.). Similarly, in the traffic demand model, a lack of certain data (detailed employment by sector, a low-income population that is difficult to sample, etc.) creates an additional need for data adjustments, simplifications, and assumptions.

Reproducibility is a crucial element of any traffic demand model. Pursuant to this, all rationale behind all data manipulations will be presented, such that the model can be confidently held as a reliable tool for predicting future traffic demand and the basis for the major infrastructure investments needed in Mombasa.

The economy and housing patterns of Mombasa are extremely informal yet complex at the same time. With a limited ability/budget to survey (particularly, the intricacies of freight movement and household person trip surveys). Thus, various equations, have seemingly low r-squared values. However, these equations were determined to be the strongest after months of data adjustments and statistical F-tests / model building.

3 Baseline Model

3.1 Classifications

Forecasting Area and Zones

Mombasa and parts of surrounding Kilifi and Kwale County ("Greater Mombasa") are divided into traffic forecasting zones. The forecast area is designated to cover the alignment of the Northern Bypass, Southern Bypass and SEZ, which are likely to materialize in the future and will have a great influence on transport demand and traffic flow.

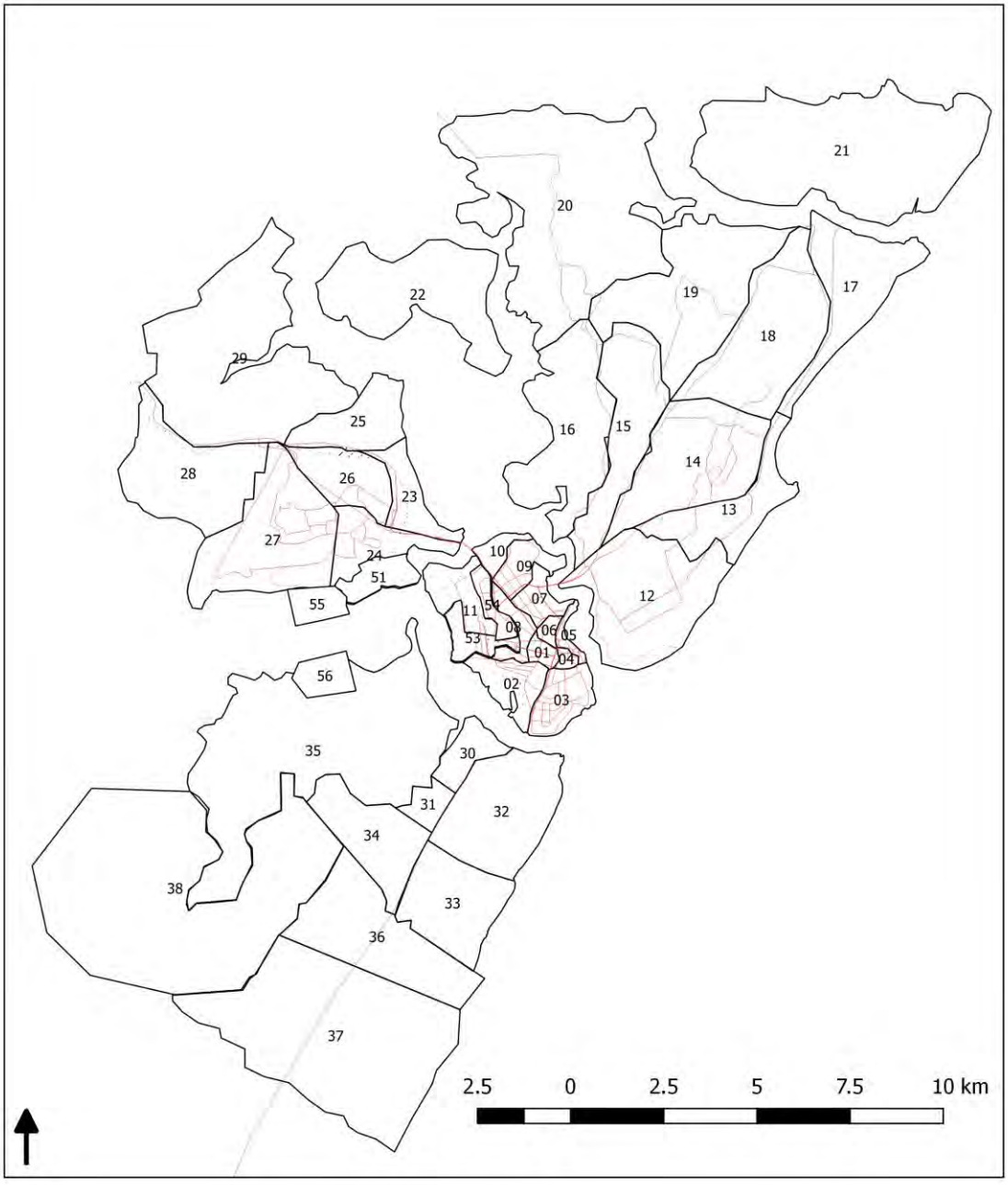
The Internal Zones used for the modeling of Greater Mombasa are as follows:

- Zones 1-11, representing the Island
- Zones 12-22, representing the Mainland North areas in Mombasa and one zone of Mtwapa, Kilifi (the beginning point of the Northern Bypass).
- Zones 23-29, representing the Mainland West areas to the County border
- Zones 30-38, representing the Mainland South areas in Mombasa and three zones of Kwale, covering the Southern Bypass and SEZ.

The traffic analysis zones (TAZ) boundary follows the area of the Enumeration Areas of the National Census Bureau, due to reliability of population data. In addition to these, special zones were added that are exclusive to traffic demand forecasting and are not used elsewhere in this Study:

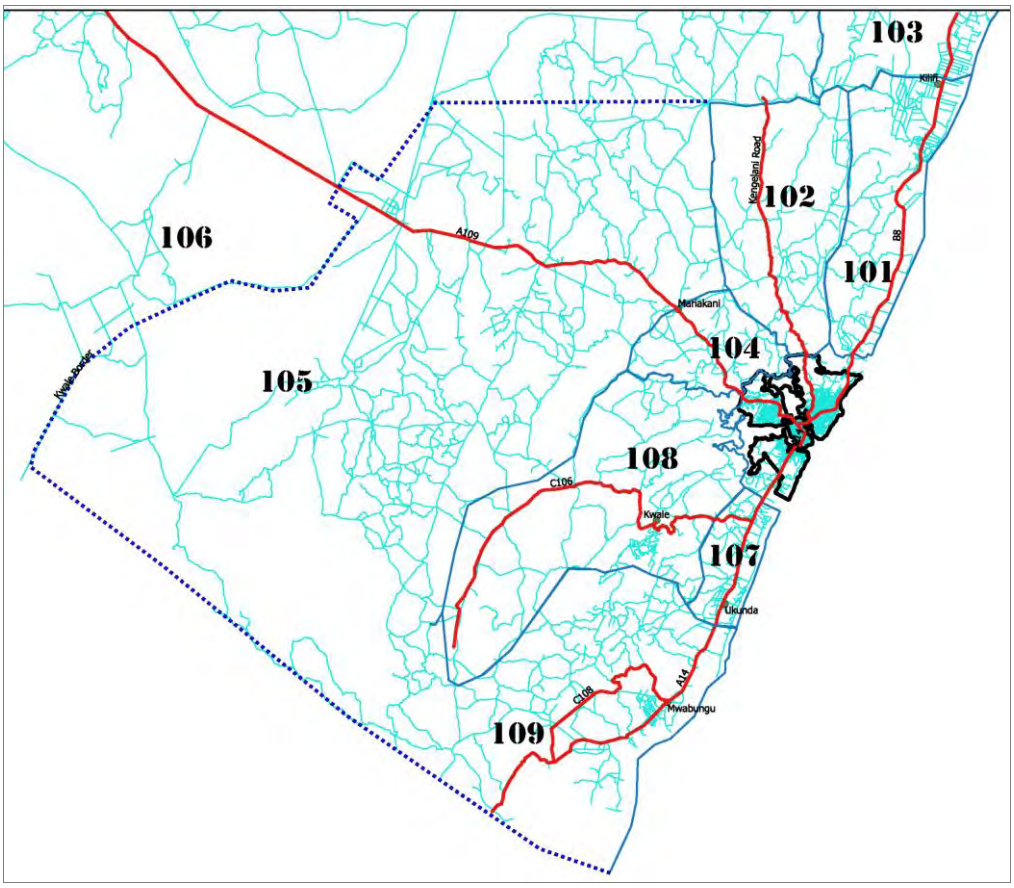
- Zones 101-109, representing external areas to the North, West, and South.
- Zones 51-54, subdivisions of the Port/Industrial Area (Zone 11), used only for freight trip modeling.
- Zone 55 for new container berths (20-25) and Zone 56 for Dongokundu SEZ/Port for scenarios after 2020.

Maps of the Internal and External Zones are shown in the figures below:



Source: JICA Expert Team

Enumeration Areas (1-38), Freight Zones (51-54, within Zone 11 and 55-56)



Source: JICA Expert Team

External Zones (101-109)

Trip Purpose

From the person trip survey (HIS), there were nine options for Trip Purpose. For demand forecasting, these have been simplified into four categories, as follows:

Trip Purpose Categories

HIS	Demand Forecasting
1. To Home	1. Home
2. To Work	2. Work
3. To School	3. School
4. Personal Business	4. Others
5. Company Business	
6. Social / Visit Relatives	
7. Shopping	
8. Send off / Pick up a person	
9. Other	

Source: JICA Expert Team

Modes

For passenger trips, the HIS Survey allowed for 14 options for Travel Mode *within each trip*, as follows:

Travel Modes within Trips

1. Walking	8. Tuk Tuk
2. Bicycle	9. Matatu
3. Push Cart	10. Bus
4. Boda Boda	11. Ferry
5. Car / 4WD	12. Railway
6. Truck	13. Air
7. Trailer	14. Other

Source: JICA Expert Team

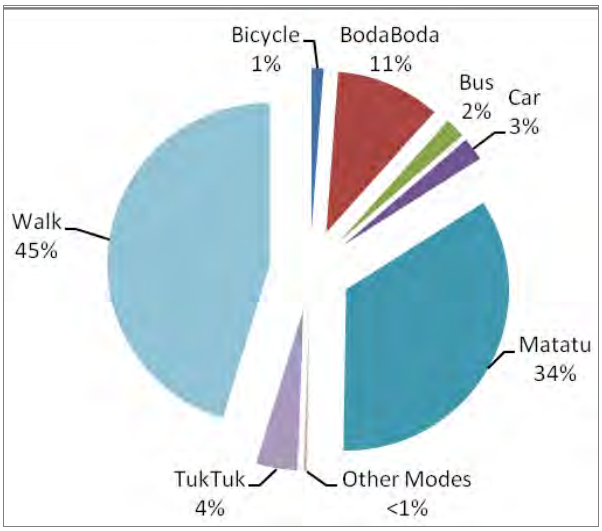
The first step was to determine the "dominant mode" used for each trip. Some examples are shown below:

Examples of Dominant Travel Modes

Actual Modes Used for Trip	Dominant Mode
Walk – Boda Boda – Matatu	Matatu
Ferry – Tuk Tuk – Walk	Tuk Tuk
Walk – Matatu – Car	Car
Private Bus – Matatu – Matatu	Matatu

Source: JICA Expert Team

From the HIS Survey, there were 366 such combinations. These were aggregated into 11 dominant modes.



Source: JICA Expert Team

Dominant Trip Modes from HIS Survey

For demand forecasting, these have been simplified into three categories, as follows:

Passenger Trip Mode Categories from HIS

Dominant Mode	Demand Forecasting
Car	1. Private
Matatu	2. Public
Bus	
Boda Boda	3. Taxi
Tuk Tuk	
Trailer	Freight
Truck	
Walk	Walk
Bicycle	
Push Cart	
Other	

Source: JICA Expert Team

As shown in the figure above, Walk trips are the dominant mode in Mombasa. However, the purpose of modeling is to forecast the vehicle traffic flow on the road network, so the demand analysis includes the modes of Private, Public, and Taxi. Freight was excluded for two reasons: (i) its low frequency (41/21,110, or 0.2% of the HIS trips), and (ii) the effect of freight on the road is captured separately (through TVS surveys), and not included in a passenger trip forecasting.

With regard to vehicle traffic modeling, the Likoni Ferry traffic cannot be expressed by the model. For example, a traveler from Likoni to Nyali, using walk, ferry, and matatu modes, is modeled as a matatu user for the entire trip, and virtually assigned as "traffic" at the Likoni Channel. Therefore, the four modes for reproducibility check are as follows:

Final Modes for Demand Forecasting

Source	Demand Forecasting
HIS Passenger Trips	1. Private
	2. Public
	3. Taxi
TVS Counts and Freight Surveys	4. Freight

Source: JICA Expert Team

Mode Characteristics

For modeling purposes, the four modes require a velocity and PCU factor applied to them. Velocity factors are based off of operating conditions (e.g., matatus and tuk tuks have speed governors), and PCU values are based off industry standards (freight is adjusted upward, to represent the high prevalence of trailers in Mombasa). The PCU of the Freight is set as 3.5, representative of freight in Mombasa (dominated by trailers and trucks).

Velocity and PCU of Travel Modes

Mode	Velocity	PCU
1. Private	80	1.0
2. Public	80	1.2
3. Taxi	60	0.75
4. Freight	40	3.5

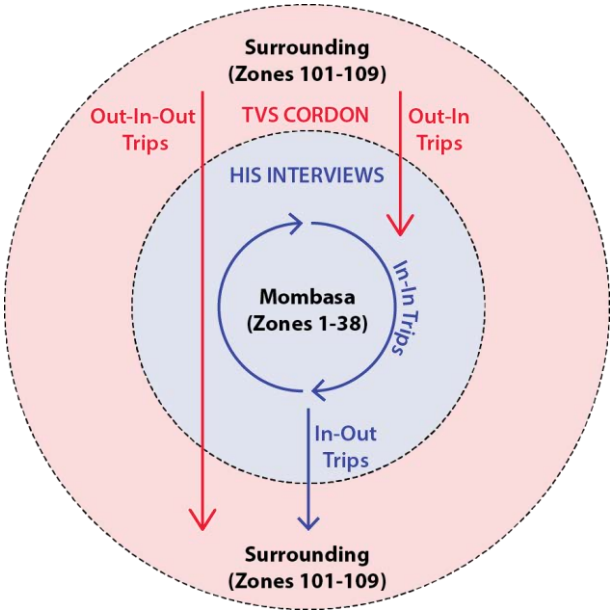
Source: JICA Expert Team

3.2 O-D Matrix Preparation

O-D matrices were produced for two types of traffic: (i) passenger trips (in the Private, Public, and Taxi modes, and Walk), and (ii) freight movements.

Passenger O-D Preparation

Passenger movements in the study area are captured in two ways. HIS surveys were conducted in Mombasa (i.e., Zones 1-38), and account for trips of those residents. However, there are also trips originating from outside this area and into the city. These trips were captured separately by TVS cordon line surveys. The theory behind this is represented in the diagram below:



Source: JICA Expert Team

Internal and External Trips Captured by HIS and TVS

Expansion of HIS Trips

After preparation of O-D tables of HIS trips by Trip Mode (Public, Private, Taxi, Walk), the total number trips in each O-D table was multiplied by a factor of 80. The target sampling rate for the HIS survey was 1.25% of the population. Therefore, if the HIS sample accounts for 1.25% of the population, 100/1.25 = 80.

Expansion of TVS Cordon Trips

At TVS Cordon points, both passenger interview O-D surveys (of matatus) and vehicle O-D surveys were conducted for 12 hours. There are three types of expansions of this data which are required:

- Expanding from 12 to 24 hours.
- Accounting for sampling rate of vehicles (not every vehicle can be stopped for the surveys).
- Accounting for the sampling rate within matatus (only one-third of passengers were interviewed).

To expand from 12 to 24 hours, a factor of 1.37 was calculated by examining Screen Line Survey data (which was 24 hours). The sum of the first 12 hours was compared to the overall 24-hour sum at each of the three screen line locations, and a blended average of 1.37 was calculated.

To account for the vehicle sampling rate, the number of stopped vehicles by type (tuk tuk, matatu, passenger car, etc.) was compared to the total classified traffic count at the same location. The table below shows an example of one such calculation.

Sample Stopping Rate Expansion at Cordon Line (C1: Mtwapa)

	Bicycle / Push Cart	Tuk Tuk	Boda Boda	Car/Private Matatu/Bus	Matatu	Bus
Classified Count	451	168	4573	3004	1449	185
Stopped Count	7	7	4	227	267	35
Expansion	64.43	24.00	1143.25	13.23	5.43	5.29

Source: JICA Expert Team

Finally, for accounting for the sampling rate within matatus, each passenger interview was considered to be three passengers.

Workflow of Expansion of O-D Trips from Cordon Line Surveys

	Vehicle O-D Surveys	Passenger O-D Surveys
Original Count	Count of Stopped Vehicles by Type	
	▼	
Expansion	*Vehicle Stopping Rate by Type*	
	▼	
Count	Total Expected Vehicles	
	▼	
Expansion	*Expanded from 12 to 24 hours (factor of 1.37)*	
	▼	
Count	Vehicle Passengers	Matatu Passengers
	▼	▼
Expansion	*None*	*apx. 1/3 sampling (factor of 3)*
	▼	▼
Final O-D Trips	**Vehicle Passengers O-D**	**Matatu Passengers O-D**

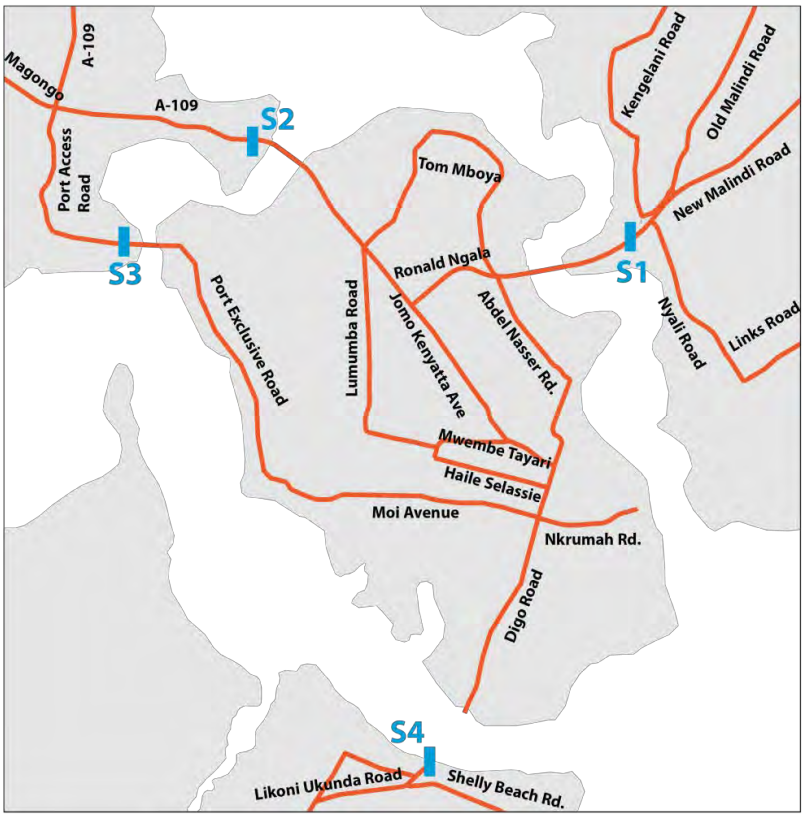
Source: JICA Expert Team

Combining HIS & TVS

By combining sums of the expanded HIS and TVS O-D tables, a complete Passenger O-D by Mode (Private, Public, Taxi, Walk) is accomplished.

Vehicle Trip O-D

Given the completed Passenger O-D Tables, the next step is to convert the Passenger Trips into Vehicle Trips. In order to do so, it is required to calculate occupancy rates for different vehicle types. From the TVS Survey, occupancy rates were measured at Screen Line Survey locations ((i) Malindi Road at Nyali Bridge, (ii) A109 at Causeway, (iii) Port Exclusive Road, (iv) Ukunda Road at Ferry Crossing). The survey locations and loading data are as follows:



Source: JICA Expert Team

Screen Line Locations Used for Occupancy Rates

Occupancy Rates Recorded in TVS Screen Line Surveys

Tuk Tuks Private Vehicles	Matatu (14 or fewer seats) Bus (over 14 seats)
1 – Driver only	A – Empty
2 – Driver + 1 Pass	B – 1/4 full
3 – Driver + 2 Pass	C – 1/2 full
4 – Driver + 3 Pass	D – full
5 – Driver + 4 or more Pass	E – overloaded

Source: JICA Expert Team

Of the four Screen Line Survey locations, Malindi Road at Nyali Bridge and A109 at Causeway are considered appropriate representations of Mombasa traffic (the Port Exclusive Road is basically for freight only, and at the Ferry Crossing most people cross on foot).

Applying the occupancy values to the counts at the two selected Screen Line locations, the following average occupancy rates were calculated:

Occupancy Rates for Modes

	Private	Taxi	Public
Occupancy Rate	1.67	2.18	8.55

Note: Within "Public", matatus were weighted as 90% of the total and larger buses as 10%.
Source: JICA Expert Team

Finally, by applying these occupancy rates to the Passenger Trip O-D, a Vehicle Trip O-D matrix is generated, which will be used for assignment in the traffic model.

Freight O-D Preparation

The conditions of freight movement in Mombasa are unique. Every day in Mombasa, the majority of freight movement is Port-related. In a well-functioning freight transport environment, all Port-related cargo would be managed and handled within the Port's boundaries, only leaving to reach a major access road (e.g., A-109) toward its final destination. However, the Port-related activities of Mombasa spill out throughout the Changamwe/Jomvu/Shimanzi areas. Container stuffing, customs clearance, empty container transport, and other functions happen in these areas. The associated heavy vehicles – lorries, tractors hauling empty containers, etc. – are forced to circulate throughout the urban area and/or park on the roadside, creating vast congestion. On ship-calling days, backups of heavy vehicles queuing to enter the Port stretch back to major intersections of commuter roads, exponentially increasing travel time.

With this in mind, it was important to capture a freight O-D for Mombasa, to confirm the quantity of HVs on the roads, as well as determine how much freight is bound for external locations (e.g., Nairobi). Information on freight movements in Mombasa was collected in three ways: (i) TVS Cordon Surveys, (ii) TVS Freight Interviews in June 2015, and (iii) a local freight O-D survey in June 2016 (focusing on Kongowea Market).

Expansion of TVS Cordon Data and Freight Interview

The expansion of TVS Cordon Line and Freight Interview Survey data follows the same methodology as was used for passenger/vehicle expansion: comparing the stopping rate by vehicle type to the classified counts by type at the same location. By summing these two sets of data, the first O-D table is created.

Further Adjustments

With the first O-D table created by expansion of the TVS data, the values at six locations were compared to the actual classified counts. At the initial comparison, large differences were found between the predicted and observed counts, as per the table below:

Unadjusted Freight O-D vs. Actual Counts (Heavy Vehicle) at Key Locations

Location	Original O-D	Actual Count	Diff. %
Likoni	2,385	1,032	-131 %
Nyali	2,840	8,010	65 %
Changamwe	7,451	9,255	19 %
Ukunda	2,550	1,119	-128 %
Mtwapa	1,721	2,873	40 %
Miritini	4,037	8,209	51 %

Source: JICA Expert Team

This gap was created by the following discrepancies: (i) selection bias in the location of freight interview surveys (the interviews in Kilindini may expand the OD for Likoni and Ukunda, while at the same time, the four locations of interviews in Changamwe/Shimanzi more accurately detected O-D), and (ii) the local freight movements were not captured as much in the surveys, which focused on Port-related traffic (the major source in Mombasa). Shortages are seen in movements in Nyali.

In order to minimize the differences at these key crossings, a series of eight iterations of adjustments were conducted on the data. For example, any O-D pair that was going between Mainland North zones and Island zones (passing through the Nyali Bridge) was multiplied by a factor of 2.82 (8,010/2,840 = 2.82). After the eight iterations, the resulting differences were within acceptable thresholds, as follows:

Adjusted Freight O-D vs. Actual Counts at Key Locations (after 8th iteration)

	Adjusted O-D	Actual Count	Diff. %
Likoni	1,001	1,032	3%
Nyali	7,857	8,010	2%
Changamwe	10,061	9,255	-9%
Ukunda	1,133	1,119	-1%
Mtwapa	2,845	2,873	1%
Miritini	7,844	8,209	4%

Source: JICA Expert Team

With this, the Freight O-D matrix is generated, which will be used for assignment in the traffic model.

3.3 Forecasting System

The JICA STRADA version 3.0 (System for Traffic Demand Analysis) software suite for transport demand forecasting was used for network development and traffic assignment.

3.4 Network Model

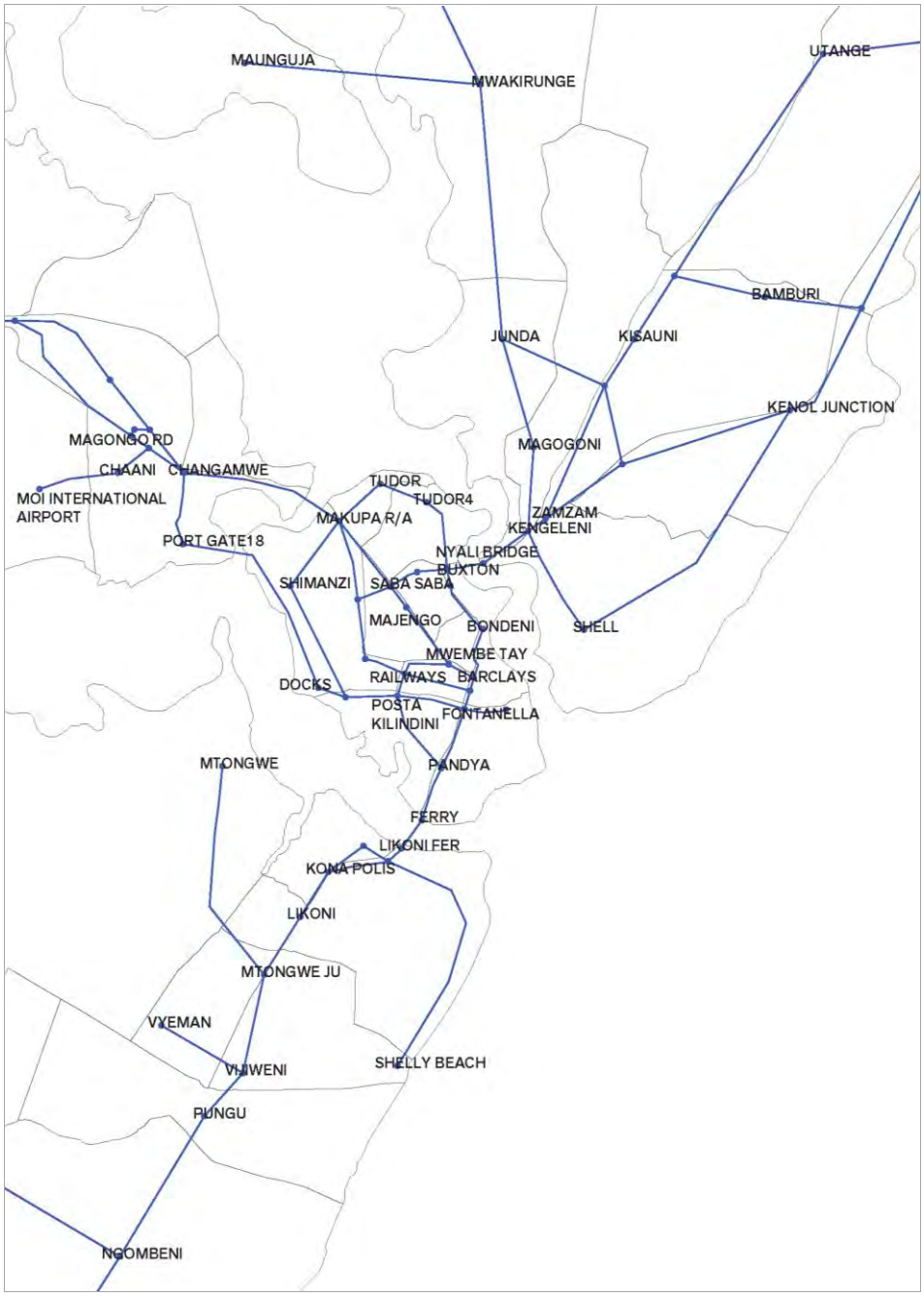
There is no complete inventory of roads in Mombasa with information such as widths, design capacity, and speed restrictions. As such, the road network was simplified into key passageways connecting zones. Three capacity levels were created: low, medium, and high. Assigning capacities to roads in the networks by done by observations of the congestion levels and TVS traffic count data.

Network Road Types and Attributes

Road	Velocity (kph)	Capacity (veh/day)
Low	40	10,000
Medium	60	25,000
High	80	50,000

Note: In some areas, capacity/velocity pairs "mix and match", e.g., to represent the throughput limiting nature of a roundabout, capacity is lowered while speed is maintained.
Source: JICA Expert Team

The simplified network model has 81 nodes (51 of which are zone centroids) and 96 links. A sample of the network (focusing on the Island and close-by Mainland areas) is shown below:

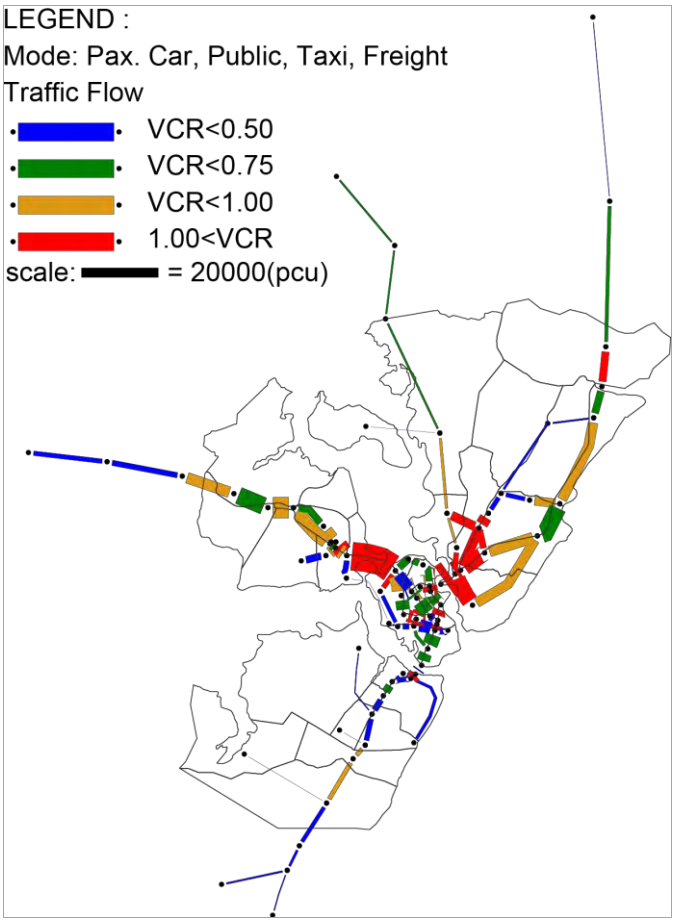


Source: JICA Expert Team

2015 Base Road Network (Island and Close-by Mainland Areas)

3.5 Assignment Results for Baseline Model

Using an incremental assignment model, applying the O-D for Passenger Trips and Freight on the network model yields the following results:



Source: JICA Expert Team

Reproducibility Check: Initial O-D on Existing Road Network

4 Four-Step Model

4.1 Trip Production Forecasting

Before the four-step demand forecasting model, a model of Trip Production for the entire study area is created, for predicting the total number of trips/day.

From the HIS Survey, there were 19,242 valid trips. The number of people surveyed (those above age 5) was 10,783, for a gross trip rate of 1.7844. The number of people who made trips was 8,633, for a net trip rate of 2.2289.

Trip Rates from HIS

Gross Trip Rate	Net Trip Rate
1.7844	2.2289

Source: JICA Expert Team

A further breakdown of these trip rates are shown in the tables below:

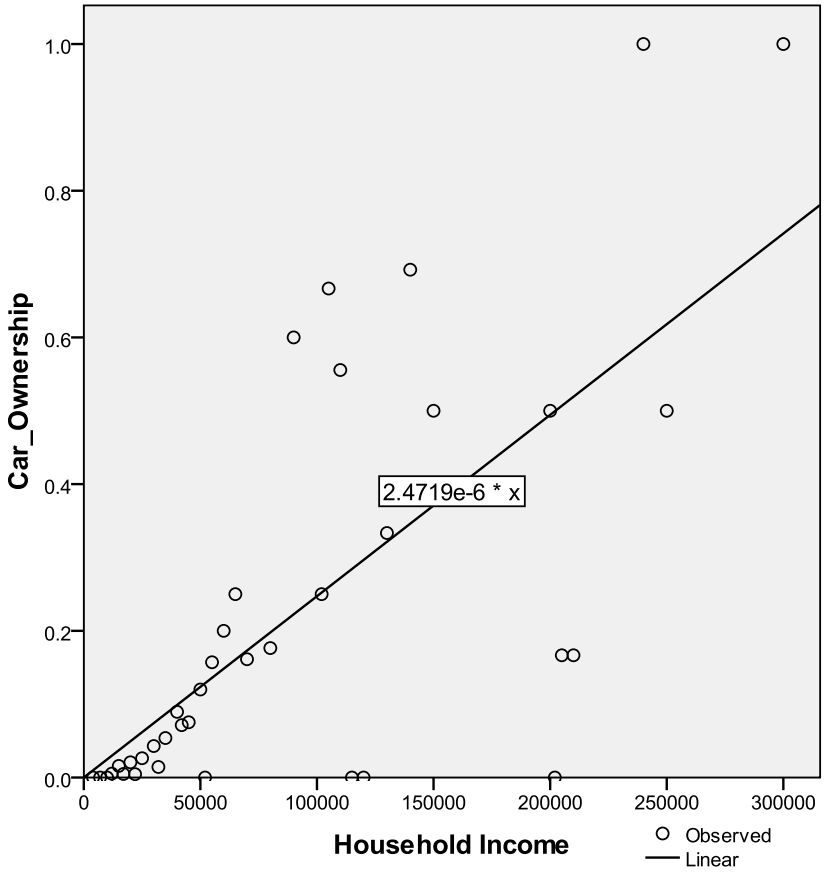
Trip Rates by Key Characteristics (Net Rate)

		Trip Purpose				
Household		**Home**	**Work**	**School**	**Others**	**Total**
Non-car owner	Employee	1.0586	0.8280	0.0083	0.3388	2.2337
	Student	1.1124	0.0096	1.0612	0.0601	2.2433
	Unemployed	1.0619	0.0230	0.0044	1.0637	2.1531
	Total	1.0766	0.4517	0.3506	0.3470	2.2258
Car owner	Employee	1.0809	0.8553	0.0085	0.4085	2.3532
	Student	1.0879	0.0110	1.0220	0.0769	2.1978
	Unemployed	1.0741	0.0741	0.0000	1.0370	2.1852
	Total	1.0822	0.5779	0.2691	0.3711	2.3003
Total	Employee	1.0597	0.8294	0.0083	0.3423	2.2397
	Student	1.1116	0.0097	1.0599	0.0606	2.2418
	Unemployed	1.0622	0.0242	0.0043	1.0631	2.1538
	Total	1.0768	0.4569	0.3473	0.3480	2.2289

Note: "Unemployed" includes those who are self-employed, a major characteristic of Mombasa
Source: JICA Expert Team

It is notable that there is not much variation between employed/unemployed, student/employee, etc. This is majorly attributed to the fact that "unemployed" includes those who are self-employed informally, a major characteristic of Mombasa.

It is also notable that there is not much variation in trip generation between car owners and non-car owners (2.303 and 2.2258, respectively). However, in general, car ownership is extremely low in Mombasa (4%), to the point where it is difficult to model. The diagram below shows the correlation between household income and car ownership rate:



Note: r-squared = 0.693
Source: JICA Expert Team

Household Car Ownership vs. Household Income

4.2 Trip Generation and Attraction Forecasting

The first step in the four-step disaggregated model, a Trip Generation and Attraction model is used to forecast the traffic volumes which depart and arrive at each zone. For interzonal and intrazonal trips, two equations for the model are shown below:

$G_i = (a_i * X1_i) + (b_i * X2_i) + (c_i * X3_i) + \cdots + k$ Interzonal Generation Model

$A_j = (a_j * X1_j) + (b_j * X2_j) + (c_j * X3_j) + \cdots + k$ Interzonal Attraction Model

$I_i = k * {G_i}^{\alpha} * {A_i}^{\beta} * {X1_i}^{\gamma} \ldots$ Intrazonal Trip Rate

Where:

G_i : Trips Generated by zone *i*

A_i : Trips Attracted by zone *j*

I_i : Intrazonal trip rate for zone *i*

a_i, b_i, c_i : Interzonal Model coefficients

α, β, γ : Intrazonal Model coefficients

$X1_i$ $X2_j$: Attributes of zone i, j

A separate model is produced for each trip purpose: Home, Work, School, Other. The parameters as determined by regressions are shown below:

Trip Generation and Attraction Parameters (Home)

Variable	Interzonal		Intrazonal
	Generation	Attraction	Generation
Population Over 5 (count)	0.332		
Households (count)		3.570	
Constant	20755.417	-779.653	-1.488
Generation (Intra. only), natural log			0.021
Attraction (Intra. only), natural log			1.023
r-squared	0.125	0.731	0.874

Source: JICA Expert Team

Trip Generation and Attraction Parameters (Work)

Variable	Interzonal		Intrazonal
	Generation	Attraction	Generation
Workers Population (count)	1.089		
Population Density (p/sqkm)			
Commercial Area (sqkm)		4511.707 (standardized)	
Constant	-931.458		-1.098
Generation (Intra. only), natural log			0.871
Attraction (Intra. only), natural log			0.119
r-squared	0.737	0.337	0.845

Source: JICA Expert Team

Trip Generation and Attraction Parameters (School)

Variable	Interzonal		Intrazonal
	Generation	Attraction	Generation
Students (count)	1.959		
Primary Schools (count)		492.714	
Secondary Schools (count)		211.677	
Constant	-200.134	5912.186	-2.390
Generation (Intra. only), natural log			
Attraction (Intra. only), natural log			
r-squared	0.437	0.122	0.802

Source: JICA Expert Team

Trip Generation and Attraction Parameters (Other)

Variable	Interzonal		Intrazonal
	Generation	Attraction	Generation
Commercial Area (sqkm)	3875.967	1486.545	
Constant	3814.635	8435.591	-1.873
Generation (Intra. only), natural log			1.090
Attraction (Intra. only), natural log			-0.020
r-squared	0.306	0.046	0.753

Source: JICA Expert Team

4.3 Trip Distribution Forecasting

The second step in the four-step model for traffic demand forecasting is Trip Distribution Forecasting. The interzonal trip model is the classic gravity model, using the length between zones (shortest network path) instead of time as an impedance factor. The interzonal trip rate is assigned from the modeling in the previous step.

$X_{ij} = K * (G_i{}^{\alpha}) * (A_j{}^{\beta}) / (L_{ij}{}^{\gamma})$ (Interzonal Trip Distribution Gravity Model)

$I_i = k * G_i{}^{\alpha} * A_i{}^{\beta} * X1_i{}^{\gamma}$ ... (Intrazonal Trip Rate Model, from previous step)

Where:

X_{ij} : Interzonal trip distribution from zone *i* to *j*

I_i : Intrazonal trip rate for zone *i* (from previous step)

G_i : Trip generation in zone *i*

A_j : Trip attraction to zone *j*

L_{ij} : Travel length from zone *i* to *j* (km)

K, α, β, γ : Model parameters

To perform a regression, the model is transformed with a logarithm to a linear form:

$X_{ij} = K * (G_i{}^{\alpha}) * (A_j{}^{\beta}) / (L_{ij}{}^{\gamma})$ (Gravity Model)

$ln[X_{ij}] = ln[K * (G_i{}^{\alpha}) * (A_j{}^{\beta}) / (L_{ij}{}^{\gamma})]$ (Logarithmic Transformation)

$ln[X_{ij}] = ln[K] + \alpha * ln[G_i] + \beta * ln[A_i] - \gamma * ln[L_{ij}]$ (Linear Trip Distribution Model)

Interzonal Trip Distribution Model Parameters by Trip Type (Linear Transformed)

Trip Purpose	α	β	γ	K	r-squared
Home	-0.255	0.633	0.622	3.447	0.305
Work	0.582	-0.072	0.324	1.547	0.214
School	0.575	1.062	0.508	-8.498	0.266
Other	0.495	0.354	0.154	-1.798	0.094

Source: JICA Expert Team

4.4 Modal Split Forecasting

The third step in the four-step disaggregated model for traffic demand forecasting is Modal Split Forecasting. The most common method for estimating modal split is with a logit model (i.e., a probabilistic model, with the chance of a user selecting a mode between 0 and 1).

Utility Functions

Before producing the Modal Split models, it is first required to determine the utility function of each mode. The modal shares of walk, car, private, and taxi were regressed against interzonal distance, zone income (average of the O-D pair), household car ownership rate (average of the O-D pair), the cost of each mode (a function of distance and cost per km), and the time (a function of distance and speed) of each mode.

Cost and time matrices were calculated under the following basis:

Cost / Time Matrices Parameters by Mode

Mode	Base Cost	Base Distance (km)	Cost per km	kph
Walk	0	0	0	2.5
Car	20	0	10	60
Public	20	2	15	60
Taxi	50	2	50	60

Source: JICA Expert Team

The utility models with the strongest r-squared values were determined as such:

$U_{walk} = \frac{0.329}{dist_{ij}}$; r-squared = 0.329

$U_{car} = 0.005 + 0.30 * dist_{ij}$; r-squared = 0.563

$U_{bus} = 0.493 + 0.41 * dist_{ij}$; r-squared = 0.309

$U_{taxi} = U_{car} - 0.01 * dist_{ij}$; r-squared N/A

$U_{AGT} = 3.0 * U_{bus}$; r-squared N/A

$U_{BRT} = 1.5 * U_{bus}$; r-squared N/A

For the model U_{walk}, it was expected that income would be the strongest determinant of walk share. However, only the logarithmic distance between zones showed any correlation.

For the models U_{car} and U_{bus}, mode share was predicted by mode cost and income. It was expected that car ownership rate would be the strongest determinant. However, car ownership rates are low in Kenya in general (28 per 1,000 inhabitants).[1] Indeed, the HIS sample, when expanded, accounts for approximately 16,000 cars in the city. With such a relatively small sample size, it is difficult to find a statistically significant correlation involving car ownership.

For the model U_{taxi}, there was no statistically significant relationship found with any of the predictor variables. Therefore, the utility function is fixed to the utility function for cars, using the assumption that a person may interchange trips between car and tuk tuks depending on the situation (certain areas are more difficult to drive / park, a person may find themselves without their car, etc.).

Taxi Share vs. Predictor Variables

	Distance (O-D)	Income (O-D Avg.)	Household Car Share (O-D Avg.)	Time	Cost
r-value (correlation) Correlation	.012	-.003	.022	.167	-.005
p-value (significance)	.806	.955	.652	.001	.923

Source: JICA Expert Team

Mode Split Models

The modal split functions are probabilistic logit models, as follows:

1 Refer to: http://www.busiweek.com/index1.php?Ctp=2&pI=4527&pLv=3&srI=47&spI=28 (motorization rate)

$P_{ij,walk} = e^{U_{walk}} / (e^{U_{walk}} + e^{U_{car}} + e^{U_{bus}} + e^{U_{taxi}})$

…etc. (for each mode type, including AGT and BRT in 2030/2040)

Where:

$P_{ij,mode}$: The probability that a mode is selected for a trip between *i* and *j*

U_{mode} : Utility function for each mode, previously defined

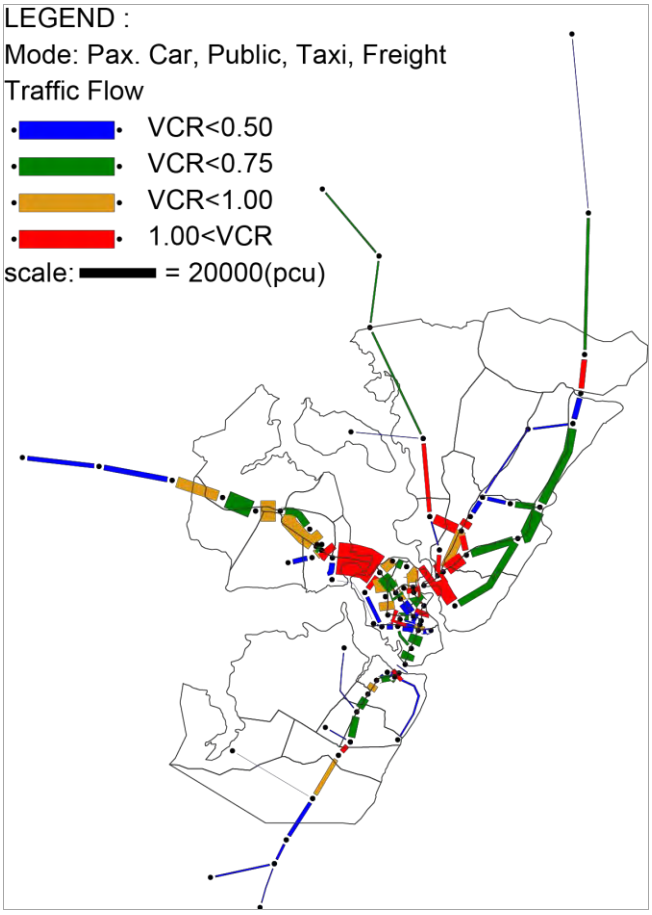
4.5 Trip Assignment

At this stage, internal zones (1-38) passenger O-D matrices are calculated from the Modal Split Models.

The O-D matrices by mode of external trips (to/from zones outside 1-38) are combined with these modeled passenger O-D matrices. (In later stages of reporting, growth of external trips will be a function of population growth in those areas. However, at this stage, they are taken as a given.)

These passenger O-D matrices are combined with the Freight O-D determined by TVS surveys. (In later stages of reporting, a freight production model will be generated, based on Port of Mombasa expansion, for future freight traffic. At this stage, the existing freight O-D is taken as a given.)

The trips are assigned using JICA STRADA Incremental Assignment. The results of the Trip Assignment in the modeled case are shown in the figure below:



Source: JICA Expert Team

Trip Assignment for 2015 (Modeled Case)

The model produced by the JICA Expert Team estimates trip generation and attraction and modal split using the same models for all areas in Mombasa. Using this model is considered appropriate for the traffic forecast in the medium to long term (i.e., for 2030 and 2040) in which transport conditions are expected to be similar across different areas of the county. In the short term, however, the condition of vehicular transport in the Mainland South (Likoni area) would still be behind other areas in Mombasa, and it may be appropriate to better reflect the current traffic situation of Likoni area in the 2020 forecast. To do this, the O-D figures for Mainland South zones in the 2020 forecast are calculated using the area's trip generation/attraction volumes and modal split in 2015 as a base, while the O-D figures for all other areas are estimated using the model produced above.