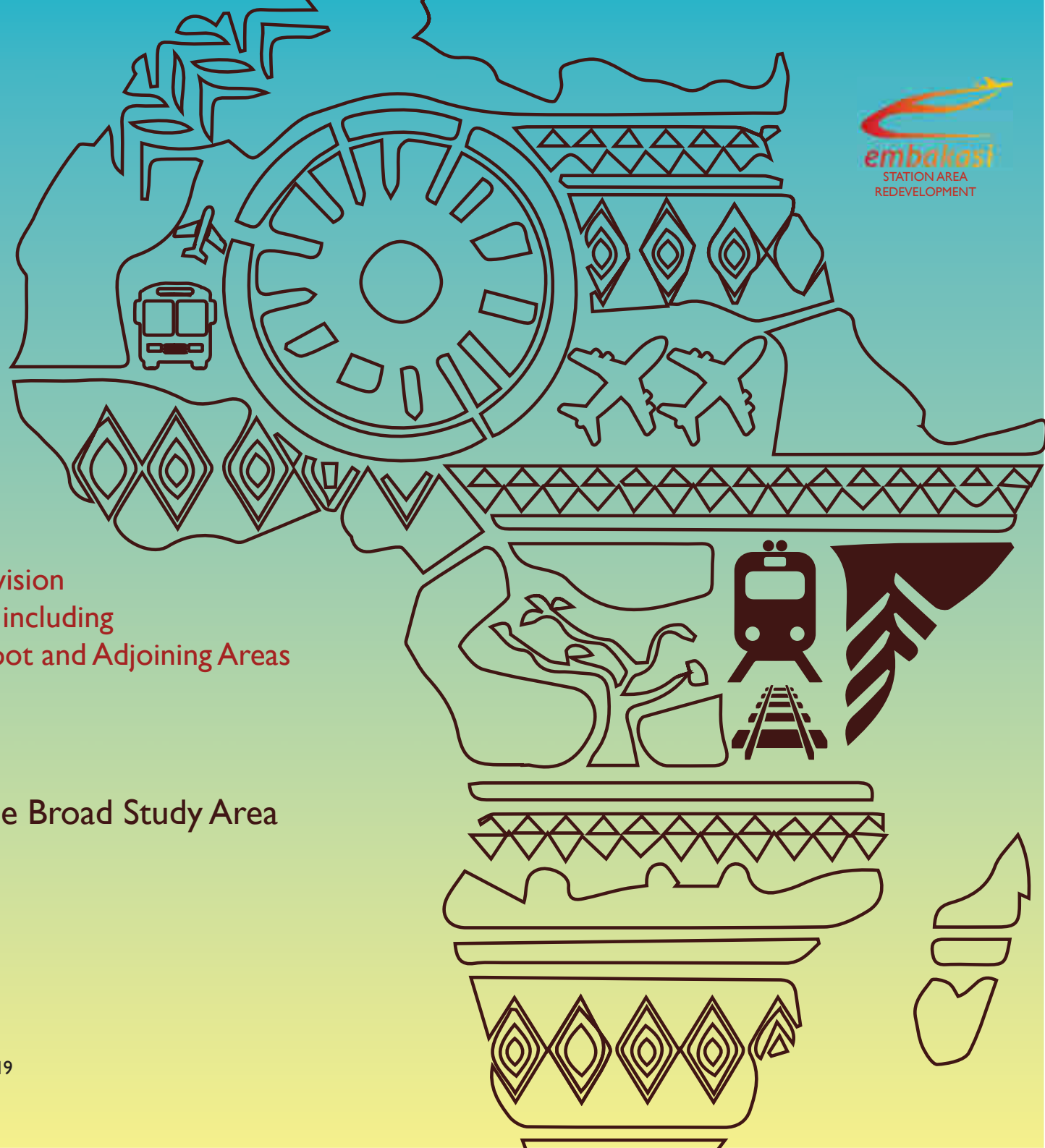
Republic of Kenya | Kenya Railways | Nairobi City County | Machakos County

embakasi STATION AREA REDEVELOPMENT

Planning, Design and Infrastructure Provision for SGR Embakasi Railway Station Area including Syokimau Station, Inland Container Depot and Adjoining Areas

Draft Final Report

Volume 1: Harmonized Plans for the Broad Study Area



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Republic of Kenya

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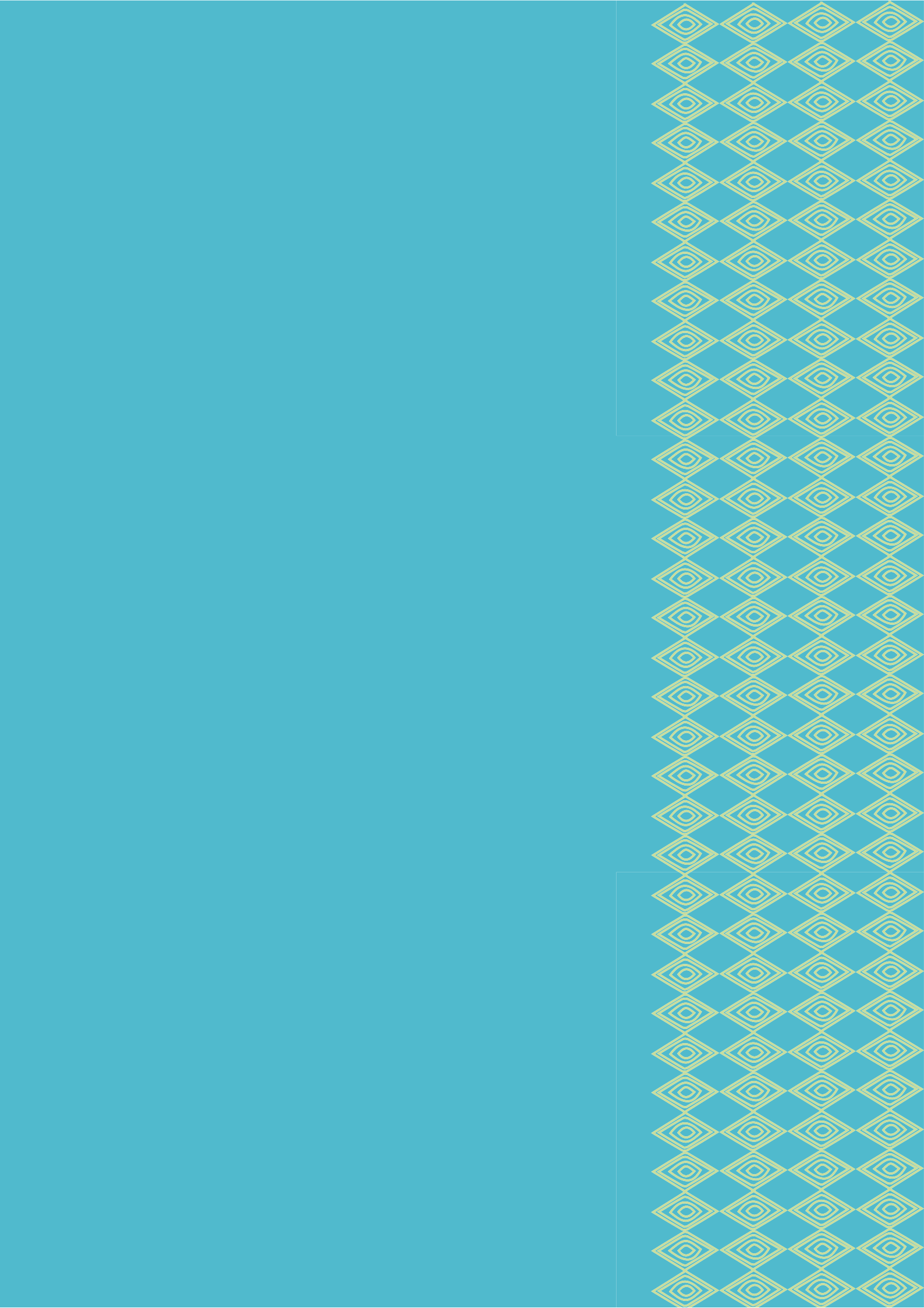

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ABBREVIATIONS AND ACRONYMS

AAK	Architectural Association of Kenya
AWSB	Athi Water Services Board
BRT	Bus Rapid Transit
CBD	Central Business District
CA	Communications Authority of Kenya
DoU&MED	Directorate of Urban and Metropolitan Development
EBK	Engineers Board of Kenya
EPZA	Export Processing Zones Authority
IDEA	Imara Daima Estate Association
ICD	Inland Container Depot
ILUT	Interdisciplinary Land Use and Transport
ISUDP	Integrated Strategic Urban Development Plan
JKIA	Jomo Kenyatta International Airport
KAA	Kenya Airports Authority
KAHC	Kenya Association of Hotelkeepers and Caterers
KAM	Kenya Association of Manufacturers
KEBS	Kenya Bureau of Standards
KCAA	Kenya Civil Aviation Authority
KIP	Kenya Institute of Planning
KIA	Kenya Investment Authority
KMS	Kenya Meteorological Service
KNBS	Kenya National Bureau of Statistics
KNCCI	Kenya National Chamber of Commerce and Industry
KeNHA	Kenya National Highway Authority
KPA	Kenya Ports Authority
KPLC	Kenya Power and Lighting Company
KPDA	Kenya Property Developers Association
KRC	Kenya Railways Corporation
KRA	Kenya Revenue Authority
KRB	Kenya Roads Board
KTB	Kenya Tourist Board
KURA	Kenya Urban Roads Authority
KWRMA	Kenya Water Resources Management Authority
KWS	Kenya Wildlife Services
LRT	Light Rail Transit
MRT	Mass Rail Transit
MRTS	Mass Rapid Transit System
MOE	Ministry of Education
MoITC	Ministry of Industry, Trade & Cooperatives
MOI	Ministry of Information, Communications and Technology
MOM	Ministry of Petroleum and Mining
MOT	Ministry of Tourism
MoTIH&UD	Ministry of Transport, Infrastructure, Housing and Urban Development
MOW	Ministry of Water and Irrigation
NCC	Nairobi City County
NCWSC	Nairobi City Water and Sewage Company
NCR	Nairobi Commuter Rail
NAHA	Nairobi Hawkers Alliance
NIUPLAN	Nairobi Integrated Urban Development Master Plan
NMR	Nairobi Metropolitan Region
NaMSIP	Nairobi Metropolitan Services Project
NaMATA	Nairobi Metropolitan Transport Authority
NEMA	National Environment Management Authority
NMK	National Museums of Kenya
NTSA	National Transport and Safety Authority
NCTTCA	Northern Corridor Transit and Transport Coordination Authority
NERA	Nyayo Estate Residents Association
OLS	Obstacle Limitations Surfaces
QW	Quick Win
SPC	Spatial Planning Concept
SGR	Standard Gauge Railway
SoK	Survey of Kenya
SRA	Syokimau Residents Association
KARA	The Kenya Alliance of Resident Associations

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embakasi
STATION AREA
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INTRODUCTION

1.1 INTRODUCTION

Dar Al Handasah Consultants (Shair and Partners), (referred to 'Dar' or 'the Consultant') has been commissioned to provide consultancy services for Planning, Design and Infrastructure Provision for the Embakasi SGR Railway Station Area Development including Syokimau Station and Inland Container Depot and Adjoining Areas in Nairobi, Kenya.

The Embakasi SGR Railway Station Area Development Project is part of the wider Nairobi Metropolitan Services Improvement Project (NaMSIP), that is being funded by the World Bank. The objective of NaMSIP is to strengthen service delivery in the metropolitan region by investing in local infrastructure (railways, roads, drainage, etc.) and in providing large-scale metropolitan infrastructure in the area of solid waste, transport, and sewerage services. The project is also an integral element of the World Bank's Country Partnership Strategy (CPS) 2010-2013 that emphasizes the themes of growth, equity, environment and governance.

It is through the NaMSIP Project that the Kenya Railways Corporation, the Nairobi City County; the Directorate of Urban and Metropolitan Development of the Ministry of Transport, Infrastructure, Housing and Urban Development and other key stakeholders, intend to develop the Embakasi Railway Station Area with a view to providing inter-linkages among the various existing modes of transport and creating a new urban sub-centre within Nairobi.

Within the Embakasi Area Redevelopment project, the development of the Core Area shall be referred to as a Local Physical Development Plan and the development of the Study Area (Core and Broader Areas combined) will result in a Regional Physical Development Plan.

1.1.1 PROJECT BACKGROUND

The construction of Phase I of the Standard Gauge Railway (SGR) from Mombasa to Nairobi was completed in May 2017 and the next phase is presently being developed. The SGR is a high capacity, high speed railway for passenger and freight transportation being developed by the Governments of Kenya, Uganda, Rwanda and Southern Sudan, with a view to providing high capacity, cost effective railway transport and connecting the port of Mombasa to Kampala, Kigali and Juba.

Figure 1.1: Study Area showing the approximate Broader Area and Core Area boundaries

The SGR traverses the Study Area (See Section 1.1.2), where it runs in parallel to the Nairobi Commuter Railway (NCR). The NCR network is also presently the subject of a study covering the upgrading of the existing metre gauge line and future extensions.

The SGR development holds particular significance for the NCR, as it will free the existing metre gauge line for the NCR development. The NCR will in turn provide the SGR line with a large metropolitan passenger ridership. The two railway systems interface within the study area and this creates an interdependence and synergy that will have a considerable impact on the transport system and urban development of metropolitan Nairobi.

Further, the location of the Study Area in close proximity to the airport gives it the added potential to transform the Study Area into an important urban sub-centre for the city.

1.1.2 THE STUDY AREA

The study area, as defined in by the Client in the RFP, includes the following key facilities and the areas located within a 1 kilometre radius of the facilities:

- SGR Nairobi South Station – marshalling yard and passenger terminal
- Embakasi Village Commuter Railway Station
- Syokimau Commuter Railway Station
- Embakasi Inland Container Depot
- Airport City
- Mlolongo Freight Logistics Area
- Relevant sections of Highway A8 (previously A104)
- Imara Daima Commuter Railway Station and surrounding areas within the Broader Area boundary.

The Broader Area will be subject of the preparation of the concept master plan to be delivered. Bordering the Study Area is the Nairobi National Park. The boundary of the Broader Area of the study has been confirmed by the Client in the project Inception Report (submitted June 2018).

The Core Area of the Study defines the extents of the detailed urban plans and urban design proposals to be prepared. The location of the Broader Area and Core Area of the site is shown in Figure 1.1.

1.1.3 STRUCTURE OF THE REPORT

This document is the first volume of the Draft Final Report. The overall Report comprises two volumes, as follows:

- Volume 1 builds on the Concept Masterplan prepared during the previous stage of the project, by providing the policies and proposals, plot development and public realm guidelines which set the framework for the creation of a high quality built environment and efficient transport network.
- Volume 2 contains the detailed engineering design of of critical infrastructure selected by the Client during the previous stage of the project.

1.1.4 STRUCTURE OF VOLUME 1

The document includes the following sections:

- Chapter 2 provides the project background, including existing conditions and discussion of the relevant plans, studies and institutional arrangements.
- Chapter 3 explains the policies and proposals that have been formulated for the Study Area.
- Chapter 4 contains details on the Core Area proposed land use and phasing, which have been further developed from the previous stage of the project;
- Chapter 5 is where the detailed plot development guidelines for the Core Area are set-out
- Chapter 6 contains the detailed public realm guidelines for the Core Area;
- Chapter 7 presents the supporting transport policies that have been prepared; and
- Chapter 8 contains a discussion of the airport planning considerations relevant to the development of the Core Area. This is an updated version of what has been presented at various stages throughout the project. It explains how these have informed the proposals for the Core Area and how they should continue to inform future planning and implementation.

Volume 1: Harmonised Plans for the Broad Study Area

Volume 2: Detailed Engineering Design of Critical Infrastructure

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2.1

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STATION AREA
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PROJECT BACKGROUND

1.2 PROJECT BACKGROUND

1.2.1 STRATEGIC CONTEXT

The Study Area is situated to the south of Nairobi, with the Core Area lying within 10km of the city's CBD.

In May 2017, the first phase of the Mombasa to Nairobi Standard Gauge Railway (SGR) was completed, establishing new regional connectivity and thereby considerably enhancing the strategic importance of the site. The SGR is an international high speed railway for passenger and freight transportation that is being developed by the Governments of Kenya, Uganda, Rwanda and Southern Sudan, to provide a high capacity, cost effective railway transport link that and connects the port of Mombasa to the capital cities of Kampala, Kigali and Juba.

1.2.1.1 THE SGR INFLUENCE AND THE NORTHERN CORRIDOR

The Northern Corridor is a multimodal trade route linking the landlocked countries of the Great Lakes Region with the Kenyan maritime sea port of Mombasa. The Northern Corridor Transit and Transport Agreement (NCTTA) treaty facilitates interstate and transit trade between the member states of Burundi, Democratic Republic of Congo, Kenya, Rwanda, and Uganda. (South Sudan acceded to the Agreement in 2012). Through the NCTTA, the Governments of Kenya, Uganda, Rwanda and Southern Sudan are committed to providing high capacity, cost effective railway transport within the Northern Corridor.

1.2.1.2 THE SGR

The SGR is an international, high capacity, high speed standard gauge railway for passenger and freight transportation and a key component of the Northern Corridor Development. The Governments of the four countries (Kenya, Rwanda, and Uganda and Southern Sudan) have signed and ratified a Protocol for the development of an SGR connecting the port of Mombasa to Kampala, Kigali and Juba. Each country will develop the section of the railway line within its borders. Hence Kenya is committed to developing the Mombasa – Malaba section of the entire proposed network to Kigali through Uganda. The Mombasa – Malaba section is being developed in two phases:

- Phase 1 Mombasa / Nairobi: The Mombasa to Nairobi Standard Gauge Railway line was commissioned on May 31, 2017 and the Freight Service was commissioned in May 30, 2017;

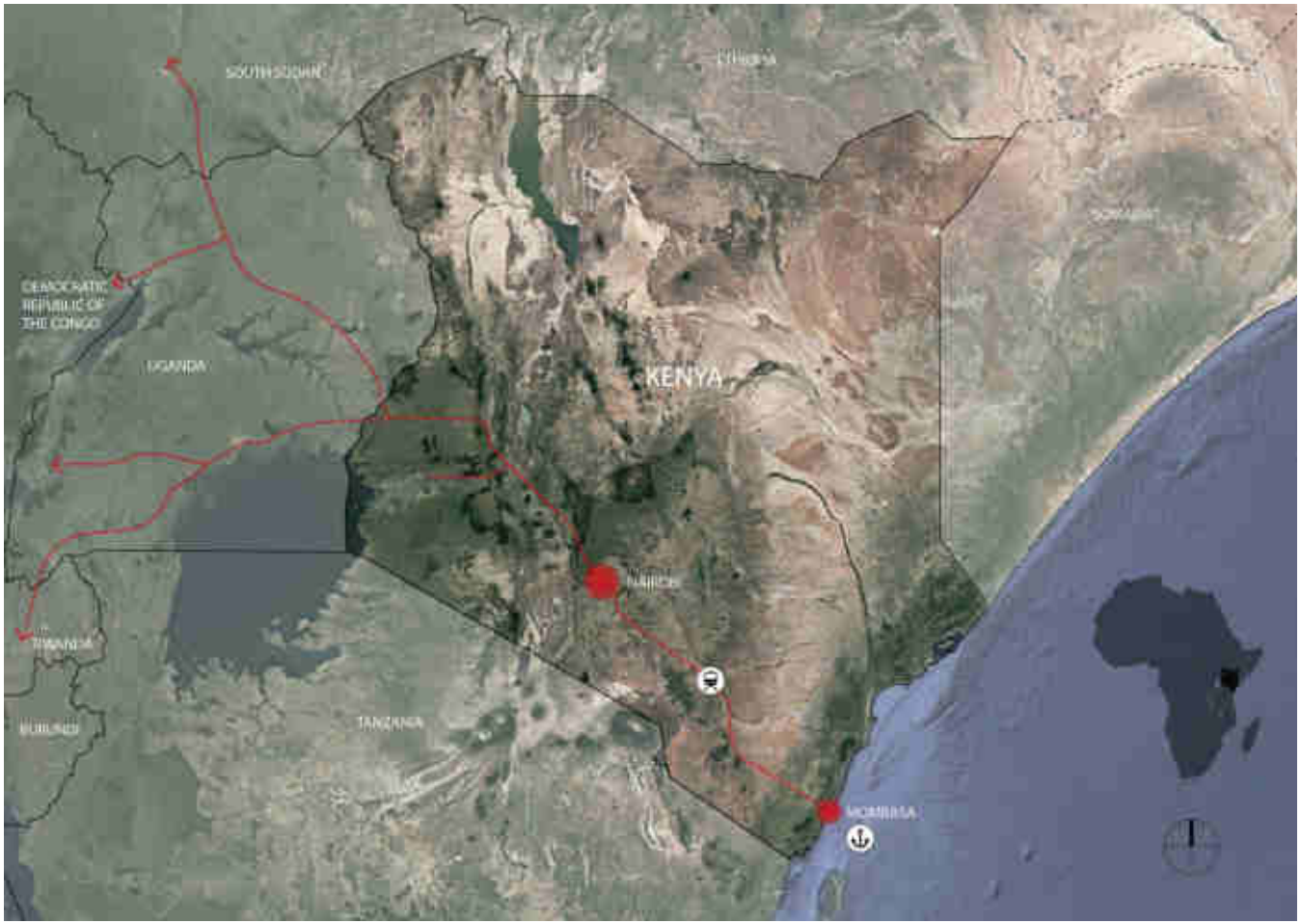

Figure 1.2: Kenya Aerial View and SGR Line

- Phase 2 (Nairobi / Malaba): has been divided into the following three sub-phases:
- Phase 2A – Nairobi / Naivasha;
- Phase 2B – Naivasha / Kisumu including the development of a new high capacity port at Kisumu;
- Phase 2C – Kisumu / Malaba The railway line will have a uniform design specification which will permit seamless operation across the borders of the four countries and in turn reduce transportation and production costs.

1.2.1.3 THE IMPACT OF SGR

The SGR traverses the Study Area, where it runs parallel to the Nairobi Commuter Railway (NCR). The NCR network is presently the subject of a study covering the upgrading of the existing metre gauge line and future extensions.

The SGR development holds particular significance for the NCR, as it will free the existing metre gauge line for the NCR development. The NCR will in turn provide the SGR line with a large metropolitan passenger ridership. These two railway systems interface within the study area, creating a potential interchange hub that can add significant value to Nairobi's transport system and its urban development. The proximity of this interchange hub to the airport gives it the added potential to transform the Study Area into an important urban sub-centre for the city.

It will be crucial that external access to the passenger stations and the marshalling yards to Mombasa Road are established to enable accessibility for the existing and foreseeable large numbers of trucks and passenger vehicles expected in this zone. This should be delivered in a way that reduces conflict between different road users.

1.2.1.4 PLANNING CONTEXT

The Study Area is within the latest structure plan for Nairobi City County, the NIUPLAN 2014. The adjacent diagram shows the site boundary superimposed over the NIUPLAN 2014 and presents the planning context. Located largely to the periphery of the Nairobi Urban Area, the site shows a predominance of transport and industrial uses with large tracts of low-income residential areas.

The structure plans on the following pages (also from NIUPLAN) are evidence that the impact of the new SGR station has not been taken into consideration, as the site is not recognised as one of the sub-centres proposed in NIUPLAN.

An overview of Committed and Ongoing Government projects and their relevance to the site is presented in later in this Chapter.

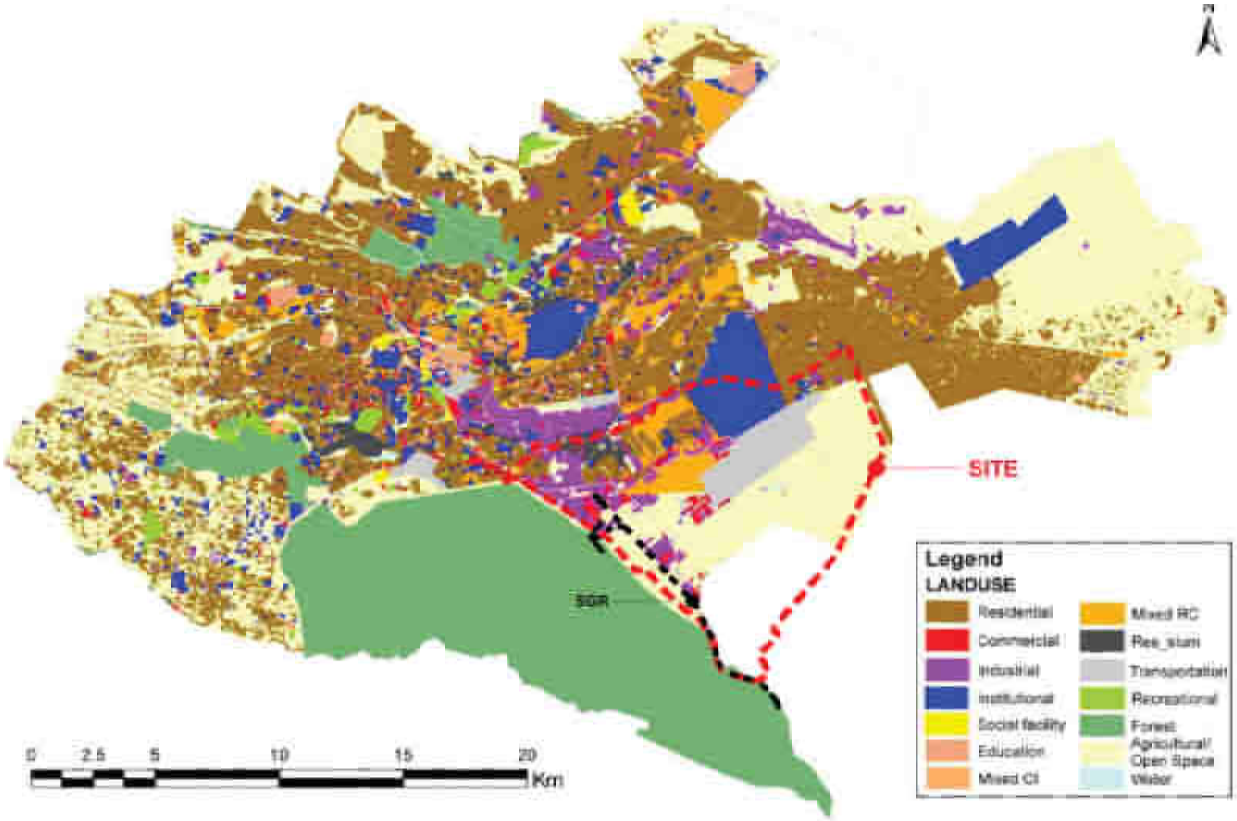

Figure 1.3: NIUPLAN Current Land Use and SGR with Site Boundary

1.2.2 EXISTING CONDITIONS

1.2.2.1 BACKGROUND

The project area lies in both Nairobi County and Machakos County. The counties in Kenya are comprised of constituencies, within which there are several wards, defined as 'electoral units within a constituency'. The project area is situated within the constituencies of Embakasi East and Embakasi South in Nairobi County and Mavoko Constituency in Machakos County.

Within these constituencies the project will be influenced by developments in Syokimau/Mlolongo Ward (Mavoko constituency), Imara Daima Ward (Embakasi South Constituency) and Utawala Ward (Embakasi East Constituency).

Figure 1.4 outlines the project's intended area of influence.

The project area is an urbanised mixed-use site that includes commercial, industrial and residential estates, along with Jomo Kenyatta International Airport (JKIA). The residential areas are highlighted in Figure 1.3. Site visits to the neighbourhoods were undertaken in June 2018, to identify residential areas and community facilities.

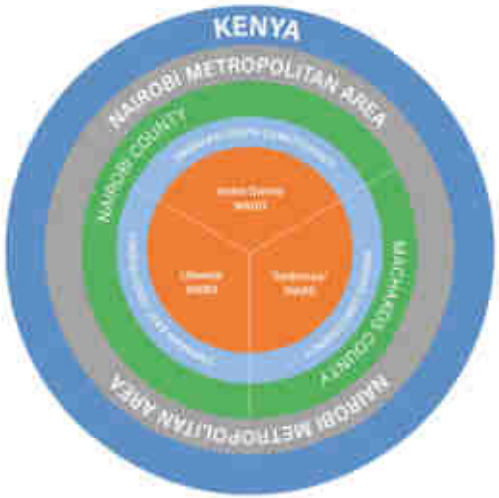

Figure 1.4: Project's Area of Influence

1.2.2.2 LAND USE DISTRIBUTION IN NAIROBI

The NIUPLAN splits Nairobi into three distinct urban areas.

- A centrally located core urban activity area;
- A rapid growth area to the east; and
- An area of environmental value and protection to the west, which includes agricultural activities.

The Study Area is located in the Metropolitan Growth Area in the south east of the city.

Areas of commerce and administration

Nairobi's Central Business District (CBD) is demarcated by key urban roads: Uhuru Highway in the west, University Avenue in the north, and Haile Selassie Avenue in the south. The CBD began as a market place, it was Nairobi's hub for the buying and selling of goods and services. As the city has grown, the CBD has maintained its status as a key centre for commerce and retail, while becoming an important administrative centre. In the mid-20th century, the CBD developed into a centre of finance and it currently provides for private and public office space. This urban morphology has been influenced by a number of tall buildings densifying the area and raising the city's skyline.

The CBD has since extended into the adjacent Upper Hill immediately west of the Uhuru Highway. The area is largely characterised as mixed-use, with amenities required for a large working population. Additionally, the majority of governmental institutions have headquarters in these two locations. Increasingly the city's new private sector office space is located outside the CBD along major arterial roads. This is changing the distribution of offices in the city, and could impact on the current institutional locations.

Mix of character areas in NIUPLAN

As identified by NIUPLAN, Nairobi's areas have diverse characters and thereby face different challenges. The Karen-Langata area, for example, located in the south-western part of Nairobi maintains a low-rise and low-density residential profile with ample open space. Development in Ruai on the other hand, has been conducted in a disjointed manner by private developers that is not adhere to comprehensive development concept, meaning that it is transforming into a high density area and low open spaces area.

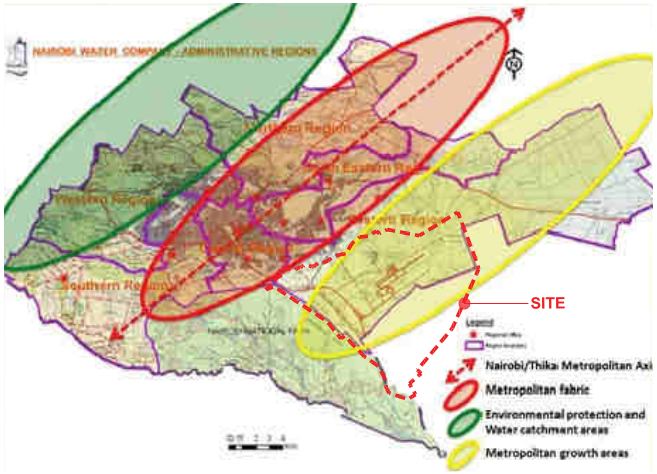

Figure 1.5: Basic Urban Character with Site Boundary (Source: NIUPLAN, 2014)

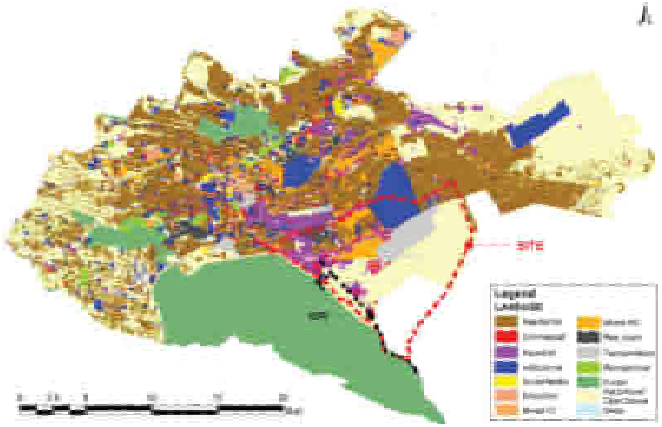

Figure 1.6: Current Land Use and SGR with Site Boundary (Source: NIUPLAN, 2014)

1.2.2.3 LAND-USE CHANGES DURING LAST DECADE

The NIUPLAN highlighted substantial changes that have taken place between 2003 and 2012 that have transformed land uses. These are summarised below:

- **Soil rich farm lands to residential areas**: Northern and eastern parts of Nairobi have rich red soil utilised for tea/coffee plantation or other agricultural activities. These plantations have been recently developed into residential areas;
- **Grasslands to residential areas**: The eastern part of Nairobi is mainly lower grassland with some areas that have become residential;
- **Detached houses to apartment or office**: High land in the western area of Nairobi were developed as estates for European settlers before the independence. Recently low-rise detached houses for single families are converting into high-rise apartments or offices;
- **River bank to informal settlements**: Informal settlements on river banks are still spreading rapidly. A research paper indicated that half of increased population during last decade has settled in so-called slum areas; and
- **Typical development pattern and population density**: Karen and Muthaiga areas have the lowest density in Nairobi of 5 persons/ha, Lavington and Kilimani areas show about 20 to 30 persons/ha respectively. Mathare and Huruma areas show the highest density over 1,000 persons/ha. European average population density is from 50 to 100 person/ha and United States average is around 10 to 20 persons/ha. The Nairobi Metropolitan Growth Strategy 1973 recommended average density 15 persons per acre (equivalent to 37.5 person/ha).

1.2.2.3.1 OVERVIEW OF CONSTRAINTS AND PLANNING ISSUES

As also identified in the NIUPLAN, many of the overall planning issues have been caused by insufficient or outdated urban development management mechanisms that have led to a lack of planning coherenceand are outlined below:

(1) Urban Planning

- **Lack of sufficient urban infrastructure (water supply, sewage, waste disposal, power supply, telecommunications):** A number of infrastructure plans have already been prepared but many are not implemented. In some cases, lack of coordination between Nairobi city and the national governments hinders the process. Since population projection that can be shared by stakeholders has not been available and land use plan that justifies the infrastructure has been weak, implementability and efficiency of the infrastructure plans was not secure;
- **Sprawl and expansion of uncontrolled urban development:** Sprawl and expansion of uncontrolled urban development occurs for several reasons, and the main reasons are that master plan is outdated and development permit and land use plan are not linked. In order to stop urban sprawl, the master plan has to be updated to match the development trend and implementation mechanism of the master plan including development permit system has to be strengthened;
- **Uncontrolled development by private sector (insufficient affordable housings and unplanned development):** In addition to the issues mentioned in (ii), lack of proper public awareness on development control is a cause of uncontrolled development. Some people are unaware that a development permit and building permit are required for development. Disseminating the master plan and rules of development is necessary to reduce uncontrolled development; and
- **Heavy road congestion around the CBD:** A major issue in Nairobi city is heavy congestion around the urban centre, particularly in and around CBD where existing roads bring all traffic to CBD. An integrated development plan is required in order to distribute radial traffic evenly around the CBD, railway yard, upper hill, Nairobi riverfront and Moi Avenue.

(2) Urban Transport

- **Passage of international transport route through the urban centre:** Uhuru Highway, which passes through the centre of Nairobi city is a part of the main road connecting Mombasa to Kisumu (the northern economic corridor). Many articulated vehicles use this route. The road network within and around Nairobi should bypass these routes to reduce congestion of heavy articulated vehicles;
- **Rapid increase of private vehicles:** Car ownership has dramatically increased over recent years, putting increasing pressure on road capacity. Proper planning is required to be able to finance, co-ordinate and develop a strong strategy for improvement, including the consultation of stakeholders;
- **Lack of efficient public transportation system (MRT and BRT):** Nairobi has a population of more than 3 million, yet there is no mass public transit mode. A public transport system is needed in order to ease the movement of people around the city.
- **Delay of road development and intersection improvement (includes suburban areas):** There have been many transport improvement plans, however only a few have been implemented. In order for those plans to be efficiently implemented up to the year 2030, a land-use plan and transport plan have to be synchronized and co-ordinated.

(3) Socio-economics

- **Safety and security in districts:** Safety and security are identified as a priority social concern. Poor planning, design and management are some of the numerous factors that give rise to crime and violence in the city. Existing governance, legal and institutional frameworks have also failed in providing a safe and secure city, which has contributed largely to loss of property and even sometimes loss of possible investment opportunities. Consequently the county's economic development agenda both in terms of loss of human and financial resources is failing. Proper urban development with a strong institutional foundation is required;
- **Inadequate housing for a variety of income groups:** Providing housing for all income levels is required. IHousing issues include high rents, poor housing conditions, congested residential areas, and not enough housing for low income people (believed to be one of the causes of urban sprawl). The government should provide housing through sub-center development and institutional strengthening. Housing should also be provided through public and private collaboration;
- **Insufficient public service facilities (educational and health facilities, regional facilities and open space):** As the population projection and allocation of the population in Nairobi city is not clear, it is difficult to prepare plans for social facility development. A number of public facilities required have to be examined based on the future population and its allocation based on the land-use plan.

(4) Unemployment particularly among youth

- Unemployment, particularly among the youth is prevalent in most districts of Nairobi. unemployment is largely caused by lack of skills and poor access to job market. Equal distribution of social facility development for capacity development and sub-centre development to improve access to employment opportunity are expected to contribute to improving employment condition. In addition, industrial development has to be promoted.

1.2.2.4 LAND HOLD AND LAND TENURE

In Kenya, land hold (land ownership) and land tenure are two distinct terms. About 80% of land in Nairobi is owned by the government, although it is used by a number of bodies and are held by several types of users. About 41% of government land (33% of the total land) is allocated to private owners.

1.2.3 SITE CONDITIONS OVERVIEW

The figure below and adjacent images present an overview of the site conditions. The land uses are largely characterised by large-scale transport and freight uses, a prevalence of industrial sites, some scattered commercial areas, and largely low-income residential areas. The site is severely segregated by transport infrastructure including the major trunk roads Mombasa Road and the Airport North Road, as well as the train lines for the SGR and the Nairobi Commuter Rail (NCR) lines.

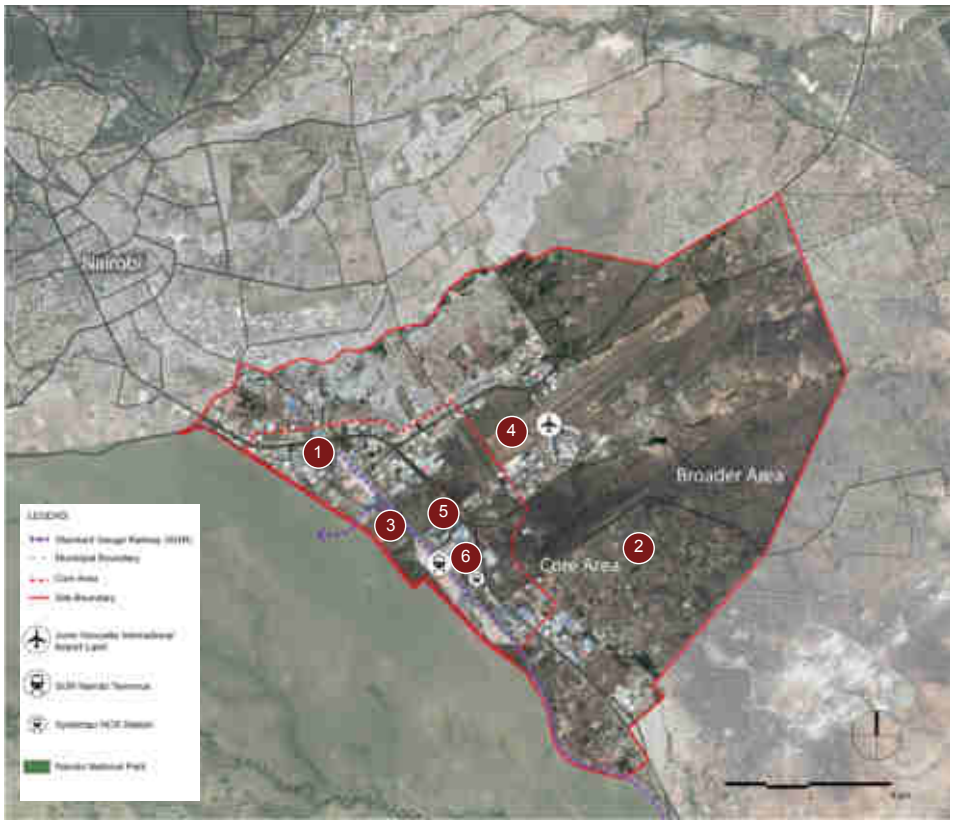

Figure 1.7: The Site and Surrounding Area

Warehousing Facilities adjacent to ICD

Typical Road Condition in Syokimau Residential Area

Nairobi SGR Passenger Terminal

Jomo Kenyatta International Airport

Hilton Hotel in Nairobi West

Gateway Mall along Mombasa Road

Figure 1.8: Photographic Survey

1.2.4 SITE APPRAISAL

The Consultant conducted a series of field reconnaissance and surveys with the principal aim of developing an understanding of the physical, topographical and environmental setting. The following activities were undertaken:

- Recording the physical characteristics of the study area;
- Visually verifying existing structures and general land use activities for the Broader Area and in greater detail for the Core Area, based on publicly available satellite imagery;
- Identifying areas of opportunities and constraints;
- Identifying environmentally important features within the project area; and
- Gathering surface evidence of ground conditions.

The site visit covered the following locations within the Core Area:

- Mombasa Highway within the Core Area and its immediate environs;
- Main access points to the Nairobi SGR Terminus premises;
- Old Mombasa Road within the Core Area and its adjacent land uses;
- Nairobi SGR Terminus facilities (locomotive area, maintenance yard, vehicle depot, freight area) and adjoining industrial/warehousing areas;
- Nairobi Terminus building and SGR/NCR switch-yard area;
- Embakasi Inland Container Depot and adjoining areas;
- Syokimau Commuter Railway Station and the area surroundings;
- Dupoto informal settlement behind Nairobi SGR Terminus;
- Nairobi-Naivasha SGR connection currently under construction;
- Public utilities within the Core Area;
- Airport runways (existing and proposed) flight clearance zones within the Core Area;
- Interchange at Mombasa Road and Eastern Bypass Road junction;
- Existing borrow pits south of Inland Container Depot;
- Vacant lands within the Core Area; and
- Newly acquired land by Kenya Railways located between the National Park and the Nairobi Southern Station premises.

1.2.5 EXISTING LAND USES WITHIN THE STUDY AREA

The general land use pattern within the Broader Area consists of predominantly residential use, transport facilities and industrial/commercial uses.

The Land Use distribution within the Broader Area is indicated in Table 1.1 below, with the subsequent pages providing the overall Land Use Plans for the Broader and Core Area as well as detailed assessments of the various land use zones within the Broader Area.

Table 1.1: Broad Land Use Distribution within the Study Area

Land Use Type	Areas (ha)	Percentages
Formal Residential	*1,386.7*	*13.2%*
Informal Residential	*430.3*	*4.1%*
Mixed-use (Residential/ Commercial)	*388.5*	*3.7%*
Commercial/ Services/ Showrooms	*254.3*	*2.4%*
Industrial/ Warehousing	*867.6*	*8.3%*
Governmental Military Land	*581.1*	*5.5%*
Community Facilities and Utilities	*99.8*	*1.0%*
Transport (Railway Stations)	*190.2*	*1.8%*
JKIA Land	*4,436.9*	*42.3%*
Agriculture	*55.4*	*0.5%*
Vacant Land / Borrow Pits	*1,798.1*	*17.1%*
Total	***10,488.8***	***100.0%***

1.2.5.4.1 BROADER AREA LAND USES

The site has a clear segregation of land uses, with the industrial zones adjacent to the transport/ freight uses of the airport and the SGR.

Residential areas are located in two distinct areas to the north west and the south east of the site.

There is currently vacant land towards the centre of the site, which is ideal for the creation of a transport hub or city sub-centre linking the airport and the SGR terminus.

Some vacant land is also seen to the south of the site and this can be developed to maximise the industrial and logistics opportunities as well as the creation of bus / matatu termini or 'park and ride' facilities with a view to aiding metro ridership.

The Inland Container Depot to the west of the site is surrounded by industrial uses which can be consolidated.

The conflicting land uses here are primarily industrial areas (particularly in front of the SGR terminus) which currently occupy prime frontages and locations.

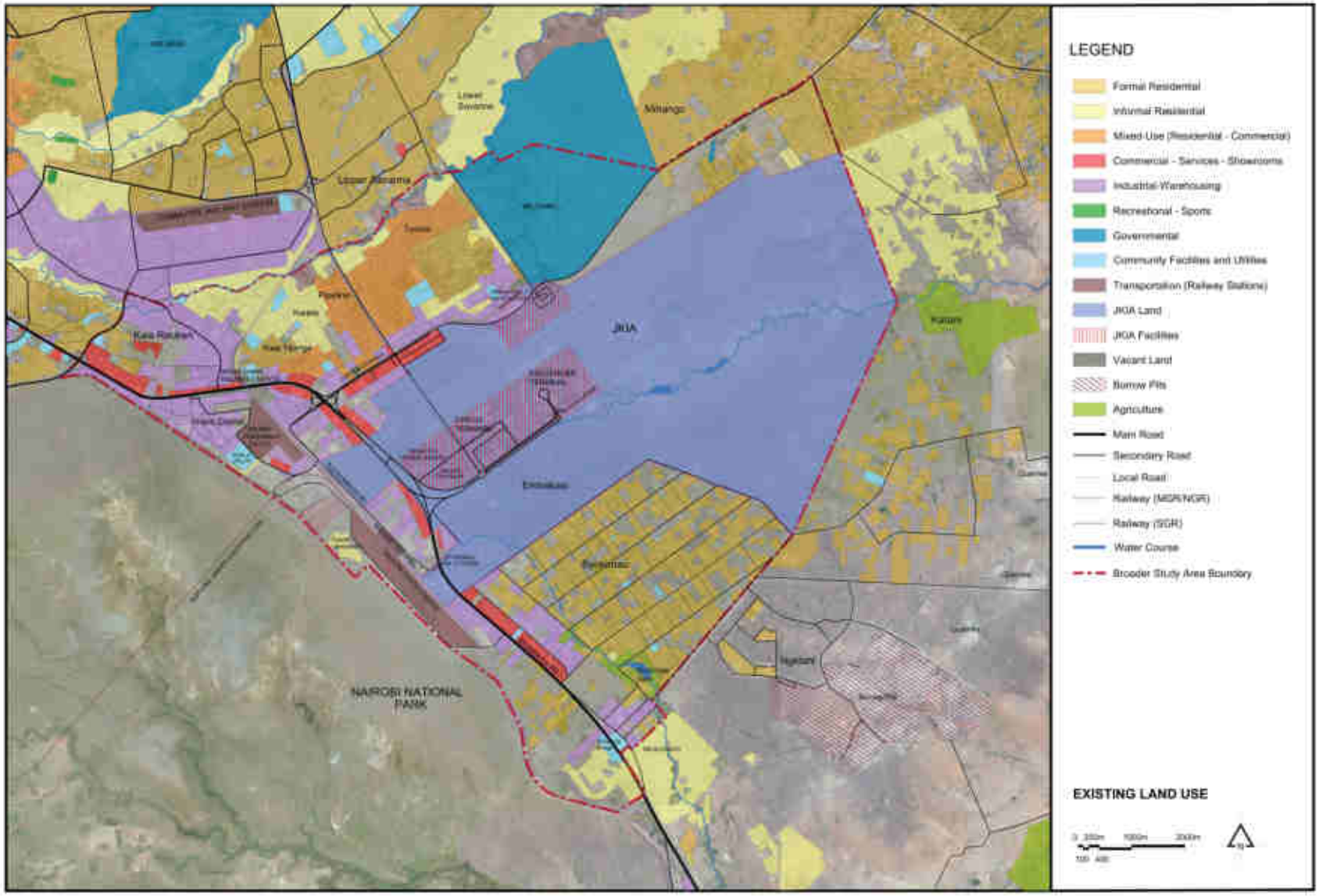

Figure 1.9: General Land Uses Map

1.2.5.4.2 CORE AREA LAND USES

The Core Area comprises primarily industrial and transport uses and vacant land. Transport uses are located on the south-west side of the SGR Nairobi Terminus and SGR railway and include a large marshalling yard and associated rail operations. The ICD is a prominent feature in the north-west part of the Core Area, with a large industrial area surrounding it on all sides. Some vacant land is present within the Core Area, located primarily between the marshalling yard and industrial area, and to the north-east of the SGR Nairobi Terminus. Also within the area between the marshalling yard and industrial area is an informal Dupoto settlement and some borrow pits.

Outside the Core Area, mixed-use commercial and industrial areas are seen to the north, with industrial beyond this to the north-west and residential to the north-east. To the east is JKIA and associated uses, and to the south-east are residential, industrial and commercial uses at Syokimau and Mlolongo. The entire south-west edge of the Core Area abuts the Nairobi National Park boundary.

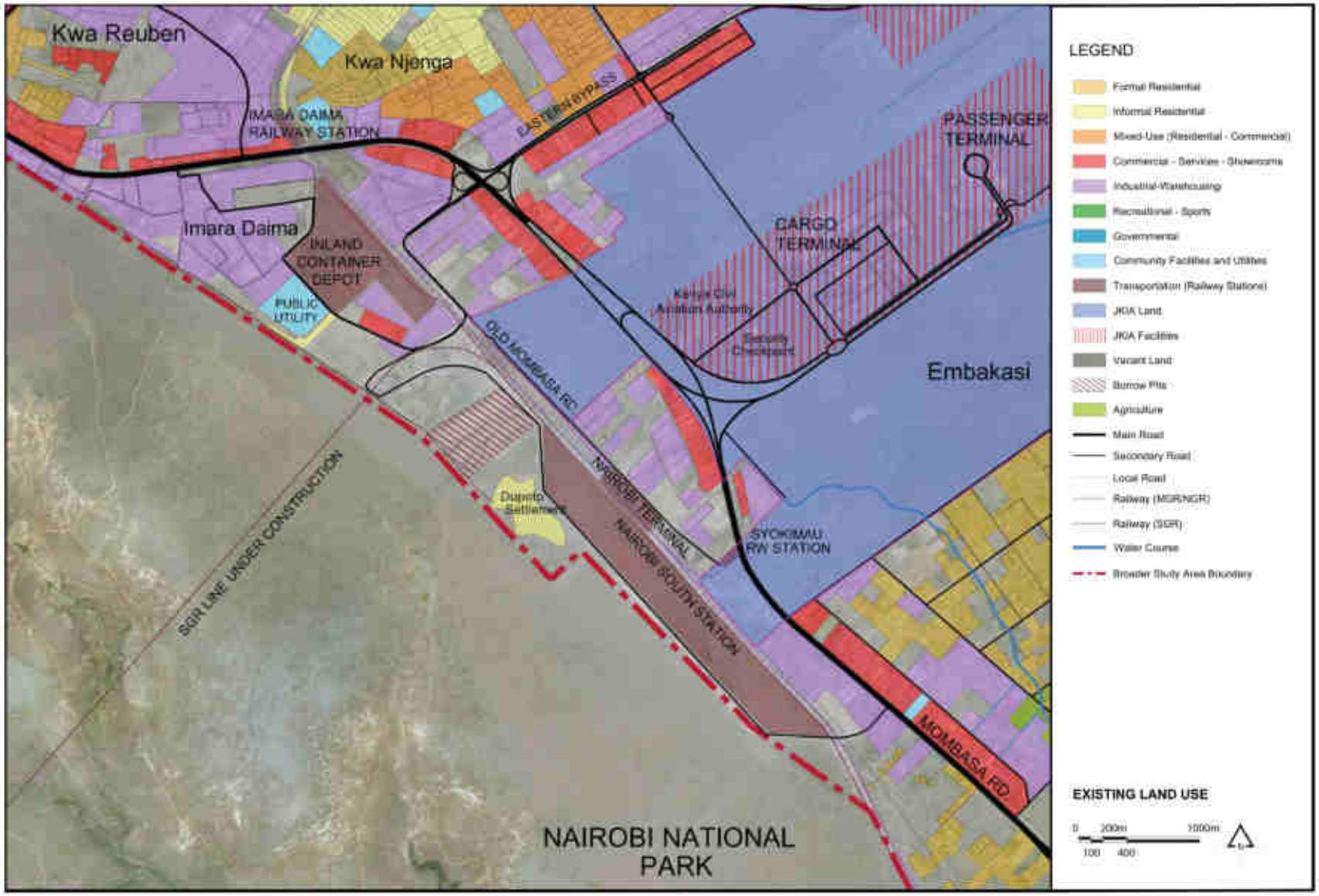

Figure 1.10: Land Uses Map of Core Area

The section examines the key features of the various land use zones identified within the site.

1.2.5.4.3 MOMBASA ROAD NORTH

The Nairobi-Mombasa Road is the main link between Nairobi, Kenya's largest city and Mombasa, the country's largest port city. The road is part of the Great North Road that links the Kenyan coast to the land-locked countries of Burundi, the Democratic Republic of Congo, Rwanda, Uganda and South Sudan. There are severe congestion issues, largely due to the concentration of heavy-duty freight vehicles and the road being the main route to access the JKIA from the north and the south, also the main route to access the Nairobi CBD from the south.

- Mombasa road is a major constraint within the study area, providing a substantial barrier between the JKIA and the SGR Nairobi terminus;
- To the north of Mombasa road, the newly built Imara Daima Station has been designated as a new sub-centre within the NIUPLAN 2014 proposals.

1.2.5.4.4 MOMBASA ROAD SOUTH

Development along the road is largely a mix of industrial and commercial uses, with some scattered small-scale industrial uses occurring to the south.

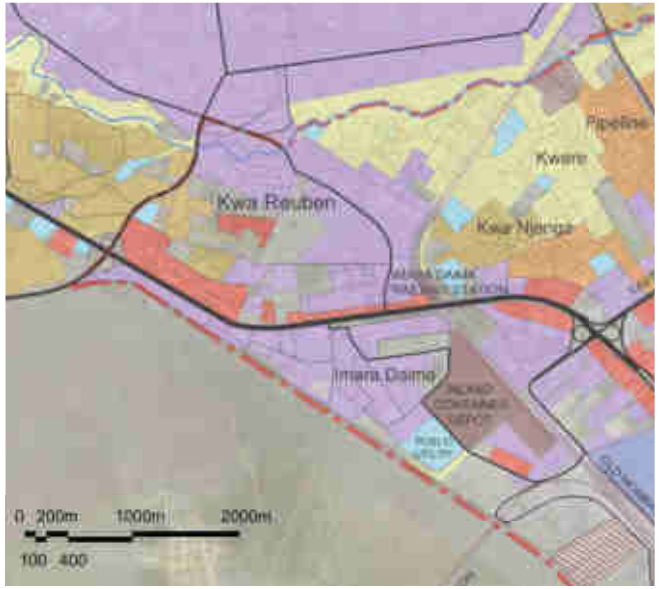

Figure 1.11: Location of pictures for Mombasa Road North

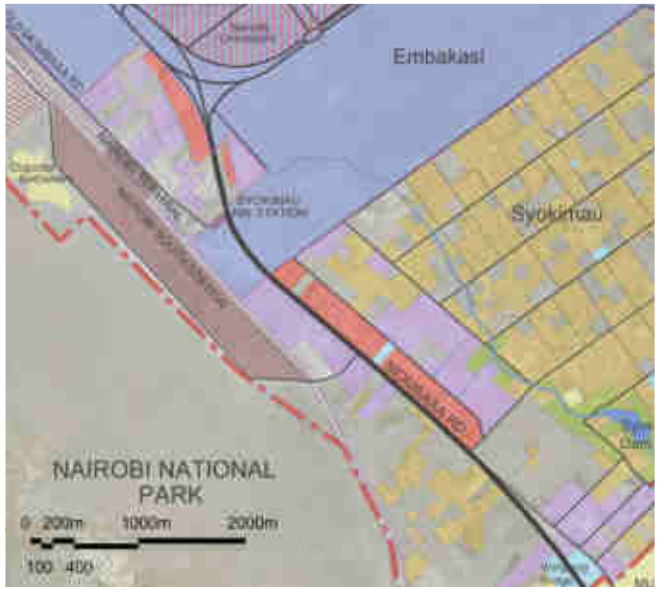

Figure 1.12: Location of pictures for Mombasa Road South

1.2.5.4.5 KRC TRANSPORT FACILITIES

The KRC-owned land within the study area comprises the marshalling yards, housing for railway staff and some industrial development. The land in proximity to the SGR affords the potential to be consolidated with an integrated transport hub.

An area of the land has been occupied by squatters with scattered dwellings.

A gated road links the KRC land to the ICD and the industrial development existing to the north-west of the site.

1.2.5.4.6 SGR NAIROBI TERMINUS

The Mombasa-Nairobi SGR is the biggest infrastructure project in Kenya in recent years. The station built in close proximity to the JKIA, which affords substantial potential for the creation of a new sub-centre at Embakasi.

At present the station is fronted by conflicting land uses, primarily industrial and vacant land, with poor access from JKIA and Mombasa Road. Adjacent roads are at present, poorly developed.

There is potential to create a road link with Imara Daima and an NCR station within the SGR terminus. At present, a temporary platform has been constructed to service the NCR line.

There is also the potential to create a modern transport hub which will create a sense of place and add a much needed contemporary image for modern Nairobi, with direct lins to JKIA Airport.

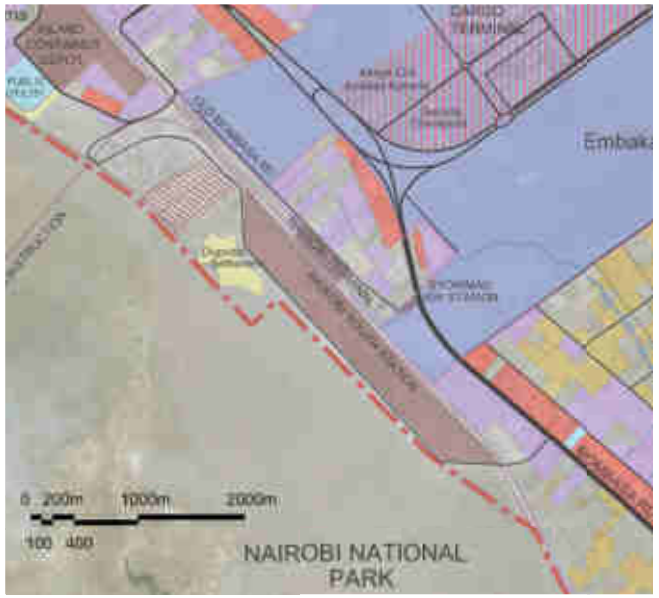

Figure 1.13: Location of pictures for KRC Transport Facilities

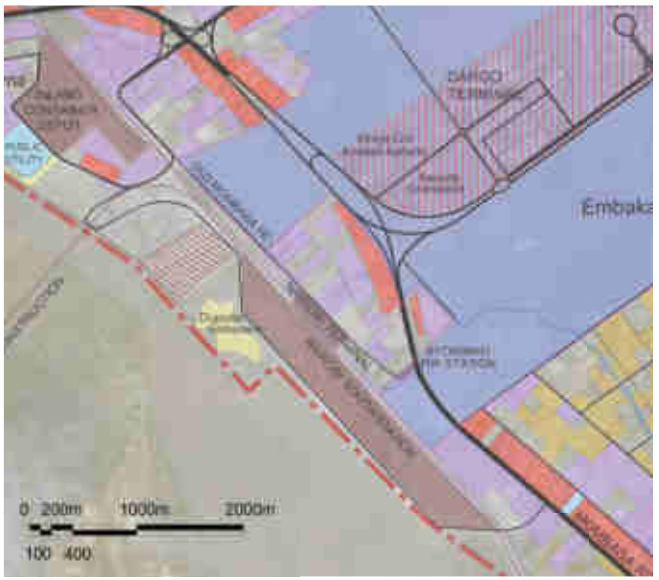

Figure 1.14: Location of pictures for SGR Nairobi Terminus

1.2.5.4.7 AIRPORT NORTH ROAD

The airport North Road flanks the JKIA to the north-west and affords the possibility of a second access to the JKIA at the intersection with the Outer ring road.

The development along this road is primarily a mix of residential-commercial to the west and industrial / logistics uses to the east.

The Imara Daima Station, which has been designated as a future sub-centre in Nairobi as part of the NIUPLAN 2014 proposals is located at the intersection of the Airport North Road with Mombasa Road and this offers significant potential to re-develop the surrounding area to higher density residential and commercial uses.

Figure 1.15: Location of pictures for Airport North Road

1.2.5.4.8 SYOKIMAU RESIDENTIAL

The Syokimau residential area flanks the south-eastern boundary of the JKIA and is a large, low-density residential development with poor existing infrastructure services.

The roads are in need of upgrading, also proper drainage installed to minimize flooding impacts during the rainy season.

The area is bounded by a mix of industrial and commercial uses along Mombasa Road.

Figure 1.16: Location of pictures for Syokimau Residential area

1.2.5.4.9 EMBAKASI VILLAGE NCR AND SURROUNDINGS

The Embakasi Village NCR is acessible from the Airport North Road and is bounded by industrial uses and largely low-income residential areas.

However, there are some estates, including the Nyayo estate constructed in recent years that caters to middle-income residents. The Nyayo estate is a gated development, comprising four-storey apartment buildings and two-storey maisonettes.

The Area has a concentration of retail, commercial and some industrial uses along the Outer ring road and its intersection with the Airport North Road.

Figure 1.17: Location of pictures for Embakasi NCR and surroundings

1.2.5.4.10 MLOLONGO INDUSTRIAL AREA

The Mlolongo Industrial Area comprises small and medium scale manufacturing and logistics units. Development in this area is largely unplanned, which in turn cause congestion isues.

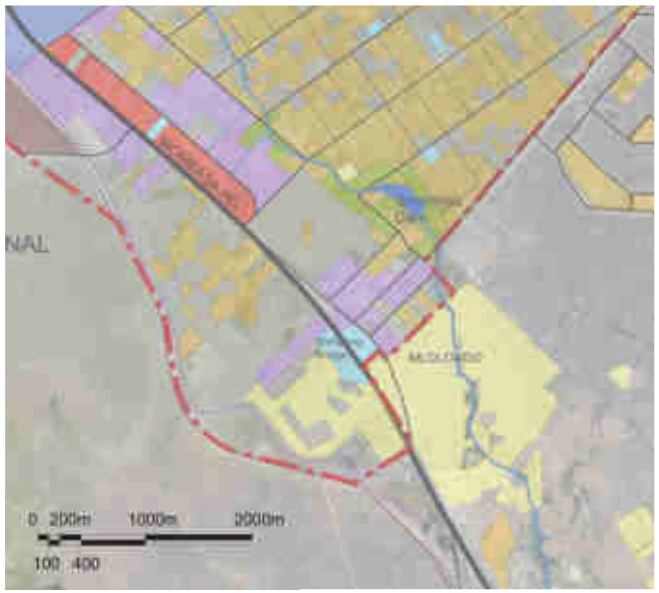

Figure 1.18: Location of pictures for Mlolongo Industrial Area

1.2.5.4.11 IMARA DAIMA STATION

As part of the de-centralisation strategy, NIUPLAN 2014-2030 has proposed to establish a sub-centre at Imara Daima, which is in-keeping with its plan to establish sub-centres in Nairobi along the interchanges of the urban transport system to increase synergies between urban development and urban transport development. It has been identified that:

- The access road to the station doesn't adequately serve commuters who access the station from Mombasa Road;
- Kenya Power Authority and the International Christian Church have large land holdings near the station and about 37ha of land can be developed for urban function (NIUPLAN 2014);
- North east of the station is an Mukuru informal settlement area;
- NIUPLAN also proposes that direct access roads to the station from Mombasa road and Enterprise road is needed, and that it is necessary to renovate and widen the underpass below Mombasa Road for pedestrians.

Figure 1.19: Location of pictures for Imara Daima Station

1.2.5.4.12 SYOKIMAU STATION

The Syokimau NCR Station provides a key mode of transport for commuters who reside to the south of the JKIA Airport, particularly during the peak morning and evening hours. Key observations were:

- The station is located a short distance from the SGR Nairobi Terminus, and there is a need for road and streetscape improvements between the two stations; and
- There is vacant land to the south of the station that has potential to be re-developed as a bus/matatu terminal, increasing ridership of the NCR.

Figure 1.20: Location of pictures for Syokimau Station

1.2.5.4.13 JKIA

Jomo Kenyatta International Airport is Kenya's largest aviation facility, and the busiest airport in East Africa. The flight paths of the airport present a considerable development constraint.

The Airport's main route to central Nairobi traverses Mombasa road is a heavily congested road with significant access issues.

At present there is no physical link between the Airport and the SGR (or NCR) station – it is highly recommended that this is incorporated to provide immense value to both developments.

The airport plans for expansion include the development of a second runway, which will impose further restrictions on adjacent urban development.

Figure 1.21: Location of pictures for JKIA

1.2.5.4.14 ICD AND SURROUNDINGS

The Inland Container Depot in Nairobi is owned and operated by Kenya Ports Authority.

Linked by rail with Mombasa Port, the ICD provides shippers with dry port facilities covering an area of 29 hectares and can accommodate a throughput of over 180,000 TEUS per annum (Source: KPA).

The ICD is bounded by some established industrial development but the road infrastructure is in need of upgrading. The zone also includes some vacant land and poorly developed industrial sites.

The Transport Ministry has committed to the upgrade of access roads leading to the inland container depot (ICD) to ease movement of trucks to and from the facility.

The ICD has plans to expand the facility through acquisition of adjacent industrial lands.

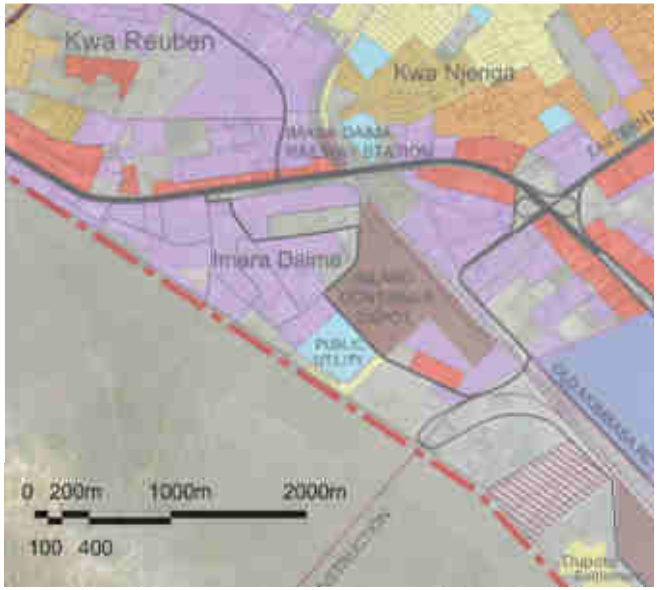

Figure 1.22: Location of pictures for ICD and surroundings

1.2.5.1 COMMUNITIES

This section provides an analysis of the neighbourhoods within the project area. This analysis is important in that it identifies the people potentially affected by project planning interventions and whose input will be critical in the planning and implementation phases.

1.2.5.1.1 BACKGROUND

The project area cuts across both Nairobi County and Machakos County. The counties in Kenya are comprised of constituencies, within which there are several wards, defined as “electoral units within a constituency”. The project area is situated within the constituencies of Embakasi East and Embakasi South in Nairobi County and Mavoko Constituency in Machakos County.

Within these constituencies the project will be influenced by developments in Syokimau/Mlolongo Ward (Mavoko constituency), Imara Daima Ward (Embakasi South Constituency) and Utawala Ward (Embakasi East Constituency).

The project area is urbanised mixed-use and includes commercial, industrial and residential estates, along with Jomo Kenyatta International Airport (JKIA). The residential areas are highlighted in Figure 1.23. Several site visits to the neighbourhoods were undertaken between June and August 2018, to identify residential areas and community facilities. These are described in the following text.

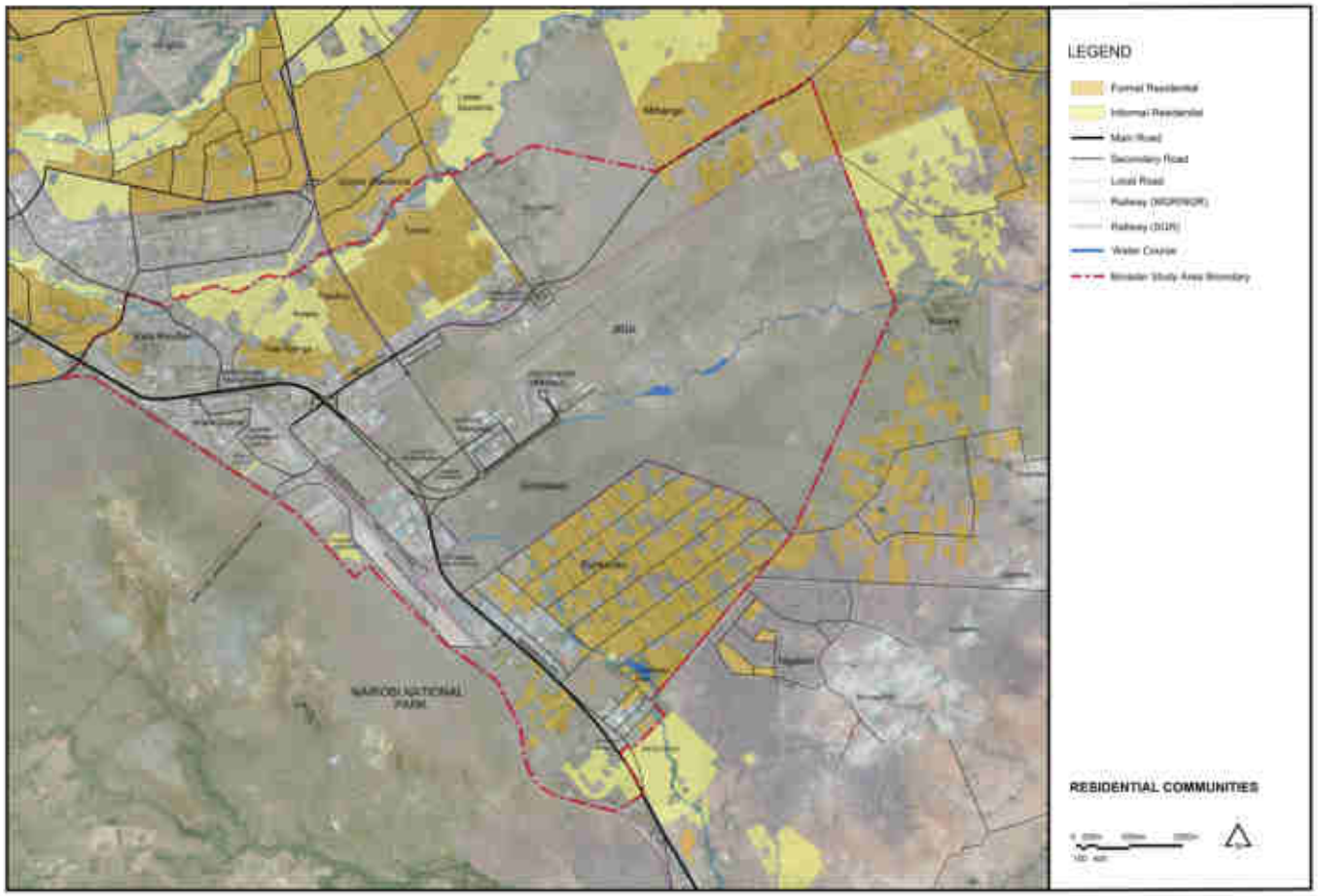

Figure 1.23: Residential Neighbourhoods in the Study Area

1.2.5.1.2 RESIDENTIAL NEIGHBOURHOODS

Syokimau

Syokimau/Mlolongo is a residential area in the west of Machakos County, just south of Nairobi and Jomo Kenyatta International Airport. It covers an area of approximately 15 km^2. Syokimau is the fastest growing residential area and the latest suburb of Nairobi Metropolitan Area following a campaign to reduce congestion in the city of Nairobi (Syokimau Residents Association, 2018). The population of Syokimau/Mlolongo ward in 2009, according to the National Population and Housing Census was 42,154. The site visit identified Syokimau Police Post, but no education centres or other community facilities were noted.

Imara Daima

Imara Daima is an electoral ward located within Embakasi South, the population of which was 70,455 in 2009 following the National Population and Housing Census. During the site walkover in June 2018, two primary schools (Rueben Primary School and Njenga Primary School) and one secondary school (Embakasi Girls High School) were identified within the ward. Other facilities within Imara Daima include Villa Police Station, Rueben Police Station and Mukuru Health Centre.

During consultations held in Imara Daima for the development of the Nairobi County Integrated Development Plan (2017), the following priority issues were identified:

- Poor access roads; and,
- Lack of Early Childhood Development (ECD) centres.

Utawala

Utawala ward is within East Embakasi Constituency and in 2009, during the National Population and Housing Census had a population of 30,924. Three primary schools (Utawala Academy, Garrison Primary School and Embakasi Primary School), two secondary schools (Utawala Secondary and Garrison Secondary) and three further education facilities (East African School of Aviation, GSU Training School and AP Training School) were recorded within Utawala.

During consultations held in Utawala for the development of the Nairobi County Integrated Development Plan (2017), the following priority issues were identified:

- Lack of health facilities;
- Lack of public schools;
- Lack of a sewer line;
- Lack of markets;
- Lack of ward administrators office;
- Lack of fresh piped water;
- Lack of waste collection/dumping area;
- Lack of a social hall;
- Inadequate street lights;
- Lack of a village polytechnic;
- Poor road network;
- Noise pollution;
- Disorganised establishment of kiosks in the area;
- No ambulance for medical emergencies;
- Lack of firefighting equipment;
- Lack of public land;
- Lack of public toilets; and,
- Food insecurity

Mukuru

Mukuru is situated towards the North West of the study area and includes a variety of smaller settlements including Kwa Njenga, Kew Reuben, Kayaba and Mariguni, all of which is situated in one of Nairobi's industrial zones approximately 7km southeast of the CBD. The Mukuru Community is bisected by the Nairobi Commuter Railway which runs along the border between Kwa Reuben and Kwa Njenga. The east-west Ngong River also creates a physical barrier within the area.

In the late 1980s, the land Mukuru sits on passed into the hands of private developers for light industry, yet despite this, the land remained largely undeveloped and quickly grew into one of Nairobi's largest informal settlement areas. It is estimated that the population of Mukuru is 310,683 people according to a Situational Analysis (2017), conducted by a variety of Universities and NGO's. It is now surrounded by an industrial belt of manufacturing and distribution centres as well as a growing number of middle-class housing estates and municipal assets such as hospitals, schools and shopping centres.

Some of the key concerns highlighted from a Situation Analysis Report (2017) concluded that:

- The railway, river and lack of bridges act as mobility barriers, limiting circulation within Mukuru.
- Few motorable roads limit vehicle access including matatus and other affordable transit options.
- Only 1% of residents have access to private or individual water sources and private toilets.
- There is no organised solid waste collection in Mukuru which contributes to odours, disease, clogged drains and flooding and
- Low elevation of the land means the area is prone to flooding.

Figure 1.24: Existing Conditions in Mukuru

Informal Settlements

Kenya's rapid urbanisation and lack of poor urban planning has resulted in the proliferation of informal settlements (Ministry of Lands, Housing and Urban Development, 2014). These informal settlements are generally of two types:

1. Squatter settlement; and,
2. Illegal sub-division of either government or private land.

Generally both types of informal settlements have some of the following characteristics:

- Located in proximity to areas with employment opportunities;
- Located on insufficiently serviced land (land lacking infrastructure such as roads, water, electricity and sanitation);
- Overcrowding;
- Poor housing conditions;
- Insecure land tenure status;
- Located on land that is inappropriate for habitation; and,
- Residents of these areas are within the bracket of low income earners with limited resources.

There are large areas of informal settlements in the northwest of the project area. Desk-based research undertaken has identified this informal settlement as the Mukuru community (Wairumu, 2014). The majority of the Mukuru community was born in Nairobi's Industrial district approximately 35 years ago when people began to build make-shift homes near the factories they worked in. The area now has a population of over 600,000 and many families live in corrugated iron shacks measuring 10 X 10 feet (Reuben Centre, http://www.rubencentre.org/index.php/about-us/mukuru-slum).

There are numerous health related issues within the informal settlement and the most common diseases include malaria, typhoid, dysentery, tuberculosis and HIV/AIDS. Malnutrition is visible among the children which is attributable to the high cost of food, compounded by the typically low household income. Any medical care, supplies and facilities are either too far away or too expensive for most of the residents (Wairumu, 2014).

The high level of poverty puts basic education beyond the reach of families. This has impacted negatively on education. It also contributes to high levels of illiteracy and drop out levels among those fortunate enough to be going to school. Dropouts amount to 44% of the school-going children in the informal areas. Many parents are unable to pay the few hundred shillings (approximately 2 USD) per term towards school fees. This makes it particularly difficult for school management to run the schools because they have little or no financial resources. The lack of teaching materials, desks, adequate sanitation facilities and playing areas fatally undermines the children's psychological, emotional and physical growth (Wairumu, 2014).

Organisations such as the Reuben Centre located in the Mukuru kwa Reuben area, Imara Daima Ward, are attempting to reconcile some of the hardships that the residents of Mukuru face (Reuben Centre, 2018). The Ruben Centre has strategies for strengthening the relationship that exists between the Centre and the local community, which include:

- Quarterly meetings with parents of the school children, either together or in class groups;
- Regularly conducting information session with outpatients at the clinic as they gather for services;
- Inviting the local Chief and other community leaders to functions and meeting to address specific concerns;
- Regular sharing of information with police and inviting them to conduct visits and sessions with children as situations materialise;
- Inviting the community to use facilities at the centre as is appropriate; and,
- Inviting parents and families to be present for some special celebrations for the school.

The Consultant project team and members of the Project Implementation Team (PIT) also met with the local community in the Dupoto informal settlement as shown in Figure 3.54. The location of this community is also shown in Figure 3.53. At this stage of the project no further information is available on this community.

1.2.5.1.3 DATA SOURCES

The data used in this section of the report has been obtained from the following sources:

- Reports:
  - Community and Community Facilities report prepared by P. Kibinda and M. Wakari following site walkovers in June 2018;
  - Nairobi City County, County Integrated Development Plan 2018 – 2022, 2017;
  - Wairimu, Karuga Dorcas, Crime Incidence and Coping Mechanisms in Nairobi's Slums: The Case of Mukuru Kwa Reuben, 2014;
  - Ministry of Lands, Housing and Urban Development, Kenya Informal Settlements Improvement Project, 2014.
- Website:
  - Syokimau Residents Association Website, http://sra.or.ke/ Accessed July 2018
  - http://www.rubencentre.org/

1.2.5.1.4 REFERENCES

- Ministry of Lands, Housing and Urban Development (2014) Kenya Informal Settlements Improvement Project;
- Nairobi City Council (2017) County Integrated Development Plan (CIDP);
- Ruben Centre (2018) Empowering Mukuru Community. http://www rubencentre.org/ Accessed July 2018;
- Syokimau Residents Association (2018) http://sra.or.ke/ Accessed July 2018;
- Wairimu, K.D (2014) Crime Incidence and Coping Mechanisms in Nairobi's Slums: The Case of Mukuru Kwa Reuben.

1.2.6 OVERVIEW OF THE MAIN PLANS COVERING THE STUDY AREA

This section provides an overview of the main plans that cover the study area and have directly affected the planning proposals. Together with the Master Plan, they form the planning framework that will guide planning decisions related to the study area. These plans are:

- Spatial Planning Concept for Nairobi Metropolitan Region (SPC);
- Nairobi Integrated Urban Master Plan (NIUPLAN);
- JKIA Master Plan;
- Emerging Mukuru Integrated Development Plan; and
- Emerging Mavoko Integrated Strategic Urban Development Plan (ISUDP).

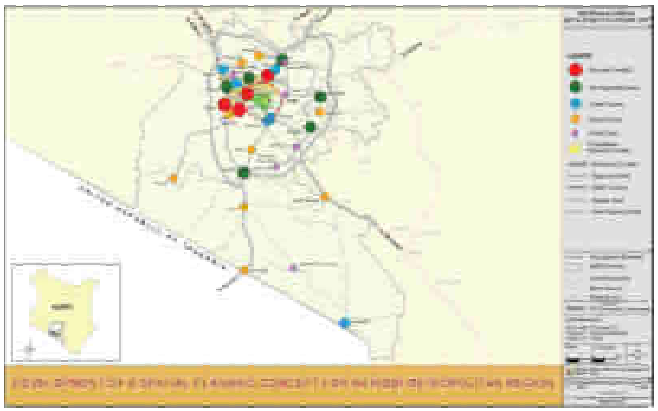

Figure 1.25: Proposed Urban Settlement Pattern for the NMR in 2030 (with site boundary overlaid) (Source: adapted from SPC, 2012)

1.2.6.1 SPATIAL PLANNING CONCEPT FOR NAIROBI METROPOLITAN REGION (SPC) (PUBLISHED 2012)

In summary, the Spatial Planning Concept for Nairobi Metropolitan Region emphasises and proposes the following points regarding the broad strategic and policy guidance for development in the Nairobi Metropolitan Region:

- The role of Nairobi shall continue to be a prime city but share this function with two or three other cities of the country;
- Nairobi is to be planned and developed as an international city in functions and role and as a world class city in facilities and convenience;
- The growth of the city is to be sustained and its economic base diversified;
- Modern and knowledge based 'Information- Communication-Entertainment' (ICE) economic activities are to be promoted;
- Tourists to be welcomed, tourist facilities developed and tourist packages operated;
- The physical and social infrastructure systems to be developed to provide high quality of service;
- The resources and components of the city to be enabled to be productive;
- The city to be enabled to be competitive with other international cities to attract interest and investments;
- The Nairobi Master Plan to be prepared to guide the physical development of the city.

The proposed NMR spatial concept does not follow one particular pattern of development. It is an integration of three spatial patterns. It is adopted from combination of the poly-nuclear development and corridor-ring development.

Five levels of settlement hierarchy have been proposed and are detailed below.

- Regional complex settlements will provide highest administrative functions, specialised and world class facilities, tertiary activities;
- Sub-regional centre settlements will provide administrative functions / county headquarters, higher level infrastructure, secondary and tertiary activities, strong industrial base;
- Growth centres will act as intermediary towns with important role in promoting rural development and in achieving a balanced distribution of urban population, provide functional linkages between the smaller towns and Sub-regional centre;
- Market centres will be small towns having linkages with immediate rural hinterlands. It is the higher order village having a central location and potential for development within its catchment area, with better services and facilities in terms of education, health, communication, accessibility serving a group of basic villages;
- Priority town (new towns) will aim to de-congest Nairobi and developments in the surrounding regions, designed with specialised facilities on the basis of world class norms, will be planned as special packages and a special focus for development.

It has been envisaged that Nairobi along with the adjacent urban centres would grow as a consolidated regional complex. The site is located predominantly within the Nairobi urban centre. To make NMR an internationally competitive economy, Nairobi city together with the 24 urban centres will contribute towards economic development. For the envisaged development, economic targets have been also set for the urban centres.

For the development of Nairobi City, a multi-nuclei pattern is proposed; the CBD at the centre and six other district centres serving a population size of 0.5 million to nearly 1.0 million, with one centre for each division (constituency). Of the 8 divisions, the CBD will service the 3 divisions of Makadara, Kamukunji and Starehe. The other centres identified are Langata, Dagoretti, Westlands, Kasarani, Embakasi and Airport.

These district centres need to be planned, developed and managed as centres of activities with large employment and as mixed-use development, standing second, next to CBD meeting the day to day needs providing for work, business, commercial, recreation, health and other needs.

Six 'New Towns' have been proposed and are envisioned to operate self-contained cities to create new growth centres in the national economy as well as to accommodate new activities, encourage and reinforce the incentives for such development. The new towns proposed are: Aerotropolis, Knowledge/ Health City, Cyber City, Transport New Town, Sports City and Ambosilli new town, with a population of 100,000 each in an area of 2000 ha with density of 50 ppha.

The sites for the proposed new towns have been located in close vicinity of Nairobi City. Most are within a 20 km – 60 km radius, apart from Amboseli which is at a distance of 150 km due to its useful proximity Amboseli National Park.

The location of each new town, its occupational structure, development guidelines for residential sectors, transportation, infrastructure and services, urban forms and urban design principals have been defined and presented within the SPC document.

1.2.6.2 NAIROBI INTEGRATED URBAN MASTER PLAN (NIUPLAN) (PUBLISHED 2014)

NIUPLAN Proposed Structure Plan:

The structure plan proposes a de-centralisation policy to redistribute the traffic and development load away from the CBD.

- To realise a symbolic status as the centre of Kenya, and a gateway to East Africa Region by strengthening the function of Nairobi's CBD;
- To strengthen sub-centres and promote balanced development by:
  - Narrowing the east-west gap;
  - Easing development pressure for the existing CBD, and
  - Dispersing social economic activities throughout NCC.
- To establish sub-centres along the interchanges of urban transport system to synchronise urban development and urban transport development: interchanges of major road network, interchanges of road and railway (including LRT).

The sub centres (Runda-Ruaka, Ruiru, Kasarani, Uthiru, Kabete, Ruai, Karen, Langata, Airport north, Githurai, Dandora, Dagoretti, Woodley, Makadara, Imara-daima and Syokimau) are located on interchanges in consideration of the road network and railway corridor.

It expects to make economic activity more efficient by the promotion of distribution of daytime population which is concentrated in the CBD currently.

Road network and nodes:

Several nodes which are located on the interchange of expected road network were proposed as sub centres. The features and locations of each sub centre are shown as below:

- Residential and Commercial : Runda-Ruaka, Ruiru, Ruai, Karen and Langata;
- Office and Commercial : Uthiru and Kabete;
- Industrial and Commercial : Donholm and Airport north; and
- Residential, Commercial and Entertainment(Sport facilities) : Ruaraka (Kasarani).

Since NIUPLAN was completed in 2014, before the implementation of the new SGR Railway Station, the NIUPLAN development vision does not take into account the increased significance of the Study Area in the light of the completion of the SGR train line and railway station.

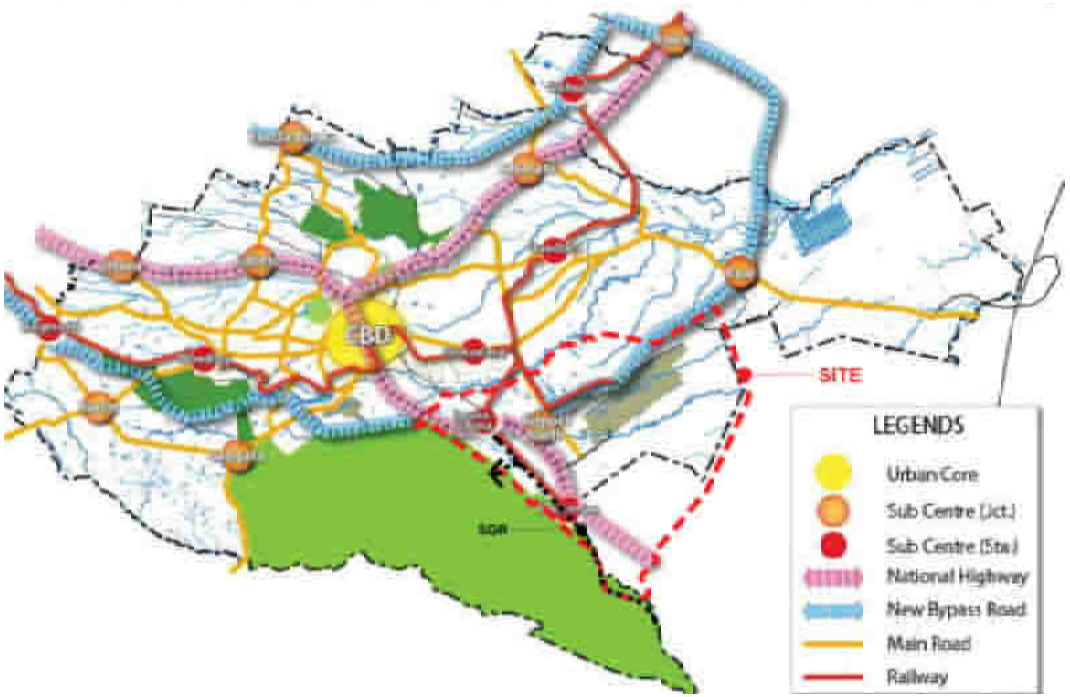

Figure 1.26: Proposed structure plan for Nairobi and SGR with Site Boundary (Source: NIUPLAN, 2014)

Principal Policies from the NIUPLAN Land Use Plan 2030

The Study Area will need to take policies 1, 2 and 3 into account.

1. Decentralise business and commerce functions:

The land use zoning and plot ratio of sub-centres will be changed to promote the decentralisation of business and commerce functions from the central to suburban locations.

2. Supply appropriate housing for all:

The Constitution of Kenya, 2010 stated in Clause (b) of Section (1) in Article 43 as "Every person has the right to accessible and adequate housing, and to reasonable standards of sanitation". The National Land Policy also states in clause 213 in Section 3.6.9 as "(c) Put in place appropriate mechanisms for removal of squatters from unsuitable land and their resettlement," and "(e) Ensure that land subject to informal settlement is developed in an ordered and sustainable manner". Provision of housing for low incomes is important responsibility of central and county government. Appropriate allocation of residential land use and its densification setting is important to accommodate required housing in Nairobi.

3. Create an ecological network:

Nairobi has rich forests, woods, as well as an extensive national park and river network. Those ecological environments should be connected to maintain and further encourage biodiverse network for plants and animal species.

4. Conserve agricultural activities:

Historically, the western part of Nairobi was developed as farm land because to its rich soil due to heavy rainfall. Agricultural activities should remain in their current form to sustain diverse land use.

5. Restructure industrial areas:

Industrial areas of Nairobi city will be expanded to the south near Jomo Kenyatta International Airport and the planned railway freight station in Embakasi.

The NIUPLAN development framework envisages a compact city with multiple core centres and a revitalized Central Business District for Nairobi city. It also proposes reordering of the city's urban structure by creating multiple sub-centres which will decentralise employment and service delivery.

The plan sets the general direction of spatial development of the County and indicates the distribution and organization of population and activities in the county. It aims to ensure that land and natural resources are used optimally and promotes equitable, planned development and conservation of the environment.

The plan forms the basis for the preparation of district plans and sectoral policies as well as plans in the areas of industry, transportation and infrastructure, environmental management, tourism and agriculture.

The main points of the master plan for 2030 are:

- The development vision proposed for Nairobi City County (NCC) is to become not only the centre of Kenya but also the centre of the East African region;
- Sub-centre system (multi-core development) will strengthen the Central Business District (CBD) and the development of seven sub-centres. This aims to promote balanced development narrowing the east-west gap, easing development pressure for the existing CBD, and dispersing social economic activities throughout NCC;
- For the urban transport development, a multi-modal development is proposed including road network public transport network, and traffic management. Establishing the sub-centres along the interchanges of urban transport system aims to synchronize the urban development and the urban transport development, interchanges of major road network, interchanges of road and railway (including Light Rail Transit (LRT));
- The infrastructure proposal covers water supply, storm-water drainage and sewerage, power supply, solid waste management and telecommunication;
- A capacity development programme is proposed to strengthen urban development management;
- A number of priority programs are proposed to be implemented in the short term.

NIUPLAN covers subjects such as development vision, structure plan, sub-centre development, urban transport development, infrastructure development, and capacity development. In summary the plan aims to:

- **Enhance County Competitiveness:** The land use zoning and plot ratio of sub-centres will be changed to promote a decentralisation of business, administrative and commerce functions from the central to suburban locations. The sub-centres (Runda-Ruaka, Ruiru, Kasarani, Uthiru, Kabete, Ruai, Karen, Lang'ta, Airport North, Githurai, Dandora, Dagoretti, Woodley, Makadara, Imara-Daima, and Syokimau) are located on interchanges in consideration of the road network and railway corridor. It is expected to make economic activity more efficient by distributing the daytime population, currently concentrated in CBD. Syokimau, Airport North, Imara-Daima sub-centres are located within the site area.
- **Modernise Agriculture:** Food production and distribution along the food system is still to be mapped out for further development. The County government will zone land for agricultural production in the urban and peri-urban areas based on the past and present situation as well as future sustainability.
- **Diversify Tourism:** The County government is committed to working with the private sector to encourage growth as well as strengthening the linkages between tourism and the rest of the economy. To diversify tourism, the County government will develop and implement aggressive marketing of Nairobi as a major tourist destination, encourage film industry and sports tourism niches, encourage and market domestic tourism, rehabilitate tourism infrastructure, diversify and develop tourism products, develop high value cultural centres and festivals, develop niche products such as conference tourism, eco-tourism, cultural tourism, sports tourism, bird watching and heritage and historical sites. The promotion exercise is intended to market the diversity of attractions available in Nairobi, to include eco-conference, sports, film industry and domestic tourism.
- **Manage Human Settlement:** The County government will provide appropriate housing for all by constructing low cost housing units in Starehe, Eastlands and Dagoretti through public/private partnership, upgrade slums and informal settlements in Embakasi, Mathare, Westlands, Dagoretti and Roysambu, redevelop old county estates, review the allocation of residential land use and its densification, and provision of necessary infrastructure and support to address the challenges faced by the residents in both formal and informal settlement. The County government will introduce development control policies and zonal plans which will assist in the preparation of detailed district/sub-centre plans and also facilitate implementation of NIUPLAN.
- **Conserve the Natural Environment:** The county government will, integrate environmental issues in development planning, implement a solid waste management plan, maintain public parks, open spaces and road reserves; increase tree cover in the County, through plant nursery management, planting and controlling cutting of trees, develop and enforce environmental standards and regulation, create environmental awareness through public education and sensitization, prevent and control environmental pollution through monitoring and enforcement of environmental regulation, improve garbage collection, expand the sewer system, river regeneration, back filling of abandoned quarries, prevention of flooding and expansion of the storm water drainage system and provide proper means for disposal of industrial waste.
- **Enhance the Transportation Network:** The County government will increase financial resources for road construction and maintenance, construct new roads, expand and maintain existing roads, invest in commuter rail and rapid bus transit systems, fast track road construction works, construct non-motorized transport facilities, and improve drainage along the roads. For more information regarding the transportation network, please refer to chapter 6.

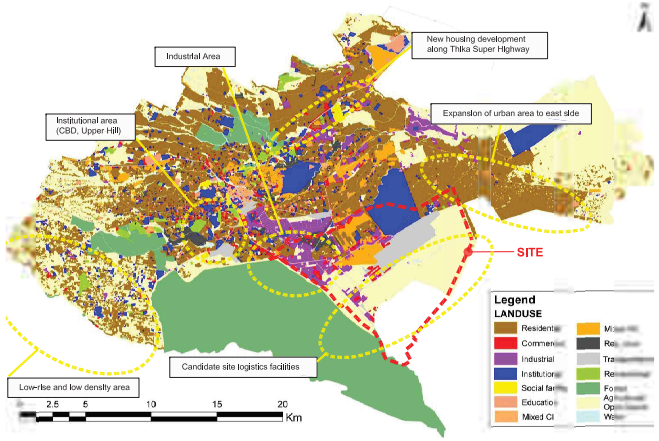

Figure 1.27: Distribution of current land use of Nairobi City and their features with the site boundary overlaid (Source: NIUPLAN, 2014)

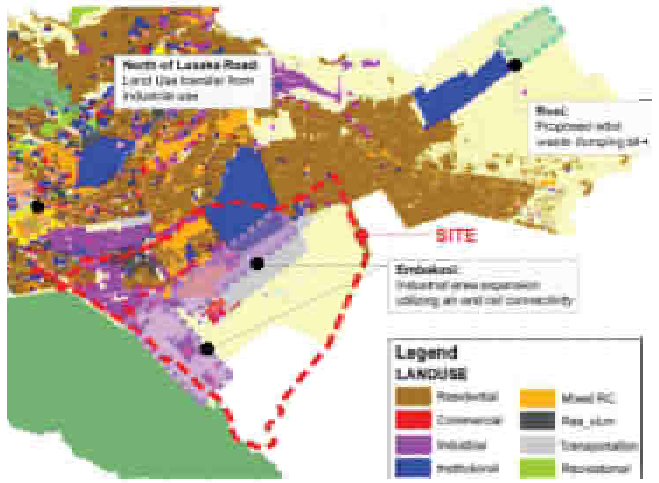

Figure 1.28: Existing land use and industrial restructuring proposal with the site boundary overlaid (Source: NIUPLAN, 2014)

1.2.6.3 EMERGING MUKURU INTEGRATED DEVELOPMENT PLAN (IDP)

The main documentation on the Mukuru Special Planning Area (MSPA) is the Inception Report drawn up in April 2017. The Inception Report for Mukuru was triggered due to the SPA designation. The Report conveys NCC's and the consortium's thinking on how to take this opportunity forward through understanding project outputs and methodology adopted in reference to the existing planning system.

It is estimated to take two years to fully develop a spatial strategy for the area and involves addressing seven core sectors determined by NCC. These include Education, Health, Housing, Environment, Finance, Water/Sanitation and Energy.

The planning process for MSPA will involve three different planning levels in order to have an integrated and structured approach. These are:

- **Village Level:** Each village is dynamic with well-defined boundaries, and local leadership structures consisting of village elders who represent local administration. These villages were formed at different times thus present different historical backgrounds which need to be incorporated into the area.
- **Local Level:** This involves planning across the entire MSPA. This level of planning aims at making proposals made at a village level and consolidating them into an integrated Mukuru SPA Plan.
- **Regional Level:** This level is designated at ward level which ensures the integration of the SPA into existing developments such as roads, sewer and power distribution.

Project Output

The Mukuru Integrated Development Plan will have both long and short term plans and shall be comprised of sectoral, spatial plans and a budget of proposed development. The most critical objectives include:

- Provision of water dispensers/waste management (Immediate);
- Water and garbage collection require urgent attention (short term);
- Providing adequate living conditions for residents;
- Essential community facilities to be within walking distance of residents;
- Provide adequate utilities such as power, water and telecommunications;
- Creation of green corridors to promote the continual reduction in pollution.

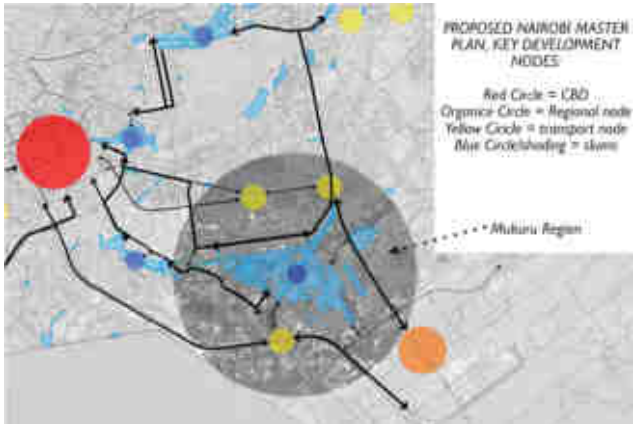

Figure 1.29: Proposed strategy to incorporate slums into the surrounding urban areas

(Source: Mukuru Inclusive City Report, 2014)

Figure 1.30: Proposed Master Plan for Mukuru

Note: No Legend was available for this Figure.

Mukuru Inclusive City Report

This report was prepared in 2014 by the University of California, Berkeley, University of Nairobi and Kenya Civil Society organizations including Muungano and Akiba Mashinani Trust (AMT) as well as the residents Association of Mukuru. It aimed at seeking an alternative but complementary plan to Nairobi Vision 2030 and the Nairobi Master Plan, specifically targeting slum dwellers and informal settlements.

The report highlights a proposal to integrate slums into Nairobi through numerous roads and transport nodes around slum areas. It also highlights integration with a regional node (sub-centre), which is currently identified in NIUPlan.

A proposed Master Plan was drawn up to suggest appropriate land uses in Mukuru. It largely consists of a cluster of residential and commercial buildings mixed in with light manufacturing. A host of greenery is also proposed in the area, incorporating the site with the existing waterway on site.

1.2.6.4 EMERGING MAVOKO INTEGRATED STRATEGIC URBAN DEVELOPMENT PLAN (ISUDP)

The Mavoko Integrated Strategic Development Plan focusses on the sub-county of Mavoko.

Key proposals also cover Mavoko Town, which lies within Mavoko sub-county and is primarily an industrial-service activity hub. Mavoko Town, more commonly known as Athi River, and is demarcated by the Plan as an Industrial 'Intermediary town' with a key role in promoting rural development and achieving a balanced distribution of urban population. It is also proposed that Athi River will be a future sub-regional centre, providing functional linkages between the adjacent smaller towns.

Mavoko County is under considerable pressure from economic growth and development and in order to promote sustainable growth and control unplanned development. To achieve this, strategic planning proposals will focus on the following:

- **An Industrial Hub:** Athi River will benefit from the establishment of an Export Processing Zone (EPZ) and a growing number of other industrial entities, such as cement producers, mining, flower farming, horticulture, distillers, and quarrying. The town is envisioned to be developed as an industrial hub and has the following advantages:
  - Large existing set of established industries such as Bamburi cement, Mombasa cement, Simba cement, Athi river cement and Portland cement, Kappa refineries, International steel company and Jua Kali;
  - Mavoko's strategic location is the likely expansion area of the Greater Nairobi Metropolitan Region and its proximity to two busy highways connecting Nairobi with the port of Mombasa and Tanzania offers great potential for industrial development. It is also linked to Mombasa port, Nairobi Airport and though marine, road and air traffic.
  - Mavoko's strategic location will benefit from export-orientated industries. It is expected to initiate, promote and provide attractive investment opportunities for the export business ventures in the country and attract companies in the areas of food processing, fresh produce, packaging for shelf-ready products, wooden products, leather and animal based products, jewellery and gemstones, pharmaceutical products and herbal medicines, cosmetic and personal care products, packaging products, textiles, transport equipment, electronic and electrical goods, building materials and furnishings, data processing and audio-visual services and consultancy and professional services;
- **A Logistics Hub**: Athi River is a stopover for articulated vehicles to and from Mombasa. The town is envisioned to attract a logistic hub/centre for freight transport and market facilities. This could foster complementary tertiary and service activities as a multiplier of economic activity and wealth, and would determine the whole economy of the corridor leading to substantial economic benefits to the entire NMR. This logistics centre will ease road traffic and parking issues by providing its own parking on site. It will also offer a location for companies and industries to set up their manufacturing bases and large distribution and warehouse facilities.

Mavoko offers a good opportunity for the expansion of the Nairobi Metropolitan Region and therefore, the area is of strategic importance. However Mavoko's rapid growth, has led to an explosive growth of slums around strategic locations close to industries and other places of employment. Urban poverty is prevalent in Mavoko, with a large proportion of its residents living in slums, with its residents experiencing an increasing income gap.

Athi River has been designated in the SPC for NMR as a Growth Centre. It is considered an Intermediary Town providing an important role in promoting rural development and in achieving a balanced distribution of urban population. Due to the location and wide geographical spread of Mavoko, this role will be performed by linking its own growth centres and Isinya to Machakos (Sub-Regional Centre) and to the Nairobi-Ruiru-Ngong-Ongata Rongai Complex (Regional Complex).

Urban growth is expected to be driven by housing, transport and industrial developments as the town is the gateway linking Nairobi city to the Mombasa/ Central Africa Corridor. It will also be catalysed by the development of the adjacent Konza City and the implementation of the Sports City and Transport New Town proposals of the SPC for NMR. This will further be facilitated by major transport proposals to include road and rail improvements along with the proposed MRTS inter-change station at the junction of Mombasa Road and Airport Road and terminal station at Athi River. The are will likewise benefit from the Transit Oriented Development (TOD) proposals for Athi River under NaMSIP which seeks to improve centralities around multi-modal transportation nodes.

The configuration of Mavoko's urban growth may be hinged on creating compact centres, maintaining Mombasa Road as an economic corridor and channelling housing and developments towards the more suitable northeast side of the sub-county. Mavoko's existing centres particularly Athi River and others such as Mlolongo, Syokimau, Chumvi, Utawala and Joska, should be transformed into compact and walkable urban centres.

The creation of compact urban centres can be facilitated by NaMSIP's proposals to utilise TOD approaches for key centres such as Athi River. Key tools would be to, amongst others, allow higher densities, mixed residential-commercial and ancillary uses as well as provide urban amenities such as well-appointed public parks and open spaces.

Realising Mavoko's potential largely relies on in it becoming the NMR's industrial and logistics hub which are dependant on the performance of the Mombasa Road acting as an economic corridor. Currently, an industrial belt has emerged along the Mombasa Road which is more pronounced in areas nearer to Nairobi city. There is also an observed trend towards expansion as industrial developments are already observed at the southeast stretch of Mombasa Road.

Industrial buildings should be located close to the Mombasa Road for ease of transportation. The ISUDP suggests that the emerging trend of gated communities being developed along the corridor should be stopped since these will conflict with the role of Mombasa Road as an industrial belt. Vehicular traffic along this road should be prevented.

Residential, and related developments, are best suited in the sub-county's northeastern area at the Athi River plains. Channelling them into this location supports the maintenance of Mombasa Road as an economic corridor and supports the overall concept of NaMSIP to transform the northeastern area as the 'main development area' of Nairobi as it will coalesce with growth from Tala-Kangundo, Ruiru and Juja. It may ease development pressure away from the Nairobi National Park.

This area will also benefit from the presence of the Athi River. Following NaMSIP's concept for Mavoko, Athi River should be transformed into a 'linear green/ blue park'.

It should be noted that developments at this northeastern location are related to those in the Tala- Kangundo area, particularly along Kangundo Road. This area will serve as a transition from the industrial belt along Mombasa Road to the more commercially-oriented developments along Kangundo Road.

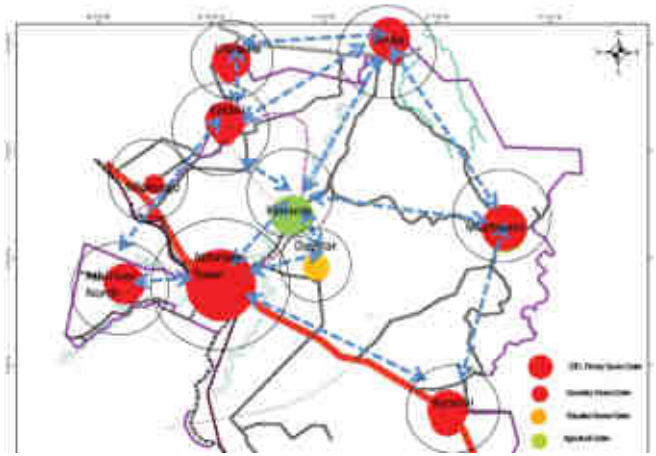

Figure 1.31: Strategic Connections within Mavoko County (Source: ISUDP Working Documents)

The planning area's central business district (CBD) is Athi River Town. Athi River is an industrial settlement that grew out of the railway station and expanded as industries have become established. The most dominant urban features of this town are the towering cement factories and other industrial buildings.

Current Working Documents

Working documents were provided by the client on 11th October 2018 and analysed by the Consultant. It is understood that none of these documents have been implemented into a final report at this stage, but they do illustrate the progress that has occurred between the draft preliminary report in 2015 and the present.

The documents explain that the area is defined by two territories: Mombasa Road to the West and Kangundo Road to the East. The two territories are described as follows:

a) **Mombasa Road** is dominated by transport and housing activities. As a result, the main planning issues will focus on economic strategies based on promoting logistic centres for freight transport and market facilities. The strategy will also emphasise on the need to prioritize commuter rail transport and its effects of supporting transportation and accessibility.

The housing strategy will be developed around commuter stations aimed at serving high-density housing neighbourhoods in environmentally controlled urban surroundings. Residential development will be promoted perpendicular to the Mombasa Road transport corridor and will be structured at least 1 Km beyond the economic activities of the corridor. The corridor will be designated for logistics and related industrial functions, while housing development will be promoted further away to reduce land use conflicts and congestion.

b) **Kangundo Road** is envisioned to serve as the metropolitan zone for large residential developments. The planning approach will be guided by a balanced vision where transport, social housing, economic activities and social facilities are ntegrated. This corridor will serve as the major residential neighbourhood. However, for it to function it will require investment in physical and social infrastructure to sustain the residential activities.

More information on the existing and proposed roads as well as planned commercial centres for the Mavoko Area were also illustrated in Figure 1.32. It shows a new link road to ease congestion away from the quarry roads and Mombasa Road and in addition to this, a proposed circular railway is identified connecting Athi River through Ngelani, back round to Mlolongo where the existing commuter railway lies.

This proposed transport network links into the Multi Nodal Network and the Territorial Strategy for Mavoko (Figure 1.32 and Figure 1.33). These are both adapted from the original NaMSIP Spatial Concept for the area.

The working documents also recognise that Mombasa Road is severely congested north of Athi River town, so it is suggested that a by-pass road be constructed that passes east of JKIA and connects with Kagundo Road.

The working documents incorporate all these features and strategies together and provide a preliminary TOD proposal for the Mavoko Integrated Strategic Development Plan area (Figure 1.33).

The Nairobi-Malili Transport Corridor

The Nairobi-Malili transport corridor (also called NMTC or Mombasa Road) is located at the southwest of Machakos County. The NMTC traverses Mavoko Sub-County and extends from the boundary of Nairobi City/Syokimau/ Mlolongo Ward to the boundary of Konza City in Kalama Ward.
The trunk road currently serves as a main cargo route and an important metropolitan, regional and international transit link.

The corridor serves many economic and business purposes in the region. Traffic on the corridor caters for international traffic enabling movement from Mombasa Port to the neighbouring countries of Uganda, Rwanda, South Sudan and Ethiopia. The main railway trunk line from Mombasa to Malaba passes through Mavoko, Kikuyu, Limuru, and is within the Nairobi-Malili transport corridor, enabling convenient movement of goods and services to and from the region, thus leading to the prosperity of economic activities.

The airport, situated between Malili and Nairobi, enables easier movement of people coming in and out of Malili without having to drive through the hectic city of Nairobi, one can easily get to Malili through the highway.
Once Malili is developed and the Nairobi-Malili highway is fully functional, the Corridor is expected to provide solid economic and logistical support to the NMR in the following ways:

- Provide a more effective means of transportation of goods and people to and from central Nairobi and Malili;
- Reduce congestion on Mombasa Road, (currently one of the busiest roads in the country); by providing local and express through-lanes and accessible public transit. The highway will reduce average travel time during peak hours;
- Improve the economic productivity and mobility of those living along the road;
- Develop the entire NMR region into an IT hub and attract huge sectoral and regional investments by providing national and international connectivity to Malili;
- Reduce traffic accidents and air pollution and enhance regional economic development;
- Reduce travel times, especially for the heavy freight that transport goods to wider locations.

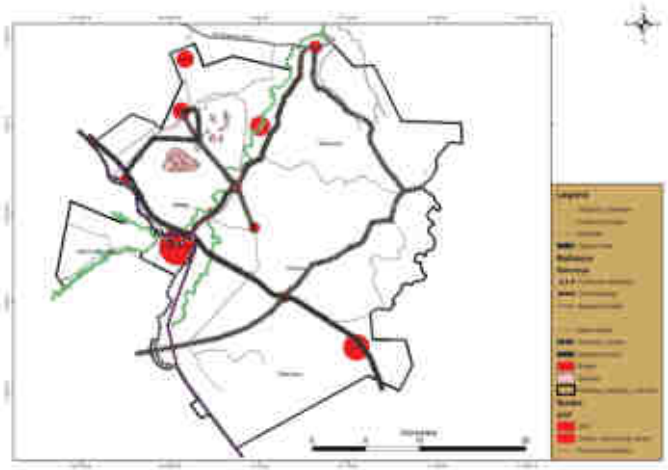

Figure 1.32: Existing and Proposed Roads in Mavoko Area (Source: ISUDP Working Documents)

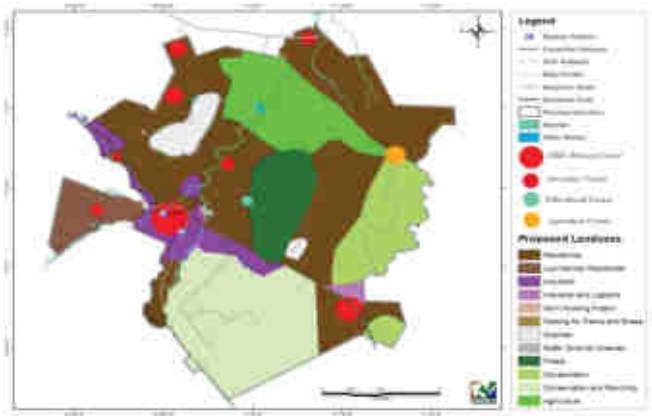

Figure 1.33: TOD Model of Mavoko Site Area (Source: ISUDP Working Documents)

With an abundance of currently under-utilised land, the corridor has vast economic scope, particularly in the following sectors:

- **Construction and Real Estate:** With construction expected to boom, employment conditions along the Corridor are likely to improve, improving the generic economic profile of the region. The local population would be able to support themselves through leasing out or selling off land to real estate developers and/or tenants themselves, and through the growth of other supporting establishments in the public (police stations, fire stations, hospitals) and private (malls, salons, groceries) sector;
- **Logistics Centre for freight transport and market facilities:** It is suggested that one of the key aspects of economic strategy in this corridor should be to situate a Logistic Centre for freight transport and market facilities. A Logistic centre could foster complementary tertiary and service activities as a multiplier of economic activity and wealth. By the provision of parking, congestion along the main road will be reduced;
- **IT Education:** Development of the education sector and establishment of key educational institutions along the Corridor shall serve as a key input to the growth of Malili and NMR into an IT hub. Establishing residential engineering schools and universities offering IT and computer-based courses shall be a milestone in achieving the goal of developing Kenya's own Sillicon Valley - Malili. Growth of education sector across the Corridor will also lead to the general building of human capital, and greater socio-economic development in the region;
- **Services:** An IT hub where national and international firms can be established. The town shall provide financial support to educational facilities along the corridor. In addition to creating employment and economic opportunities for the regional population, other IT-based and IT-related services are expected to grow over the years.

Malili Corridor has a wide variety of land uses. It is an industrial zone, which is host to six cement factories and other processing plants. It is also seen as a key dormitory for Nairobi. At the same time, it has both animal rearing and subsistence farming existing side-by-side. The land use proposed activities within the corridor have been influenced by a combination of factors including, close proximity to Nairobi City, proposed Konza Techno City, location of the Export Processing Zone, good transport links with Nairobi as well as lower land prices in comparison to Nairobi.

Future urban growth in the corridor will largely be shaped by developments in the rest of Mavoko Sub-county. Conversely, the corridor is envisioned as Mavoko's premier driver of growth that will play a significant role in the overall development of the Sub-county with impacts to Nairobi city and the rest of NMR.

As per the SPC for NMR, the Corridor will directly serve Mavoko Growth Centre which is considered to be an intermediary town with an 'important role in promoting rural development and in achieving a balanced distribution of rural population.' Mavoko is also expected to link the small towns in their hinterlands to Machakos Sub-regional centre. The corridor is crucial in the town's performance of this role.

Mavoko has the potential to be an Industrial Hub in the NMR due mainly to the presence of the corridor. The town can capitalise on the existing industries within and the accessibility and connectivity provided by Mombasa Road aside of course from being host to the Athi River export processing zone. It is also well-positioned to become a logistics centre in the region on the strength of its location and having emerged as a stopover for all trucks to and from Mombasa. Moreover, the vast area northeast of Mombasa Road can absorb a significant amount of urban expansion and may well become part of NMR's main development area.

Current Working Documents

Working documents were also provided by the client regarding this element of the ISUDP project. An existing land-use map has been provided which illustrates the dominant land uses. Whilst most of the corridor comprises undeveloped land between population/economic centres, the built-up areas that do exist are largely industrial and residential.

1.2.6.5 JKIA MASTER PLAN

The Master Plan for JKIA was developed and submitted by the KAA in response to the National Airports Systems Plan. At the heart of the Master Plan is the proposal for a new runway running in an east-west direction along with a new terminal building. It would be situated in the current vacant land between Syokimau Airport Road and Airport S Road, allowing additional capacity for the East African Hub. The Master Plan also envisions the creation of Nairobi International Medical City located on the 670 hectare triangular parcel of land towards the south. A proposed railway link is also proposed to facilitate direct connections between the airport and Nairobi International Medical City allowing passengers on short transits or visiting facilities within the medical city.

Two new proposed cargo terminal are also envisioned, one adjacent to Nairobi Medical City as well another close to the Eastern Bypass, just north of the existing operational runway. A proposed apron extension is also highlighted within the Master Plan as well as a variety of new taxiways to connect these all together. Other proposals as part of the Master Plan include a 100 hectare solar farm towards the eastern edge of the airport boundary which is imagined to improve reliance in power distribution throughout the airport as well as promote green energy production and a Special Economic Zone (SEZ) of approximately 205 acres just north east of the airport which remains undeveloped.

Finally, connecting these together is the New Proposed Dual Carriageway which will orbit the airport originating from the existing roundabout connecting Airport S Road to Mombasa Road interchange heading south around the proposed 2nd runway. From here, the proposed route would then split to enclose Nairobi International Medical City with one road running parallel to the proposed Katani Road, with another running north of the medical city providing connections to a new cargo terminal. The road would then head north to a new roundabout near the Eastern Bypass where a new commercial zone is proposed.

As one of the 10 busiest airports in Africa, JKIA is a major development drive to Nairobi and to the Embakasi area when the expansion plans become fully implemented.

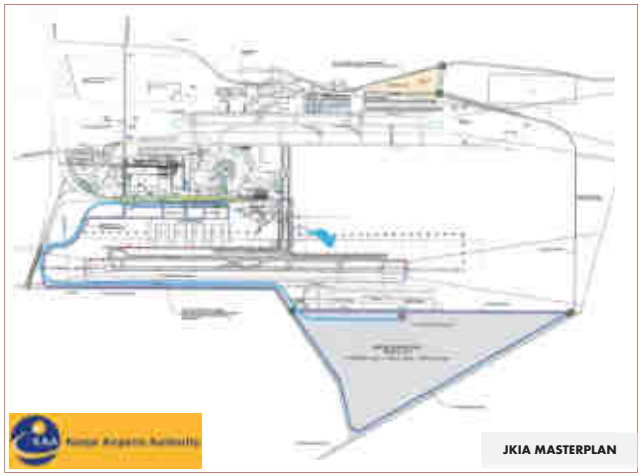

Figure 1.34: JKIA Master Plan (Source: KAA)

1.2.6.6 SUMMARY OF THE MAIN PLANNING PROPOSALS

The analysis of the various aspects of the committed plans and studies that are related to the study area can be summarized and recommend as following:

SPC

- The SPC broad strategic and policy guidance for development in the Nairobi Metropolitan Region to be considered and as possible followed in relation to the site area development;
- The SPC envisaged settlements' character, economic targets and development details for the urban centres of the Nairobi Metropolitan Region and especially the ones that are in close proximity to the site (Mavoko, Kitengela, Ongata Rongai) need to be taken into consideration. Details of the adjacent centres and their new identity will give a sense of the area and future structure development approach;
- The SPC proposal needs to be taken into consideration regarding the Embakasi area which is identified as district centre to be planned, developed and managed as centre of activities with large employment and as mixed-use development, standing second, to CBD in meeting the day to day needs providing for work, business, commercial, recreation, health and other needs;
- The SPC details regarding the New Towns' character, salient features, development guidelines, urban forms, and urban design principals need to be taken into consideration when developing the site area. The New Towns have been located such that they are in close vicinity to the Nairobi City contributing to its future development as well as setting the development trends and standards;

NIUPLAN

- The NIUPLAN structure plan, the distribution of current land use of the Nairobi City and their features, and the industrial restructuring proposals need to be taken under consideration when developing the site area;
- The NIUPLAN's recommendations regarding enhancing the county's competitiveness, modernizing agriculture, diversifying tourism, managing human settlement, conserving natural environment, transportation network need to be taken into consideration when developing the site area;

Mukuru Special Planning Area

- The NCC has committed to the Mukuru Special Planning Area and its improvement. There are clear objectives which need to be considered and progress needs to be monitored to ensure a holistic approach.

ISUDP

- The recommendations, existing conditions and visions for the Mavoko Integrated Strategic Development Plan, and the Nairobi-Malili Transport Corridor developed in the ISUDP need to be taken into consideration when developing the site area.
  - Note that the development plans are a work-in-progress and this ISUDP document will be fine-tuned and evolve through subsequent participatory consultations with the PIT, WB, County Government and various stakeholder groups;
- The recommendations of the ISUDP general purpose and objectives to be considered and as possible followed in relation to the Site area development.

JKIA Master Plan

- The JKIA Airport Master Plan, whilst still in planning phase provided a broad overview of development around the airport. These have been factored into the wider strategic plan for Embakasi.

1.2.6.7 LEGAL AND INSTITUTIONAL FRAMEWORK

1.2.6.7.1 THE LEGAL FRAMEWORK

The master plan for the Embakasi SGR Railway Station has been prepared within the scope of existing laws and regulations. The applicable laws that have been used include;

The Constitution of Kenya, 2010

In the Constitution, Article 10 provides principles of governance that calls for sustainable development, Article 60 requires land to be held and used in an optimal way that is sustainable and productive, Article 64 gives the government powers to regulate the use and interest in any land for purposes of physical planning while schedule four gives the county governments (powers?) to oversee planning within their areas of jurisdiction. The constitution provides that land in Kenya shall be held, used and managed in a manner that is equitable, efficient, productive and sustainable, and in accordance with the following principles;

- Equitable access to land;
- Security of land rights;
- Sustainable and productive management of land resources;
- Transparent and cost-effective administration of land;
- Sound conservation and protection of ecologically sensitive areas;
- Elimination of gender discrimination in law, customs and practices related to land and property in land; and
- Encouragement of communities to settle land disputes through recognised local community initiatives consistent with this constitution.

The Physical Planning Act, Cap 286

The Act provides for guidelines for land use planning. It entrenches stakeholder participation and institutional linkages within the spatial disciplines. Essentially, it provides for the preparation and implementation of physical development plans.

Further, it empowers the Director of Physical Planning to prepare various types of physical development plans. The Director of Physical Planning performs functions such as the formulation of development policies, guidelines and strategies for preparation of national, regional and local physical development plans.

Section 29 empowers the county governments to prohibit or control the use and development of land and buildings. Development control is in the interests of proper and orderly development of its area. In so doing the county government may consider and approve all development applications and grant all development permissions.

County Government Act, 2012

The County Government Act 2012 gives power to the county governments to determine how the counties are run. The key elements in the Act in regard to the region's (which region is this referring to?) management are summarised include;

- Section. 104. (1) A county government shall plan for the county and no public funds shall be appropriated outside a planning framework developed by the county executive committee and approved by the county assembly.
- Section 105: A county planning unit shall be responsible for coordinating integrated development planning, ensuring integrated planning, ensuring linkages between county plans and national plans, and establishment of a GIS based database system.
- Section 106: County plans are guided by the activities of the county government.
- Section. 107. (1) To guide, harmonize and facilitate development within each county there shall be the following plans;
  - County integrated development plan;
  - County sectoral plans;
  - County spatial plans; and
  - Cities and urban area plan as provided for under the Urban Areas and Cities Act
- Section 110: There should be a 10-year county GIS-based database system spatial plan.

According to the Act, planning, design and infrastructure provision for SGR Embakasi Railway Station master plan is considered a cities and urban area plan.

Urban Areas and Cities Act, 2011

The Urban Areas and Cities Act of 2011 was enacted precisely to guide the development process and governance of urban areas and cities. Among the objectives of the Act is to establish a legislative framework for governance and management of urban areas and cities. Participation by the residents in the governance of urban areas and cities are included in the Act. In accordance with this Act, every city, county and town are expected to operate within the framework of an integrated development plan.

Environmental Management and Coordination Act, EMCA 1999 (should this be amended EMCA 2015?)

This Act is an amendment of the EMCA Act of 1999. It gives guidance to the constitution on the right to access clean and healthy environment. It provides the legal and institutional framework for environmental management. General principles of the Act are that every person in Kenya is entitled to a clean and healthy environment in accordance with the Constitution and relevant laws and has the duty to safeguard and enhance the environment.

The entitlement to a clean and healthy environment includes the access by any person within the project area to the various public elements or segments of the environment for recreational, educational, health, spiritual and cultural purposes. It also provides for environmental assessments, auditing and conducting of social environmental impacts.

Land Act, 2012 (amended 2016)

The Land Act, 2012 gives effect to Article 68 of the Constitution, to revise, consolidate and rationalise land laws; to provide for the sustainable administration and management of land and land-based resources, and for connected purposes.

The guiding values and principles of land management and administration in the Land Act include:

- Equitable access to land; security of land rights;
- Security of land rights;
- Sustainable and productive management of land resources;
- Transparent and cost-effective administration of land;
- Conservation and protection of ecologically sensitive areas;
- Elimination of gender discrimination in law, customs and practices related to land and property in land;
- Encouragement of communities to settle land disputes through recognised local community initiatives
- Participation, accountability and democratic decision making within communities, the public and the Government;
- Technical and financial sustainability;
- Affording equal opportunities to members of all ethnic groups;
- Non-discrimination and protection of the marginalised; and
- Democracy, inclusiveness and participation of the people; and
- Alternative dispute resolution mechanisms in land dispute handling and management.

The act is important as it gives guidance in case of land issues such as land disputes and compulsory acquisition of land within the project area.

National Land Commission Act, 2012

This is an Act of Parliament that makes further provision to the functions and powers of the National Land Commission, qualifications and procedures for appointments to the Commissionand gives effect to the objectives and principles of devolved government in land management and administration (deleted this part because it is unclear, purposes connected to what?). The Act provides for the roles of Lands Commission and those that are related to regional development and management are:

- To manage public land on behalf of the national and county governments; to conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities;
- To monitor and have oversight responsibilities over land use planning throughout the country.
- Ensure that public land and land under the management of designated state agencies are sustainably managed for their intended purpose and for future generations;
- Develop and maintain an effective land information management system at national and county levels;
- Manage and administer all unregistered trust land and unregistered community land on behalf of the county government;

The implementation of this plan requires use of resources such as land. This will call for constant coordination with the National Land Commission.

Water Act, 2016

This Act of Parliament provides for the management, conservation, use and control of water resources and the acquisition and regulation of rights to use water. Further, it provides for the regulation and management of water supply and sewerage services. It also provides guidelines for the establishment and running of institutions involved in the management and provision of water services.

Further, the fourth schedule of the Constitution (2010) part 1 section 22(c) spells out the function of the national government in relation to water as “water protection, securing sufficient residual water, hydraulic engineering and the safety of dams”. Part 2 of the schedule of the constitution section 11(b) lists water and sanitation as one of the functions of the county government. This in effect means that the national government is responsible for water resources development while the county government will oversee the operations of water service providers including water and sanitation companies.

Through the Water Act 2016, administrative bodies such as Water Resources Management Authority (WRMA), Water Services Regulatory Board (WSRB), Water Services Trust Fund (WSTF) and Water Appeal Board (WAB) have been established to ensure harmony and form a bridge between the national planning effort and the water development and management agencies in the two counties that is: Nairobi City Water and Sewerage Company (NCWSC) and Athi Water Services Board (AWSB) for Nairobi and Machakos counties respectively.

Wildlife Conservation and Management Act, 2013

Wildlife Conservation and Management Act (2013) governs wildlife conservation and management in Kenya. This law is enforced primarily by the Kenya Wildlife Service (KWS) with support from the police and other government agencies.

The main functions of KWS is to -

- Conserve and manage national parks, wildlife conservation areas, and sanctuaries under its jurisdiction;
- Provide security for wildlife and visitors in national parks, wildlife conservation areas and sanctuaries;
- Set up a County wildlife conservation committee in respect of each county;
- Promote or undertake commercial and other activities for the purpose of achieving sustainable wildlife conservation;
- Collect revenue and charges due to the national government from wildlife conservation areas and, as appropriate, develop mechanisms for benefit sharing with communities living in wildlife conservation areas;
- Develop mechanisms for benefit sharing with communities living in wildlife conservation areas;

Nairobi National Park is located adjacent to the planning area hence the act is essential in ensuring its management and conservation.

Public Health Act, Cap 242

This Act makes provision for securing and maintaining the health of the public. It provides standards and guidelines to maintain a clean environment, effective ventilation and liveable developments in an area. Occupational licences are given under these provisions. The act will help give guidance on acceptable infrastructure which does not compromise the health of the public.

Survey Act, Cap 299 Revised Edition [2012]

The Survey Act makes provision in relation to surveys, geographical names and the licensing of land surveyors, (deleted because unclear what this means).

The Department of Surveys, under the Director, provides and maintains plans for property boundaries in support of accurate land registration throughout the country. In preparation of this plan, existing survey data was used to prepare the plans.

The surveying and mapping work done under this project do not override the role of the Director of Surveys. The maps produced during the preparation of the plan are not an authority on boundaries.

1.2.6.7.2 MASTER PLAN STATUS

Planning, Design and infrastructure provision for SGR Embakasi Railway Station area involves planning for the core and Broader Area which fall within Nairobi and Machakos counties.

Within the existing planning laws, there is no reference to a plan that is prepared cutting across two counties. In the proposed amended Physical Planning Bill in Parliament, any plan cutting across more than one county is referred to as a regional development plan. Common examples include, the Lake Basin Regional Plan and the Kerio Valley Regional Plan which were prepared sometime back. Similarly, within the same proposed Bill, plans for towns which cut across two or more counties are considered to be a regional plan.

Planning, design and infrastructure provision for SGR Embakasi Railway Station area as a master plan comprises both a regional development plan (Broader Area and Core Area) and a local development plan (Core Area only).

The Broader Area is a regional development plan as its purpose is to provide for planning, re-planning, or reconstructing the whole or part of the area (public land, trust land or private land) comprised in the plan, and for controlling the order, nature and direction of development in an area within Nairobi City County and Machakos County (Physical Planning Act Cap 286 section 16).

The Core Area falls under the realm of a local development plan as it is mainly domiciled within the Nairobi City County as provided for in the County Government Act, 2012, Urban Areas and Cities Act, 2011 and the Physical Planning Act, 1996.

These are elaborated further below.

Regional Development Plan

Part 4, section 16 of the Physical Planning Act PPA provides for the formulation of a regional development plan. The purpose of a regional development plan is to provide for planning, re-planning, or reconstructing the whole or part of the area (government land, trust land or private land) comprised in the plan, and for controlling the order, nature and direction of development in an area of authority of a county. In this context, the county is the region. The plan is undertaken to ensure suitable provision for transportation, public purposes, utilities and services, commercial, industrial, residential and recreational areas, including parks, open spaces and reserves and also the making of suitable provision for the use of land for building or other purposes.

The Act also outlines the contents of a regional development plan, which include:

- A technical report on the conditions, resources and facilities in the area;
- A statement of policies and proposals with regard to the allocation of resources and the locations for development within the area;
- Such description and analysis of the conditions of development in the area as may be necessary to explain and justify the statement of policies and proposals;
- Relevant studies and reports concerning physical development of the area;
- Maps and plans showing present and future land uses and development in the area;
- Defining the scope of the plan; and
- Defining the area to which the plan relates.

Local Development Plan

Section 24 of the Act provides that a local development plan be prepared with reference to any public land, trust land or private land within the area of authority of a city, municipal, town or urban council or with reference to any trading or marketing centre. Further to that, a local development plan is prepared for the purpose of guiding and coordinating development of infrastructural facilities and specific control of the use and development of land or for the provision of any land in such area for public purposes.

The contents of a local development plan includes:

- A survey in respect of the area to which the plan relates carried out in such manner as may be prescribed; and
- Such maps and description as may be necessary to indicate the manner in which the land in the area may be used.

Approval

For purposes of adoption and approval, the regional development plan will go through the county assemblies of Nairobi City County and Machakos County while the local development plan will pass through the Nairobi City County Assembly.

The following steps are undertaken to facilitate approval of the master plan:

- Publication of Notice of Completion of Development Plan.
- The Physical Planning Act Cap 286 requires that upon completion of the planning process, a notice of completion of development is published to provide for comments from the public.
- Submission of the master plan to the county assemblies for approval.
- Endorsement and signing by respective officers.
- Establishment of an implementation board/authority.

1.2.6.7.3 THE INSTITUTIONAL FRAMEWORK

1. County Governments

a) Nairobi City County Government (NCCG)

A key stakeholder is the Nairobi City County which is the creation of the Constitution of Kenya 2010 and successor of the defunct City Council of Nairobi. It operates under the auspices of the Cities and Urban Areas Act, The Devolved Governments Act and a host of other acts. The Nairobi City County is charged with the responsibility of providing a variety of services to residents within its area and jurisdiction. These include the services that were previously provided by the defunct City Council and new services, which have been transferred from the national government of Kenya (NCCG 2018). One of the latest achievements of NCC is the development of the greater Nairobi (Nairobi City and surrounding environs) up to the year 2030 (unclear what NCC's latest achievement is). All the departments of the county government will be involved in this process but the key ones are as highlighted below:

- Department of Urban planning.
- Department of Lands & Housing.
- Department of Roads & Infrastructure.
- Department of Environment, Water, Energy & Natural Resources.

b) County Government of Machakos

The County Government of Machakos is an administrative county in Kenya. Machakos County has eight (8) sub-counties including Machakos Town, Mavoko, Masinga, Yatta, Kangundo, Kathiani, Matungulu, and Mwala. Machakos County lies within the jurisdiction of the Nairobi Metropolitan Services Improvement Project (NaMSIP) therefore within the metropolitan region of Nairobi . Mavoko sub-county lies within the broader study area of this project. The departments that will be actively involved are;

- Department of Transport, Roads, Public Works & Housing
- Department of Lands, Urban Development, Energy & Natural Resources

2. National Government Departments & Parastatals

a) Ministry of Transport, Infrastructure, Housing, Urban Development and Public Works

The Ministry of Transport, Infrastructure, Housing, Urban Development and Public Works is a state department tasked with creating a modern and efficient transport system, maritime economy, the built environment and a sustainable urban development.

Under the state department of transport & infrastructure, its main mandates are:

- Develop and maintain sustainable transport and infrastructure to facilitate efficient movement of goods and people.
- Develop and enforce regulations and standards to ensure safe, secure and
- Efficient transport and infrastructure systems.
- Undertake research and implement the findings for an efficient transport and infrastructure system

Under the state department of housing and urban development, its main mandates are:

- Regulation and development of construction industry through Developing building standards and research
- To formulate and coordinate implementation of policies and legal framework for
- Sustainable housing and urban development.
- To facilitate access to adequate housing and affordable housing.
- To improve livelihoods of people living and working in slums and informal settlements.
- To develop and coordinate implementation of metropolitan and integrated strategic urban development and capital investment plans.

b) Directorate of Urban and Metropolitan Development

Directorate of Urban and Metropolitan Development falls under the Ministry of Land, Housing and Urban Development ("the Ministry"), which was established in May 2014. The mandate of Nairobi Metropolitan Development Directorate is to formulate, coordinate and administer policy in respect to Nairobi metropolitan region. The development of an integrated Nairobi Metropolitan Areas Growth and Development Strategy covers among others: integrated roads, bus and rail infrastructure, efficient mass transport system and development of a sustainable funding framework for the development of identified urban and metropolitan areas. To enable fulfilment of its mandate the Ministry has secured the assistance of the World Bank for the proposed Nairobi Metropolitan Services Improvement Project (NaMSIP) which is being implemented under the Directorate of Urban and Metropolitan Development. This project will be implemented under NaMSIP and hence the directorate will be the implementing agency.

c) Kenya Railways (KR)

Kenya Railways is a state corporation which was established in 1978 pursuant to the Kenya Railways Act, Cap 397 Laws of Kenya to provide a coordinated and integrated system of railway and inland waterways transport services and inland port services (Kenya Railways 2018). Kenya Railways is developing the standard gauge railway from Mombasa to Nairobi and revamping the Nairobi Commuter Rail. Most of the land and the Core Area fall squarely on Kenya Railways' land and Kenya Railways can be said to be the owner of the project.

d) Kenya National Highway Authority (KeNHA)

Kenya National Highways Authority (KeNHA) is a state corporation, established under the Kenya Roads Act 2007 with the responsibility for the management, development, rehabilitation and maintenance of international trunk roads linking centres of international importance and crossing international boundaries or terminating at international ports (Class A road), national trunk roads linking internationally important centres (Class B roads), and primarily roads linking provincially important centres to each other or two higher-class roads (Class C roads). In undertaking this mandate, the Authority propels the country to achieve its infrastructure goals espoused in the vision 2030.

The inception of KeNHA was part of the wider reforms to improve the running of the roads sub sector that included defining clear mandates for every agency involved in the sector, establishing authorities with specific focus on roads management and a need to manage road matters in a professional manner so as to ensure greater returns on investment (ROI) (KeNHA 2018). The Mombasa road which is a part of the master plan is managed by KeNHA hence the institution will play a role in the redesigning and incorporating the highway within the master plan.

e) Northern Corridor Transit and Transport Coordination Authority (NCTTCA)

NCTTCA is an intergovernmental body mandated with the coordination of transport infrastructure improvements within the Eastern African region. The port of Mombasa is the core element of this body since it connects the economy East and Central Africa to the rest of the world's economy (NCTTCA 2018). It is a central body in the construction of the standard gauge railway and its facilitation of cargo transportation. Given that the plan centres on the inland container depot that is served by the standard gauge railway, this institution plays a major role within the Core Area of the master plan.

f) Kenya Urban Road Authority (KURA)

Kenya Urban Roads Authority (KURA) is a state corporation under the Ministry of Transport and Infrastructure established by the Kenya Roads Act, 2007 with the core mandate of management, development, rehabilitation and maintenance of national urban trunk roads (KURA 2018). Therefore, as an institution it will play a major role in providing road infrastructure within and around the master plan area.

g) Kenya Ports Authority

Kenya Ports Authority (KPA) is a state corporation established in 1978 through an act of parliament with the responsibility to "maintain, operate, improve and regulate all scheduled seaports" on the Indian Ocean coastline of Kenya, including principally Kilindini Harbour at Mombasa. Other KPA ports include Lamu, Malindi, Kilifi, Mtwapa, Kiunga, Shimoni, Funzi and Vanga. The Port of Mombasa is the key entry and exit point for cargoes belonging to a wider agricultural and natural resource hinterland consisting of Kenya, Uganda, Rwanda, Burundi, DRC, Northern Tanzania, South Sudan and Ethiopia. It is well connected in the region through the Northern Corridor Rail and Road infrastructure (KPA 2018). This agency is key since the planning area includes an inland container depot which stores cargo transported from Mombasa or cargo waiting to be transported to Mombasa via the standard gauge railway.

h) Kenya Civil Aviation Authority (KCAA)

Kenya Civil Aviation Authority (KCAA) was established on 24th October 2002 by the Civil Aviation (Amendment) Act 2002 with the mandate to plan, develop, manage, regulate and operate a safe, economically sustainable and efficient civil aviation system in Kenya. Other primary functions include:

- Regulation and oversight of aviation safety and security.
- Economic regulation of air services and development of civil aviation
- Provision of air navigation services, and training of aviation personnel as guided by the provisions of the convention on international civil aviation, related ICAO Standards and Recommended Practices (SARPs), the Kenya Civil Aviation Act, 2013 and the civil aviation regulations (KCAA 2018).

Since the Jomo Kenyatta International Airport (JKIA) is part of the planning area, the KCAA is an important institution in the planning and redesigning of the Embakasi Railway Station area.

i) Kenya Airports Authority

Jomo Kenyatta International Airport, formerly called Embakasi Airport and Nairobi International Airport, is Kenya's largest aviation facility, and the busiest airport in East Africa. Its importance as an aviation centre makes it the pace setter for other airports in the region (KAA 2018). JKIA falls within the broader project area therefore a major decision-making authority in the project.

j) Nairobi City Water and Sewerage Company (NCWSC)

NCWSC was incorporated in 2003 under the Companies Act cap 486. It is owned and operated by Nairobi City County. It is mandated with the provision of clean water and sewerage services to residents of the county (NCWSC 2018). Since part of the planning area is in Nairobi County, NCWSC will be involved in the provision of these services to the area.

k) Athi Water Services Board (AWSB)

AWSB is one of the eight water boards established under the Ministry of Water and Irrigation. It was created under Section 51 of the Water Act 2002. NCWSC is under AWSB. As part of its mandate, AWSB is the owner and custodian of water and sewerage infrastructure serving Nairobi County, including the planning area. It is also involved in planning, developing, and expanding water and sewerage infrastructure in the areas it serves (AWSB 2018). Since water will be a key service in planning area, AWSB is a major decision making institution in the project.

l) Kenya Wildlife Service (KWS)

It is a state corporation that was established by an Act of Parliament (Cap 376), now repealed by Wildlife Conservation and Management Act 2013 (WCMA), with the mandate of conserving and managing wildlife in Kenya, and to enforce related laws and regulations. KWS undertakes conservation and management of wildlife resources across all protected areas systems in collaboration with stakeholders (KWS 2018). KWS manages the Nairobi National Park (11,640 ha) which borders both the Core Area and Broader Area of the project. Therefore, the agency is highly involved in the planning process for the master plan.

m) National Environment Management Authority (NEMA)

NEMA was established under the Environmental Management and Co-ordination Act No. 8 of 1999 (EMCA). It is involved in the implementation of policies related to the environment (NEMA 2018). The body will be critical to the project since it is likely to impact the environment in various ways. For instance, the project might result in the destruction of vegetation and the increased discharge of solid waste. The level of air and water pollution may also increase. The involvement of NEMA will be aimed at finding ways to mitigate these impacts especially during the implementation stage of the project.

n) Kenya Power and Lighting Company (KPLC)

KPLC is the company tasked with the transmission and distribution of electricity throughout Kenya (KPLC 2018). Energy provision is one of the key services required for the implementation of the project. KPLC will be involved in meeting the electricity needs of industries, companies, and residential premises in the area. It will also be tasked with meeting social lighting needs, such as street lighting.

3. Private Sector

a) The Kenya Alliance of Resident Associations (KARA)

The Kenya Alliance of Resident Associations (KARA) is the apex body representing the voice and pro-active action of resident associations on consumers and taxpayers' rights countrywide and on accelerated access to public service delivery.

KARA was formed in 1999 out of the need to replicate successes of her founding members at a national scale. The Alliance was registered in September 2000, (under the Societies Act Cap. 108, section 10), as an umbrella organisation wholly mandated to coalesce with a view to tackling the service delivery challenges people face on a day to day basis, in a structurally unified voice (KARA 2018). Therefore, KARA is an important stakeholder in the project because they form an essential part in the stakeholder's consultation.

b) Neighbourhood Associations

The planning area is situated in an area that has several adjacent residential neighbourhoods, such as Syokimau, Imara Daima, Utawala and Nyayo highrise estate. The project will have several positive impacts on the residents, including the creation of employment. However, it may also lead to negative impacts, such as increased noise pollution. To increase the buy-in of these residents, it is critical to involve them in the various stages of planning. Their representation should be sought through neighbourhood associations such as the Syokimau Resident Association (SRA), Imara Daima Estate Association (IDEA) and Nyayo Estate Residents Association (NERA) among others.

c) Professional Bodies

Various professional bodies will be critical to the implementation of the plan. Among the key bodies are the Architectural Association of Kenya (AAK), Kenya Institute of Planning (KIP) and the Engineers Board of Kenya. The contribution of members of these bodies will be critical to ensuring adherence to the set standards pertaining to engineering, planning, and architectural designs.

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STATION AREA
REDEVELOPMENT

REGIONAL PLAN POLICIES AND PROPOSALS

1.3 REGIONAL PLAN POLICIES AND PROPOSALS

1.3.1 INTRODUCTION

As stated in Chapter 2, the plan for the Study Area (Core Area and Broader Area combined) will take the form of a Regional Plan. This chapter describes the stakeholder engagement undertaken and key planning informants, followed by the policies and proposals for the Study Area, the most significant of which is the Spatial Development Strategy. This provides the overall framework for development in the Study Area. A number of other proposals relating to specific elements of the Study Area are then discussed.

There are five specific parts of the Study Area where significant opportunities for development exist. Land Use Strategies for each of these have been prepared, which comprise a description of the existing conditions, land use proposals and recommendations for future detailed planning.

Throughout the chapter, high-level, strategic policies with associated policy guidance are set-out. The purpose of these is to guide the future planning of the Study Area. Once the Regional Plan is operational, the policies and guidance should be used to inform planning decisions until such a time that detailed plans, policies and guidance have been prepared that can replace them.

1.3.2 STAKEHOLDER ENGAGEMENT

The Regional Plan policies and proposals have been informed by the major stakeholder engagement events undertaken so far in the project, which include the Launch of the Planning Process, the Visioning Workshop and the 1st Stakeholders Workshop. Reports for all of these workshops have been submitted to the Client and a summary of these is set-out in Chapter 2. The Visioning process is discussed further in Chapter 3.

Numerous stakeholder meetings have been undertaken since the project inception in order to gather data, understand existing conditions, and consider opportunities for development in the Study Area. Key stakeholders in respect of the Broader Area have included Slum Dwellers International and Akiba Mashinani Trust, Syokimau Residents Association, Urban Lines Consultants (on behalf of VisionRI Consultants) and Kenya Airports Authority.

1.3.3 OTHER KEY INFORMANTS

In addition to stakeholder engagement informing the policies and proposals, there are a number of existing planning documents which have been reviewed. A summary is contained in Chapter 2.

Where possible, the policies and proposals have aimed to respect and enhance the proposals contained in these documents, as well as providing new proposals that complement these. In some cases, it has been necessary to include amended proposals from those contained in the documents. Generally, this has been where existing conditions have changed in the time since those documents were prepared. This has led to some proposals no longer being valid, whilst for others the changes have created enhanced and new opportunities.

Figure 1.37 shows existing land use within the Study Area alongside proposed land use in the JKIA Master plan and emerging Mavoko ISUDP, which have influenced the policies and proposals.

Figure 1.35: Discussions at the Visioning Workshop

Figure 1.36: Discussions at the Visioning Workshop

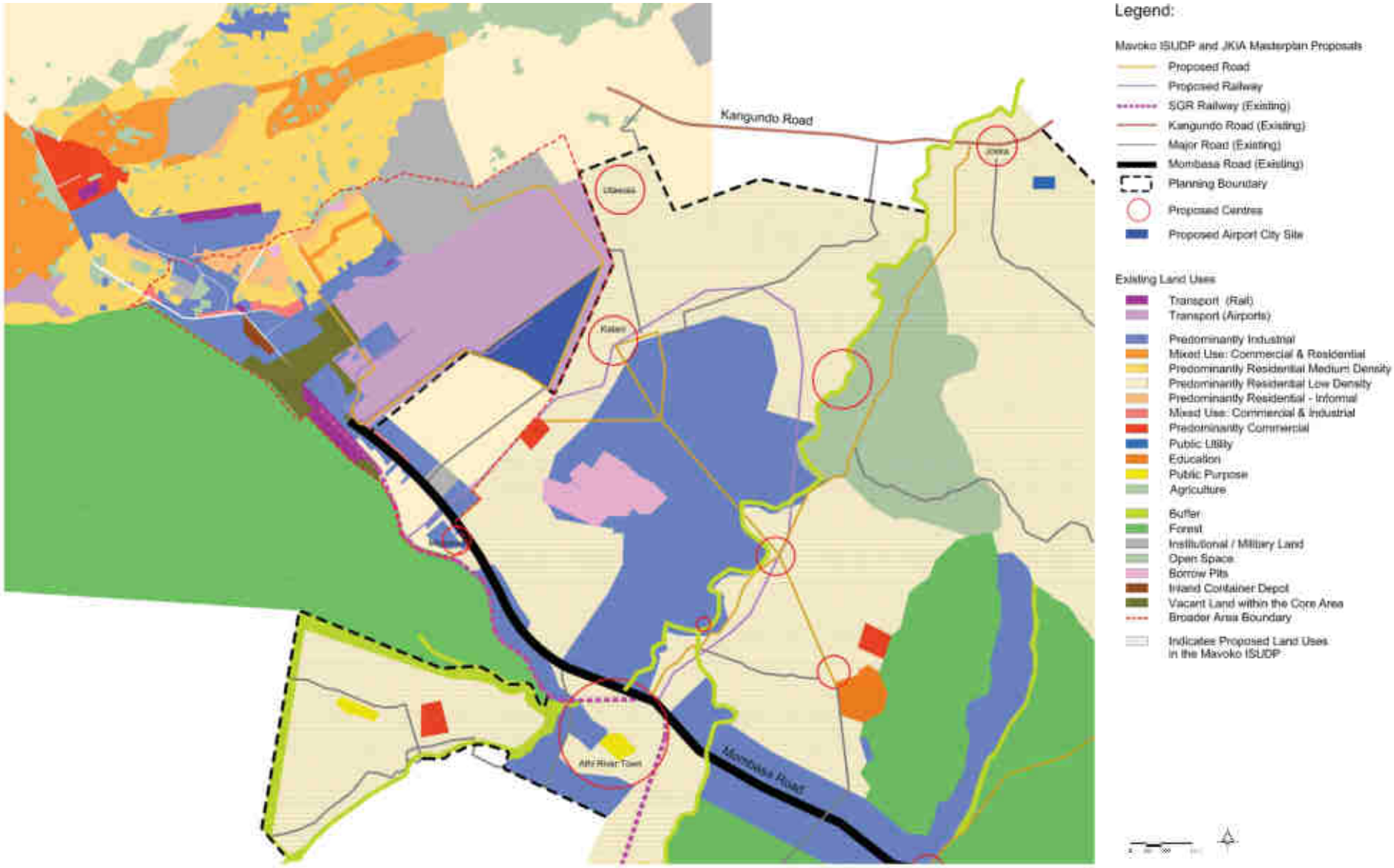

Figure 1.37: Study Area Existing Land Use, JKIA Master plan Proposed Land Use and Emerging Mavoko ISUDP Proposed Land Use

1.3.4 SPATIAL DEVELOPMENT STRATEGY

1.3.4.1 DECENTRALISATION

The spatial development strategy continues the strategy of decentralisation that first emerged in the Spatial Planning Concept for the Nairobi Metropolitan Region (NMR) and was continued in the NIUPLAN. The aim of this strategy is to focus the majority of economic development and activity outside of the CBD, by creating sub-centres where new development will take place. An exception to this is the Railway City project, which will essentially expand the CBD in a south-east direction, making use of an under-utilised site around Nairobi Central Commuter Rail Station.

The strategy of decentralisation will provide numerous benefits to Nairobi, including more even distribution of economic activity and opportunities. Combined with transport improvements, it is envisaged that there will be reduced traffic congestion in the central areas and reduced commuting times for the workforce.

1.3.4.2 SUB-CENTRES

The NIUPLAN uses the concept of sub-centres in order to achieve the strategy of decentralisation. Various sub-centres are identified around Nairobi, each of which will be a focus for new development. The spatial development strategy recognises the presence of three proposed sub-centres from the NIUPLAN that fall within the Study Area:

- Airport North;
- Syokimau; and
- Imara Daima;

Airport North is discussed further within the Local Development Plan for that area. The Syokimau sub-centre appears to cover the area around Syokimau Commuter Rail Station. It is proposed that this sub-centre is relocated/ subsumed within a new sub-centre at the SGR Nairobi Terminus. Again, this is discussed in the Local Development Plan.

The Imara Daima sub-centre is described further in the Land Use Strategies section below.

The spatial development strategy includes the creation of an additional sub-centre at Embakasi Village to complement the above network of sub-centres. It shares similar characteristics to Imara Daima in that it will benefit from future public transport improvements and contains some opportunities for intensification.

1.3.4.3 GROWTH CENTRES

The Spatial Planning Concept proposes an urban settlement pattern around Nairobi City (referred to as the 'Consolidated Regional Complex') that is envisaged to contribute to the decentralisation strategy. These include Regional Complexes, Sub-Regional Centres, Growth Centres, Market Centres and Priority Towns. Some of these overlap with the Nairobi City boundary.

The spatial development strategy recognises the presence of a centre at Mlolongo, as proposed within the emerging Mavoko ISUDP. This is a new centre proposed in addition to those in the Spatial Planning Concept. The Consultant understands that it would be classified as a growth centre. It is discussed in the Land Use Strategies section below.

The spatial development strategy includes the creation of additional growth centres as follows:

- Syokimau Town; and
- Airport City.

Like Mlolongo, Syokimau Town is envisioned as a growth centre based on its strategic location close to the SGR Nairobi Terminus Sub-Centre and the availability of undeveloped land to facilitate new development. Airport City is proposed as a Growth Centre as it provides an opportunity for large scale and high quality development benefiting from its strategic location close to JKIA.

The growth centres are areas with a greater capacity for new development than the sub-centres. Hence, they will provide a stronger focus for decentralisation.

1.3.4.4 HIERARCHY OF CENTRES

Although the NIUPLAN originally defined the sub-centres, it does not include a hierarchy of sub-centres. They are all considered to be of importance to achieve the strategy of decentralisation. Likewise, the emerging Mavoko ISUDP does not include a hierarchy of growth centres.

The Consultant has considered the strategic importance of the established and additional sub-centres and growth centres in the Study Area. The SGR Nairobi Terminus and Airport City both have special characteristics that distinguish them from the other centres. They are the two areas in the master plan which provide the opportunity for comprehensive new development, whereas the other centres are based on new development incorporated into existing built environments.

Based on the strategic importance of the centres, the proposed hierarchy is as follows:

1. SGR Nairobi Terminus (incorporating Airport North)
2. Airport City
3. Other Growth Centres (Mlolongo and Syokimau Town)
4. Other Sub-Centres (Imara Daima and Embakasi Village)

1.3.4.5 FUNCTION OF CENTRES

Sub-Centres

As referred to above, the NIUPLAN does not include a hierarchy of sub-centres, nor does it include a description of the function that sub-centres are expected to perform other than contributing to the overall strategy of decentralisation.

As per the visioning process, the SGR Nairobi Terminus sub-centre is envisioned as an 'integrated and world class gateway'. One of the key functions aligned with this vision is for the sub-centre to act as a transport hub, which was identified by a number of stakeholders.

Imara Daima and Embakasi Village are proposed to function as Transit-Oriented Sub-Centres. The driver for this is the proposed improvements to commuter rail services, which will see both stations served by up to 12 trains per hour from 2030, which is a high frequency service. This will allow the two sub-centres to provide the resident population with excellent accessibility to other parts of the city for employment and leisure. Likewise, employment and leisure facilities can be provided in the sub-centres as they will benefit from excellent accessibility from other parts of the city.

Growth Centres

The Spatial Planning Concept describes the function of Growth Centres as 'Intermediary towns; Important role in promoting rural development and in achieving a balanced distribution of urban population; Provide functional linkages between the smaller towns and Sub-Regional Centre'. This description is considered applicable to Mlolongo and Syokimau Town, as proposed in this master plan.

As referred to above, Airport City has special characteristics and therefore a different function to the other Growth Centres. When KAA were undertaking a procurement process for the master planning of Airport City (previously called JKIA Sky City) in May 2016, the function of the area was to accommodate commercial facilities and boost the revenue base of KAA. Based on discussions undertaken with KAA, these elements are still relevant for Airport City, but there also appears to be a possibility of providing a more mixed community that also benefits the surrounding area and stakeholders.

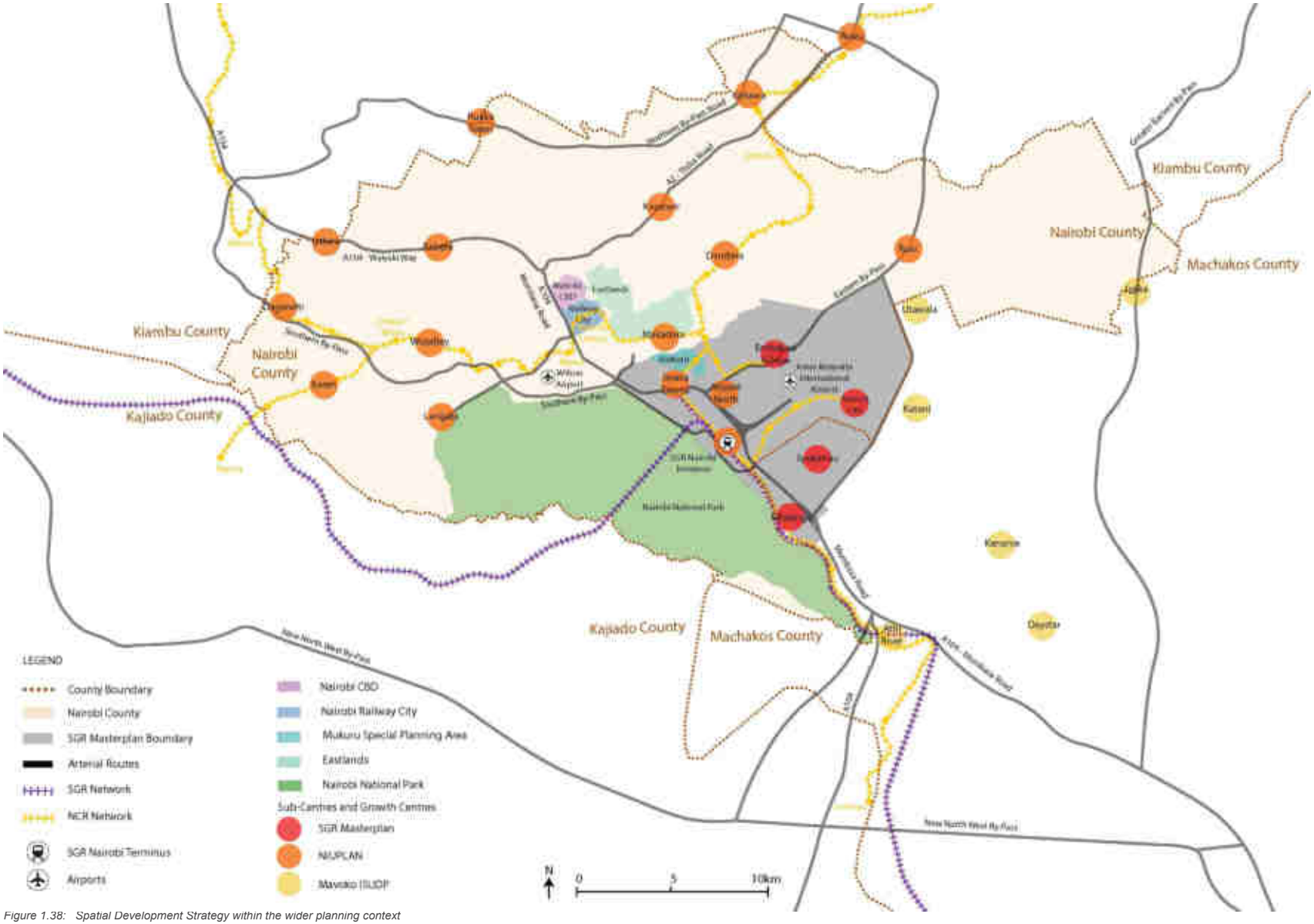

Figure 1.38: Spatial Development Strategy within the wider planning context

On this basis, the spatial development strategy envisages Airport City functioning as a Growth Centre that provides facilities that benefit from the proximity of JKIA and generate revenue for KAA, accommodates part of Nairobi's population growth, and provides employment opportunities for the resident population and surrounding areas.

1.3.4.6 INTER-CONNECTIONS

The spatial development strategy, when combined with NIUPLAN and emerging Mavoko ISUDP strategies, results in a number of new sub-centres and growth centres in this part of Nairobi and the wider Metropolitan Region. This is considered appropriate as each sub-centre and growth centre within the Study Area has a specific rationale and will perform certain functions.

Merging proposed centres to reduce the overall number is not considered feasible as major transport infrastructure creates physical barriers between them. Therefore, it is considered necessary to plan for a degree of self-containment in terms the mix of housing, jobs and other services within each centre.

Some inter-connectivity between sub-centres, growth centres and other strategic facilities, such as JKIA, is provided for in the spatial development strategy.

The SGR Nairobi Terminus sub-centre and JKIA are particularly strong focal points and the visioning process has demonstrated that stakeholders consider their inter-relationship to be important.

1.3.4.7 EXTERNAL CONNECTIONS

Although the sub-centres and growth centres will have a degree of self-containment and there will be inter-connectivity between centres in the Study Area, it is important to ensure that there are strategic and physical connections with areas outside the Study Area.

The western zone of the Study Area is part of the primary urban area (i.e. the built-up area) of Nairobi City, whereas the eastern zone is separated from it by JKIA. The centres in the west zone have a strong strategic and physical connection with Railway City and the CBD and there is likely to be a large volume of people moving between these.

On a strategic level, Railway City and the CBD will provide a high number and density of jobs, particularly in the office sector. The centres in the west zone will also provide jobs in this sector in order to achieve some self-containment. There is also likely to be in-commuting to these centres from elsewhere. The CBD and Railway City will inevitably attract some residents from the centres in the west zone, who will have the opportunity to commute using the improved commuter rail services or new BRT system.

The amount of office development proposed in the west centres is in general conformity with the development recommendations contained in the Market Analysis report. Therefore, this can be delivered and operated without undermining the office development at Railway City.

The sub-centres and growth centres in the east zone of the Study Area are separate from the primary urban area of Nairobi City. They have a stronger physical connection with areas in Machakos County and the eastern part of Nairobi County. This includes the Ruai sub-centre and growth centres at Utawala and Katani. These areas are less developed at present, so strategic connections are not yet established.

Airport City is envisioned as being a focal point for economic activity and jobs within this area, resulting in a large volume of people moving between it and the other centres listed above. This can be achieved via the new road along the eastern boundary and feeder buses that will use it, as proposed in the Transport Strategy. The economic activity at Airport City would include the health and hospitality sectors, which respond to KAA's vision of the specific opportunities that exist here. Therefore, this will not conflict with the economic uses that could be provided in the other centres, which are likely to be based on more common uses such as logistics, industry and offices.

The JKIA and the SGR Nairobi Terminus connection with Wilson Airport is strategically important as there will be visitors wishing to transfer between the transport modes to continue their onward journeys. A BRT route from the CBD to Wilson Airport is proposed in other studies. Therefore, visitors will be able to interchange to this in the CBD via the commuter rail lines from JKIA and the SGR Nairobi Terminus.

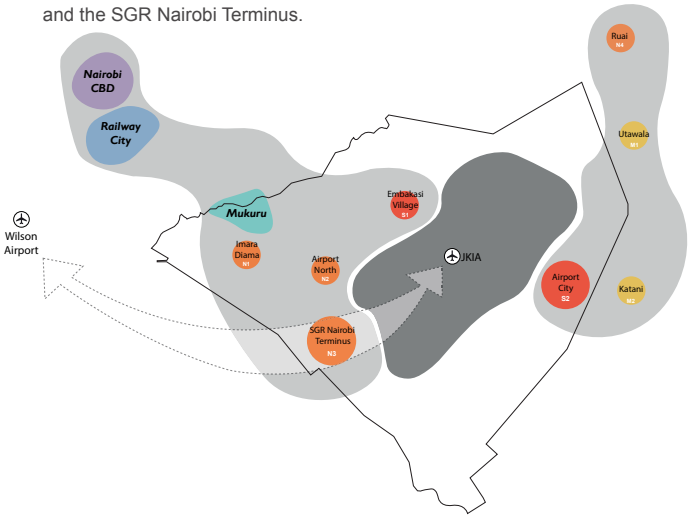

Figure 1.39: Connections between the Study Area and external areas

Strategic Policy 1: Spatial Development Strategy

The strategy of decentralisation shall be the focus of future detailed planning.

Imara Daima, Airport North, SGR Nairobi Terminus and Embakasi Village shall be planned and function as Sub-Centres. Mlolongo, Syokimau Town and Airport City shall be planned and function as Growth Centres.

Future detailed planning shall be informed by the strategic importance of the Centres, based on the following hierarchy:

1. SGR Nairobi Terminus (incorporating Airport North)
2. Airport City
3. Other Growth Centres (Mlolongo and Syokimau Town)
4. Other Sub-Centres (Imara Daima and Embakasi Village)

Inter-connectivity between Centres shall be planned for as shown on the Spatial Development Strategy Diagram.

Policy Guidance:

The policy objective is to ensure that the Spatial Development Strategy, as explained above and shown on the Spatial Development Strategy Diagram, is properly implemented and future detailed planning is in accordance with it. This is important to ensure that the area and individual centres can function in the way envisaged and contribute to wider planning strategies contained in the National Spatial Plan, Spatial Planning Concept and the NIUPLAN.

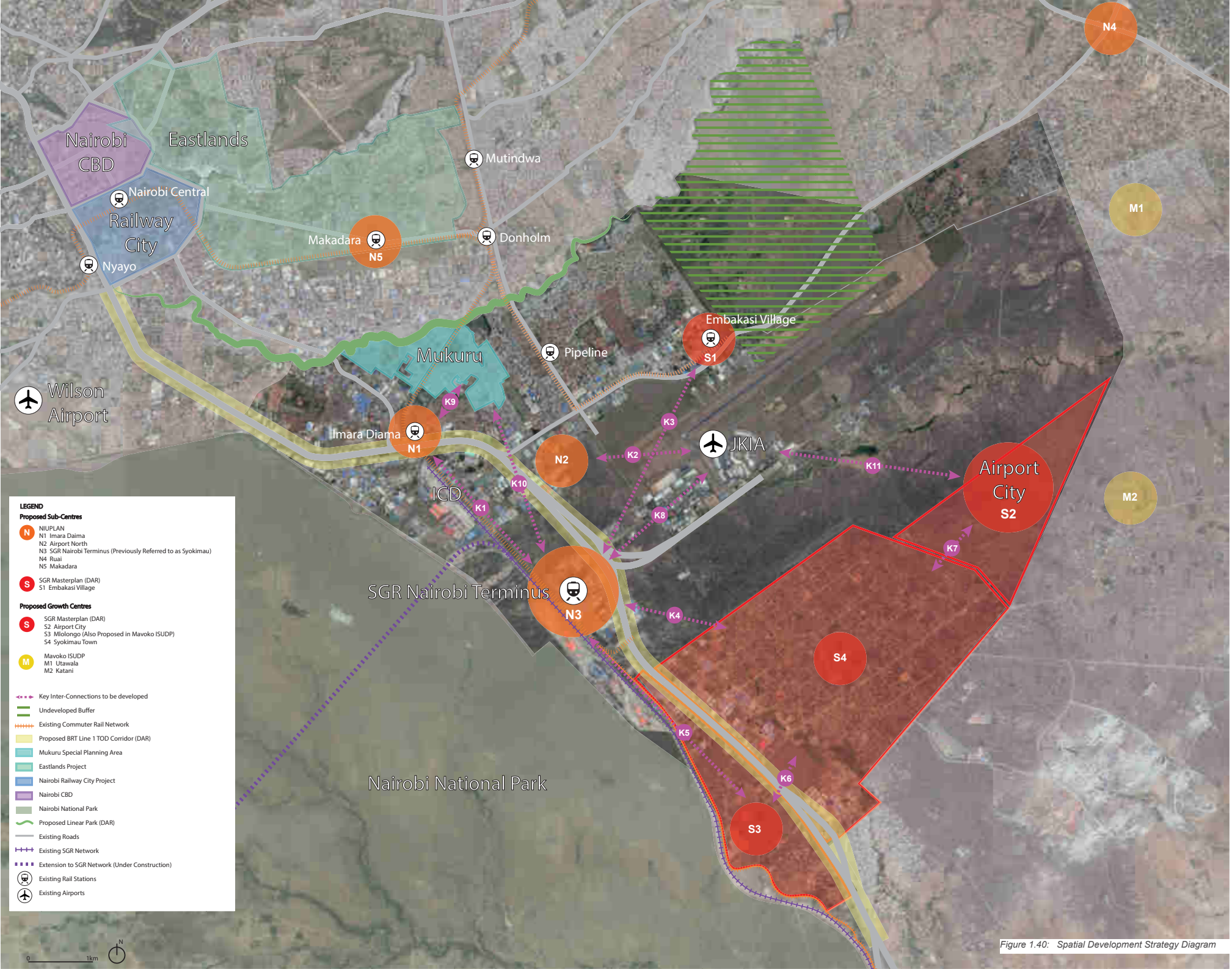

Figure 1.40: Spatial Development Strategy Diagram

1.3.5 SUMMARY OF TRANSPORT STRATEGY

A Transport Strategy was created due to the need for a uniform, comprehensive approach on the transport solutions within the Study area. A summary of the transport proposals is listed below.

1.3.5.1 PROPOSED NON-MOTORIZED TRANSPORT

Emphasising the reduction in automobile usage and promoting active travel, a variety of non-motorised transport is proposed. These include:

- The main non-motorized transport facility to is a cycle path and a pedestrian pathway that runs along with the extended BRT Line 1 alignment route in Mombasa Rd.
- At the connection of the SGR Nairobi Terminus Sub-Centre with Syokimau Growth Centre, it is being recommended that the proposed flyover also provides (on the same structure) a bicycle-only path and a footbridge.
- At Imara Daima commuter rail station, a large pedestrian link such as a plateau could be provided, to overcome the slope up to Mombasa Road and at the same time enable pedestrians to the transpose railway line safely.
- The connection between Imara Daima Sub-Centre and the SGR Nairobi Terminus Sub-Centre can be improved by reconfiguring the space underneath the existing flyover, providing a tunnel for pedestrians and bike-users only. This could also become a regular access to the ICD area.
- At Embakasi Village commuter rail station, a footbridge connecting both sides of the station is proposed. If the station design does not allow this possibility, a separate footbridge must be provided.

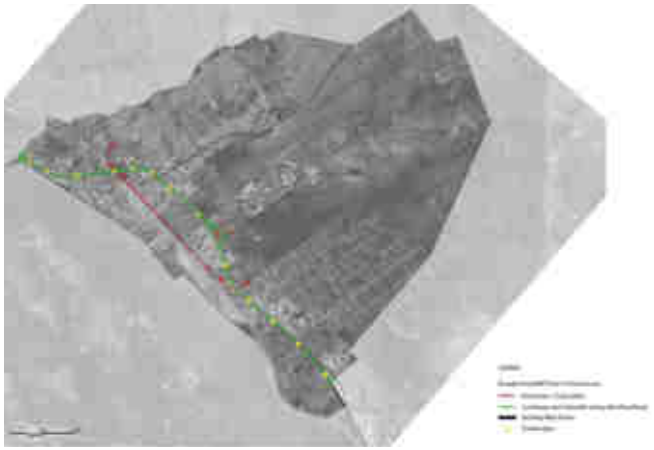

Figure 1.41: Non-Motorised Transport Proposals for the Study Area

1.3.5.2 PROPOSED PUBLIC TRANSPORT

- There is an emphasis to utilise public transport in order to reduce automobile use. To facilitate this, eight transportation connection nodes are created, predominantly at commuter rail stations. These transportation nodes would be utilised through a variety of feeder bus lines, BRT routes as well as matatus.
- The extension of BRT 1 is also suggested by extending its original terminus point (Imara Daima as stated in NIUPLAN) to Mlolongo running along the extent of Mombasa Road. Each BRT Station would require the creation of an elevated walkway to the centre station which can also be utilised by pedestrians crossing Mombasa Road.
- The closure of Syokimau Commuter Rail station allows for an extension of the commuter rail line towards JKIA, and a future tunnel to connect to Airport City is proposed. There are also proposals to create a new station at Mukuru to better incorporate the informal settlement into Nairobi. This is in line with the Commuter Rail expansion to provide more frequent services by 2030.

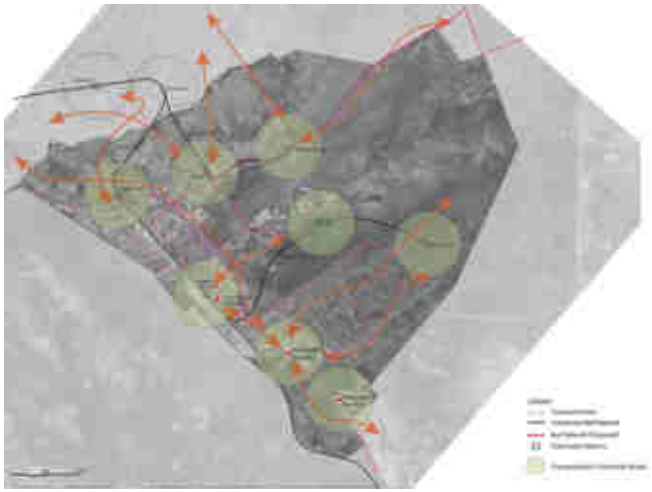

Figure 1.42: Public Transport Proposals for the Study Area

1.3.5.3 PROPOSED ROAD NETWORK

Several proposed road amendments and improvements area also encouraged as part of the strategy. The changes include:

- Improvement of two roads bordering the area of Syokimau.
- Creation of a road which extends from Mombasa Road to Airport City and then heading towards Mihango and onwards towards the Eastern Bypass.
- Creation of a new bypass South-West of the Core Area to provide an alternate route onto Mombasa Road from West Nairobi.
- Creation of two new junction connecting Mombasa Road and the Core Area into Syokimau.
- Reopening of the road from Airport North to JKIA.
- A new tunnel north of Imara Daima Station to bridge the divide caused by the railway line.
- Redesign of the intersection between JKIA and Mombasa Road. This has the potential to implement a direct elevated road link between JKIA and the Core Area.
- Creation of a new segregated roundabout near Imara Daima allowing a North to South vehicular access point.
- Grade Separated flyover U-turn at strategic locations along Mombasa Road.

Figure 1.43: Road Network Proposals for the Study Area

1.3.6 OTHER PROPOSALS

1.3.6.1 BRT LINE 1 - TRANSIT ORIENTED DEVELOPMENT CORRIDOR

Summary of Existing Conditions, Plans and Studies

The current road network in Nairobi is inadequate in terms of coverage to meet current and future demands. There is heavy congestion on most of the city roads especially during the morning and evening peak hours, particularly Mombasa Road, one of the most significant roads in Kenya. A push towards efficient public transportation is critical.

Numerous plans have been identified and reviewed. They ware summarised in Chapter 2. These include the NIUPLAN and the MRTS Harmonisation Study, which prove the most relevant to bus rapid transit (BRT) in Nairobi.

NIUPLAN highlights the lack of efficient public transportation systems within Nairobi and identifies the need for improvement. One of these proposed improvements is the introduction of a BRT system on nine road corridors, serving the most densely populated and low-income parts of Nairobi. The NIUPLAN does not include any guidance or proposals relating to land uses or development along BRT corridors.

The objective of the MRTS Harmonisation Study was to bring together the various transportation studies that had been undertaken for the Nairobi Metropolitan Region (NMR) over the recent few years, and to develop an integrated public transport network. The Study was completed in May 2014 and identified the following key points:

- Phase 1
  - The recommendation that Phase 1 should be based on BRT lines rather than LRT/metrorail
  - The recommendation that BRT corridors should be served by lines that are cross linked across the CBD rather than by radial lines terminating at a single hub within the CBD
  - Five BRT lines as follows:
  - Line 1: Kangemi-Imara (Waiyaki Way and Mombasa Road corridors)
  - Line 2: Bomas to Ruiru (Langata Road and Thika Road corridors)
  - Line 3: Kimbo Stage to Njiru (Ngong Road and Juja Road corridors)
  - Line 4: T-Mall to Mama Lucy (Kenyatta Avenue and Jogoo Road corridors)
  - Line 5: Outer Ring Road Corridor (from Imara to Balozi)
- Phase 2
  - Additional BRT capacity in the corridor or upgrade to metrorail along Ngong Road, Mombasa Road, Juja Road and Thika Highway.
  - The increased development of intermodal connection , such as:
  - Bus interchange facilities
  - BRT interchange and/or Park and Ride

The design for BRT Line 1 is advancing. This passes along Mombasa Road through the Study Area.

Along Mombasa Road, the land uses surrounding Imara Daima vary between industrial/warehouses with some retail and commercial development. Close to JKIA, much of the land is undeveloped. As Mombasa Road traverses' southwards, the land uses are predominantly industrial/warehouses near Syokimau and Mlolongo, gradually transitioning to residential at the southern extent of the Study Area.

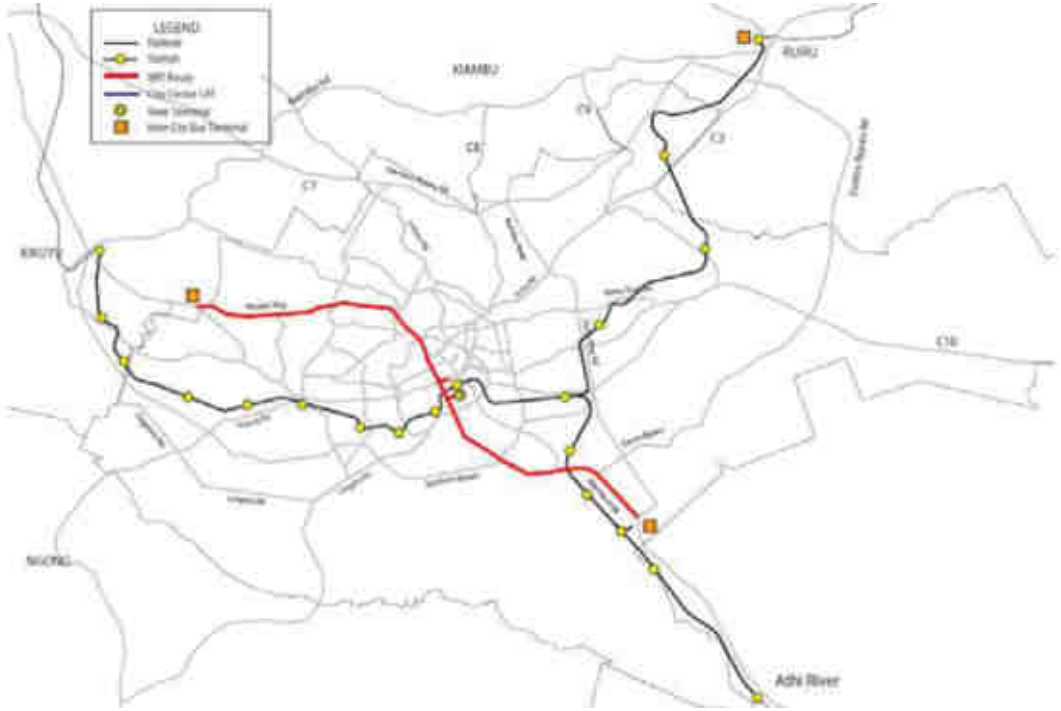

Figure 1.44: BRT Line 1 (Source: NIUPLAN)

BRT Corridors - Benchmarking

With BRT becoming an ever-increasing concept implemented across the world, a variety of benchmarks were undertaken to establish positive and negative implementation and design elements in respect of land use along BRT corridors.

> Rede Integrada de Transporte - Curitiba, Brazil

Curitiba is known for its BRT system and is noted as one of the first and most successful examples of transit-oriented development.

Local governments pro-actively leveraged TOD through zoning reforms, pro-development tax policies, assistance with land assemblage, and supportive infrastructure investments. Local government mandated that all medium- and large-scale urban development be sited along a BRT corridor.

A design element used to enhance transit accessibility in Curitiba was the "trinary" - three parallel roadways with compatible land uses and building heights that taper with distance from the BRT corridor. The first two floors of buildings surrounding the bus-way are slated for retail uses. Above the second floor, buildings must be set back at least five meters from the property line, to allow sun to cast on the transit-way. The inclusion of upper-level housing entitles property owners to density bonuses, which has led to vertical mixing of uses within buildings.

An important benefit of mixed land uses and transit service levels along these corridors, in addition to extraordinarily high ridership rates, has been balanced bidirectional flows, ensuring efficient use of bus capacity. The higher densities produced by the trinary design have translated directly into higher ridership. Concentrated commercial development has also channelled trips from residences beyond BRT termini to the trinary corridors.

Figure 1.45: Diagram showing Curitiba BRT system and surrounding land use proposals

> TransMilenio – Bogotá, Columbia

Inspired by the BRT system in Curitiba, TransMilenio consists of several interconnected BRT lines.

Local governments sought to leverage TOD through zoning reforms and supportive infrastructure investments. The approach to implement the BRT routes was focussed along corridors in mostly economically stagnant zones, but these had limited vacant land and were usually situated in busy roadway medians. This constrained opportunities for leveraging TOD and resulted in mostly unattractive pedestrian environments immediate to stations. There has been minimal intervention around station area planning or incentives for private property-owners to redevelop parcels.

Unlike Curitiba where high intensity development occurred around BRT routes, Bogatá has faced unprecedented high-density development further away along feeder lines. This is due to the availability of comparatively low-cost vacant parcels and opportunities to convert informal housing to higher-quality formal housing.

The densest parts of the city were on the city's western periphery (comprised mostly of low-income housing situated beyond a walking distance of TransMilenio and its feeders) as well as along a north-south mostly commercial corridor that abuts the Andes mountains to the east, two to eight city blocks away from TransMilenio trunkline services.

Placing stops in the medians of active roadways inevitably means a poor-quality pedestrian-access environment and thus little commercial development near the stations themselves. Neither the city nor neighbourhood districts (where detailed land use planning is regulated and implemented) prepared station-area plans to orchestrate private development, change zoning (including increasing permissible densities), introduce complementary improvements (like streetscape enhancements) to entice private investments, or take any other pro-active steps to leverage new development.

Figure 1.46: Bogatá BRT System

> Lagos BRT – Lagos, Nigeria

The Lagos BRT is a 22km Bus Rapid Transit (BRT) Lite scheme opened in 2008. It is the first example of a comprehensive and integrated approach to improving public transport in sub-Saharan Africa. The overall objective of the Lagos BRT system is 'to improve mobility and transport affordability in the city of Lagos through regulatory reform and facilitation of person movement on major corridors through a combination of traffic management and implementation of a high quality, high performance bus rapid transit system'.

The Lagos BRT System is a Private/Public Partnership where LAMATA, the public transit authority for Lagos, provide the enabling framework and infrastructure comprising bus depot garage, 3 bus terminals, 65% segregated bus ways, 28 bus shelters, road markings and other traffic management measures while the selected private sector operator (First BRT Cooperative Limited) accepted regulatory enforcement, commitment to procurement of buses, operations and maintenance. An average of 180,000 citizens ride the BRT Daily, exceeding its original estimates by 200%.

The land uses surrounding the BRT are predominately residential towards the end of the lines with the BRT running through the heart of the city where majority of office and tertiary sector services occur. This aids in allowing citizens to travel from the residential outskirts areas to their workplace in the CBD easily and relatively quickly. Most of these land uses were already in place prior to the BRT system, hence the BRT was a transport focussed intervention rather than seeking to leverage TOD.

Proposed Strategy

Because Mombasa Road passes through the heart of the entire Study Area, the commencement of high-frequency BRT services has the potential to create significant benefits for those areas along the corridor. The proposed strategy for this corridor is to implement transit oriented development (TOD) principles, in order to provide these benefits to the maximum resident and worker population. The benchmarking examples have shown that this approach can prove highly successful, in the case of Curitiba. On the other hand, the lack of an integrated land use strategy alongside BRT proposals can create undesirable outcomes, as shown with TransMilenio.

The Harmonisation study identified the concept of BRT catchment zones around BRT stations . Areas within 500 metres are identified as having "good connectivity", where there should be pedestrian access, NMT, boda-boda, matatu, BRT, park and ride, and kiss and ride functions. There was no detailed guidance in the document about land uses within these catchments.

Because BRT stations are positioned at frequent intervals along the route, the 500 metre catchments generally overlap with those of other stations. On this basis, the strategy proposes a corridor approach, whereby TOD principles are encouraged within 500 metres either side of the route (i.e. a corridor with a width of one kilometre). This approach also provides flexibility, as station locations can be amended slightly at the detailed design and construction phases without undermining the strategy (i.e. the designated one kilometre corridor remains unaltered, whereas a catchment would have to be relocated if stations are moved). The corridor approach has proved highly successful in the case of Curitiba.

As per the MRTS Harmonisation Study, the initial 250m corridor closest the BRT route on either side would comprise walkable areas filled with high-density, mixed-use development and major services. Within the 251-500m corridor, the density gradually decreases to a medium-high density.

Land within the corridor that is already developed could gradually be redeveloped over time to provide these land uses and densities. The strategy does not propose the instant relocation of existing uses but seeks to promote gradual change to medium-high density mixed use corridor that best utilises the high frequency public transport that will be available in the future.

Connectivity and integration is vital within the BRT corridor. Non-motorised transport should be prioritised in these areas and bicycles should have parking areas as close as possible to BRT stations to promote cycling by residents, visitors and workers. Every BRT station should incorporate footbridges in the design to provide better and safe connection between both sides of the road.

Strategic Policy 2: BRT Line 1 - Transit Oriented Development Corridor

As shown on the Spatial Development Strategy Diagram, a corridor with a width of one kilometre is identified along the proposed BRT Line 1 (500 metres either side of the route) as a Transit Oriented Development Corridor. Future detailed planning for this corridor shall be in accordance with Transit Oriented Development principles.

Transit Oriented Development principles are those set-out in the latest edition of the TOD Standard (published by: Institute for Transportation and Development Policy).

Policy Guidance:

The policy objective is to ensure that future detailed planning is based on transit-oriented development principles. The globally-recognised resource containing these is the TOD Standard. This is periodically revised and re-published. In implementing this policy, decision makers should ensure that they are referring to the latest edition (available at: https://www.itdp.org/library/standards-and-guides/).

At the time of publishing this report, the 3rd Edition of the TOD Standard is the latest version. Figure 1.48 shows the eight principles in the Standard.

Figure 1.47: Illustrative Diagram of BRT Catchment Areas (Source: MRTS Harmonisation Study)

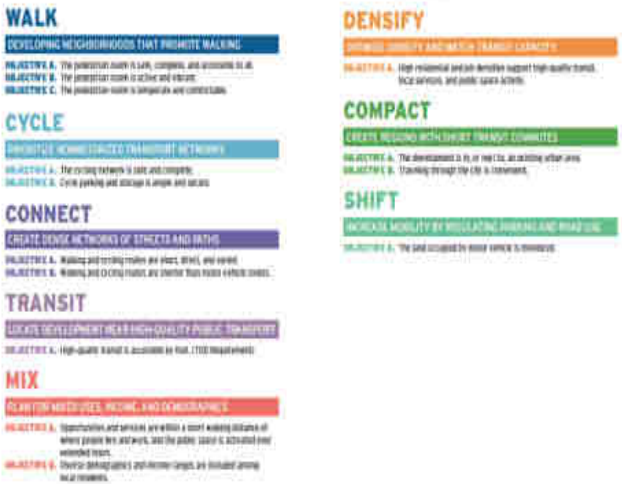

Figure 1.48: TOD Planning Principles (source: TOD Standard, 3rd Edition, 2017)

In Mlolongo, the Transport Strategy includes a new public transport interchange to integrate the BRT with trips from smaller capacity transport systems, such as matatus and feeder buses as well last mile complementary services. Additionally, a public transport interchange at Syokimau will play a similar role for this transport integration.

1.3.6.2 INTEGRATING MUKURU

Summary of Existing Conditions, Plans and Studies

In consultation with Slum Dwellers International and Akiba Mashinani Trust, it is understood that narrow road widths within Mukuru discourage car use and encourage sustainable modes of transport such as cycling and walking. However, the narrow road widths also mean that there is no public transport that penetrates the area. As a result, residents who are not working in the locality are required to walk long distances to gain access to transportation to other parts of the city. This is one of the major challenges facing the area in terms of its relationship with surrounding areas.

As noted in Chapter 2, Mukuru has been designated as a 'Special Planning Area'. It faces different planning challenges to other parts of the Study Area, but this designation ensures that efforts are being made to try and address these. The overall objectives set-out in the MSPA Inception Report (April 2017) are to:

- Guide and determine the future type and density of development;
- Act as a basis for the County Government to acquire land or buildings;
- Foster the integration of Mukuru into the rest of the city; and
- Set practice precedents and inform policy.

No definitive proposals for Mukuru have been published as yet, but these objectives provide some guidance as to how the Spatial Development Strategy can plan for Mukuru as a composite part of the Study Area. Proposals for Mukuru itself that provide for the needs of its residents will be covered by the Special Planning Area project.

Proposed Strategy

The Proposed Strategy for Mukuru supports the principle that Mukuru residents should be able to gain access to public transport at the nearest feasible location, thus avoiding long distances on foot. It is also important that walking and cycling routes used by residents are attractive, safe and secure. These measures will better integrate Mukuru with its immediate surroundings and the rest of the city, so will contribute towards achieving the third objective contained in the MSPA Inception Report (April 2017).

The Transport Strategy explains the proposal for a new commuter railway station in Mukuru, as part of the improvements to the wider network. This will have a significant contribution towards integrating Mukuru with the rest of the city by providing access to high quality public transport. This will provide a greater number and range of employment opportunities as it will facilitate easier commuting to and from other parts of the city.

Strategic Policy 3: Integrating Mukuru

Future detailed planning shall include measures so that Mukuru residents can gain access to public transport at the nearest feasible location. In the short-term, this shall include improvements to inter-connectivity with Imara Daima Commuter Rail Station. Post-2030, this shall include a new Commuter Rail Station at Mukuru, as proposed in the Transport Strategy.

Existing walking and cycling routes used by residents shall be upgraded and new routes designed so that they are attractive, safe and secure.

Policy Guidance:

The policy objective is to support efforts being made as part of the Mukuru Special Planning Area and overcome some of the challenges faced by Mukuru residents, insofar as they can be address in this Regional Plan. One the main challenges that can be addressed by this Plan is the issue of transportation, as set-out in the Strategic Policy.

Figure 1.49: Mukuru Existing Conditions (Source: Mukuru Situational Analysis, 2017)

Figure 1.50: Integrating Mukuru Concepts

Figure 1.51: Integrating Mukuru Concepts

1.3.6.3 EMBAKASI BARRACKS - UNDEVELOPED BUFFER

Summary of Existing Conditions, Plans and Studies

At the north-east of the Study Area is Embakasi Barracks and, to the east of this, the Kenya Police Training Camp. The Barracks are on the northern side of the Eastern Bypass, with the Police Camp on the southern side. There are some buildings and structures on these sites, normally in clusters, but on the whole they are largely free from built development. It has been possible to retain this status due to the nature of the institutional occupiers of the land, which presumably has made it an unattractive location for unplanned/informal development.

The characteristics of this area at the north-east of the Study Area creates a feeling of openness and a visual break in built development. From a functional perspective, it provides a planning benefit by interrupting the urban sprawl of Nairobi.

Under the existing Nairobi City Development Ordinances and Zones, this area falls within Zone 20, which includes Public/Strategic Reserved Areas. The types of development allowed are 'special/strategic facilities and developments'.

Proposed Strategy

The Proposed Strategy for Embakasi Barracks seeks to preserve and enhance the important and beneficial characteristics of this area by designating it as an 'Undeveloped Buffer'. This does not prevent the institutional occupiers from using the sites for their desired functions in accordance with the existing Development Ordinances and Zones, nor does it prevent them from undertaking further built development. The objective of the designation is to preserve the overall feeling of openness and prevent large-scale built development that would constitute urban sprawl. Further greening of this area is supported, through measures such as tree planting. There may also be opportunities for other environmental enhancements.

Strategic Policy 4: Embakasi Barracks - Undeveloped Buffer

As shown on the Spatial Development Strategy Diagram, an area of land within the northern part of the Study Area is identified as an Undeveloped Buffer.

Future detailed planning shall seek to preserve the openness of this area. Small-scale built development related to existing institutional operations is acceptable, but built development that is large-scale or not related to existing institutional operations is not acceptable, unless exceptional circumstances are demonstrated.

Policy Guidance:

The characteristics of this area at the north-east of the Study Area creates a feeling of openness and a visual break in built development.

The designation as an 'Undeveloped Buffer' does not prevent the institutional occupiers from using the area for their desired functions. The policy objective is to preserve the overall feeling of openness and prevent large-scale built development that would constitute urban sprawl.

Further greening of this area is supported, through measures such as tree planting. There may also be opportunities for other environmental enhancements.

Figure 1.52: Embakasi Barracks Undeveloped Buffer Concepts

Figure 1.53: Embakasi Barracks Undeveloped Buffer Concepts

1.3.6.4 NGONG RIVER - LINEAR PARK

Summary of Existing Conditions, Plans and Studies

Much of the northern boundary of the Study Area is formed by the Ngong River. The southern banks of the river, which are within the Study Area, are predominantly occupied by informal housing with some evidence of historic and existing quarrying activities. The northern banks of the river, outside the Study Area, are more mixed.

Informal housing on both banks of the river has been constructed very close to the river channel, meaning these may be at risk of flooding. The river channel itself is in a poor environmental condition in many places, caused in particular by solid waste dumping. It is clear that the river is an environmental hazard in many ways.

Proposed Strategy

The Proposed Strategy for the Ngong River promotes the comprehensive rehabilitation of the river corridor, with the aim being to create a linear park that is an environmental and recreational resource for Nairobi.

The long-term vision is the creation of an area that provides numerous benefits including a safe and attractive route for pedestrians and cyclists to access various parts of the city. The river runs through Mukuru, so provides another opportunity to improve the ability of residents here to access other parts of the city. The linear park would also be a location where people can come to spend their leisure time and partake in physical activity and relaxation.

Figure 1.54: Ngong River Existing Conditions

As shown on the Spatial Development Strategy Diagram, there may be scope to extend the linear park towards the Railway City project. The proposals for this show an area of green space in the south-west corner where the river is located, and also show an indicative extension of this along the river corridor towards the Study Area.

Figure 1.55: Ngong River Linear Park Concepts

Figure 1.56: Ngong River Linear Park Concepts

Strategic Policy 5: Ngong River - Linear Park

As shown on the Spatial Development Strategy Diagram, the general extent of the Ngong River corridor is designated as a Linear Park. The precise extent shall be designated through future detailed planning. This shall be informed by a Flood Risk Assessment. Areas at high risk of flooding shall be included within the designated corridor.

Once the precise extent has been designated, people and properties at high risk of flooding shall be relocated and the river corridor shall be rehabilitated. This shall be undertaken in the short-term to address existing adverse environmental effects. Following this, a linear park shall be created that will provide environmental and recreational benefits for Nairobi.

Development that would compromise the ability to achieve these elements is not acceptable.

Policy Guidance:

The policy objective is to:

1. Minimise the impacts of flooding on people and property;
2. Improve the environmental condition of the Ngong River corridor; and
3. Better utilise the river corridor.

It will be necessary to assess and determine those areas alongside the river that are at risk of flooding. It is likely that there will need to be a relocation of people and property close to the river that fall within areas identified as being at high risk of flooding. This is important as lives may be at risk. The Flood Risk Assessment may determine the need for more extensive relocation.

Various measures will be required to rehabilitate the river, including:

- Clearing away solid waste that has been dumped in the river channel;
- Provision of appropriate facilities for dealing with solid waste (in accordance with the waste hierarchy of re-use, recycle, recovery, disposal);
- Provision of appropriate services for collecting solid waste; and
- Other environmental measures to restore water quality and condition of the channel.

Implementing a solid waste management strategy is vitally important to ensure that the rehabilitated corridor and linear park do not fall back into poor condition. The NIUPLAN included a strategy that should be implemented across the city.

Once an area of rehabilitated open land has been established on the river banks, it will be possible to commence the creation of the linear park and appropriate features can be incorporated, such as pedestrian and cycle paths, and areas for relaxation.

1.3.7 LAND USE STRATEGIES

1.3.7.1 INTRODUCTION

As referred to above, in the Study Area there are three NIUPLAN sub-centres, one additional sub-centre proposed, one emerging Mavoko ISUDP growth centre, and two additional growth centres proposed. These are as follows:

- SGR Nairobi Terminus - NIUPLAN Sub-Centre (previously referred to as Syokimau);
- Airport North - NIUPLAN Sub-Centre;
- Imara Daima – NIUPLAN Sub-Centre;
- Embakasi Village – additional Sub-Centre;
- Mlolongo – emerging Mavoko ISUDP Growth Centre;
- Airport City – additional Growth Centre; and
- Syokimau Town – additional Growth Centre.

The SGR Nairobi Terminus and Airport North are covered by a Local Development Plan. For the other five centres, land use strategies have been prepared to provide area-specific visions and a framework for future detailed planning. These are set-out in the following pages.

Figure 1.57: Imara Daima Existing Conditions

1.3.7.2 IMARA DAIMA

Summary of Existing Conditions, Plans and Studies

Imara Daima is situated towards the north-western corner of the Study Area, just north of Mombasa Road. It comprises some recently-constructed gated residential accommodation and some warehouse industry. There is also a strip of commercial/showrooms land adjacent to the northern edge of Mombasa Road. Some undeveloped land is present around the station area.

There are two sizeable extents of community facilities which include a collection of schools. These include Riara Springs Academy, Riara Group of Schools Springs Campus, Riara Springs Girls Campus, Jabali Christian Schools as well as an International Christian Centre and Connection Centre.

Other notable features include Mukuru, a large area of predominantly informal housing located towards the north and east of Imara Daima with a population estimated at 100,000 (MSPA Inception Report, 2017).

Access to Imara Daima from Mombasa Road is poor and subject to congestion at peak times.

In the Nairobi City Development Ordinances and Zones, Imara Daima is within Zone 10E. This allows for residential mixed development with a ground (plot) coverage of 50% and plot (floor area) ratio of 75% (0.75).

The NIUPLAN includes a Concept Land Use Plan for Imara Daima. This shows the development of land to the north and east of the station for high density residential and mixed-use development, involving significant land use changes from the existing situation. The current Development Ordinances and Zones would probably need to be altered to achieve this, as the floor area ratio is too low to facilitate high-density development. The Concept Land Use Plan includes new access to/from Mombasa Road and a new road from the east to west side of the railway.

Proposed Land Use Strategy

Imara Daima is envisioned as a Transit Oriented Sub-Centre. It is proposed that new development should take place in this sub-centre based on Transit Oriented Development (TOD) principles. A radius of 800m around the station should be the focus for TOD. This equates to an approximate walking distance of 10 minutes, which is where TOD is able to have the greatest influence and yield the greatest benefits.

Future high frequency commuter rail services will present the area as a more desirable place to live and stimulate rejuvenation of the area. Imara Daima has the potential to incorporate TOD principles into practice by developing high density, mixed uses (residential/retail and leisure/offices) in the vicinity of the station.

The proposed land use strategy is in general accordance with the NIUPLAN concept for Imara Daima, which also recognises the opportunity for high density mixed-use development and the need for land use changes to facilitate this.

The Land Use Strategy for Imara Daima suggests a two phase approach to development.

- Phase 1: TOD on Undeveloped Land (short to medium term)

Phase 1 does not involve extensive land use change and instead requires the utilisation of undeveloped land within 800 metres of the station. Phase 1 can occur prior to the improved commuter rail services that are set to be available in 2030 and would create mixed use areas that would form the basis of TOD.

Other development within the 800 metre boundary includes that in the Local Development Plan for the SGR Nairobi Terminus sub-centre.

Phase 1 sees potential improvements to the pedestrian and cycle network. A green corridor could be created following the railway line, including pedestrian and cycle routes. This would provide a link southwards to the SGR Nairobi Terminus (underneath Mombasa Road) and to Mukuru in the north. This route between Mukuru and Imara Daima is already a popular route along a narrow road and there is scope to improve the appearance and safety of this through measures such as landscaping and street lighting.

Phase 1 also provides for additional pedestrian links, most likely in the form of a new foot bridges, to connect the two sides across the railway. This is an important link to enable people who work in the employment areas on the west of the railway to easily access their place of work.

The Transport Strategy includes provision for a new road connecting Mombasa Road and the main access road to the rail station, which should address some the existing problems regarding access to the area.

- Phase 2: Land Use Changes to Facilitate TOD (post-2030)

Phase 2 proposes some land use changes to further support the TOD from Phase 1. One area would be the existing warehouse land north of Mombasa Road and east of the mixed use development in Phase 1. It is proposed that this is re-zoned to mixed use (residential/retail and leisure) which would create an extension of the Phase 1 mixed use land. The justification for this re-zoning is that it would facilitate a larger residential population within the 800m radius of the railway station, maximising the population with good accessibility to public transport, promoting the TOD ideology and walkable communities. As it also facilitates retail and leisure development, local residents have the opportunity to work, shop and play within their own area. It creates a destination which is easily accessible by public transport, thus widening its appeal to people from other parts of Nairobi.

West of the station, a new office quarter is proposed through re-zoning of some of the existing industrial/warehouse land. The justification for this re-zoning is that it would lead to a more intense form of employment and a net increase in the number of jobs, when compared to the existing land use. The location is suited to this high intensity employment use due to the availability of public transport that will exist post-2030 and it achieves the objective of maximising the number of people able to commute by sustainable modes of transport. The higher residential population created in the mixed use areas may also provide a local workforce that is able to walk to their place of work here.

Stage 2 also proposes a green buffer along the northern edge of Mombasa Road, to provide some mitigation against noise and air pollution for users of the nearby proposed mixed use areas.

The Transport Strategy includes provision for a new tunnelled road connecting the east and west sides of the railway.

Figure 1.59 shows how the proposed land use strategy can be achieved spatially.

Estimated Development and Population Capacity

Table 1.2 contains an estimation of the amount of development that could be achieved along with the population and employment generated

Recommendations for Future Detailed Planning

In order to progress the proposed land use strategy referred to above, it is recommended that the following planning actions are implemented:

- The undeveloped land should be zoned for mixed use development (as per the proposed Phase 1). This should be considered as an immediate action as it is important in order to prevent the land being developed for an alternative use that may not be compatible with TOD principles.
- A Local Development Plan should be prepared to set-out the development envisaged in both Phases 1 and 2. This needs to include the following matters:
  - Detailed breakdown of acceptable land uses;
  - Affordable housing requirements;
  - Development guidelines covering matters such as densities, heights, setbacks and floor area ratios;
  - Urban design guidelines;
  - Open space and community facility standards;
  - Road and utilities infrastructure requirements;
  - Transport and movement strategy;
  - Public realm strategy; and
  - Implementation strategy.
- Land required to facilitate the Phase 2 development should be zoned in accordance with the Local Development Plan. As referred to above, it is envisaged that Phase 2 will be completed post-2030, once improved Commuter Rail services are operational.

Figure 1.58: Imara Daima Mixed-Use Development Concept

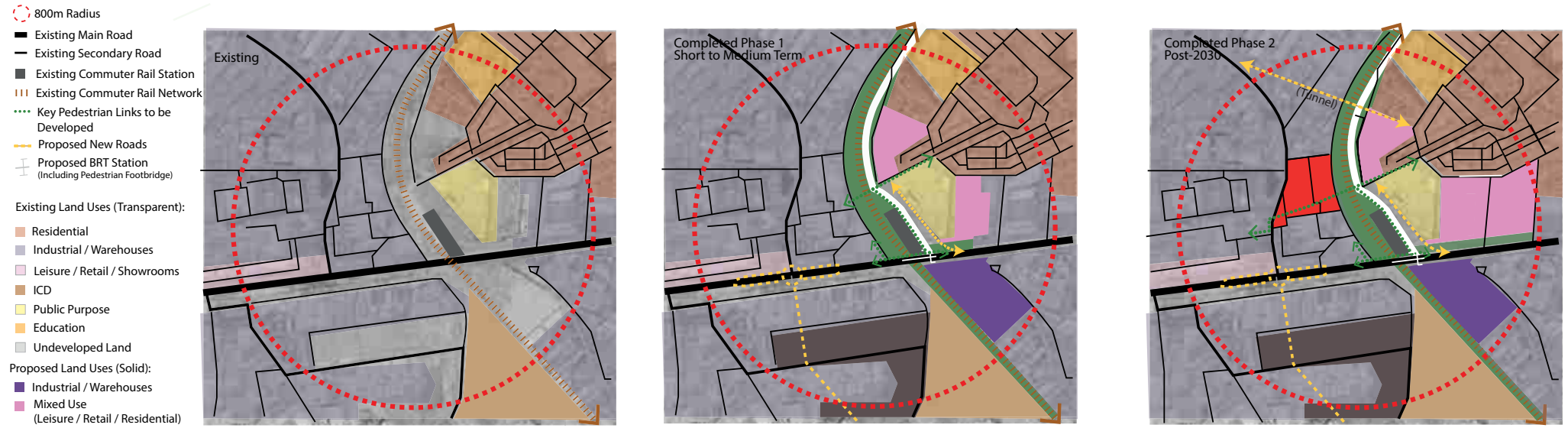

Figure 1.59: Imara Daima Concept Land Use Plans

Table 1.2: Imara Daima Estimated Development and Population Capacity

IMARA DAIMA																
PROPOSED LAND USE	GROSS LAND AREA (HA)	NET LAND AREA (HA)	AVERAGE PLOT FAR	GROSS FLOOR AREA (M2)	NET FLOOR AREA (NON-RESIDENTIAL) (M2)	NET FLOOR AREA (RESIDENTIAL) (M2)	NUMBER OF RESIDENTIAL UNITS	NUMBER OF SERVICED APARTMENT / HOSPITALITY KEYS	NUMBER OF HOSPITAL BEDS	RESIDENTS	VISITORS	STUDENTS/ PATIENTS	SERVICED APARTMENT / HOSPITALITY OCCUPANTS	WHITE COLLAR STAFF	BLUE COLLAR STAFF	DOMESTIC STAFF
Commercial - Offices	5.9	3.7	2.0	73,808	51,977									2,772	693	
Mixed Use (Leisure / Retail / Residential)	16.3	10.2	2.5	254,345	30,450	148,667	1,487			5,947	1,522			609	913	743
Strategic Green Spaces	9.4	9.4														
Public Purpose (within residential and mixed use areas)		0.7	2.0	13,310	9,373						469			351	117	
TOTAL	31.6	24.0	N/A	341,462	91,800	148,667	1,487	-	-	5,947	1,991	-	-	3,733	1,724	743

1.3.7.3 EMBAKASI VILLAGE

Summary of Existing Conditions, Plans and Studies

Embakasi Village is located north of Airport North Road and JKIA. A mixture of residential properties exist, including Nyayo estate, constructed in recent years that cater to middle-income residents towards the north with a narrow strip of formal apartment blocks towards the east.

An area was also noted to comprise of a mixture of informal housing/ workshops which wraps around a large existing industrial area towards the west. The remainder of the area is primarily industrial/warehouse, but does contain one large plot for the Kenya Airways Pride Centre, an area equipped for aviation training but also in use for hospitality/event purposes.

In terms of existing Infrastructure, Airport North Road is the primary road serving the area. Embakasi Village commuter rail station is not well integrated with the surrounding urban environment. It is bounded by industrial uses and access is only available from the south-west side via a long track connecting to Embakasi Road.

In the Nairobi City Development Ordinances and Zones, Embakasi Village is within Zone 10E. This allows for residential mixed development. Figures for ground (plot) coverage and plot (floor area) ratio are not given.

Figure 1.60: Embakasi Village Existing Conditions

Proposed Land Use Strategy

Like Imara Daima, Embakasi Village is envisioned as a Transit Oriented Sub-Centre. Again, a radius of 800m around the station should be the focus for TOD as this equates to an approximate walking distance of 10 minutes, so this is where TOD is able to have the greatest influence and yield the greatest benefits.

The Land Use Strategy for Embakasi Village suggests a two phase approach to development, as follows:

> Phase 1: Creation of a Station Hub (medium term)

Phase 1 seeks to address the existing conditions where the rail station lacks legibility and visibility, and is poorly integrated with its surroundings. This would prepare the environment around the station in readiness for the improved commuter rail services that will commence from 2030.

An open plaza is proposed next to the station, to improve the physical relationship with the surroundings and facilitate more direct pedestrian movements.

Some high density, mixed use development is proposed close to the station, requiring some land use changes from the existing industrial/warehouses. The retail and leisure element within the mixed use development would also provide opportunity for economic growth and a place for locals and commuters to work, shop and play.

Between the station and the mixed use area, a public transport terminus is proposed in the Transport Strategy that could serve buses, matatus, taxis etc.

The existing informal housing/workshop areas should be upgraded to formal residential use, integrating with the existing residential from the north. This could be a focus for providing affordable housing.

A green corridor is also proposed in the area and, similar to that identified in Imara Daima, would run adjacent to the existing railway, creating a route for pedestrians and cyclists. Additional pedestrian links are also proposed, particularly leading from Embakasi Village Station through existing industrial areas to the communities in the north.

> Phase 2: Land Use Changes to Facilitate TOD (post-2030)

Phase 2 expands on the previous phase by establishing a more significant area of change from industrial/warehouse land to mixed use (residential, retail and leisure) development aligned with TOD principles.

On the southern side of the station, industrial/warehouse land is proposed to be zoned to office use. This is to facilitate a higher intensity employment area close to the station hub. This commercial land use is strategically placed on Airport North Road at a prominent gateway to the city. It is also directly opposite JKIA, meaning specific commercial synergies may arise, benefiting both the airport and other landowners.

Figure 1.61: Embakasi Village Mixed Use Development Concept

Estimated Development and Population Capacity

Table 1.3 contains an estimation of the amount of development that could be achieved along with the population and employment generated.

Recommendations for Future Detailed Planning

In order to progress the proposed land use strategy referred to above, it is recommended that the following planning actions are implemented:

- A Local Development Plan should be prepared to set-out the development envisaged in both Phases 1 and 2. This needs to include the following matters:
  - Detailed breakdown of acceptable land uses;
  - Affordable housing requirements;
  - Development guidelines covering matters such as densities, heights, setbacks and floor area ratios;
  - Urban design guidelines;
  - Open space and community facility standards;
  - Road and utilities infrastructure requirements;
  - Transport and movement strategy;
  - Public realm strategy; and
  - Implementation strategy.
- Land required to facilitate the Phase 1 and 2 development should be zoned in accordance with the Local Development Plan. As referred to above, it is envisaged that Phase 1 could be undertaken in the medium term, which is envisaged as the period leading up to 2030, in order to create a station hub that is functioning upon commencement of improved Commuter Rail services.
- Phase 2 is proposed for the period post-2030, once improved Commuter Rail services are operational and further TOD can be facilitated.

Strategic Policy 6: Imara Daima and Embakasi Village – Transit Oriented Sub-Centres

As shown on the Concept Land Use Plans, the areas of land within an 800 metre radius of Imara Daima and Embakasi Village Commuter Rail Stations are designated as Transit Oriented Sub-Centres. Future detailed planning shall be in general accordance with the Concept Land Use Plans and indicative phasing.

Development within these areas shall be in accordance with Transit Oriented Development principles, unless exceptional circumstances are demonstrated.

Transit Oriented Development principles are those set-out in the latest edition of the TOD Standard (published by: Institute for Transportation and Development Policy).

Policy Guidance:

Achieving the policy objective, namely development that is transit-oriented, involves the implementation of various planning principles. The globally-recognised resource containing these is the TOD Standard. This is periodically revised and re-published. In implementing this policy, decision makers should ensure that they are referring to the latest edition (available at: https://www.itdp.org/library/standards-and-guides/).

At the time of publishing this report, the 3rd Edition of the TOD Standard is the latest version. Figure 1.62 shows the eight principles in the Standard.

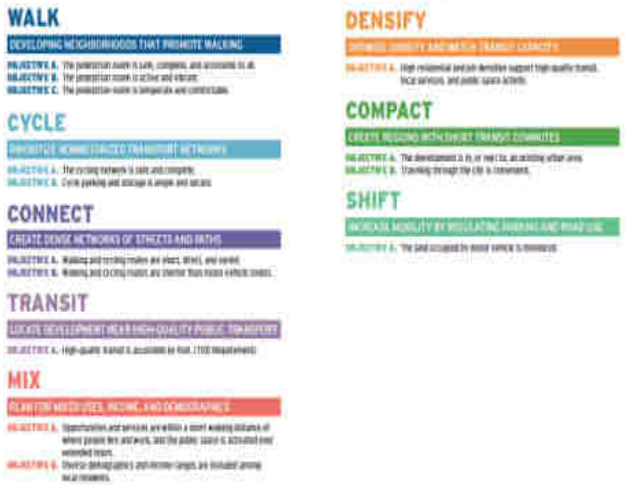

Figure 1.62: TOD Planning Principles (source: TOD Standard, 3rd Edition, 2017)

Figure 1.63: Embakasi Village Concept Land Use Plans

Table 1.3: Embakasi Village Estimated Development and Population Capacity

EMBAKASI VILLAGE																
PROPOSED LAND USE	GROSS LAND AREA (HA)	NET LAND AREA (HA)	AVERAGE PLOT FAR	GROSS FLOOR AREA (M2)	NET FLOOR AREA (NON-RESIDENTIAL) (M2)	NET FLOOR AREA (RESIDENTIAL) (M2)	NUMBER OF RESIDENTIAL UNITS	NUMBER OF SERVICED APARTMENT / HOSPITALITY KEYS	NUMBER OF HOSPITAL BEDS	RESIDENTS	VISITORS	STUDENTS/ PATIENTS	SERVICED APARTMENT / HOSPITALITY OCCUPANTS	WHITE COLLAR STAFF	BLUE COLLAR STAFF	DOMESTIC STAFF
Commercial - Offices	2.4	1.5	2.0	29,459	20,746									1,106	277	
Mixed Use (Leisure / Retail / Residential)	21.6	13.5	2.5	337,184	40,367	197,087	1,971			7,883	2,018			807	1,211	985
Residential	14.7	9.2														
Maisonettes		1.0	1.0	9,969		7,021	83			332						83
Apartments		8.2	2.0	164,298		115,703	1,157			4,628						579
Transportation	1.1	0.7												17	11	
Strategic Green Spaces	2.9	2.9														
Public Purpose (within residential and mixed use areas)		1.2	2.0	23,856	16,800						840			630	210	
Land Safeguarded for Commuter Railway Expansion	2.6	2.6														
TOTAL	42.7	28.3	N/A	564,766	77,913	319,810	3,211	-	-	12,844	2,858	-	-	2,560	1,709	1,647

3

1.3.7.4 SYOKIMAU TOWN

Summary of Existing Conditions, Plans and Studies

Syokimau Town forms an extensive area covering just over 1,600 hectares, located in the Mavoko Sub-County of Machakos County. It is bounded by JKIA towards the north and east, Mlolongo to the south and Mombasa Road to the west.

It suffers from poor existing infrastructure services and roads are in substantial need of upgrading, with the onset of the rainy season causing several roads to be unusable.

A cluster of industrial/warehouse units exist on the western edge, next to Mombasa road. Many of the industrial units are sizeable and generate extensive traffic. An area of 62 hectares is restricted from development due to land which it is understood is used for aviation communications.

A Dam is located in the southern part of the area, fed by an associated stream which it is understood runs from a northerly location. Where it runs through Syokimau Town, it can be considered a natural divide between the industrial and residential areas, although it should be noted that a few gated residential complexes appear within the industrial area.

Syokimau Residents Association (SRA) has expressed concern about water quality in the stream, resulting from some industries discharging contaminated water into the stream. Concern has also been raised about there being no protected stream corridor, meaning that the stream flows through privately owned land with no means for public authorities to access it for the purposes of environmental regulation and maintenance. It is not clear if flood risk has been considered when built development has taken place, which could mean that some properties have been built within flood prone areas.

The developed areas east of the stream are almost entirely residential and there are no major commercial, retail, leisure or community facilities hubs. The area suffers from a lack of focal points for residents and no strong/unique identity.

Most properties form their own gated communities which is reflected in the road network. Syokimau Town consists of seven north-east to south-west routes, but only one or two meaningful north-west to south-east road links. This is due to a small developments of several dwellings creating their own gated community, served by a short private cul de sac originating from the north-east to south-west road network

Syokimau Commuter Rail Station provides transport for commuters who reside to the south JKIA. However, the station lies 700m from the Syokimau Town boundary and on the west side of Mombasa Road, leading to an unsafe and difficult pedestrian route. This encourages private car use to access the station.

A truck weighbridge station is located within at the southern end of Syokimau Town and connects to Mombasa Road via slip roads.

SRA has formulated a proposed land use plan for the area . It proposes retail, commercial, residential and light industry, adjacent to Mombasa Road, with the remainder being allocated to low density residential.

Additional plans include the emerging Mavoko ISUDP. The Plan has further zoned Syokimau Town as residential, similar to the SRA plan, however it differentiates between higher densities towards Mombasa Road and lower densities towards the north-east..

It should also be noted that the National Airport Systems Plan: Land Use Planning and Management Report, prepared for Kenya Airport Authority highlighted that airport expansion could affect some residents in Syokimau Town, particularly due to increased noise from a second runway.

Proposed Land Use Strategy

Syokimau Town is envisioned as a Growth Centre based on its strategic location close to the SGR Nairobi Terminus sub-centre and JKIA, the availability of some undeveloped land to facilitate new development, and the need for existing areas to be improved. For these reasons, the strategy should be implemented in the short-term.

The Land Use Strategy for Syokimau Town maintains existing land uses, where possible, whilst utilising the remaining undeveloped land for future development. The majority of undeveloped land is proposed for residential use, based on this land use having the highest demand in the Market Analysis Development Recommendations. Some industrial/warehouse development is proposed on the undeveloped land within the existing industrial area in the western part of Syokimau Town.

The Land Use Strategy identifies two potential retail/leisure/community hubs in central Syokimau Town. These hubs could be developed as a retail shopping district or a more mixed used area. These would act as a focus for local shopping. Leisure and community facilities which not only encourage walkable communities but create an identity for the area. SRA previously advised the Consultant of the need for increased retail, leisure and community facilities provision. This proposal will contribute towards achieving this.

Mixed use development along the eastern edge of Syokimau Town is also planned and will create a more fluid integration between the Syokimau Town and the proposed Airport City.

Landscaped areas are also be part of the Land Use Strategy. Firstly, a proposed river rehabilitation corridor is proposed along the existing Syokimau dam and associated stream. This mainly includes existing undeveloped land, in order not to require relocation of any developed plots, which would

Figure 1.64: Syokimau Town - Existing Conditions

Figure 1.65: Syokimau Town - Existing Conditions

Figure 1.66: Syokimau Town - Existing Conditions

be enhanced to create green open spaces as well as the potential to create liveable areas with playgrounds and other amenities. For stream sections which run through existing developed plots, the corridor is narrow with the intention that landowners should be encouraged by the authorities to protect the water course from any contamination.

The river rehabilitation corridor would create four distinct large green spaces separated through smaller green corridors creating an interesting, dynamic changing green space. Furthermore, it would act as a buffer between the existing residential and industrial areas.

Figure 1.67: Syokimau Town Residential Development Concept

Figure 1.68: Syokimau Town Retail and Leisure Corridor Concept

The Transport Strategy makes provision for two public transport interchanges close to Mombasa Road. One would be located centrally and one at the southern corner of Syokimau. These would allow for interchanges between the BRT, feeder buses, and potentially matatus and taxis.

The Transport Strategy also includes a number of new junctions on Mombasa Road, which would improve access to/from Syokimau. These include a direct connection to the SGR Nairobi Terminus sub-centre.

Figure 1.69 shows how the land use strategy can be achieved spatially.

Estimated Development and Population Capacity

Table 1.4 contains an estimation of the amount of development that could be achieved along with the population and employment generated.

Recommendations for Future Detailed Planning

In order to progress the proposed land use strategy referred to above, it is recommended that the following planning actions are implemented:

- A Local Development Plan should be prepared to set-out the development envisaged. This needs to include the following matters:
  - Detailed breakdown of acceptable land uses;
  - Affordable housing requirements;
  - Development guidelines covering matters such as densities, heights, setbacks and floor area ratios;
  - Urban design guidelines;
  - Open space and community facility standards;
  - Road and utilities infrastructure requirements;
  - Transport and movement strategy;
  - Public realm strategy; and
  - Implementation strategy.
- Land required to facilitate development should be zoned in accordance with the Local Development Plan. As referred to above, it is envisaged that development should be provided in the short term.

Strategic Policy 7: Syokimau Town - River Rehabilitation Corridor

As shown on the Concept Land Use Plans, the general extent of the Syokimau River corridor is designated as a River Rehabilitation Corridor. The precise extent shall be designated in future detailed plans. This shall be informed by a Flood Risk Assessment. Areas at high risk of flooding shall be included within the designated corridor.

Once the precise extent has been designated, people and properties at high risk of flooding shall be relocated and the river corridor shall be rehabilitated. This shall be undertaken in the short-term to address existing adverse environmental effects. Following this, strategic green spaces shall be created where opportunities exist.

Development that would compromise the ability to achieve these elements is not acceptable.

Policy Guidance:

The policy objective for the Syokimau River is the same as for the Ngong River, referred to above.

In Syokimau Town, the Residents Association has expressed concern about water quality in the stream, rather than solid waste disposal, as is the case for the Ngong River. The measures to rehabilitate the river are more likely to be associated with the enforcement of environmental regulations to prevent nearby industries from discharging contaminated water into the river.

Once an area of rehabilitated open land has been established on the river banks, it will be possible to commence the creation of strategic green spaces incorporating elements such as pedestrian and cycle paths, and areas for relaxation.

Figure 1.69: Syokimau Town Concept Land Use Plan

Table 1.4: Syokimau Town Estimated Development and Population Capacity

SYOKIMAU TOWN																
PROPOSED LAND USE	GROSS LAND AREA (HA)	NET LAND AREA (HA)	AVERAGE PLOT FAR	GROSS FLOOR AREA (M2)	NET FLOOR AREA (NON-RESIDENTIAL) (M2)	NET FLOOR AREA (RESIDENTIAL) (M2)	NUMBER OF RESIDENTIAL UNITS	NUMBER OF SERVICED APARTMENT / HOSPITALITY KEYS	NUMBER OF HOSPITAL BEDS	RESIDENTS	VISITORS	STUDENTS/ PATIENTS	SERVICED APARTMENT / HOSPITALITY OCCUPANTS	WHITE COLLAR STAFF	BLUE COLLAR STAFF	DOMESTIC STAFF
Leisure / Retail / Showrooms	5.4	3.5	2.0	69,231	48,754						2,438			975	1,463	
Mixed Use (Leisure / Retail / Residential)	71.0	45.8	2.0	916,537	161,362	484,086	4,841			19,363	8,068			3,227	4,841	2,420
Industrial / Warehouses	35.8	25.2	0.8	201,669	142,021									303	706	
Residential	401.3	258.9														
Maisonettes		56.1	1.0	561,367		395,329	4,678			18,712						4,678
Apartments		202.8	1.5	3,041,824		2,142,129	21,421			85,685						10,711
Transportation	5.0	3.2												77	51	
Strategic Green Spaces	109.2	109.2														
Public Purpose (within residential and mixed use areas)		8.6	2.0	171,276	120,617						6,031			4,523	1,508	
Potential Leisure / Retail / Public Purpose Hub	81.6	52.7	2.0	1,054,213	742,403						37,120			27,840	9,280	
TOTAL	**709.3**	**503.9**	**N/A**	**6,016,117**	**1,215,158**	**3,021,544**	**30,940**	**-**	**-**	**123,761**	**53,657**	**-**	**-**	**36,945**	**17,848**	**17,809**

1.3.7.5 MLOLONGO

Summary of Existing Conditions, Plans and Studies

Mlolongo is bounded by Nairobi National Park and the SGR on the west and Mombasa Road on the east, creating significant barriers and a challenge to integrate existing and future developments with surrounding areas.

Mlolongo is currently sparsely developed, comprising of some industrial/ warehouse development towards the north-west and some residential, retail and leisure towards the south-east. In recent years, there has been the addition of several gated residential complexes. South of this the residential development appears to be a mixture of formal and informal. Other land uses include vehicle repair stores, shopping arcades and public services lining the eastern edge of Mlolongo, along Mombasa Road, which exacerbates localised traffic conflicts and congestion.

The road network in Mlolongo largely comprises of access roads onto the Mombasa Road service road. There is only one north to south dirt road which connects these access roads together.

A truck weighbridge station is located within Mlolongo and connects to Mombasa Road via slip roads.

The only plan relating to Mlolongo that the Consultant is aware of is the emerging Mavoko ISUDP. This shows high density residential proposed in the south-east part and industrial proposed in the north-west part.

Proposed Land Use Strategy

Mlolongo is already home to a good standard of industrial and residential development and these should be respected. There are also opportunities to enhance these areas with additional high quality development.

Figure 1.70: Mlolongo Existing Conditions

The Land Use Strategy for Mlolongo maintains existing land uses, where possible, whilst utilising the remaining undeveloped land for future development. The majority of undeveloped land is proposed for residential use, based on this land use having the highest demand for growth and expansion in the Market Analysis Development Recommendations. Some industrial/warehouse development is proposed on the undeveloped land within the existing industrial area in the north-west part.

The elements of the strategy described above are in general accordance with the emerging Mavoko ISUDP.

The Land Use Strategy identifies a potential retail/leisure/community hub adjacent to Mombasa Road. This could act as focus for community activities and seek to encourage walkable communities, whilst also creating an identity and unique feel for the area.

Due to Mlolongo being partially developed already and there likely to be a continued pressure for further development, the proposed land use strategy should be implemented as soon as possible to ensure that any development taking place is coordinated and in accordance with an overall plan and vision for the area.

The emerging Mavoko ISUDP proposes an extension to the commuter rail network, which would branch off the existing line at Mlolongo, run in a north-east direction through part of Mlolongo and Syokimau Town, then along the south-east edge of Syokimau Town (outside the Study Area).The land use strategy has safeguarded a green corridor within Mlolongo that could accommodate such a railway. However, the route appears to pass through existing industrial and warehouses within part of Syokimau Town, which would require relocation.

Figure 1.71: Mlolongo Residential Development Concept

In addition to the rail network proposed in the emerging Mavoko ISUDP, a new major road is proposed, which appears to include the upgrade of some existing roads. This is outside the Study Area, partly running close to the south-east edge of Syokimau Town.

Figure 1.72 shows how the land use strategy can be achieved spatially.

Estimated Development and Population Capacity

Table 1.5 contains an estimation of the amount of development that could be achieved along with the population and employment generated.

Recommendations for Future Detailed Planning

In order to progress the proposed land use strategy referred to above, it is recommended that the following planning actions are implemented:

- The land safeguarded for commuter railway expansion should be zoned accordingly. This should be considered as an immediate action as it is important in order to prevent the land being developed for an alternative use that may compromise this.
- A Local Development Plan should be prepared to set-out the development envisaged. This needs to include the following matters:
  - Detailed breakdown of acceptable land uses;
  - Affordable housing requirements;
  - Development guidelines covering matters such as densities, heights, setbacks and floor area ratios;
  - Urban design guidelines;
  - Open space and community facility standards;
  - Road and utilities infrastructure requirements;
  - Transport and movement strategy;
  - Public realm strategy; and
  - Implementation strategy.
- Land required to facilitate development should be zoned in accordance with the Local Development Plan. As referred to above, it is envisaged that development should be provided in the short term.

Strategic Policy 8: Syokimau Town and Mlolongo – Growth Centres

As shown on the Spatial Development Strategy Diagram, Syokimau Town and Mlolongo are designated as Growth Centres. Future detailed planning shall be in general accordance with the Concept Land Use Plans for each centre and shall be undertaken in the short-term.

Growth Centres shall be planned to function in accordance with the description in the latest edition of the Spatial Planning Concept for the Nairobi Metropolitan Region.

Policy Guidance:

The policy objective is to ensure that these centres function in the way envisaged in the Spatial Planning Concept. In implementing this policy, decision makers should ensure that they are referring to the latest edition.

At the time of publishing this report, the 1st Edition of the Spatial Planning Concept is the latest version. The description of the function of Growth Centres is as 'Intermediary towns; Important role in promoting rural development and in achieving a balanced distribution of urban population; Provide functional linkages between the smaller towns and Sub-Regional Centre'.

Strategic Policy 9: Syokimau Town and Mlolongo – Community/Retail/Leisure Hubs

As shown on the Concept Land Use Plans, areas of land within the Mlolongo and Syokimau Town Growth Centres are designated as Community/Retail/Leisure Hubs.

These areas could be developed as a focus for community facilities, retail and leisure that will serve the day-to-day needs of residents in these growth centres. In this case, their precise extent and land use distribution shall be designated through future detailed planning, which shall be undertaken in the short-term.

Policy Guidance:

The policy objective is to increase the provision of community facilities, retail and leisure within these partially developed areas that are designated as growth centres. This will assist in addressing existing deficiencies, which were reported by Syokimau Residents Association and observed by the Consultant, and in providing a focal point for community facilities, retail and leisure required to meet the needs generated by future development and population growth.

It is not intended that the designated areas are the only location for such uses, as it is important that some facilities are easily accessible by all residents, therefore they need to be distributed widely across the growth centres. This should be addressed in future detailed planning and be in accordance with the latest version of the Physical Planning Handbook (published by: Ministry of Lands).

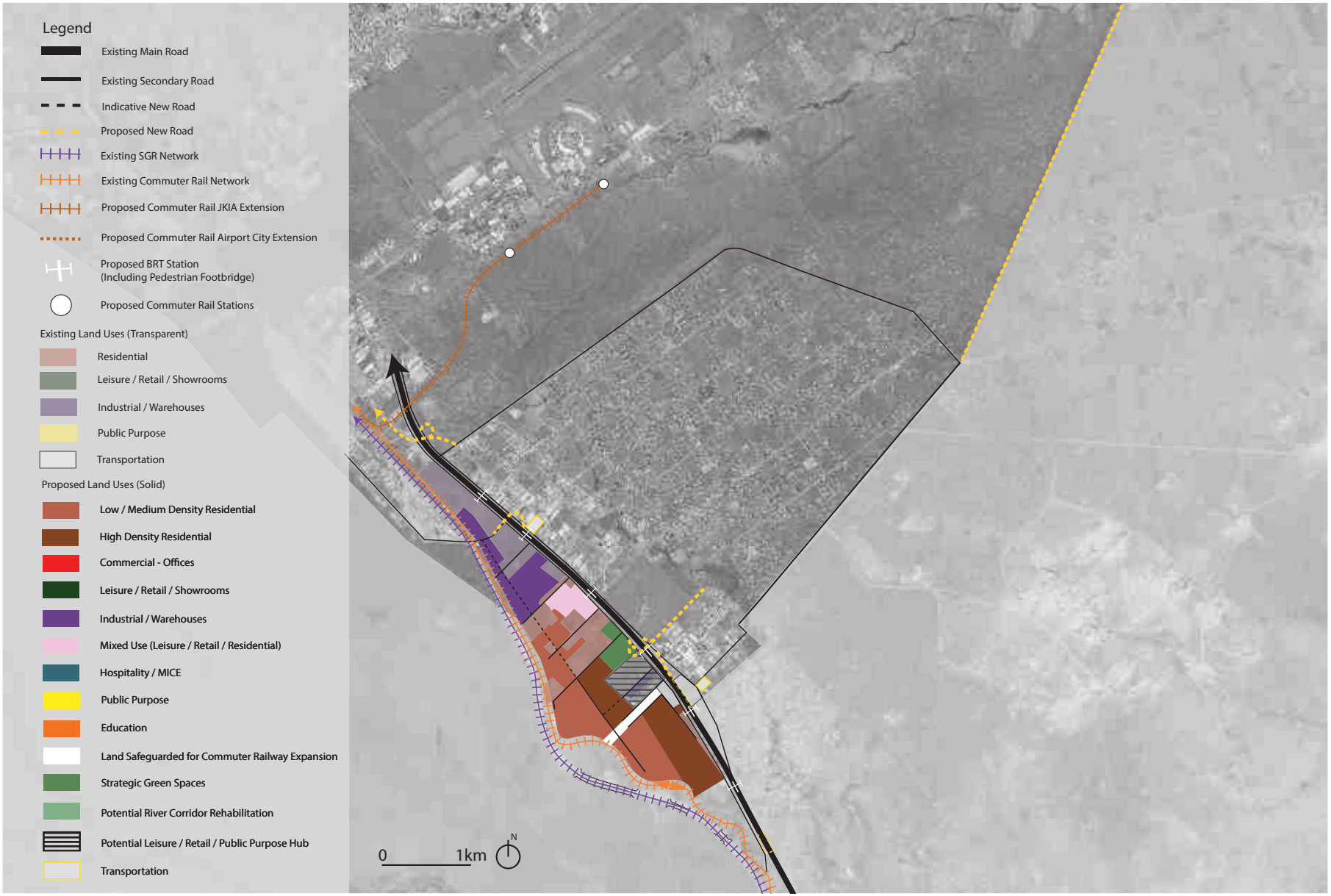

Figure 1.72: Mlolongo Concept Land Use Plan

Table 1.5: Mlolongo Estimated Development and Population Capacity

MLOLONGO																
PROPOSED LAND USE	GROSS LAND AREA (HA)	NET LAND AREA (HA)	AVERAGE PLOT FAR	GROSS FLOOR AREA (M2)	NET FLOOR AREA (NON-RESIDENTIAL) (M2)	NET FLOOR AREA (RESIDENTIAL) (M2)	NUMBER OF RESIDENTIAL UNITS	NUMBER OF SERVICED APARTMENT / HOSPITALITY KEYS	NUMBER OF HOSPITAL BEDS	RESIDENTS	VISITORS	STUDENTS/ PATIENTS	SERVICED APARTMENT / HOSPITALITY OCCUPANTS	WHITE COLLAR STAFF	BLUE COLLAR STAFF	DOMESTIC STAFF
Industrial / Warehouses	61.6	43.4	0.8	347,315	244,588									521	1,216	
Mixed Use (Leisure / Retail / Residential)	14.9	9.6	2.5	240,574	42,355	127,064	1,271			5,083	2,118			847	1,271	635
Residential	185.3	119.6														
Maisonettes		25.9	1.0	259,225		182,553	2,160			8,641						2,160
Apartments		93.6	1.5	1,404,640		989,183	9,892			39,567						4,946
Strategic Green Spaces	14.2	14.2														
Public Purpose (within residential and mixed use areas)		4.5	2.0	89,288	62,879						3,144			2,358	786	
Potential Leisure / Retail / Public Purpose Hub	25.8	16.7	2.0	333,314	234,728						11,736			8,802	2,934	
Land Safeguarded for Commuter Railway Expansion	9.1	9.1														
TOTAL	**310.9**	**202.8**	**N/A**	**2,674,356**	**576,078**	**1,298,800**	**13,323**	**-**	**-**	**53,291**	**16,575**	**-**	**-**	**12,359**	**5,952**	**7,741**

1.3.7.6 AIRPORT CITY

Summary of Existing Conditions, Plans and Studies

Airport City is a long-standing aspiration for the development of land owned by KAA. The land for the proposed airport city appears to be currently undeveloped with only a few dirt tracks identified.

In terms of future development, the JKIA Master Plan illustrates a number of proposals in addition to the Airport City site. These include an internal ring road, second runway and associated taxiways as well as a new proposed railway link directly connecting the airport terminal to Airport City. Details regarding the components and aspirations for Airport City are yet to be fully developed, but it is understood from KAA that it is likely to include a world class medical facility and there are opportunities for associated educational, hospitality, retail, leisure and residential development.

Proposed Land Use Strategy

Airport City is envisioned as containing world class medical facilities as a focal point. It is considered that there is an opportunity to provide further and/or higher education facilities, possible associated with the medical focus (e.g. facilities providing medical courses or even a university teaching hospital).

A variety of hospitality services including hotels and serviced apartments can accommodate medical visitors and their families (with the prospect of some medical tourism from other East African nations) or visitors wishing to stay within reach of the airport rather than being in the CBD. Mixed-use development incorporating some retail and leisure is proposed, which can serve these visitors and permanent residents.

Residential development is also proposed which can conveniently cater for medical and airport workers, as well as general population growth.

The land use strategy envisages seamless integration between Airport City, Syokimau Town and the Katani Growth Centre proposed in the emerging Mavoko ISUDP. On this basis, Airport City should be outside the airport fence boundary and reduce the use of checkpoints into and out of the area

The further/higher education uses would contain integrated green spaces to create a localised area for students and lecturers. To the south there is a proposed retail and leisure strip aimed to recreate a high street style shopping district whilst creating a direct pedestrian connection to the medical facilities. The streetscape of this retail and leisure area would be pedestrianised in order to limit car movement, enhance walkable communities and create a peaceful area for residents and visitors alike.

Serviced apartments are surrounded/adjoined by residential buildings, blending the change in land use whilst the hotels are situated amongst the mixed use and commercial land uses.

It is not clear when KAA envisages that development at Airport City could be commenced. Due to Mlolongo and Syokimau Town being partially developed already and envisaged for development in the short-term, it would be logical for Airport City to follow on from these, indicating that it is most likely in the medium to long term.

The Transport Strategy includes provision for an extension of the Commuter Railway to serve Airport City, and provision of an associated station. The land use strategy safeguards land as a green corridor that would allow for the further extension of the railway towards the Katani growth centre.

The Transport Strategy also proposes a new road along the eastern edge of Airport City, which is part of a strategic road connecting the Eastern Bypass with Mombasa Road via the Utawala and Katani growth centres.

Figure 1.73 shows how the land use strategy can be achieved spatially.

Estimated Development and Population Capacity

Table 1.6 contains an estimation of the amount of development that could be achieved along with the population and employment generated.

Recommendations for Future Detailed Planning

In order to progress the proposed land use strategy referred to above, it is recommended that the following planning actions are implemented:

- The land safeguarded for commuter railway expansion should be zoned accordingly. This should be considered as an immediate action as it is important in order to prevent the land being developed for an alternative use that may compromise this.
- A Local Development Plan should be prepared to set-out the development envisaged. This needs to include the following matters:
  - Detailed breakdown of acceptable land uses;
  - Affordable housing requirements;
  - Development guidelines covering matters such as densities, heights, setbacks and floor area ratios;
  - Urban design guidelines;
  - Open space and community facility standards;
  - Road and utilities infrastructure requirements;
  - Transport and movement strategy;
  - Public realm strategy; and
  - Implementation strategy.
- Land required to facilitate development should be zoned in accordance with the Local Development Plan. As referred to above, it is envisaged that development should be provided in the medium to long term.

Strategic Policy 10: Mlolongo and Airport City - Land Safeguarded for Commuter Railway Expansion

As shown on the Concept Land Use Plans, land has been safeguarded in Mlolongo and Airport City to allow for future expansion of the Commuter Railway network. The precise extent shall be designated through future detailed planning.

These areas shall be kept free from built development or any other development that would compromise the ability of expanding the Commuter Railway network.

Until such a time that these areas are required for railway construction, they shall act as green corridors that will encourage biodiversity and provide ecological benefits. They shall be managed accordingly.

Policy Guidance:

The emerging Mavoko ISUDP includes a proposal for the expansion of the Commuter Railway network via a loop line that would serve various settlements within Mavoko. Whilst the majority of this is outside the Study Area, part of the proposed railway passes through the southern part of the Syokimau Town and central part of the Mlolongo growth centres. The part within Syokimau Town would appear to require developed land to be acquired and cleared in order to implement the proposal. The part within Mlolongo passes through undeveloped land then connects to the existing Commuter Railway.

It is understood that the feasibility of this proposal has not been tested and it is not within the Commuter Railway Master plan. Therefore, it is a long-term proposal (post-2030).

The Transport Strategy includes proposals to: a) expand the Commuter Railway to JKIA; b) expand the Commuter Railway from JKIA to Airport City. The first proposal is within the Commuter Railway Master plan, but the second proposal is not. Therefore, it is a long-term proposal (post-2030).

The policy objective is to respect the emerging Mavoko ISUDP and allow for the future implementation of the Commuter Railway expansion proposals described above. Whilst it is possible to safeguard the undeveloped land in Mlolongo and Airport City for this purpose, the land within Syokimau Town is already developed so will need to be acquired and cleared at the time of implementation.

Strategic Policy 11: Airport City – Growth Centre

As shown on the Spatial Development Strategy Diagram, Airport City is designated as a Growth Centre.

This centre should be planned to function in accordance with the description in the latest edition of the Spatial Planning Concept for the Nairobi Metropolitan Region. In addition, it should provide facilities that benefit from the proximity of JKIA and generate revenue for KAA, accommodate part of Nairobi's population growth, and provide employment opportunities for the resident population and surrounding areas.

Policy Guidance:

The policy objective is to guide the future planning of Airport City towards functioning similarly to the other Growth Centres, whilst also recognising its special characteristics. It will also be important to ensure KAA's objectives are met as they are a key stakeholder in the future of this area.

Figure 1.73: Airport City Concept Land Use Plan

Table 1.6: Airport City Estimated Development and Population Capacity

AIRPORT CITY																
PROPOSED LAND USE	GROSS LAND AREA (HA)	NET LAND AREA (HA)	AVERAGE PLOT FAR	GROSS FLOOR AREA (M2)	NET FLOOR AREA (NON-RESIDENTIAL) (M2)	NET FLOOR AREA (RESIDENTIAL) (M2)	NUMBER OF RESIDENTIAL UNITS	NUMBER OF SERVICED APARTMENT / HOSPITALITY KEYS (SEE NOTE 1)	NUMBER OF HOSPITAL BEDS	RESIDENTS	VISITORS	STUDENTS/ PATIENTS	SERVICED APARTMENT / HOSPITALITY OCCUPANTS	WHITE COLLAR STAFF	BLUE COLLAR STAFF	DOMESTIC STAFF
Commercial - Offices	4.8	3.0	2.0	59,779	42,098									2,245	561	
Mixed Use (Leisure / Retail / Residential)	76.6	47.9	2.0	958,003	168,662	505,987	5,060			20,239	8,433			3,373	5,060	2,530
Residential	251.6	157.2														
Maisonettes		34.1	1.0	340,914		240,080	25,841			11,364						2,841
Apartments		123.2	1.5	1,847,279		1,300,900	13,009			52,036						6,505
Education	50.5	31.6	2.0	631,561	444,761							22,238		623	267	
Hospitality / MICE	32.0	24.6	1.0	245,967	121,251	51,965		866			8,083		1,732	1,819	4,244	52
Public Purpose (Health)	29.2	18.2	2.0	364,533	256,713				3,063			12,836		7,701	5,134	
Strategic Green Spaces	26.1	26.1														
Public Purpose (within residential and mixed use areas)		13.0	2.0	259,426	182,694						9,135			6,851	2,284	
Land Safeguarded for Commuter Railway Expansion	16.4	16.4														
TOTAL	**487.2**	**338.0**	**N/A**	**4,707,461**	**1,216,180**	**2,098,933**	**20,910**	**866**	**3,063**	**83,639**	**25,651**	**35,074**	**1,732**	**22,612**	**17,550**	**11,927**

Figure 1.74: Combined Land Use Plan for Mlolongo, Syokimau Town and Airport City

1.3.7.7 TOTAL ESTIMATED POPULATION AND DEVELOPMENT CAPACITY

Table 1.7 shows the estimated development and population that would result from the proposed land use strategies. Efforts have been made to ensure that these are in general accordance with Market Analysis and Development Recommendations prepared earlier in the project.

Residential development is the highest demand land use and this has been reflected in the proposed land uses, making up 53.8% of the total gross land area. It is estimated that 9,762 maisonettes and 45,479 apartments could be provided within the 853 ha gross land area proposed, taking into account assumptions about the resulting net floor area, floor area ratios and unit sizes. Providing this number of units equates to an average gross density of 65 dwellings per hectare.

Mixed-use development is also a prominent feature within the proposed land use strategies, making up 12.7% of the total gross land area. It is estimated that 13,358 apartments could be provided within the 200.4 ha gross land area proposed, taking into account assumptions. This would equate to an average gross density of 67 dwellings per hectare.

The densities referred to above are considered appropriate given that the land use strategies are for places that will be transit-oriented or earmarked as growth centres. However, in some parts of the Study Area this will be a step-change from the existing situation and from the current Nairobi City Development Ordinances and Zones (the Consultant does not have a similar document for Machakos County). For example, densities in Imara Daima and Embakasi Village are currently restricted to a maximum of 35 dwellings per hectare. In addition, floor area ratios are currently restricted to 0.75 whilst the land use strategies have assumed a figure of between 1.0 and 2.5 in these two areas.

The provision of strategic green spaces is considered important by stakeholders and has been reflected in the proposed land uses, making up 10.2% of the total gross land area, or 161.9 ha. Using the Ministry of Lands Physical Planning Handbook, the required provision for the Broader Area would be 27 - 54 ha (based on 1 - 2 ha per 10,000 residents). Therefore, the proposed provision far exceeds this, but this will assist in addressing current shortfalls that are understood to exist.

Table 1.7: Total Estimated Development and Population Capacity for the Broader Area

BROADER AREA TOTAL																
PROPOSED LAND USE	GROSS LAND AREA (HA)	PERCENTAGE OF TOTAL GROSS LAND AREA (%)	NET LAND AREA (HA)	GROSS FLOOR AREA (M2)	NET FLOOR AREA (NON-RESIDENTIAL) (M2)	NET FLOOR AREA (RESIDENTIAL) (M2)	NUMBER OF RESIDENTIAL UNITS	NUMBER OF SERVICED APARTMENT / HOSPITALITY KEYS (SEE NOTE 1)	NUMBER OF HOSPITAL BEDS	RESIDENTS	VISITORS	STUDENTS/ PATIENTS	SERVICED APARTMENT / HOSPITALITY OCCUPANTS	WHITE COLLAR STAFF	BLUE COLLAR STAFF	DOMESTIC STAFF
Commercial - Offices	13.0	0.8%	8.2	163,045	114,820									6,124	1,531	
Leisure / Retail / Showrooms	5.4	0.3%	3.5	69,231	48,754						2,438			975	4,841	
Mixed Use (Leisure / Retail / Residential)	200.4	12.7%	117.4	2,466,069	400,841	1,335,827	13,358			53,433	20,042			8,017	12,025	6,679
Industrial / Warehouses	97.4	6.2%	68.6	548,985	386,609									823	1,921	
Residential	853.0	53.8%	544.9													
Maisonettes			117.1	1,171,475		824,983	9,762			39,049						9,762
Apartments			427.8	6,458,041		4,547,916	45,479			181,917						22,740
Education	50.5	3.2%	31.6	631,561	444,761							22,238		623	267	
Hospitality / MICE	32.0	2.0%	24.6	245,967	121,251	51,965		866			8,083		1,732	1,819	4,244	52
Public Purpose (Health)	29.2	1.8%	18.2	364,533	256,713				3,063			12,836		7,701	5,134	
Transportation	6.1	0.4%	3.9											93	62	
Strategic Green Spaces	161.9	10.2%	161.9													
Public Purpose (within residential and mixed use areas)			27.9	557,155	392,363						19,618			14,714	4,905	
Potential Leisure / Retail / Public Purpose Hub	107.4	6.8%	69.4	1,387,526	977,131						48,857			36,642	12,214	
Land Safeguarded for Commuter Railway Expansion	28.1	1.8%	25.5													
TOTAL	1,584.4	100.0%	1,105.5	14,063,855	3,143,245	6,760,690	68,600	866	3,063	274,399	99,038	35,074	1,732	77,531	47,144	39,233

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STATION AREA
REDEVELOPMENT

4

CORE AREA LAND USE AND PHASING

1.4 CORE AREA LAND USE AND PHASING

1.4.1 INTRODUCTION

The Core Area Master plan presented in this Chapter presents the further design development from the previous stage of the project. Specifically, this relates to the proposed land uses in terms of their quantum and distribution, and the phasing of development. It provides the starting point from which the urban and landscape design guidelines have been formulated. These are explained in Chapter 3 and should be read in conjunction with this chapter.

Figure 1.75: Illustrative Masterplan

1.4.2 THE MASTERPLAN

1.4.2.1 LAND USES MAP

The key features characterising the land use allocations can be summarised as follows:

- The main commercial central spine acts as the gateway to the SGR Station .
- Residential areas are disconnected from primary road networks to enhance urban quality.
- Quieter land uses located along the park (residential, cultural and hospitality), while denser land uses are placed closer to Mombasa Road and City Centre.
- Tourism is placed along the National Park boundary with strong visual links over the Park.
- Cultural activities are located around central green spaces and commercial areas.
- Community facilities are distributed throughout the site, to ensure all residents have good access to them.

The following considerations have informed the Land Use Plan and Land Use Budget:

a) Residential Uses: The demographic projections combined with the real estate analysis will establish the appropriate residential mix in terms of size, type, density, building height.

Building on TOD Principles, the Land Use Plan has prioritised allocating mixed use (residential-retail mix) development within close proximity of public transport routes and the SGR terminus. This is expected to discourage the use of car transport, making it less attractive, while resulting in increased ridership for the Commuter Rail and creating vibrant, attractive streetscapes through the promotion of active frontages in mixed-use areas.

b) Industrial Uses: The Plan prioritises retaining industrial uses as far as possible without compromising the potential of the SGR Station

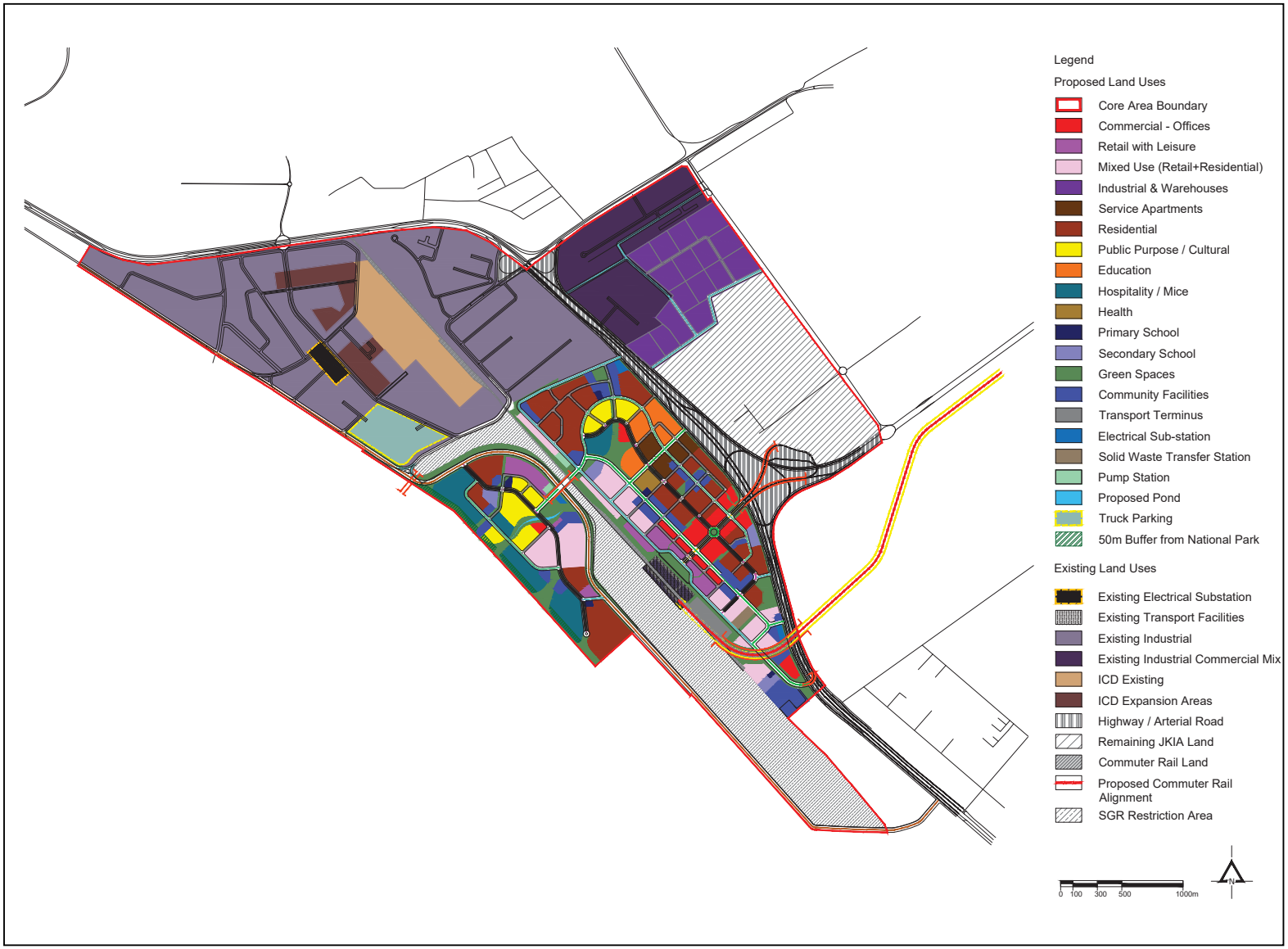


Figure 1.76: Land Use Plan

and the surroundings. As the Core Area will become a major transport hub in Kenya, it is critical that the Area is designed for optimum economic activity that capitalizes on the strategic nature of the location. Therefore, some industrial uses immediately adjacent to the SGR are proposed to be relocated, allowing for commercial and retail uses to be prioritised within this area. This relocation is based on the outputs of the Stakeholder Visioning Workshop conducted for the project and is aligned with the NIUPLAN strategy for de-centralisation of commercial activity from downtown Nairobi and for the creation of a new sub-centre adjacent to the SGR terminus.

New industrial warehousing has been proposed adjacent to the Airport, while existing industrial uses in the proximity of the Inland Container Depot (ICD) are proposed to be upgraded, allowing for future expansion of the ICD. An area ear-marked for expansion by the ICD has also been highlighted, allowing for this area to be prioritised for expansion.

c) Commercial Areas: Proposed Commercial Areas including Retail, Hotels and Office Buildings are concentrated in the high-activity zone around the SGR terminus. Retail and Cultural uses are established within the Neighbourhood hubs of the Residential Areas and the Park side area.

d) Community facilities: Land needed for the community facilities, including schools, civic halls, civil defence, medical clinics and hospitals has been provided within the residential areas.

e) Transportation Uses: Transportation Uses are a major focus for the study and the land use requirements for these have been quantified and safeguarded including rail stations, park and ride facilities, marshalling yards, major roads and junctions.

f) Green Areas: The Open Space provision comprises a substantial component of the land use budget. This will vary between recreation areas to formal park areas. Parks will be needed not only to support the residential population but to provide an important amenity within the dense urban fabric.

1.4.2.2 LAND USE BUDGET

The following page presents the land use budget for the Core Area, with the key net development areas presented in the adjacent diagram.

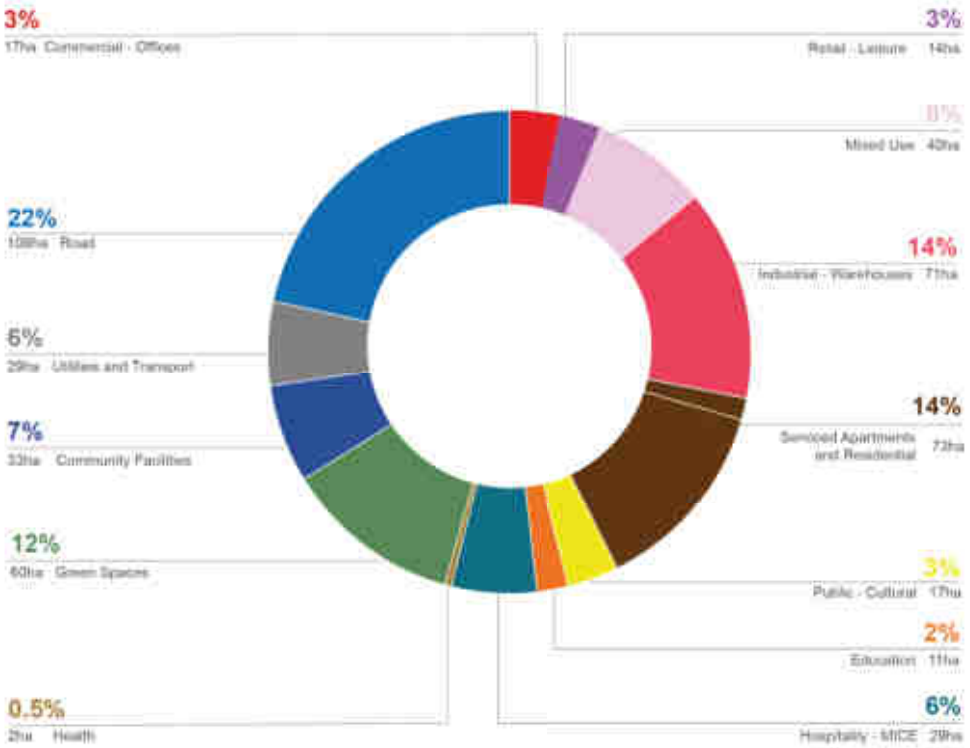


Figure 1.77: Net Development Areas for the new Proposed Land Uses.

Table 1.8: Overall Land Use Budget

Core Area - Overall																			
LAND USE ZONES	**NET AREAS**						**Development Parameters**						**Population**						
Land Use Zones	Gross Land Area (ha)	Net Land Area (ha)	Net Developable Land Percentage	Saleable Land %	maximum building height	Plot FAR	Gross Floor Area GFA (m2)	BUA (m2) net floor area non-Resi GLA	BUA (m2) net floor area Resi GLA	Number of Residential Units	Serviced Apartment / Hospitality Keys (SEE NOTE 1)	Hospital Beds	Residents	Visitors	Students/ Patients	Hotel guests/ Serviced Apartment Occupants	White collar staff	Blue Collar Staff	Domestic staff
Commercial - Offices	17.09	17.09	3.4%				534,875	347,669									18,542	4,636	
Retail with Leisure	13.77	14	2.7%				342,975	222,934						11,147			4,459	6,688	
Mixed Use (retail + residential)	36.21	36.21	7.2%				692,175	44,991	404,922	4,049			16,197	2,250			900	1,350	
Serviced Apartments	6.00	6.00	1.2%				105,000		68,250		683					1,365			68
Residential	65.72	65.72	13.0%				1,265,550		822,608	8,226			32,904						8,226
Public Purpose / Cultural	17.34	17.34	3.4%				396,150	257,498						17,167			7,725	5,150	
Education	10.70	10.70	2.1%				233,900	152,035							7,602		213	91	
Hospitality / MICE	28.88	28.88	5.7%				435,300	198,062	84,884		1,415			13,204		2,829	2,971	6,932	85
Health	2.23	2.23	0.4%				39,025	25,366				1,268			1,268		761	507	
Community Facilities	33.56	13.28	2.6%				232,400	151,060									11,330	3,777	
Other Non Salable	98.80	98.80	19.6%														2,371	1,581	
Industrial & Warehouses (towards JKIA)	71.90	61.12	12.1%			0.80	488,920	317,798									733	1,711	
Roads	100.25	131.315	26.0%																
Utilities	2.55	2.55	0.5%																
New Development Total	505	505	100.0%			N/A	4,766,270	1,717,412	1,380,663	12,275	2,097	1,268	49,101	43,767	8,870	4,194	50,005	32,423	8,379
Existing Areas Total	915	853				N/A	4790140	3113591	0	0	0	0	0	4095	0	0	7194.66	16535.54	0
WIDER CORE AREA TOTAL	**1420.0**	**1420.0**	**48%**			**N/A**	**9,556,410**	**4,831,003**	**1,380,663**	**12,275**	**2,097**	**1,268**	**49,101**	**47,862**	**8,870**	**4,194**	**57,199**	**48,958**	**8,379**

NOTE
Number of keys listed against the Hospitality / MICE / Eco Resort land use zone includes both hotels and serviced apartments

1.4.3 ROAD HIERARCHY

The adjacent figure illustrates the proposed road hierarchy. Key elements of the road hierarchy are as follows:

- The Industrial Area and Non-industrial Area have two distinct road networks, providing better fluidity and enabling a truck-free environment;
- A main boulevard connects the Transport Hub to the Airport with a bridge over Mombasa Road, providing the main entrance to the Site;
- A primary road connects the project site to Mombasa Road at the North and the South part, and serves the three main urban nodes;
- The bypass road is located at the rear of the Southern neighbourhood along the railway, allowing traffic fluidity while creating a car-free edge for the National Park where possible; and
- Boulevards and collector roads provide links to the bypass and Mombasa Road.

Figure 1.78: Road Hierarchy

1.4.3.1 COMMUNITY FACILITIES

1.4.3.1.1 INTRODUCTION

Community Facilities are defined as buildings or collections of buildings where the primary purpose is to provide services which are for the benefit of the local population.

Community facilities are important for meeting a wide range of social needs and ensure the population can live their day to day lives and, importantly, engage with their urban environment.

This section identifies the community facilities types required for the Core Area, aiming to:

- Ensure that the appropriate facilities are provided;
- Ensure there is adequate provision to serve local communities;
- Ensure that sufficient land is available to construct facilities in the future; and
- Ensure community facilities support accessibility for all.

1.4.3.1.2 CATEGORIES OF COMMUNITY FACILITIES

- **Civic:** Civil support uses are those provided by public sector organisations to the general public to support civil society. Activities include (but are not limited to): police stations, post offices, fire stations, central municipality and government offices, local municipal offices, courts of law, prison, and military sites.
- **Health:** Sites or buildings operated by the private or public sectors for the provision of inpatient or out-patient medical, wellness and health care services. Activities include: (but are not limited to) health centres, general hospitals and clinics and specialist hospitals and clinics.
- **Education:** Sites or buildings operated by the private or public sectors for the provision of full-time or part-time educational services. Excludes premises offering short-term training facilities to adults where the training is related to continued professional development. Activities include (but are not limited to): nursery, kindergarten, primary school, intermediate/ elementary school, secondary school, private school, college, university and leisure.
- **Social and Cultural:** A facility primarily established to raise awareness of arts and culture or where the general public can undertake cultural activities. Activities in this category include (but are not limited to): art gallery, community centre, cooperative services, leisure centre, libraries, museum, national entertainment complexes, theatre, youth centre, and wedding hall.
- **Sports:** A facility, serving the recreation needs of the general public. This may include (but is not limited to): golf courses; parks; camping facilities; playing fields; playgrounds; sports centre and stadium complex.

1.4.3.1.3 KEY INFORMANTS

The information provided in this section is based primarily on best practice and Consultant experience.

The Consultant has analysed the Draft Physical Planning Handbook (Ministry of Lands, no date) and this has informed the work undertaken. The Consultant has not relied fully on this document for the following reasons:

- Although the Consultant understands that the Handbook constitutes emerging guidance and therefore should be given some weight for planning purposes, it is clear that it is the early stages of production. This is evidenced by gaps within the text and areas where the authors have made a note that further information needs to be added;
- Certain community facility categories are repeated in different parts of the document, which is clearly a drafting error that would be corrected when the Handbook is finalised. There are also cases of contradictions and where standards are not precise. For example, the catchment population for primary school is 4,000 in one part of the Handbook, but 3,500-4,000 in another part. Again, this appears to be drafting error that would be corrected when the Handbook is finalised; and
- Some of the information and data used to inform the Handbook appears to be extremely dated and no longer reflects planning practice or the way that towns and cities function. For example, the 'Provision of Education Facilities Relative to Population' diagram on page 32 dates from 1971. Parts of the document also seem to refer and rely upon a Human Settlement Strategy dating from 1978.

MINISTRY OF LANDS

PHYSICAL PLANNING DEPARTMENT

PHYSICAL PLANNING HANDBOOK

DEPARTMENT OF URBAN & REGIONAL PLANNING

GADDAF ABDILLAH SAID

1.4.3.1.4 PROPOSED COMMUNITY FACILITIES GUIDELINES

Following on from the key informants above, a set of proposed community facilities guidelines have been prepared that have been used to define the quantity of land for community facility use in the Proposed Land Use Plan. Table 1.9 contains the guidelines.

1.4.3.1.5 PROPOSED QUANTUM OF FACILITIES

Informed by the guidelines in Table 1.9, the proposed community facilities provision equates to 32 hectares and comprises the following:

- 2.5 ha Civic Facilities;
- 3.3 ha Health Facilities;
- 6.1 ha Education Facilities;
- 17.5 ha Social and Cultural Facilities; and
- 2.6 ha Sports Facilities.

Table 1.9: Proposed Community Facilities Guidelines

	Number of Facilities Required per Population	*Land Area Required per Facility (sq m)*
civic facilities		
civic centre	*1 per settlement*	*5,000*
city hall	*1 per settlement*	*5,000*
Police centre	*1 per 30,000-60,000*	*125*
Magistrate court	*1 per settlement*	*5,000*
Police Station	*1 per 30,000-100,000*	*5,000*
Fire Station	*1 per 50,000-100,000*	*3,000*
Postal Agency	*1 per 10,000-20,000*	*300*
Chamber of Commerce	*1 per settlement*	*1,000*
health facilities		
Secondary Care Clinic	*1 per 24,000-70,000*	*5,000*
Primary Care Clinic	*1 per 2,500-20,000*	*2,000*
Dentist Practice	*1 per 2,500-7,500*	*2,000*
Pharmacy	*1 per 8,000-12,000*	*2,000*
education facilities		
kinder garden / nursery	*1 per 2,400-3,000*	*Incorporated within mixed-use areas (ground floors only) and/or primary schools*
pre-education facility	*1 per 2,400-3,000*	*Incorporated within mixed-use areas (ground floors only) and/or primary schools*
primary school	*1 per 1,000-7,000*	*2,400*
secondary school	*1 per 1,000-12,500*	*11,000*
social and cultural facilities		
Community Hall	*1 per 10,000-60,000*	*5,000*
Community Centre (local)	*1 per 6,000-10,000*	*2,000*
Community Centre (regional)	*1 per 20,000-100,000*	*6,000*
Cultural Centre / Art Gallery	*1 per 50,000-70,000*	*5,000*
Library	*1 per 5,000-70,000*	*5,000*
Youth Centre	*1 per 10,000-50,000*	*2,000*
Worship Centre	*1 per 3,000-6,000*	*10,000*
Local Market	*1 per 5,000*	*6,000*
Sport facilities		
Sport grounds	*1 per 2,000-10,000*	*375*
Football fields	*1 per 30,000*	*11,000*
Combi Court	*1 per 15,000*	*650*

1.4.3.1.6 PROPOSED DISTRIBUTION OF FACILITIES

In order to provide an efficient land use distribution and integration between different community facility types, the Proposed Land Use Plan includes numerous community facility areas where a range of facilities can be co-located.

The appropriate distribution of facilities is vitally important to ensure that people can easily access them for their day-to-day needs. Based on global best practice, 500m (6-7 minutes walking distance) catchment areas have been used to inform the distribution of community facilities in the Core Area and ensure that all residents are within the catchment of at least one area of community facilities.

The areas proposed for community facilities and the 500m catchment areas around them are shown on Figure 1.79.

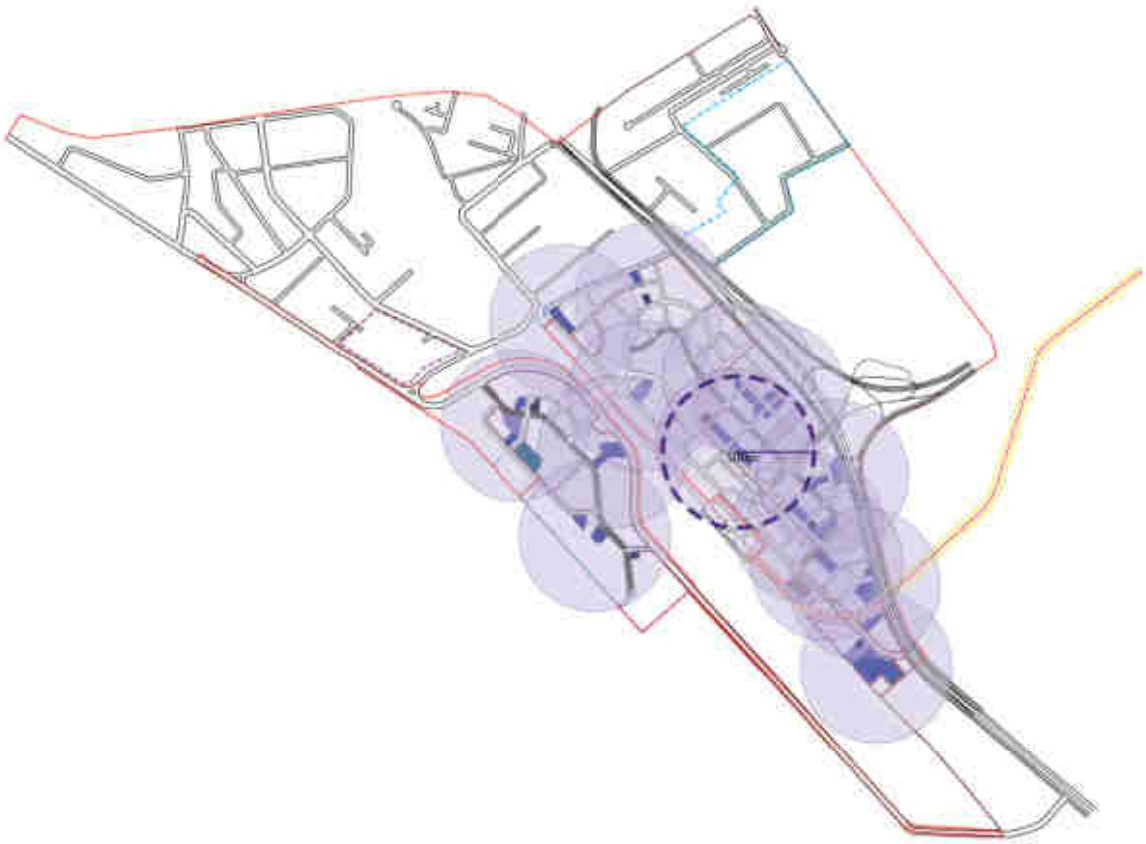
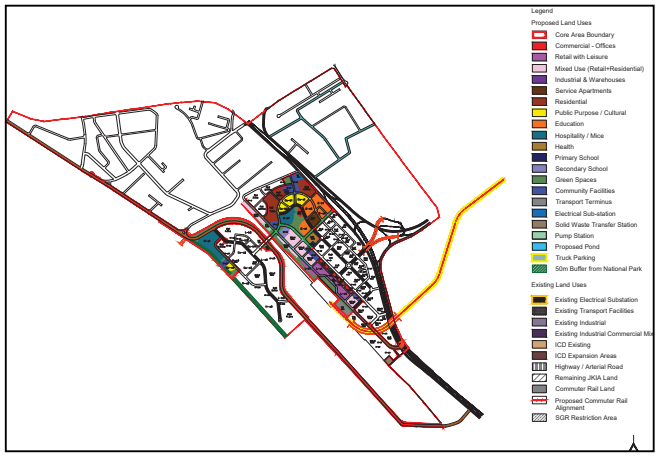
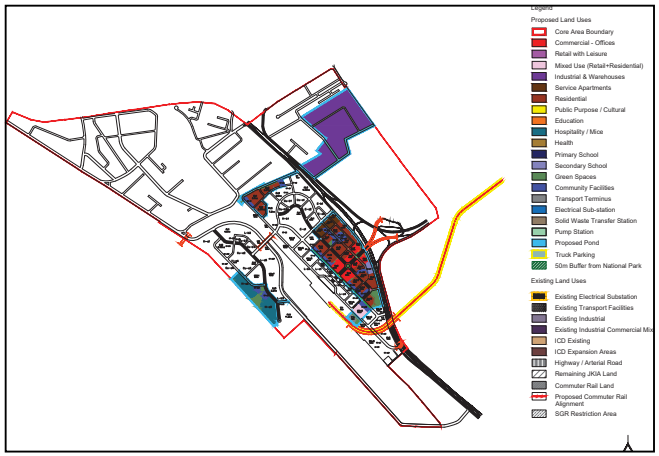
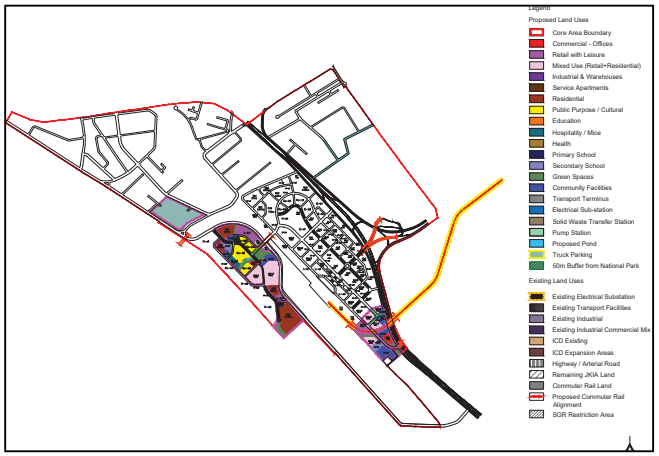


Figure 1.79: Plan showing location of proposed community facilities areas and 500m catchments

1.4.4 PHASING







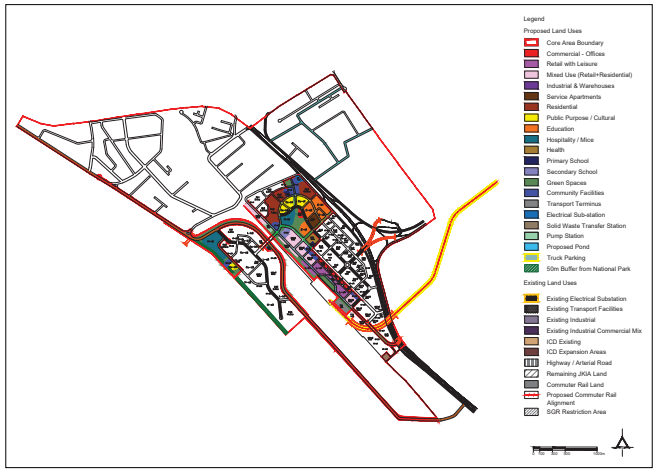
1.4.3.2 PHASING

- **Phase 1** focuses on developing the undeveloped land on the Northern part of the Site. This includes an education/research hub along with a conference centre, bringing both students and business visitors to the area;
- Some land close to the SGR Terminus would also be redeveloped to create a more suitable mix of uses and create a hub of activity.
- A small area of tourism-related development is also included close to the National Park. It is envisaged that this would be accessed from the Bypass Road;
- Utilities infrastructure, such as substations, solid waste and pump stations are developed, along with community facilities; and
- A main road loops within the site to connect the station hub with the rest of the development.

- **Phase 2** sees the development of the industrial zone located by the airport boundary to the North of Mombasa road;
- Further redevelopment of land north-east of the SGR Terminus would also take place. This continues the commercial uses from Phase 1, and includes a significant amount of residential and community facilities development;
- The tourism-related development close to the National Park would be extended; and
- As with Phase 1, roads and utilities infrastructure is provided to serve the new development areas.

- **Phase 3** connects the City to its Southern part with the creation of a bridge over the railway lines.
- The overall aim is to develop a pedestrian-friendly neighbourhood that respects its relationship with the National Park;
- The truck parking area at the southern corner the existing industrial area is also included in this phase to respond to the expansion of the ICD.

1.4.4.2.1 PHASE 1



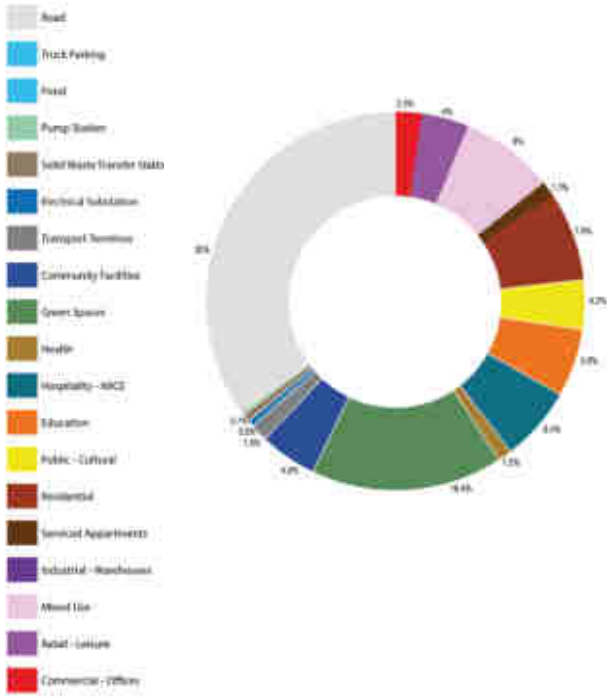
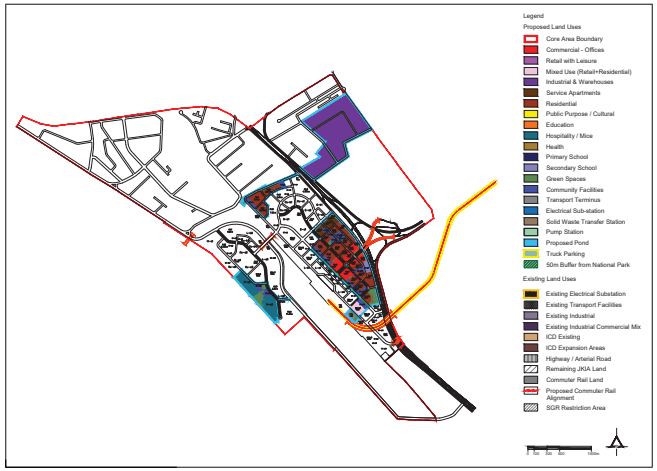


Table 1.10: Land Use Budget - Phase 1

Phase 1																				
LAND USE ZONES	**NET AREAS**						**Development Parameters**						**Population**						
Land Use Zones	Gross Land Area (ha)	Net Land Area (ha)	Net Developable Land Percentage	Saleable Land %	maximum building height	Plot FAR	Gross Floor Area GFA (m2)	BUA (m2) net floor area non-Resi GLA	BUA (m2) net floor area Resi GLA	Number of Residential Units	Serviced Apartment / Hospitality Keys (SEE NOTE 1)	Hospital Beds	Residents	Visitors	Students/ Patients	Hotel guests/ Serviced Apartment Occupants	White collar staff	Blue Collar Staff	Domestic staff
Commercial - Offices	4.16	4.16	2.3%				153,200	99,580									5,311	1,328	
Retail with Leisure	7.46	7	4.1%				232,550	151,158						7,558			3,023	4,535	
Mixed Use (retail + residential)	14.50	14.50	8.0%				339,250	22,051	198,461	1,985			7,938	1,103			441	662	
Serviced Apartments	2.40	2.40	1.3%				42,000		27,300		273					546			27
Residential	14.15	14.15	7.8%				273,625		177,856	1,779			7,114						1,779
Public Purpose / Cultural	7.81	7.81	4.3%				187,775	122,054						8,137			3,662	2,441	
Education	10.70	10.70	5.9%				233,900	152,035							7,602		213	91	
Hospitality / MICE	11.84	11.84	6.5%				213,000	96,915	41,535		692			6,461		1,385	1,454	3,392	42
Health	2.23	2.23	1.2%				39,025	25,366				1,268			1,268		761	507	
Community Facilities	9.07	9.07	5.0%				154,875	100,669									7,550	2,517	
Other Non Salable	4.20	4.20	2.3%														101	67	
Industrial & Warehouses	0.00	0.00	0.0%			0.80	0	0									0	0	
Roads	91.83	91.83	50.5%																
Utilities	1.65	1.65	0.9%																
New Dev Total	182	182	100.0%			N/A	1,869,200	769,828	445,153	3,763	965	1,268	15,053	23,258	8,870	1,931	22,515	15,540	1,847

1.4.4.2.2 PHASE 2



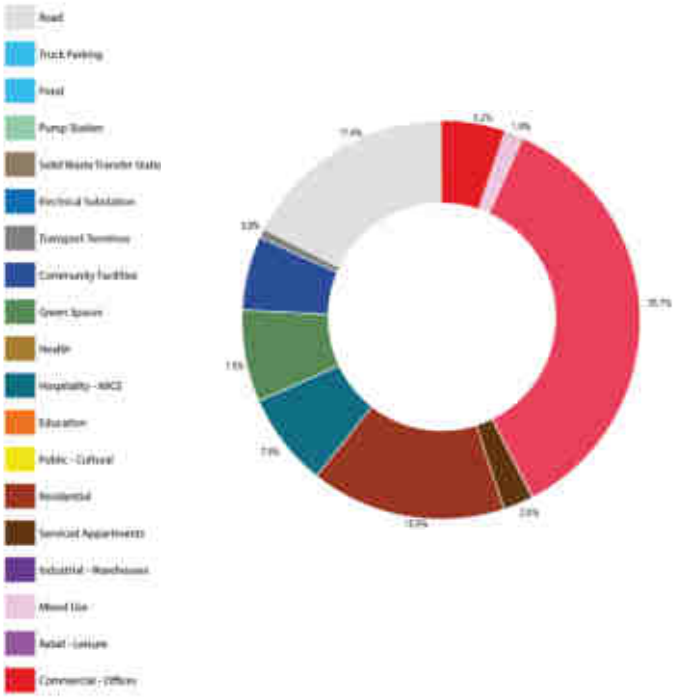
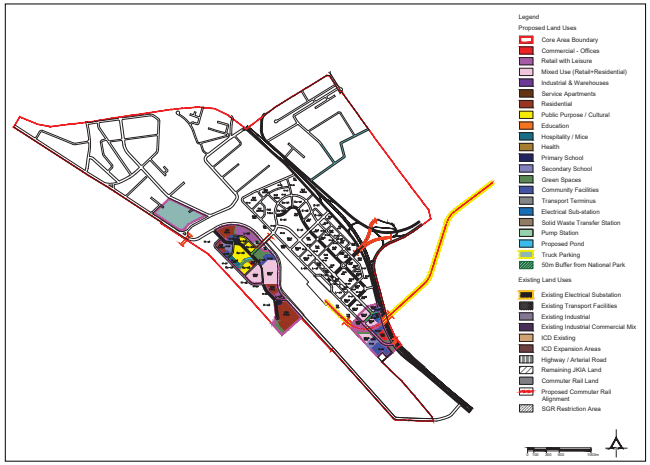


Table 1.11: Land Use Budget - Phase 2

Phase 2																				
LAND USE ZONES	**NET AREAS**						**Development Parameters**						**Population**						
Land Use Zones	Gross Land Area (ha)	Net Land Area (ha)	Net Developable Land Percentage	Saleable Land %	maximum building height	Plot FAR	Gross Floor Area GFA (m2)	BUA (m2) net floor area non-Resi GLA	BUA (m2) net floor area Resi GLA	Number of Residential Units	Serviced Apartment / Hospitality Keys (SEE NOTE 1)	Hospital Beds	Residents	Visitors	Students/ Patients	Hotel guests/ Serviced Apartment Occupants	White collar staff	Blue Collar Staff	Domestic staff
Commercial - Offices	10.36	10.36	5.2%				336,700	218,855									11,672	2,918	
Retail with Leisure	0.00	0	0.0%				0	0						0			0	0	
Mixed Use (retail + residential)	1.88	1.88	0.9%				32,900	2,139	19,247	192			770	107			43	64	
Serviced Apartments	3.60	3.60	1.8%				63,000		40,950		410					819			41
Residential	31.27	31.27	15.8%				646,675		420,339	4,203			16,814						4,203
Public Purpose / Cultural	0.00	0.00	0.0%				0	0						0			0	0	
Education	0.00	0.00	0.0%				0	0							0		0	0	
Hospitality / MICE	15.18	15.18	7.7%				189,750	86,336	37,001		617			5,756		1,233	1,295	3,022	37
Health	0.00	0.00	0.0%				0	0				0			0		0	0	
Community Facilities	11.37	11.37	5.7%				217,825	141,586									10,619	3,540	
Other Non Salable	0.00	0.00	0.0%														0	0	
Industrial & Warehouses	0.00	0.00	0.0%			0.80	0	0									0	0	
Roads	124.34	124.340	62.8%																
Utilities	0.00	0.00	0.0%																
New Dev Total	198	198	100.0%			N/A	1,486,850	448,916	517,537	4,396	1,026	0	17,583	5,863	0	2,052	23,629	9,544	4,281

1.4.4.2.3 PHASE 3



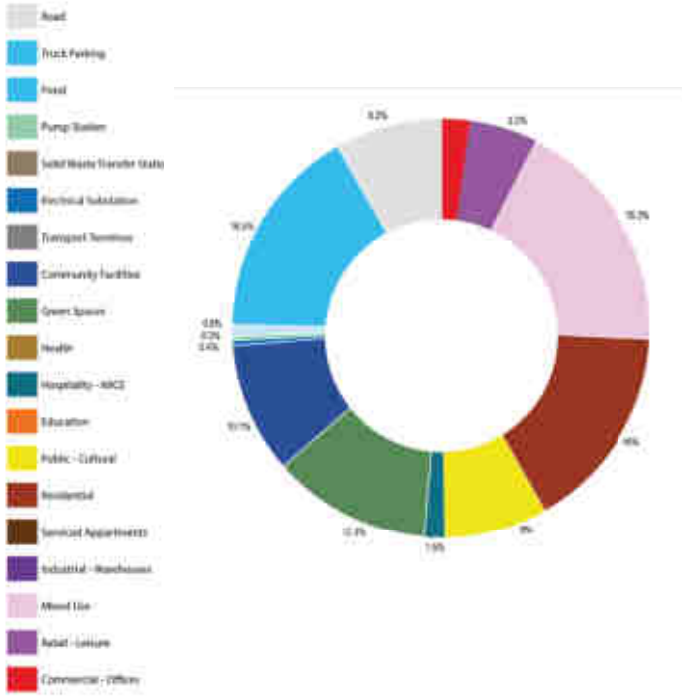


Table 1.12: Land Use Budget - Phase 3

Phase 3																						
LAND USE ZONES	**NET AREAS**						**Development Parameters**						**Population**									
Land Use Zones	Gross Land Area (ha)	Net Land Area (ha)	Net Developable Land Percentage	Saleable Land %	maximum building height	Plot FAR	Gross Floor Area GFA (m2)	BUA (m2) net floor area non-Resi GLA	BUA (m2) net floor area Resi GLA	Number of Residential Units	Serviced Apartment / Hospitality Keys (SEE NOTE 1)	Hospital Beds	Residents	Visitors	Students/ Patients	Hotel guests/ Serviced Apartment Occupants	White collar staff	Blue Collar Staff	Domestic staff
Commercial - Offices	2.57	2.57	2.1%				44,975	29,234									1,559	390	
Retail with Leisure	6.31	6	5.0%				110,425	71,776						3,589			1,436	2,153	
Mixed Use (retail + residential)	19.83	19.83	15.9%				320,025	20,802	187,215	1,872			7,489	1,040			416	624	
Serviced Apartments	0.00	0.00	0.0%				0		0		0					0			0
Residential	20.30	20.30	16.2%				345,250		224,413	2,244			8,977						2,244
Public Purpose / Cultural	9.53	9.53	7.6%				208,375	135,444						9,030			4,063	2,709	
Education	0.00	0.00	0.0%				0	0							0		0	0	
Hospitality / MICE	1.86	1.86	1.5%				32,550	14,810	6,347		106			987		212	222	518	6
Health	0.00	0.00	0.0%				0	0				0			0		0	0	
Community Facilities	12.00	12.00	9.6%				200,650	130,423									9,782	3,261	
Other Non Salable	0.00	0.00	0.0%														0	0	
Industrial & Warehouses (excludes JKIA)	0.00	0.00	0.0%			0.80	0	0									0	0	
Roads	51.70	51.700	41.4%																
Utilities	0.90	0.90	0.7%																
New Dev Total	125	125	100.0%			N/A	1,262,250	402,488	417,974	4,116	106	0	16,465	14,646	0	212	17,478	9,655	2,250

1.4.4.1 ILLUSTRATIVE MASTERPLAN

Place-making and urban design best practice have been considered in shaping the final framework for the masterplan to create a unique and distinct area with its own identity.

The SGR Nairobi Terminus is a strong focal point upon entering the main access to the site from Mombasa Road, served by a welcoming plaza to the front of the station building (20). The station provides services on the SGR line, which currently serves destinations south-east to Mombasa. The extension of the line westwards is currently under construction. The station will also be served by improved commuter rail services which are due to be operational from 2030.

Conveniently located adjacent to the south-east is the transport hub, allowing a seamless interchange between various transport modes including Bus Rapid Transit (BRT), coaches and matatus (12, 13, 15-19). With such extensive transport accessibility and connectivity, including a direct link to Jomo Kenyatta International Airport (JKIA), the site will be an important gateway to Nairobi.

The route connecting the main access to the SGR Terminus is lined with commercial uses, creating a new business district for Nairobi that benefits from excellent public transport connections (22). This will assist with the Nairobi Metropolitan Region's strategy of decentralising economic activity from the CBD.

The northern quarter of the site will provide an educational hub for this part of the city (2, 3, 7), integrating with high quality exhibition and convention centres that will attract visitors not only from Nairobi and Kenya, but internationally due to the proximity and links to JKIA (4, 5).

Crossing the railway to the western quarter of the site, visitors can utilise a range of cultural facilities including museums, theatres and galleries (23-27). These are located with easy access to a range of hospitality, many of which benefit from a location next to Nairobi National Park, offering extensive views of the natural landscape and potential opportunities for spotting wildlife. This will include environmentally sustainable resorts (21).

Spread throughout the site are residential apartments and maisonettes, ranging from luxury developments close to the National Park, to affordable housing within the heart of the site which provide residents with convenient access to employment opportunities, retail and community facilities. A selection of serviced apartments are also present, mainly designed for workers in the commercial areas of the site.

Figure 1.80: Illustrative Masterplan

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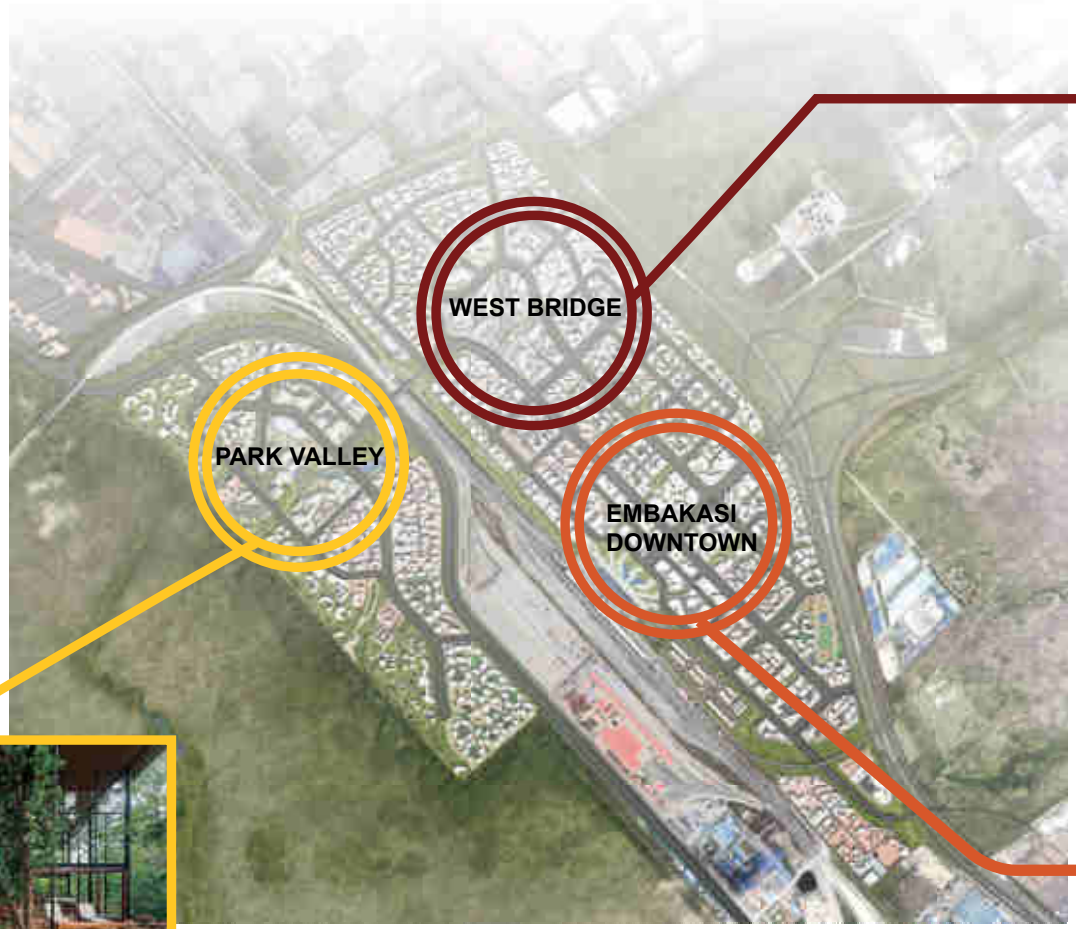
1. Airport Logistic Zone
2. Young Learning Centre
3. Library
4. Exhibition
5. Convention Centre
6. Civic Park
7. University Campus
8. Hospital and Healthcare
9. Pedestrian street
10. Underground Shopping Plaza
11. Neighbourhood Park
12. City express terminal
13. Matatus terminal
14. Retail Park
15. Short stay Car Parking
16. Bus Terminal
17. BRT Terminal
18. Passenger Drop off
19. Taxi Ranking & Pick up
20. Station Plaza & Underground Parking
21. Eco Hospitality
22. Business District
23. Science Museum
24. Transport Museum
25. Theatre
26. Art Gallery
27. National & History Museum
28. Culture Park
29. Business Park & Trading Centre
30. Truck Parking
31. Station Car Park

1.4.4.2 FOCUS AREAS

Three Focus Areas were highlighted in the Urban Design Strategy contained in reports prepared during the previous stage of the project. These are summarised again in this Section as they have been a key informant for the urban and landscape design guidelines.



This is the educational quarter, where schools and university campus takes space.

Walking along the activated park edge, visitors enjoy opportunities for passive and active recreation, as well as a connection to the local nature.

This is a denser area with office buildings, at the same time the transportation hub for local people. Lunch parks are activated by the presence of small food kiosks and the area is also activated by retail spaces and small hotels.

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1.4.4.2.1 EMBAKASI DOWNTOWN

This is a denser area with office buildings, at the same time the transportation hub for local people.

Lunch parks are activated by the presence of small food kiosks and the area is also activated by retail spaces and small hotels.

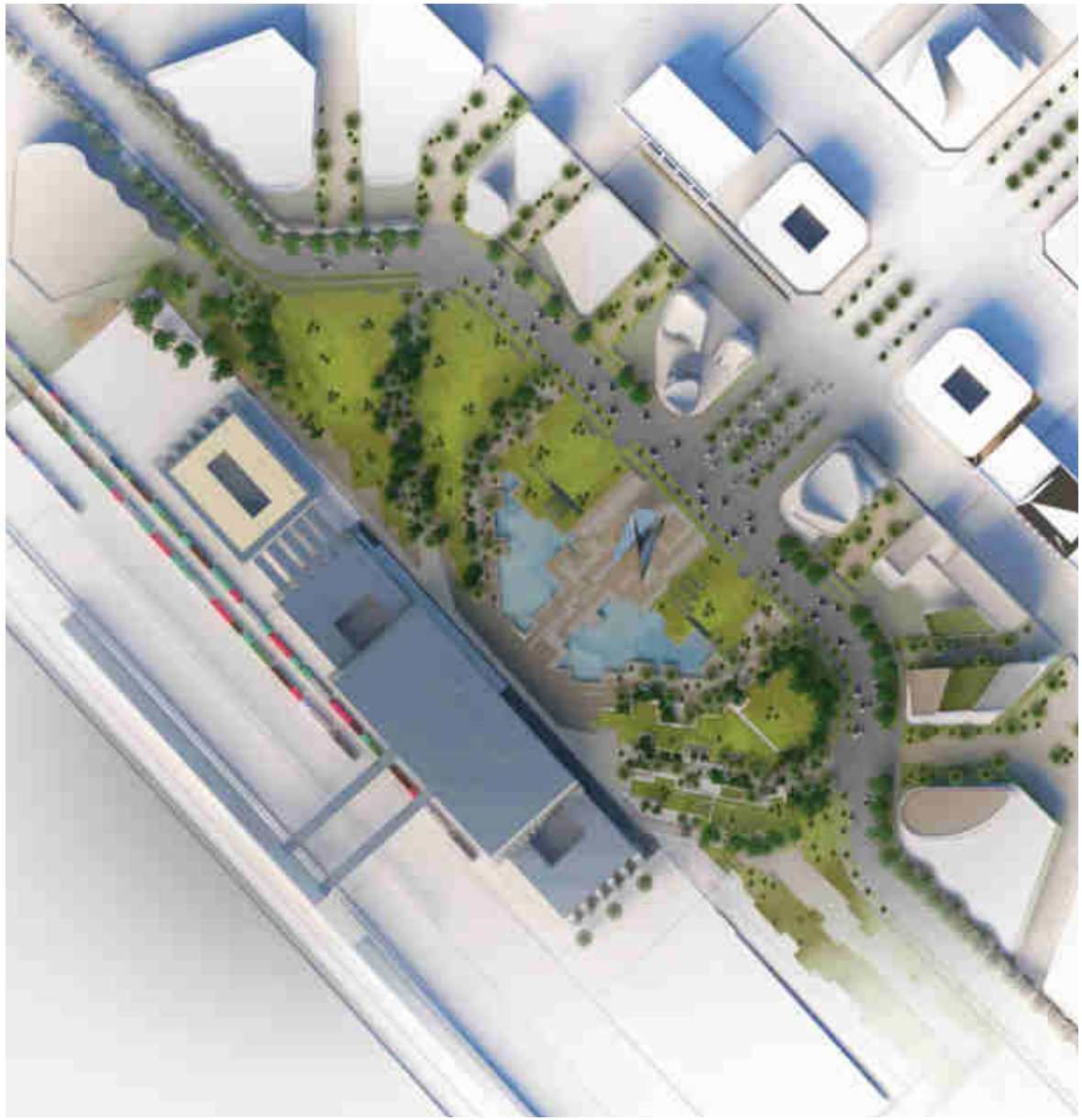

Figure 1.81: Central Plaza Top View

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1.4.4.3 PARK VALLEY

Park Valley is an area designed for cultural activities and tourism.

The mixed-use and cultural spaces will attract local and national visitors, as well as young artists and professionals who want to showcase their work. This area is designed to respect the natural environment and become an active green lunge for the city of Nairobi.

Figure 1.82: Park Valley - Top View

4

1.4.4.3.1 WEST BRIDGE

Educational buildings and public realm to support them, together with service apartments buildings and educational housing is the key character of this area.

Figure 1.83: West Bridge Top View

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embakasi
STATION AREA
REDEVELOPMENT

CORE AREA PLOT DEVELOPMENT GUIDELINES

1.5 CORE AREA PLOT DEVELOPMENT GUIDELINES

1.5.1 INTRODUCTION

This section contains the urban design guidelines which set the framework for the creation of a high quality built environment in the Core Area.

The guidelines have been developed from the overall urban design strategy that was included in the reports submitted during the previous stage of the project. The guidelines provide clarity on the nature and form of development that should be undertaken to create a high quality built environment.

The proposed land uses have been broken down into development parcels, which have been categorised and studied individually. From this, it has been possible to define a range of design parameters that development should adhere to. These include:

- Building setbacks;
- Parcel fencing;
- Building coverage;
- Floor area ratios; and
- Building heights.

The specific guidelines are set-out in the following sections.

Figure 1.84: Proposed Land Use Plan showing development parcel categories and numbers

Figure 1.85: Urban Design Strategy Diagrams

1.5.2 DESIGN GUIDELINES KEY PLAN AND TABLE

Figure 1.86 shows the Key Plan that is a reference point for identifying the development parcels within the site. The different parcel categories are listed in the legend. It should be noted that each land use has a variety of parcel categories, each with its own design specifications.

The subsequent sections contain a breakdown of the parcel categories within each land use and list the design specifications for each specific parcel (e.g. there are 15 parcels within the R-a category).

In addition, a number of axonometric sketches and reference images are included to show how the guidelines can be interpreted and the type of development that can be provided within the parameters set by the guidelines.

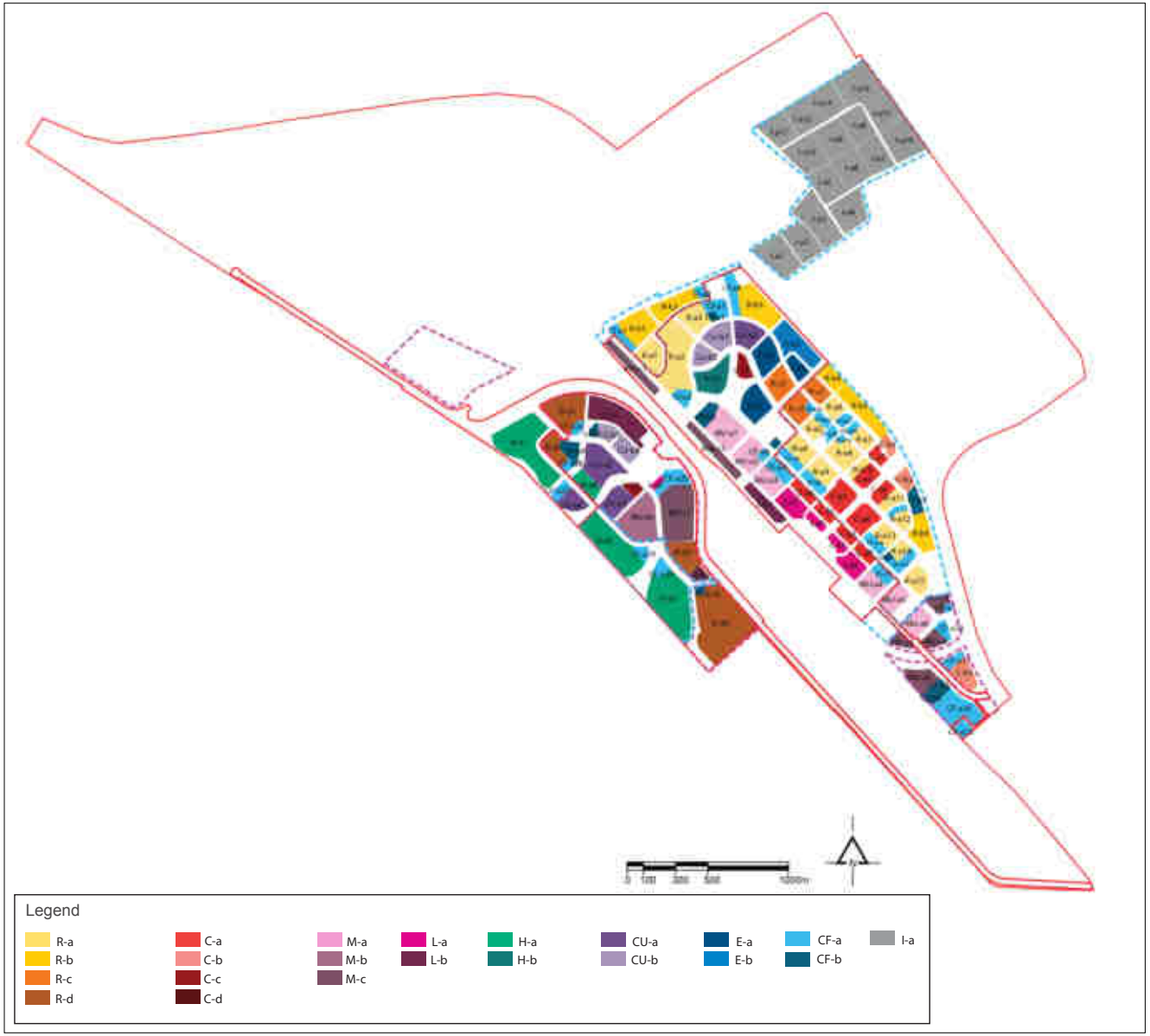

Figure 1.86: Design Guidelines Key Plan

5 *Fences: See Landscape Guidelines Section

Table 1.13: Design Guidelines Key Table

URBAN DESIGN														
Parcel Type		LU	PLOT OCCUPATION AND USE						ACCESS AND PARKING		BUILDING GUIDELINES			
			SETBACKS (m)			FENCING	COVERAGE	FAR	ACCESS	PARKING	HEIGHT	STOREYS	ARCHITECTURE/MASSING	
			Front	Sides	Rear									
Residential														
	R-a	Residential Appartments	4	4	4	F3	40%		Restricted access (Slip roads)	Ground Level (Undercroft / within building footprint) & Underground Parking			Appartment Blocks Internal Courtyard typology	
	R-b	Residential Appartments	4	4	4	F3	40%			Ground Level (Undercroft / within building footprint) & Underground Parking			Appartment Blocks Internal Courtyard typology	
	R-c	Serviced Appartments	4	4	4	F3	35%			Ground Level (Undercroft / within building footprint) & Underground Parking			Appartment Blocks Internal Courtyard typology	
	R-d	Maisonetes	4	4	4	F3	35%			Ground Level (Undercroft / within building footprint) & Underground Parking			Maisonette / Townhouses Typology	
Commercial														
	C-a	Offices	1	1	1	F1	70%			Ground Level (Undercroft / within building footprint) & Underground Parking			Porticos at ground floor level	
	C-b	Commercial & Offices	1	1	1	F1	70%			Ground Level (Undercroft / within building footprint) & Underground Parking			Porticos at ground floor level	
	C-c	Offices	1	1	1	F1	35%			Ground Level (Undercroft / within building footprint) & Underground Parking			Tower typology	
Mixed Use														
	M-a	Retail and Resi	4	4	4	F2	40%			Ground Level (Undercroft / within building footprint) & Underground Parking			1. Internal Courtyard typology 2. Continuous Frontage	
	M-b		6	6	6	F2	70%			Ground Level (Undercroft / within building footprint) & Underground Parking			Segmented building blocks	
	M-c		4	4	4	F2	40%		Restricted access (Bypass Road/Railway)	Ground Level (Undercroft / within building footprint) & Underground Parking				
Leisure														
	L-a		1	1	1	F1	60%			Ground Level (Undercroft / within building footprint) & Underground Parking			Provide Semi-Public spaces	
	L-b		4	4	4	F2	40%		Restricted access (Bypass Road/Railway)	Ground Level (Undercroft / within building footprint) & Underground Parking			Provide Semi-Public spaces	
Hospitality														
	H-a		7	7	7	F3	30%			Ground Level (Undercroft / within building footprint) & Underground Parking			50m buffer along the National Park: adequately landscaped zone. No construction of major buildings is allowed within this zone	
	H-b		7	7	9	F3	30%			Ground Level (Undercroft / within building footprint) & Underground Parking				
Culture														
	CU-a		7	7	7	F2	35%			Ground Level (Undercroft / within building footprint) & Underground Parking			Provide Semi-Public spaces	
	CU-b		5	5	5	F2	50%			Ground Level (Undercroft / within building footprint) & Underground Parking			Provide Semi-Public spaces	
Education														
	E-a	Campus	4	4	4	F3	50%			Ground Level (Undercroft / within building footprint) & Underground Parking			Educational Buildings	
	E-b	Residential	4	4	4	F3	40%			Ground Level (Undercroft / within building footprint) & Underground Parking			Student Accomodation typology	
Community Facilities														
	C-a	Community Facilites					50%			Ground Level (Undercroft / within building footprint) & Underground Parking				
	C-b	Educational Buildings					50%			Ground Level (Undercroft / within building footprint) & Underground Parking			Primary and Secondary Schools	
Industrial														
	I-a	Industrial	5	5	5	F4	50%			Ground Level (Undercroft / within building footprint) & Underground Parking				

1.5.3 RESIDENTIAL PLOTS

PLOTS	NAME	AREA (HA)	BH	FAR	PHASE	COMMENTS
	R-a1	2.6	4	1.75	P2	
	R-a2	7.2	4	1.75	P1	
	R-a3	2.6	6	2.75	P1	
	R-a4	2.0	4	1.75	P2	
	R-a5	1	4	1.75	P2	
	R-a6	1.1	4	1.75	P2	
	R-a7	1.3	4	1.75	P2	
	R-a8	2.5	4	1.75	P2	
	R-a9	1.8	4	1.75	P2	
	R-a10	0.7	7	3.25	P2	
	R-a11	1.1	7	3.25	P2	
	R-a12	0.9	7	3.25	P2	
	R-a13	1.50	7	3.25	P2	
	R-a14	1.0	4	1.75	P2	
	R-a15	1.80	4	1.75	P2	
	R-b1	3.1	4	1.75	P2	needs buffer from main road
	R-b2	2.60	4	1.75	P2	needs buffer from main road

PLOTS	NAME	AREA	BH	FAR	PHASE	COMMENTS
	R-b3	4.40	4	1.75	P1	needs buffer from Mombasa Road
	R-b4	1.20	4	1.75	P2	Service Apartments / Needs buffer from Mombasa Road
	R-b5	2.60	4	1.75	P2	needs buffer from Mombasa Road
	R-b6	2.40	7	3.25	P2	needs buffer from Mombasa Road
	R-c1	2.40	4	1.75	P1	Serviced Apartments
	R-c2	2.0	4	1.75	P2	Serviced Apartments
	R-c3	1.60	4	1.75	P2	Serviced Apartments
	R-d1	4.20	4	1.75	P3	Maisonettes / Town-houses
	R-d2	2.0	3	1.75	P3	Maisonettes / Town-houses
	R-d3	2.90	4	1.75	P3	Maisonettes / Town-houses
	R-d4	11.20	4	1.75	P3	Maisonettes / Town-houses

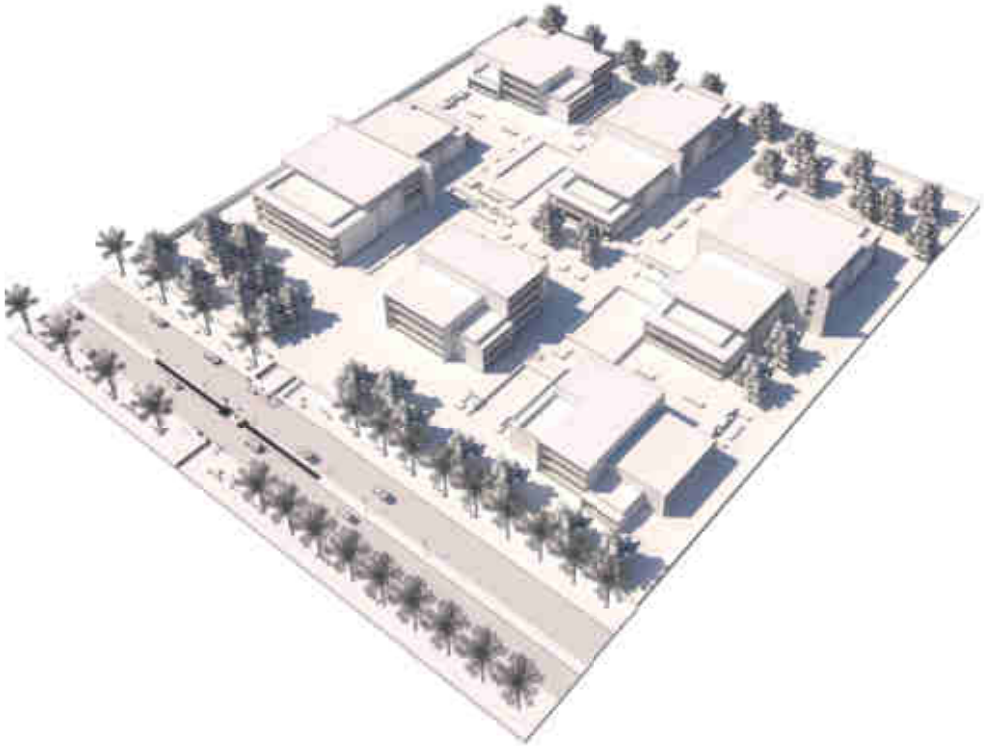

Figure 1.87: Residential Appartments (R-a, R-b, R-c plot example)

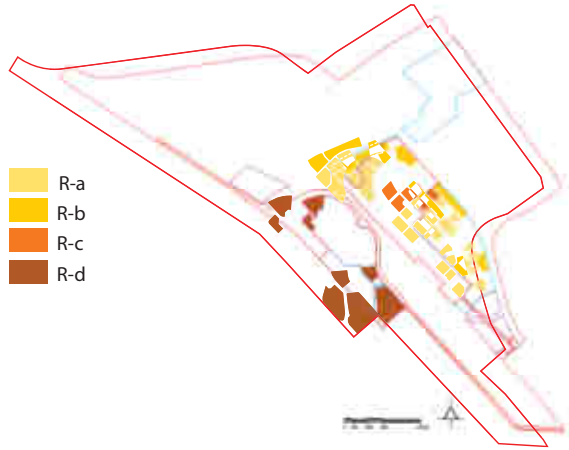

Figure 1.88: Maisonettes / Townhouses (R-d plot example)

1.5.4 MIXED USE PLOTS

PLOTS	NAME	AREA (HA)	BUILDING HEIGHTS (STOREYS)	FAR	PHASE	NOTES
	MU-a1	4.0	5	2.25	P1	
	MU-a2	2.6	5	2.25	P1	
	MU-a3	2.0	5	2.25	P1	
	MU-a4	1.65	4	1.75	P1	
	MU-a5	1.9	4	1.75	P2	
	MU-a6	2.30	4	1.75	P3	
	MU-b1	5.40	3	1.25	P3	less coverage allowance to a-type plots
	MU-c1	2.00	6	2.75	P1	buffer to be provided
	MU-c2	2.25	6	2.75	P1	buffer to be provided
	MU-c3	0.84	4	1.75	P3	buffer to be provided
	MU-c4	1.20	4	1.75	P3	buffer to be provided
	MU-c5	1.12	4	1.75	P3	buffer to be provided
	MU-c6	2.40	4	1.75	P3	buffer to be provided
	MU-c7	6.57	4	1.75	P3	buffer to be provided

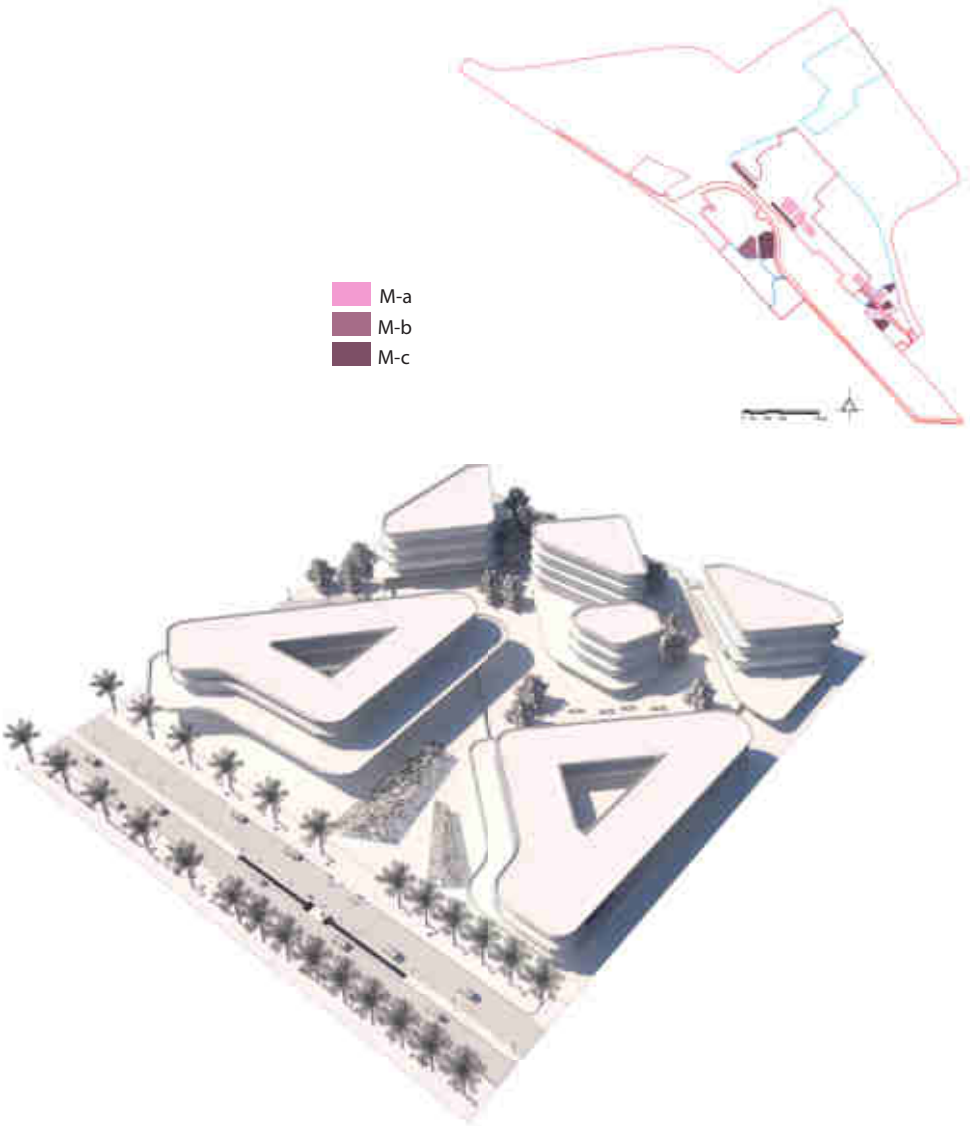

Figure 1.89: Mixed Use (MU-a plot example)

1.5.5 LEISURE & ENTERTAINMENT PLOTS

PLOTS	NAME	AREA (HA)	BH	FAR	PHASE	NOTES
	L-a1	2.12	7	3.25	P1	
	L-a2	0.75	7	3.25	P1	
	L-a3	0.75	7	3.25	P1	
	L-a4	1.85	7	3.25	P1	
	L-a5	0.40	4	1.75	P3	
	L-b1	2.00	6	2.75	P1	
	L-b2	5.00	4	1.75	P3	lower building heights compared to a-type (see Table)
	L-b3	0.85	4	1.75	P3	lower building heights compared to a-type (see Table)

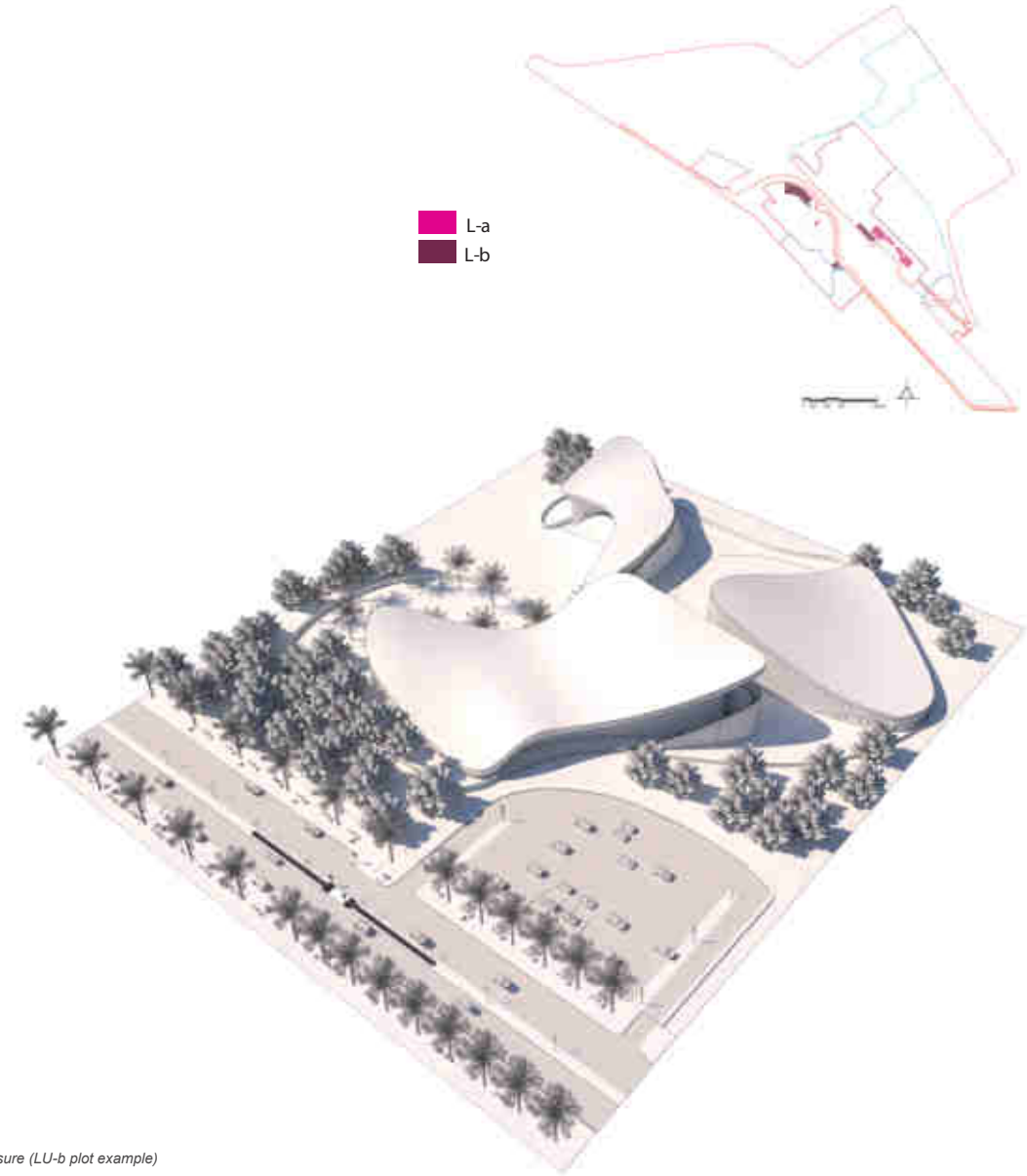

Figure 1.90: Leisure (LU-b plot example)

1.5.6 EDUCATION PLOTS

PLOTS	NAME	AREA	BH	FAR	PHASE	NOTES
	E-a1	3.10	7	3.25	P1	Main Campus buildings and facilities
	E-a2	2.70	4	1.75	P1	Main Campus buildings and facilities
	E-a3	1.25	4	1.75	P1	Main Campus buildings and facilities
	E-b1	3.65	4	1.75	P1	Student Accommodation typology

Figure 1.91: Education (E-a plot example)

1.5.7 PUBLIC PURPOSE / CULTURAL

PLOTS	NAME	AREA	BH	FAR	SETBACK	PHASE	NOTES
	CU-a1	2.40	6	2.75	15m	P1	a-type plots are less dense than b-type plots
	CU-a2	4.20	6	2.75	15m	P3	a-type plots are less dense than b-type plots
	CU-a3	2.60	4	1.75	15m	P3	a-type plots are less dense than b-type plots
	CU-a4	1.80	3	1.25	15m	P1	a-type plots are less dense than b-type plots
	CU-b1	2.15	6	2.75	4m	P1	denser plots compared to a-type
	CU-b2	1.50	6	2.75	4m	P1	denser plots compared to a-type
	CU-b3	1.15	4	1.75	4m	P3	denser plots compared to a-type
	CU-b4	1.60	4	1.75	4m	P3	denser plots compared to a-type

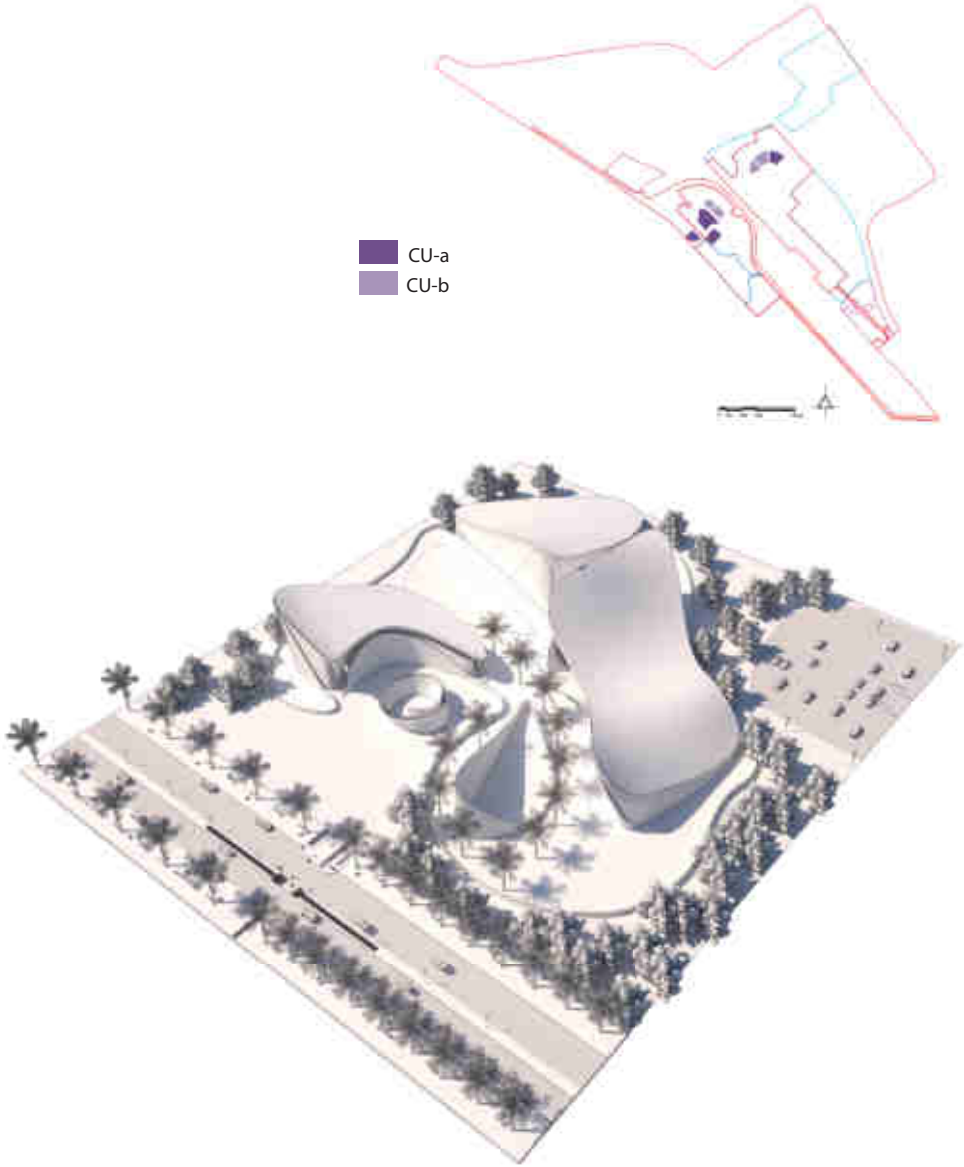

Figure 1.92: Culture (CU-a plot example)

1.5.8 COMMERCIAL PLOTS

PLOTS	NAME	AREA	BUILDING HEIGHTS (STOREYS)	FAR	PHASE	NOTES
	C-a1	0.70	7	3.25	P1	
	C-a2	0.70	7	3.25	P1	
	C-a3	2.50	7	3.25	P2	
	C-a4	2.40	7	3.25	P2	
	C-a5	1.50	7	3.25	P2	
	C-a6	1.10	7	3.25	P2	
	C-a7	0.85	7	3.25	P2	
	C-a8	0.88	7	3.25	P1	
	C-a9	0.71	7	3.25	P1	
	C-b1	0.75	7	3.25	P2	
	C-b2	1.22	7	3.25	P2	
	C-b3	1.80	4	1.75	P3	
	C-c1	1.20	10	4.75	P1	Iconic Building Typology
	C-c2	0.77	4	1.75	P3	Iconic Building Typology

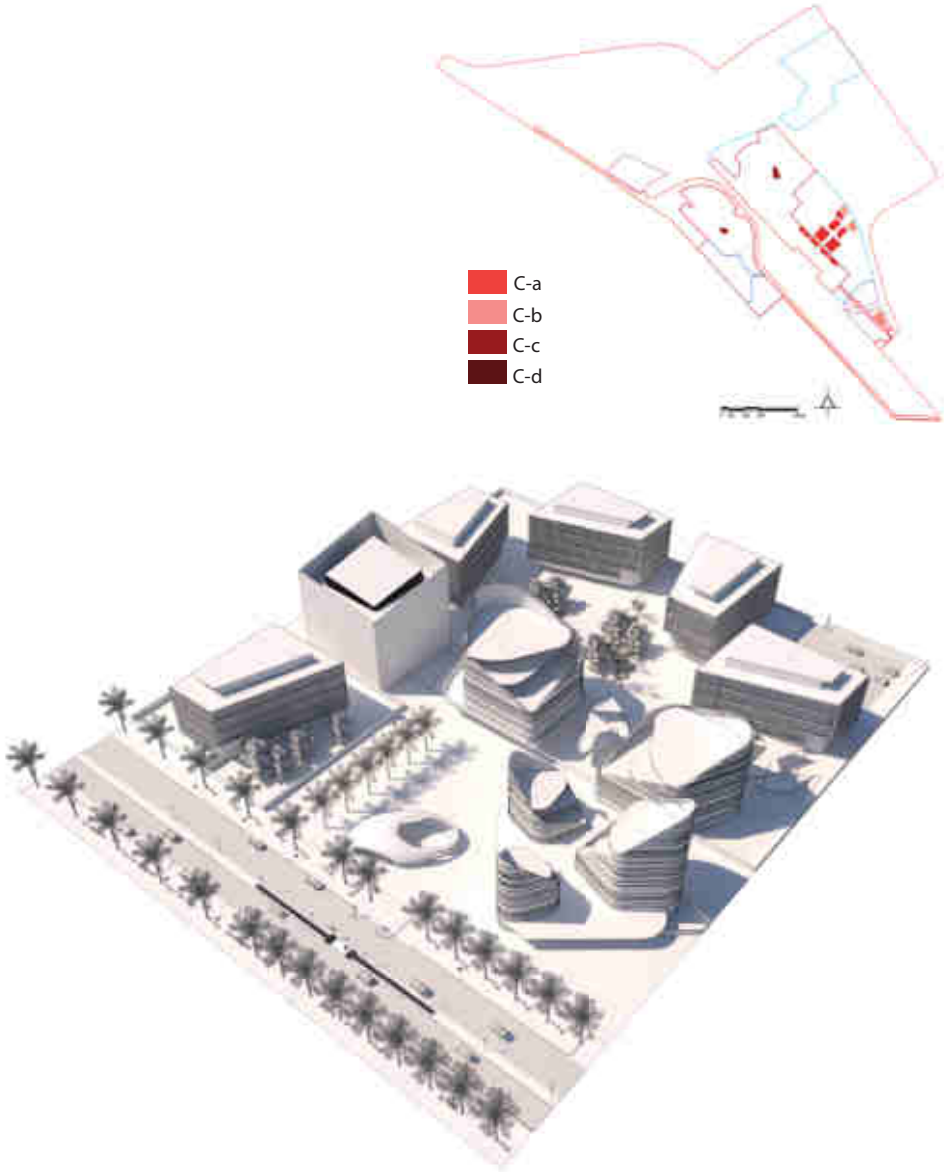

Figure 1.93: Commercial (C-a plot example)

5

1.5.9 HOSPITALITY PLOTS

PLOTS	NAME	AREA (HA)	BH	FAR	PHASE	NOTES
	H-a1	8.60	3	1.25	P1	On the NP boundary. 50m buffer zone to be adequately landscaped as part of the property. Construction of major buildings is not allowed within the buffer zone.
	H-a2	6.70	3	1.25	P2	On the NP boundary. 50m buffer zone to be adequately landscaped as part of the property. Construction of major buildings is not allowed within the buffer zone.
	H-a3	8.30	3	1.25	P2	On the NP boundary. 50m buffer zone to be adequately landscaped as part of the property. Construction of major buildings is not allowed within the buffer zone.
	H-a4	1.85	4	1.75	P3	
	H-b1	3.25	7	3.25	P1	

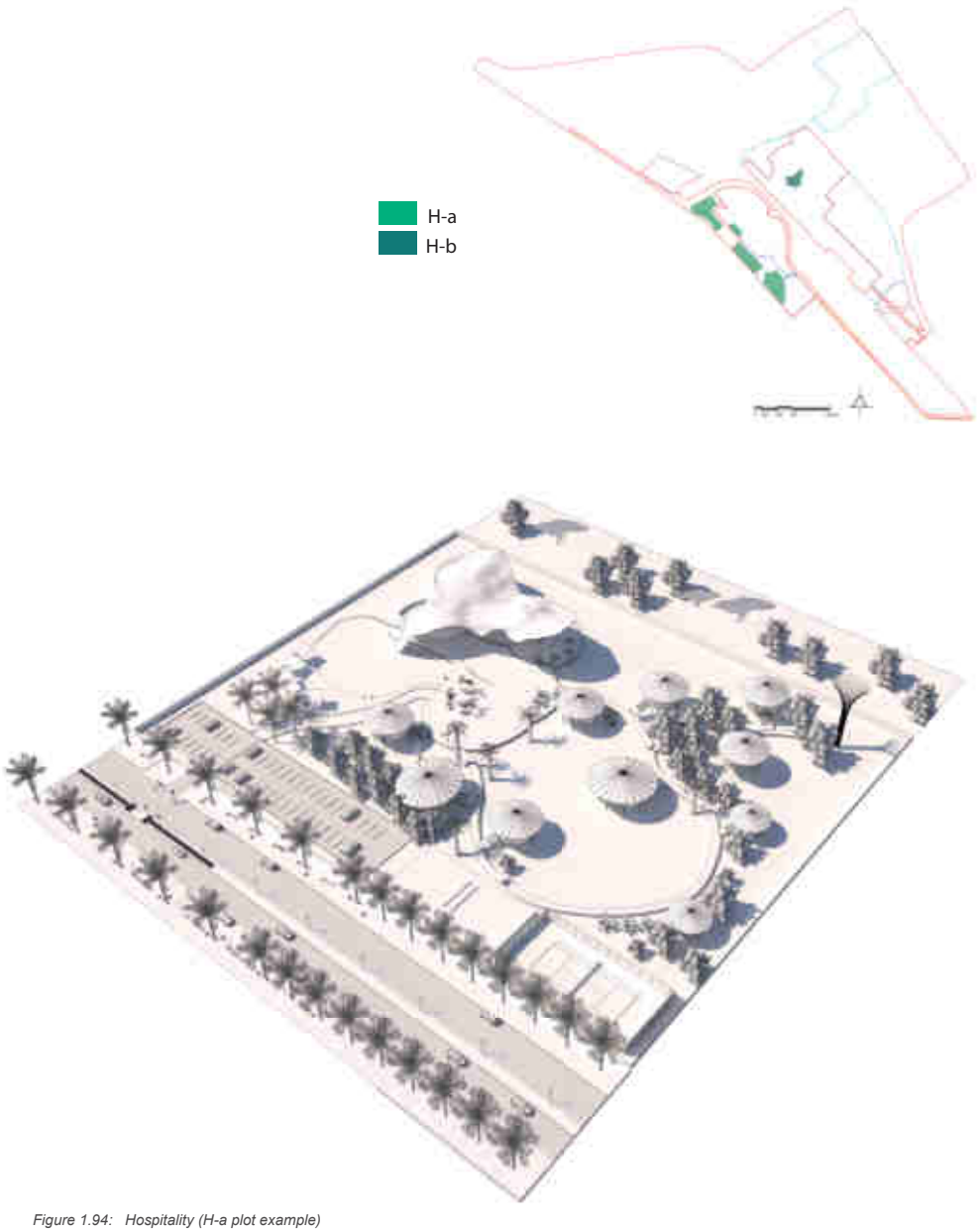

Figure 1.94: Hospitality (H-a plot example)

1.5.10 COMMUNITY FACILITIES PLOTS

PLOTS	NAME	AREA	BH	FAR	PHASE	NOTES
	CF-a1	1.15	4	1.75	P2	
	CF-a2	0.45	4	1.75	P2	
	CF-a3	1.18	4	1.75	P1	
	CF-a4	1.70	4	1.75	P1	
	CF-a5	0.95	4	1.75	P1	
	CF-a6	0.35	4	1.75	P1	
	CF-a7	1.25	4	1.75	P1	
	CF-a8	1.00	4	1.75	P2	
	CF-a9	1.00	4	1.75	P2	
	CF-a10	0.85	4	1.75	P2	
	CF-a11	0.98	4	1.75	P1	
	CF-a12	1.24	4	1.75	P2	
	CF-a13	1.10	4	1.75	P2	
	CF-a14	0.72	4	1.75	P3	
	CF-a15	0.65	4	1.75	P3	
	CF-a16	4.57	4	1.75	P3	
	CF-a17	0.22	4	1.75	P3	
	CF-a18	0.45	7	3.25	P2	
	CF-a19	0.24	4	1.75	P2	
	CF-a20	0.40	4	1.75	P2	

PLOTS	NAME	AREA	BH	FAR	PHASE	NOTES
	CF-a21	0.47	3	1.25	P2	
	CF-a22	0.47	3	1.25	P2	
	CF-a23	0.58	4	1.75	P2	
	CF-a24	0.30	4	1.75	P2	
	CF-a25	0.45	4	1.75	P3	
	CF-a26	0.45	3	1.25	P3	
	CF-a27	0.77	3	1.25	P1	
	CF-a28	1.80	4	1.75	P3	
	CF-a29	0.60	4	1.75	P2	
	CF-a30	0.75	4	1.75	P2	
	CF-b1	0.28	4	1.75	P1	primary school
	CF-b2	1.35	4	1.75	P1	secondary school
	CF-b3	0.28	4	1.75	P1	primary school
	CF-b4	0.25	4	1.75	P2	primary school
	CF-b5	0.24	4	1.75	P3	primary school
	CF-b6	1.13	4	1.75	P3	secondary school
	CF-b7	1.11	7	3.25	P2	secondary school
	CF-b8	0.40	4	1.75	P3	primary school
	CF-b9	1.20	3	1.25	P3	secondary school
	CF-b10	0.25	3	1.25	P3	primary school

5

1.5.11 INDUSTRIAL PLOTS

PLOTS	NAME	AREA	BH	FAR	PHASE	NOTES
	I-a1	4.45	*generic*	*generic*	P2	
	I-a2	3.40	*generic*	*generic*	P2	
	I-a3	5.00	*generic*	*generic*	P2	
	I-a4	3.85	*generic*	*generic*	P2	
	I-a5	3.45	*generic*	*generic*	P2	
	I-a6	3.70	*generic*	*generic*	P2	
	I-a7	3.12	*generic*	*generic*	P2	
	I-a8	3.14	*generic*	*generic*	P2	
	I-a9	3.78	*generic*	*generic*	P2	
	I-a10	4.10	*generic*	*generic*	P2	
	I-a11	3.56	*generic*	*generic*	P2	
	I-a12	3.53	*generic*	*generic*	P2	
	I-a13	3.53	*generic*	*generic*	P2	
	I-a14	6.21	*generic*	*generic*	P2	
	I-a15	4.37	*generic*	*generic*	P2	
	I-a16	4.85	*generic*	*generic*	P2	

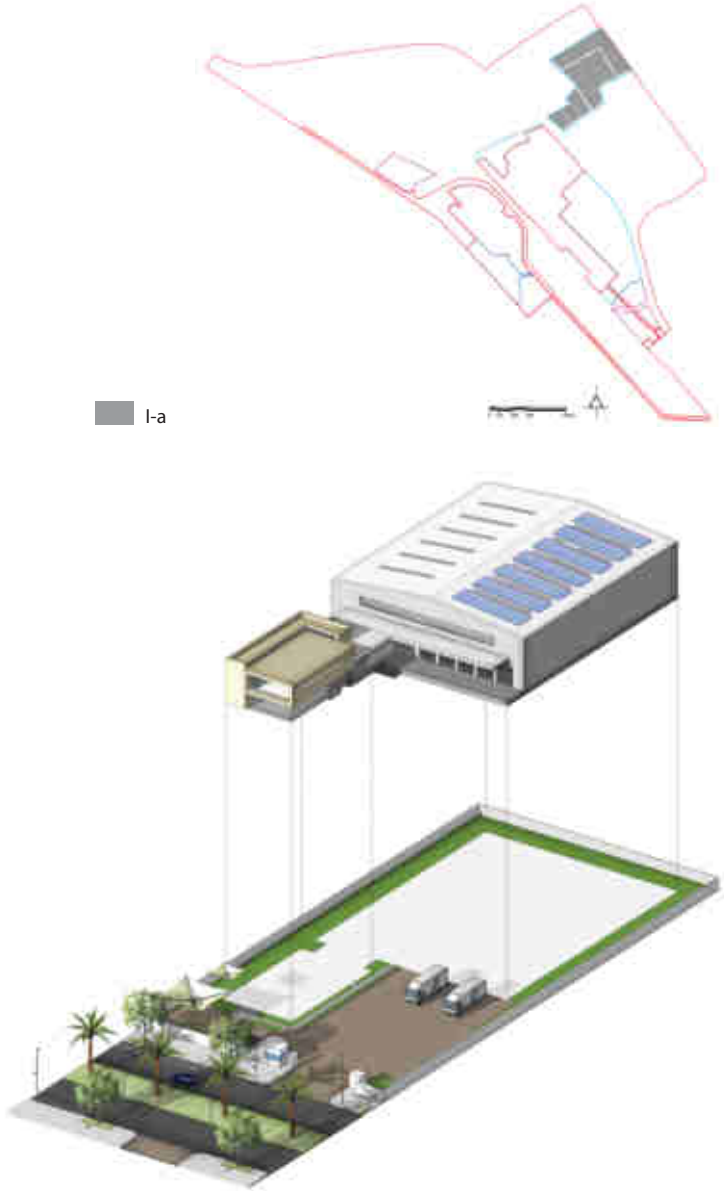

Figure 1.95: Industrial (I-a plot example)

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6

embakasi
STATION AREA
REDEVELOPMENT

CORE AREA LANDSCAPE DESIGN GUIDELINES

1.6 CORE AREA LANDSCAPE DESIGN GUIDELINES

1.6.1 LANDSCAPE VISION

The vision for Embakasi is to create a modern urban development surrounding the existing rail terminus that will achieve a high level of liveability for all its users - residents, workers and visitors alike.

A key element of this directive is the landscape strategy. The landscape strategy can provide the foundation for specific character and function zones, creating a coordinated and integrated urban realm approach that addresses the requirements of the Embakasi development.

The environmental character and amenities on site are strategically preserved and or enhanced by the use of the landscape design proposals. The overall landscape strategy directly influences the open space network and is intertwined with the notion of public space. This harmonious approach to the landscape concept is an environmentally responsive approach to the landscape design.

The principles adopted by the landscape strategy aim to follow the Kenya's requirement for sustainable development. We aim to develop and enhance systems that aim to reduce overall waste by cutting costs and decreasing emissions while improving resource efficiency by identifying sustainable synergies between landscape and the built environment.

As part of the landscape strategy the proposed development also includes a Sustainable Urban Drainage System (SUDS) that includes the development of a smart Blue and Green network, with increased properties of water absorption. This system works to direct rainwater and run-off away from the new development plots and into the natural drainage system. The increase in area of hard surfaces will affect the management of the water, and a SUDS system would alleviate potential flooding in the future.

The design of the proposed network of roads will be coupled with the SUDS ethos. The road network will provide a resilient framework suitable to accommodate and harvest water run off which will benefit Embakasi with flood mitigation and protection, rainwater harvesting, wastewater remediation, storage and reuse of rainwater, improved air quality and aesthetically pleasing spaces.

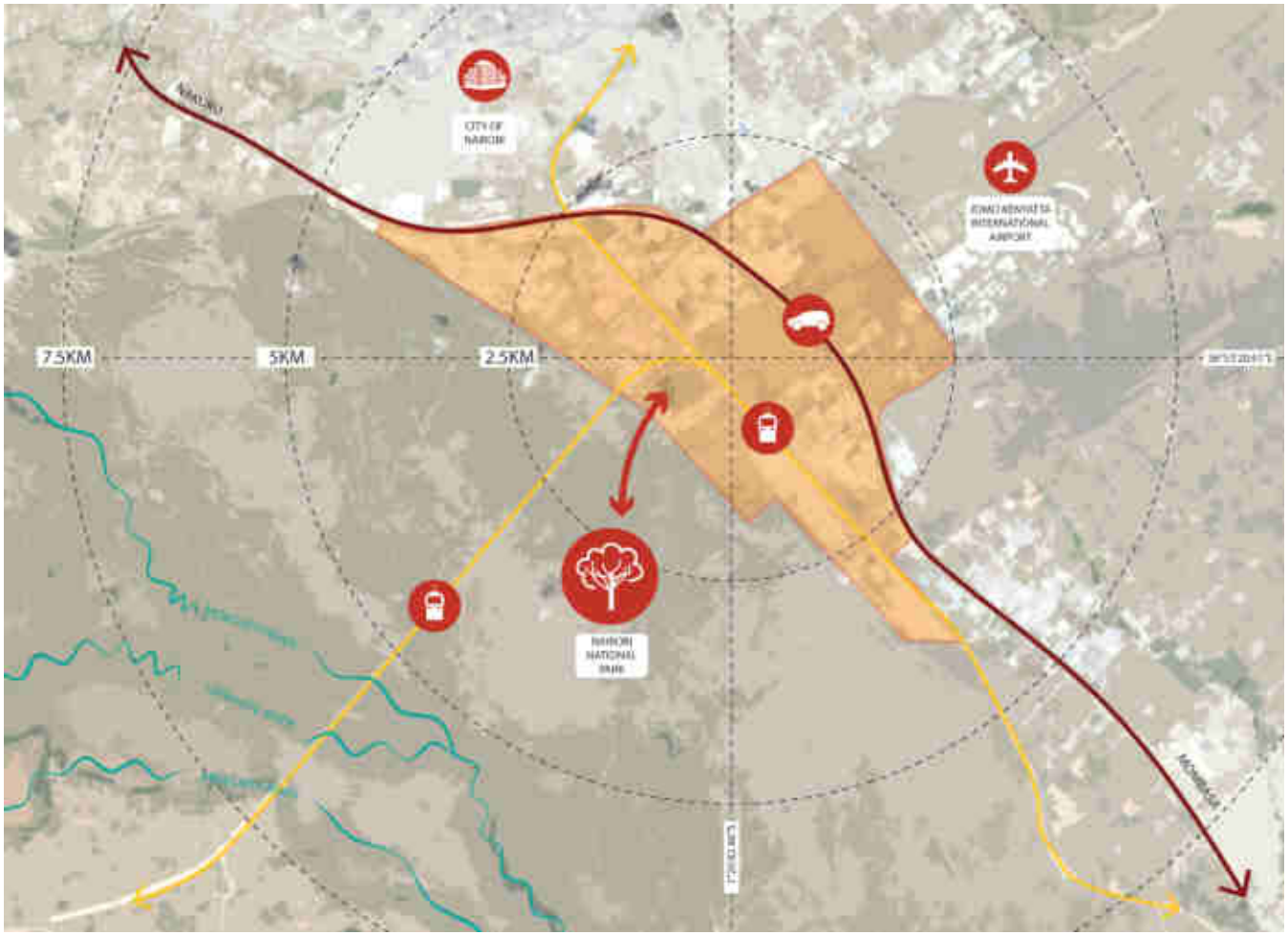


Figure 1.96: Embakasi Area - Key Distances

1.6.2 PURPOSE AND SCOPE OF THE GUIDELINES

The Landscape Design Guidelines provide detailed direction for the design of all spaces within the public and private realm. The intention is to provide direction and sufficient guidance to ensure that all users of the Guidelines have an understanding of the design requirements. The Guidelines do not provide the design but rather the guidance as to how design in Embakasi shall be achieved.

The purpose of the landscape guidelines is to enforce the underlying ambition of thoughtful, ecologically-based and sustainable landscape planning as a means of ensuring the quality of open spaces.

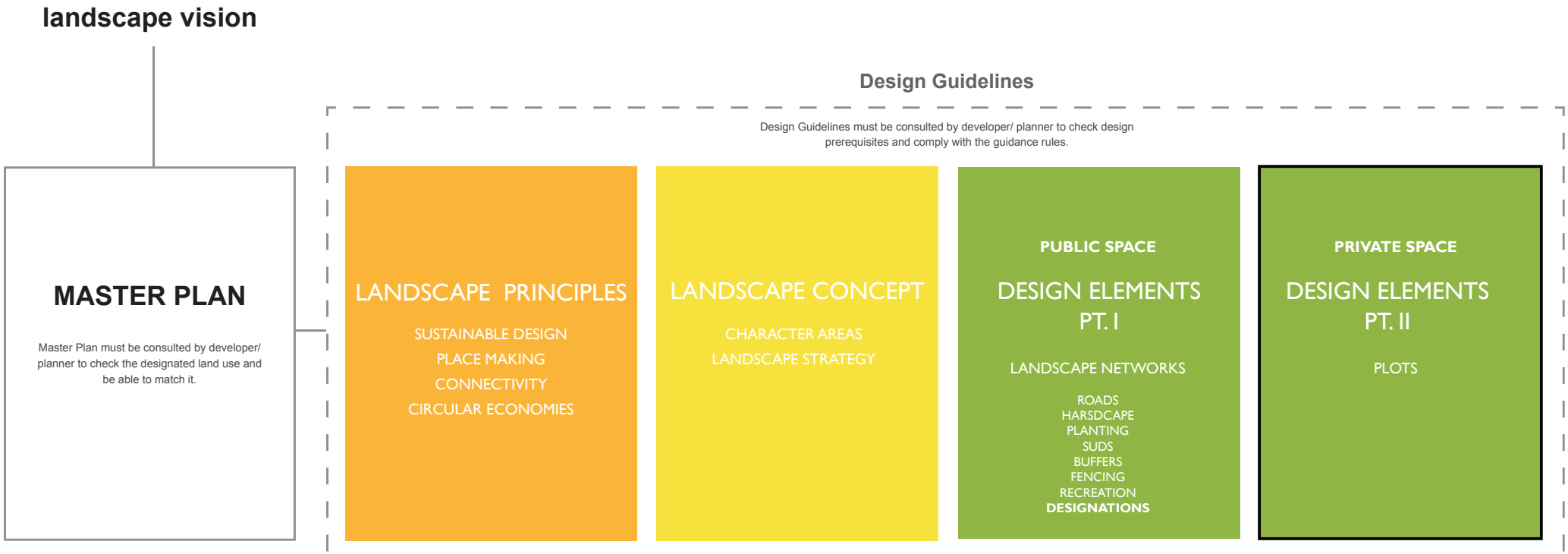
The Embakasi Design Guidelines will provide a comprehensive reference for the purposes of directing and advising development within the development's public and private realms. The Design Guidelines will outline design intentions and promote quality landscape design through the identification of standards for the development of the area. These standards will establish mandatory design requirements while at the same time provide design flexibility and opportunity for creativity and innovation. The Guidelines provide a series of comprehensive recommendations that support the scale, natural environment and public open spaces that define the development area.

The Design Guidelines will:

- Provide the main guiding principles for design of the landscape within Embakasi
- Provide confidence and a clear vision for private investors in Embakasi
- Become a design policy document for the Embakasi Masterplan
- Assist in the preparation of planning applications

1.6.3 HOW TO READ THE DOCUMENT

Guidance on how to locate & understand the information within the Planning & Design Guidelines.



1.6.4 HOW TO READ THE DOCUMENT

Application - Who will use the Guidelines

The Planning and Design Guidelines are intended for use by both professionals and nonprofessional's alike it is, principally aimed at those responsible for delivering the planning, design and construction projects within project area. The report aims to inform best practice for all landscape elements related to the development.

Interpretations

The Design Guidelines are the main point of reference for future development within the project area. As such, the Guidelines provide a clear definition of the conditions required for development. Terms employed throughout the document so that the reader/user understands the design intent and design requirements. Specifically:

1. In cases where the word "may" or "encourage" is included in a standard, it is provided as a guideline toward implementing the intent of the standard, most importantly, to promote desirable qualities through collaborative efforts with designers, developers, and local communities.
2. In cases where the word "should" is used in a standard, the standard is intended to apply to a majority of situations. However, the standard may be deviated from in a specific situation where the deviation is necessary to address unique circumstances that would otherwise render compliance impractical, or to allow an acceptable alternate means to achieve the general intent of the standard.
3. In cases where the words 'shall' or 'will' or 'required' is included in a standard, the standard is considered mandatory.
4. Where there is a conflict between the standards in this manual and the standards in a subsequent/secondary specification, the standards in the subsequent/secondary shall prevail.

Definitions

Amenity space – out door area designed for active or passive recreational use

Berm – refers to an elongated strip of mounded earth which provides separation between two adjacent areas

Bio-retention – landscaped depressions or shallow basins used to slow and treat on-site storm-water runoff

Boulevard – wide road or avenue usually lined with trees

Buffer Areas – refers to a linear strip of land, developed as a landscaped area, which separates two adjacent land uses and/or activities

Building mass – refers to the general shape or shapes that make up a building

Colour palette – selection of colours to be utilised

Crown cover – canopy of tree/shrubs covering land

Crossfall – designed fall across pavement to remove water

DWF – dry weather flow

DWFC – dry weather flow channel

Hard landscape –designed landscape with materials such as stone, brick or timber rather than plant materials

Groundcover – low growing, mat or carpet forming plants

GL – existing ground level

HPC – high performance concrete

Landscaped areas – refers to areas that have been finished to a standard with soft and/or hard materials

Locus – location

Median – central reservation between carriageways

MOS – Metropolitan Open Space

Micro-climate – climate influenced by local conditions and specific to the area

Multi-modal – transportation connections for all modes of movement, including pedestrian, cycling, and vehicular

Plants – trees, shrubs, groundcover and grass

Planting palette – a selection of trees, shrubs groundcover and grass species to be utilised

Public realm – refers to all areas to which the public has access. This includes open space and the publicly available space between buildings

Private space – area not in the public domain

Provenance – source or origin

Semi-private space – common areas within private developments where public access is allowed

Shared surface – minimal segregation between pedestrians and vehicles

Soft landscape – trees, shrubs, groundcover and grass

SUDS – Sustainable Urban Drainage Systems

Walkway – refers to sidewalks, pathways and trails

WRM – Water Resources Management

WSUDS – Water Sensitive Urban Design

1 LANDSCAPE PRINCIPLES

1.6.5 LANDSCAPE PRINCIPLES AND OBJECTIVES

The vision for Embakasi is to create a modern urban development surrounding the existing rail terminus that will achieve a high level of liveability for all its users - residents, workers and visitors alike.

A key element of this directive is the landscape strategy. The landscape strategy can provide the foundation for specific character and function zones, creating a coordinated and integrated urban realm approach that addresses the requirements of the Embakasi development.

The environmental character and amenities on site are strategically preserved and or enhanced by the use of the landscape design proposals. The overall landscape strategy directly influences the open space network and is intertwined with the notion of public space. This harmonious approach to the landscape concept is an environmentally responsive approach to the landscape design.

A strong connection with the built environment and the landscape is emphasised throughout, capturing a city that is driven by the design of the open space. The design of the landscape reflects the vision, ensuring that cultural and ecological aspects of the region and site are delivered to the open spaces.

Employing the highest possible standards, a successful environmentally appropriate focused network of public open spaces will be delivered, maximising pedestrian comfort levels and facilitate pedestrian activity for recreational enjoyment.

The development of the landscape that fulfils the vision has been built upon four landscape principles ensuring that all aspects of the design deliver a successful project.

The four landscape design directions that have been devised and promoted within the Masterplan are:

- Sustainability
- Place Making
- Connectivity
- Circular Economies

1.6.6 SUSTAINABLE DESIGN

Objective: To conserve water and energy, reduce waste and decrease runoff, respect, protect and enhance ecosystems.

The principles adopted by the landscape strategy aim to follow the Kenya's requirement for sustainable development. Sustainable landscapes are not just about creating urban and green spaces, but are about implementing design that can benefit both humans and ecosystems simultaneously.

The following key principles shall apply:

Water Usage and Sustainable Urban Drainage (SUDS)

- Develop a sustainable urban drainage system (suds) strategy that includes the development of a smart blue and green network, with increased properties of water absorption. This system works to direct rainwater and run-off away from the new development plots and into the natural drainage system. The increase in area of hard surfaces will affect the management of the water, and a suds system would alleviate potential flooding in the future.
- The design of the proposed network of roads will be coupled with the suds ethos. The road network will provide a resilient framework suitable to accommodate and harvest water run off which will benefit embakasi with flood mitigation and protection, rainwater harvesting, wastewater remediation, storage and reuse of rainwater, improved air quality and aesthetically pleasing spaces.
- Storm water from roofs should be directed to landscape areas or vegetated swales where it will naturally undergo infiltration before entering the groundwater aquifer.
- Transporting water through swales and ditches to filter out pollutants is encouraged where possible.

Sensitive Landscapes, Biodiversity and Habitats

- Protect and enhance the city's natural environment including habitats, ecosystems, air quality and water quality/quantity and providing protection from natural hazards.
- The integration of existing habitats and wildlife corridors, the provision of adequate levels of planting and protection / creation of watercourses should be key design features of new development.
- Maintain and protect existing water courses and facilitate the recharging of underground water.

Sustainable Practices and Materials

- materials, water, soil and plants should be considered valuable resources to be conserved and protected where possible.
- Ensure that the landscape proposal designs respond to the need for resilience to future-prood against the increasing demands of climate change.
- Select locally sourced plants of local provenance where possible and Incorporate plant species that are specifically adapted to the conditions of the location, reducing the need for supplemental irrigation and pest / disease control.
- Ensure materials are from local sustainable sources and are appropriate for the Embakasi area. Protect and enhance valuable ecosystems and habitats.
- Smart metering and monitoring.

1.6.7 CIRCULAR ECONOMIES

- Develop and enhance systems that reduce overall waste by cutting costs and decreasing emissions while improving resource efficiency by identifying sustainable synergies between landscape and the built environment.
- Assist with economic development through the design of supporting landscape infrastructure to maintain and encourage local business
- Provision for productive landscapes that provide low-costecosystem services, such as local food production, water storage.

1.6.8 PLACE MAKING

Objective : to achieve a quality of design interventions that responds to the so-called'genius loci' (spirit of place) thus creating spaces that are with a strong sense of place.

The sense of place is a complex concept that is used to descrive the send of belonging and place attachment as perceived by people living in a specific place that has unique characteristics and distinctive character as compared to other places.The unique physical aspects of a place depend on its particular combinations of topography, soils, hydrology, flora, road and street patterns and the characteristics of its built form and the materials used. At the same time the sense of place is related to repetitive patterns, forms and lifestyles which create a sense of familiarity. Historical and cultural patterns usually lie in the core of this sense, however the expansion of global trends have has resulted in the emergence of some global patterns that people can relate to.

The following key principles shall apply:

- Enhance the character and quality of the embakasi environment through well designed, considerate and sensitive development with a strong sense of place.
- Landmarks and public art are important as places or buildings that people identify with and use to orientate themselves with. There may be opportunities to incorporate a landmarks within sites such as in urban centres, plazas or gateways into parks.
- Identfy distinctive Character areas that result in a unique city neighbourhoods.
- Use paving and surface materials which are visually attractive, durable, easy to maintain, replace and reflect the character of the street or space.
- Encourage social, cultural, educational and physical activities, by providing appropriate spaces.
- Where suitable, new development shall retain and incorporate the area's existing natural landscape features of ecological, environmental, amenity or cultural value.
- Provide a safe and healthy living environment for all people who live, work or visit the area.
- Ensure secured by design standards are incorporated in all development proposals.
- Create a specific character to help define the neighbourhood and add identity to a development.
- Adequately illuminate the environment in order to maximise natural surveillance and create a feeling of safety.

1.6.9 CONNECTIVITY

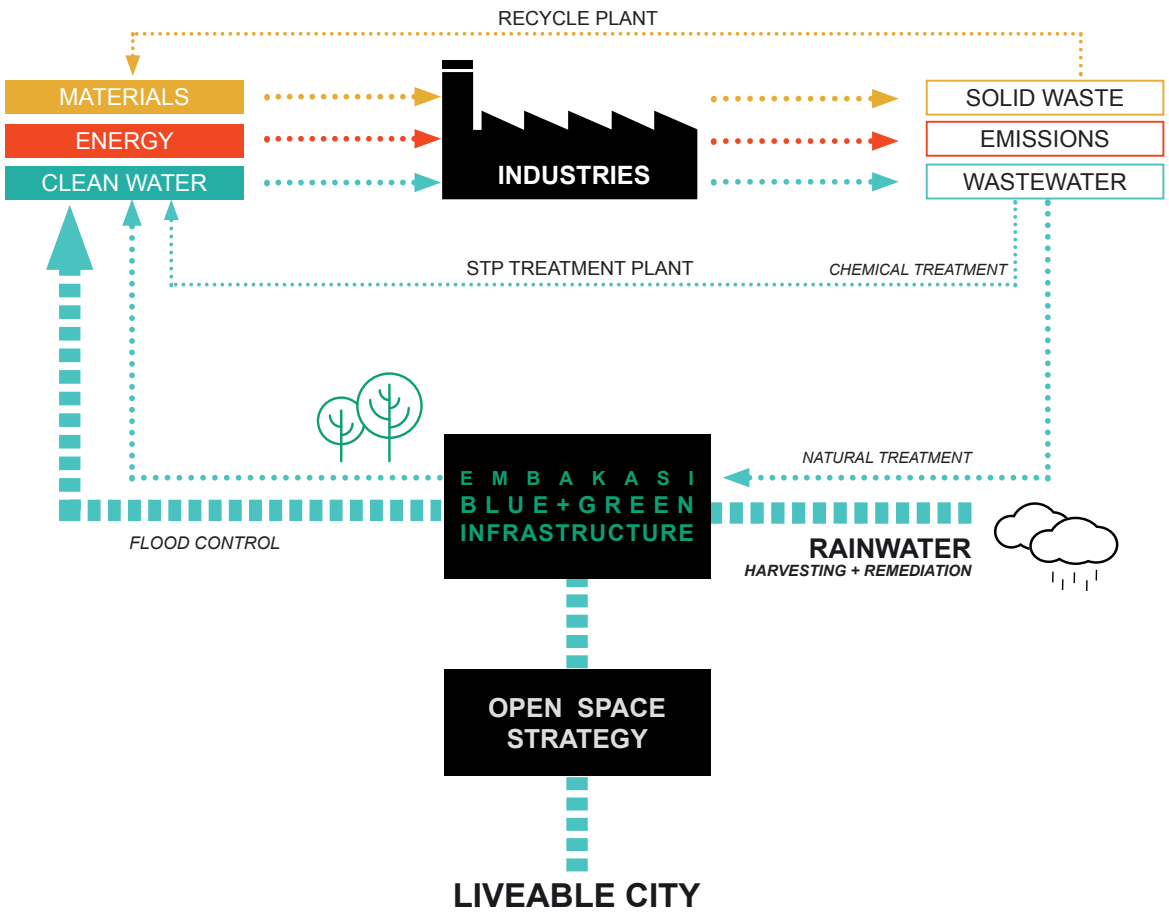
Objective : Ease of movement will ensure that people can travel easily and safely from their home to the facilities they need for their day-to-day activities. The connectivity network shall be designed to be efficient, pedestrian/cycling - friendly and fully accessible for all, regardless of age or physical ability.

Connectivity (or permeability) refers to the directness of links and the density of connections in a transport network. A highly permeable network has many short links, numerous intersections, and minimal dead-ends, creating a more accessible and resilient transportation system.

- Provide connectivity between different areas and uses through networks of roads, paths, cycleways and trails.
- Provide a co-ordinated approach to public and private transport systems with efficient and convenient multi-modal transportation connections for all users be they pedestrians, drivers, cyclists or transit riders.
- Consider and cater for the needs of cyclists by providing or supporting a network of convenient safe cycle routes, lanes and crossings.
- Roads, streets, paths and spaces should be of an appropriate width and designed to fulfil their intended function and to reflect their importance and significance.

6

- Incorporate high quality pedestrian and cycle facilities (including the provision of changing and shower facilities), at key destinations such as local and town centres, places of employment, retail and leisure facilities, educational establishments, civic and community centres and public transport interchanges.
- Clear signage should be provided to ensure ease of movement and aid way finding.
- Provide direct and attractive links between destinations which incorporate desire lines and movement patterns.
- All outdoor facilities, open spaces, paths, pavements and road crossings shall be designed to be accessible to those with mobility impairiments. Wayfinding and interpretation shall include braille and be located at and accessible height. Planting can assist way finding through sound and scent and colour.



2 LANDSCAPE CONCEPT AND STRATEGY

A. CHARACTER AREAS

B. LANDSCAPE NETWORKS

1.6.10 LANDSCAPE CONCEPT DESIGN

- Taking a view of the environments wider context, we noticed a progression from natural/ informal, to urban/ formal, as you travel from the Nature Reserve to Nairobi itself.
- The design concept progresses from informal to formal design reflecting the context, space programme and local patterns
- It develops from a more informal design, within the Residential and Leisure district, through a semi-informal design into the Civic and Educational district and up to formal spaces in the Commercial area.
- Informal and semi informal spaces reflect the wildlife environment, local animal patterns (such as zebra and wilderbeest) and geometries, more curvy but not random.
- The concept move to the man made patterns through the traditional manufacturing, such as tribal art and crafts, where the designed lines become more straight and less curved.

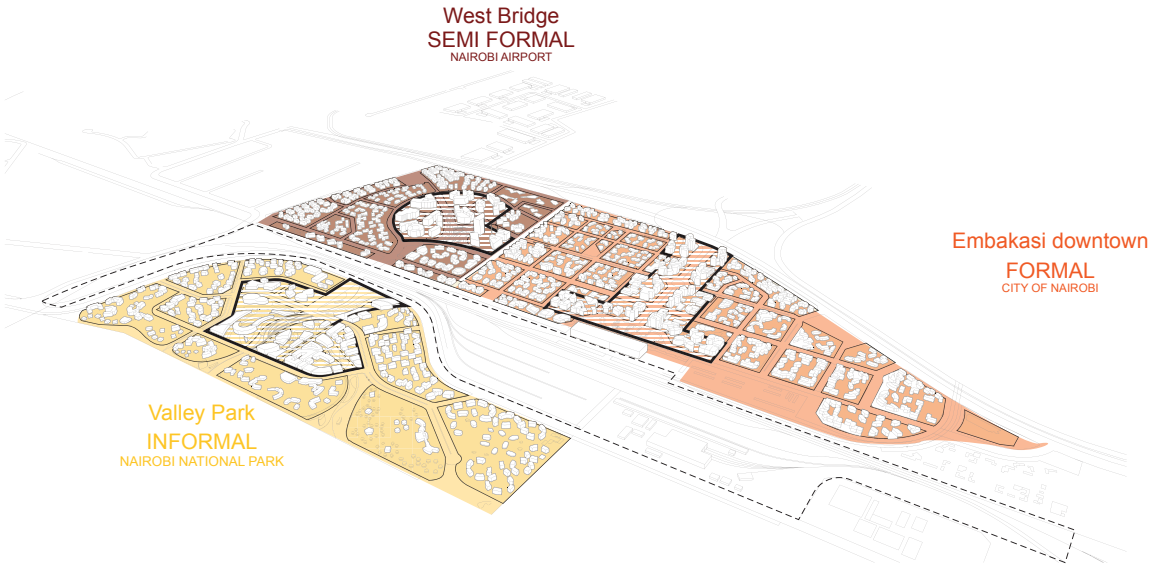
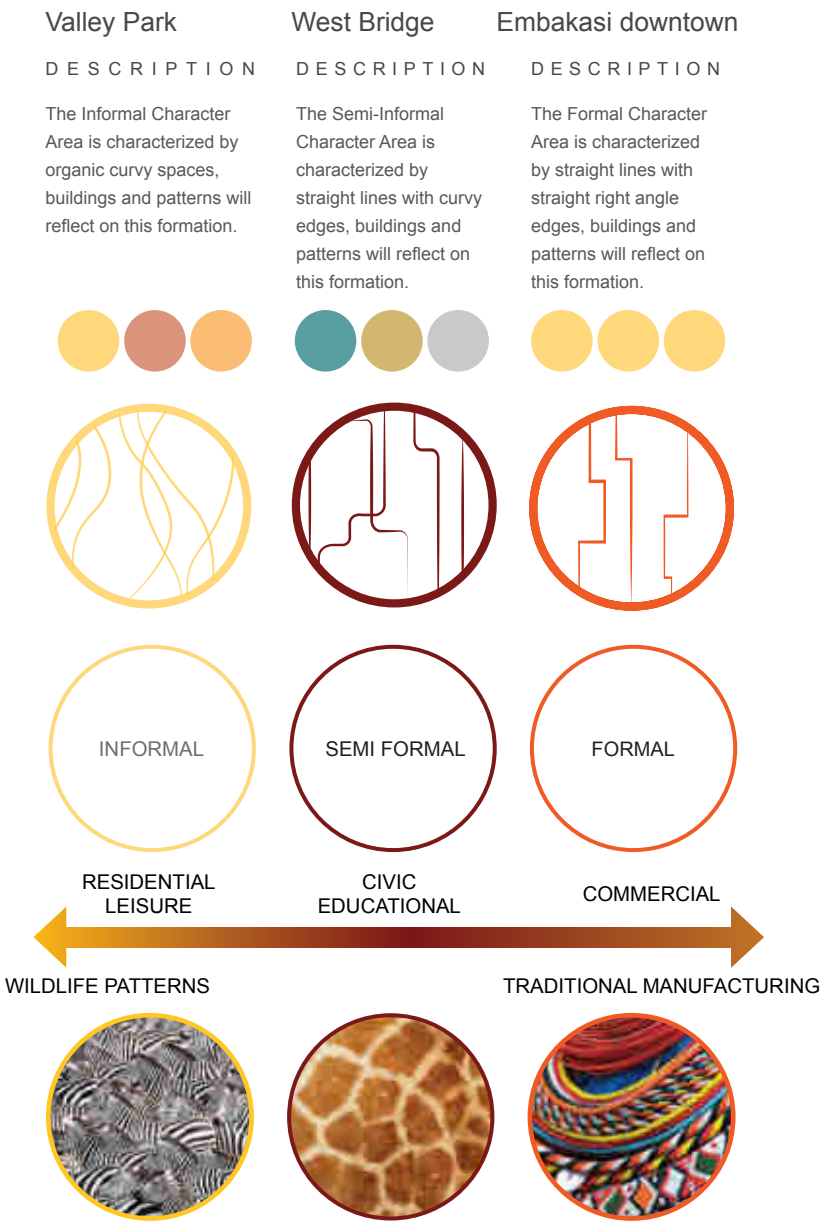
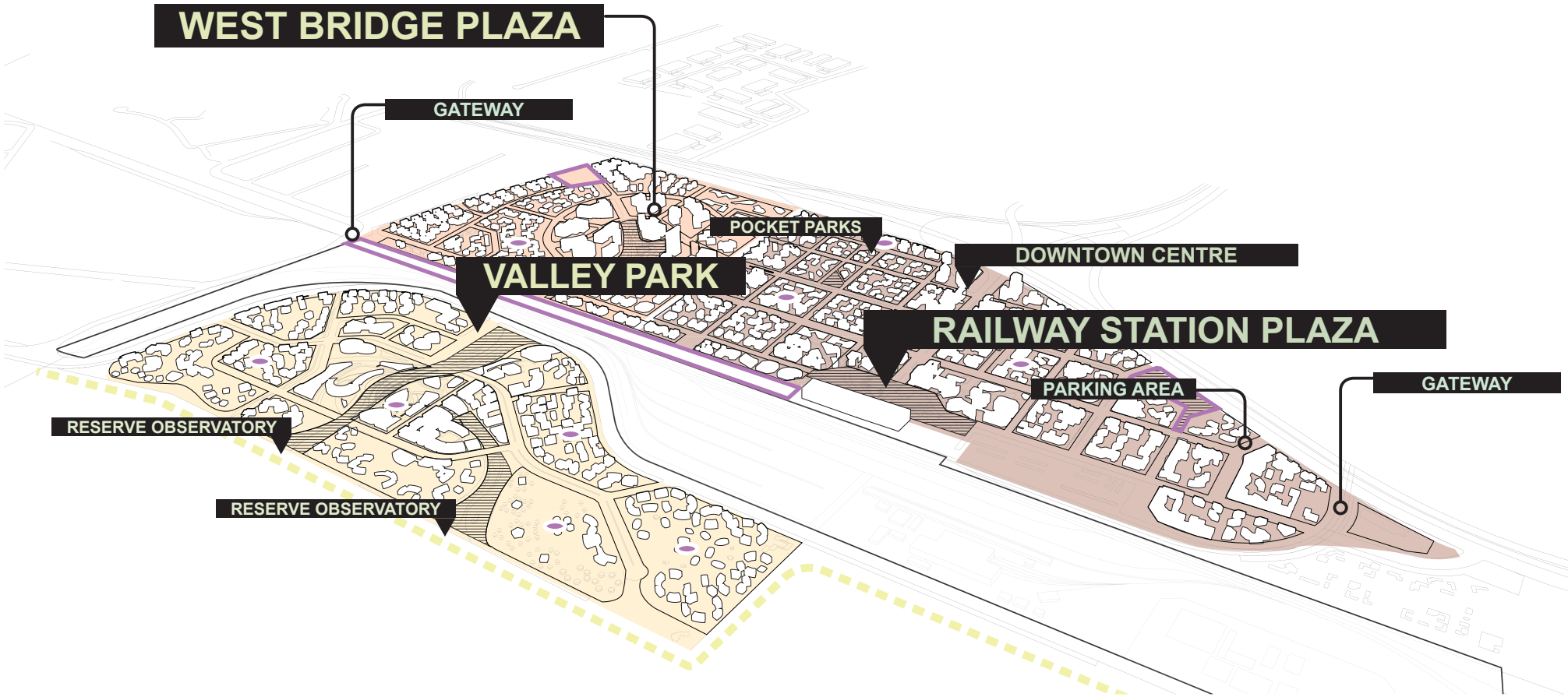


Figure 1.97: 3 AREAS




WEST BRIDGE PLAZA
GATEWAY
POCKET PARKS
VALLEY PARK
DOWNTOWN CENTRE
RAILWAY STATION PLAZA
PARKING AREA
GATEWAY
RESERVE OBSERVATORY
RESERVE OBSERVATORY

1.6.11 PARK VALLEY

General Guidelines for West Bridge/Visual Impact

- Multi-purpose spaces and furniture
- Comfortable relaxes open spaces for social interactions
- Pedestrianized road networks
- Use of native plants
- Nature strategy based designs

1. Colour: Colourful and Playful
2. Scale: Large and open
3. Movement Patterns: Flexible open spaces
4. Style: Contemporary and organic
5. Geometries : Curvy and undulating

Figure 1.99: Valley Park - Informal area with curvy lines.

Figure 1.98: Precedent images

1.6.12 VALLEY PARK

Valley Park is located around mixed-use and cultural spaces that will attract local and national visitors, as well as young artists and professionals who want to showcase their work. This area is designed to respect the natural environment and become an active green lunge for the city of Nairobi.

The landscape is designed with informal aesthetics that take organic fluid forms. It showcase and respects the natural environment, which become an active green lunge for the city of Nairobi. The mixed uses local area will attract and encourage the community for visiting.

The Water pollution in Nairobi is of high concern to the public and wildlife that are effected but the output of urban developments. Valley Park will aim to decrease the pollution of the water body with natural filtration system that will remediate pollutants from upstream. The beneficial uses of clean uncontaminated water including the use for domestic purposes, fisheries, industries, recreation and amenity use. This includes Sustainable Urban Drainage Systems (SUDS).

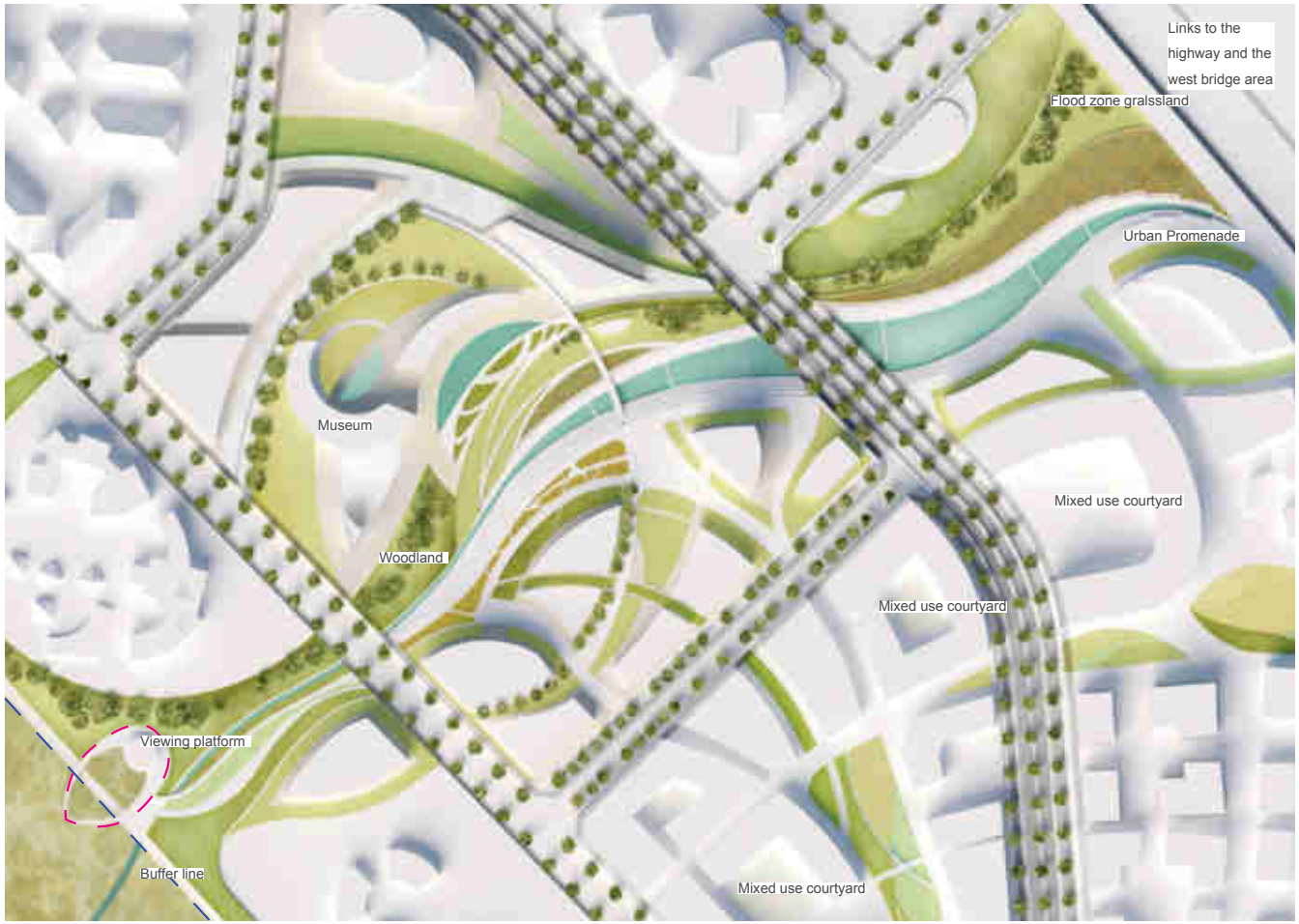


Figure 1.100: Valley Park - Example of the landscape with a guide lines that are

Key

- Urban Trees
- Natural Open Space
- Contemporary Planting Schematics
- Water Retention and polishing ponds
- Enhancing Hardscape

General Guidelines:

- Hardscape to utilize natural aggregates for pathways with an Informal aesthetic.
- A lush but uncomplicated planting palette of deep green species and sculptural plants and shrubs.
- Ensure accessibility is provided for emergency vehicles.
- Design must include upstream features or forebays that filter out sediments from storm water before it enters the basin that can affect storage volume, filtration and infiltration rates.
- Designs of detention basin to include submerged anaerobic zones to promote nutrient renewal. Also Reedbeds are to be introduced on the banks of all water bodies as they are highly effective at bioremediation to hazardous contaminants.
- Planting specified should be resilient enough to thrive in drought and flood conditions.

1.6.13 WEST BRIDGE

Design Principles/Approach

- Multi-purpose spaces and furniture
- Confortable spaces for social interactions/gatherings
- Pedestrianized road networks
- Use of native plants
- Colour: Colourful
- Scale: Playful, Dynamic
- Movement Patterns: Relaxing areas with elements of formality
- Style: Modern, Creative
- Geometries: Playful Geometries

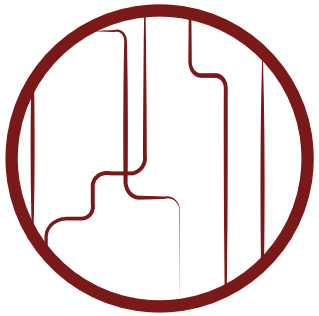


Figure 1.102: West Bridge - Semi-Informal area with straight lines with curvy edges.

Figure 1.101: Precedent images

WEST BRIDGE PLAZA

Introduction:

This plaza is located around Educational buildings, service apartments and hotels. The public realm is situated in the middle to support the needs of the adjacent users.

The geometrical forms and paving lines are generated from buildings' edges, with a semi-formal strategy forming the aesthetics of this plaza. West bridge plaza main focal point, the Amphitheater is a public performance and passive recreational space. In the centre of the Amphitheatre there is an impressive reflection pond that drains away when events are on. The area is design for the mixed uses and the education section, with convenience of outdoors lectures to take place.

Street drainage uses a network of streetscape swales and water retention areas that are integrated in the streetscape framework. The landscape strategy also includes a Sustainable Urban Drainage System (SUDS). This system works to direct rainwater and run-off away from the industrial premises and into the natural drainage system. The increase in area of hard surfaces will affect the management of the water, and a SUDS system would alleviate potential flooding.

Figure 1.103: Landscape Plaza - Example of the landscape with a guide lines that are straight lines with curvy edges.

Key

- Palm Trees
- Urban Trees
- Human Size Tree
- Natural Open Space
- Water Retention and polishing ponds
- Hardscape

General Fence Guidelines:

- High quality materials and fixtures.
- Natural stone pavers in light tones with clean contemporary planters.
- Tiered lawn-steps fronted by limestone seating strips stepping down to an open Amphitheater.
- A paved open plaza intended for public performances, outdoor movies, recreation and cultural events.
- Interactive water jets in the Amphitheater serving as play elements and attractive sculptural features when events are not taking place.
- A lush but uncomplicated planting palette of deep green species and sculptural plants and shrubs.
- Ensure accessibility is provided for emergency vehicles.

1.6.14 EMBAKASI DOWNTOWN

Design Principles/Approach

- Clear Accessibility Patterns
- Signage is really important
- Comfortable spaces for social interactions/gatherings
- Use of native plants
- Colour: Simple/ Formal
- Scale: Small and grand
- Movement Patterns: Efficient
- Style: Modern
- Geometries: Efficient

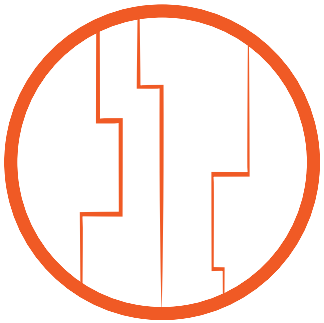


Figure 1.105: Embakasi downtown - Formal area with straight lines and edges.

Figure 1.104: Precedent images

1.6.15 RAILWAY STATION PLAZA

Introduction:

This is a denser area with office buildings, at the same time the transportation hub for local people.

Lunch parks are activated by the presence of small food kiosks and the area is also activated by retail spaces and small hotels.

Station's entrance works as a focal point of the landscape. The paths are located strategically for the connivance of pedestrians. As the fist visual impact there is a water body on either side and art sculpture in the centre will welcome the new comers to the area. The plaza will contain underground car park for aesthetic reasons. The area is going to be used for offices with he presence of small food kiosks with a link to the commercial district. The water features same as previous landscapes will contain the water filtration system.

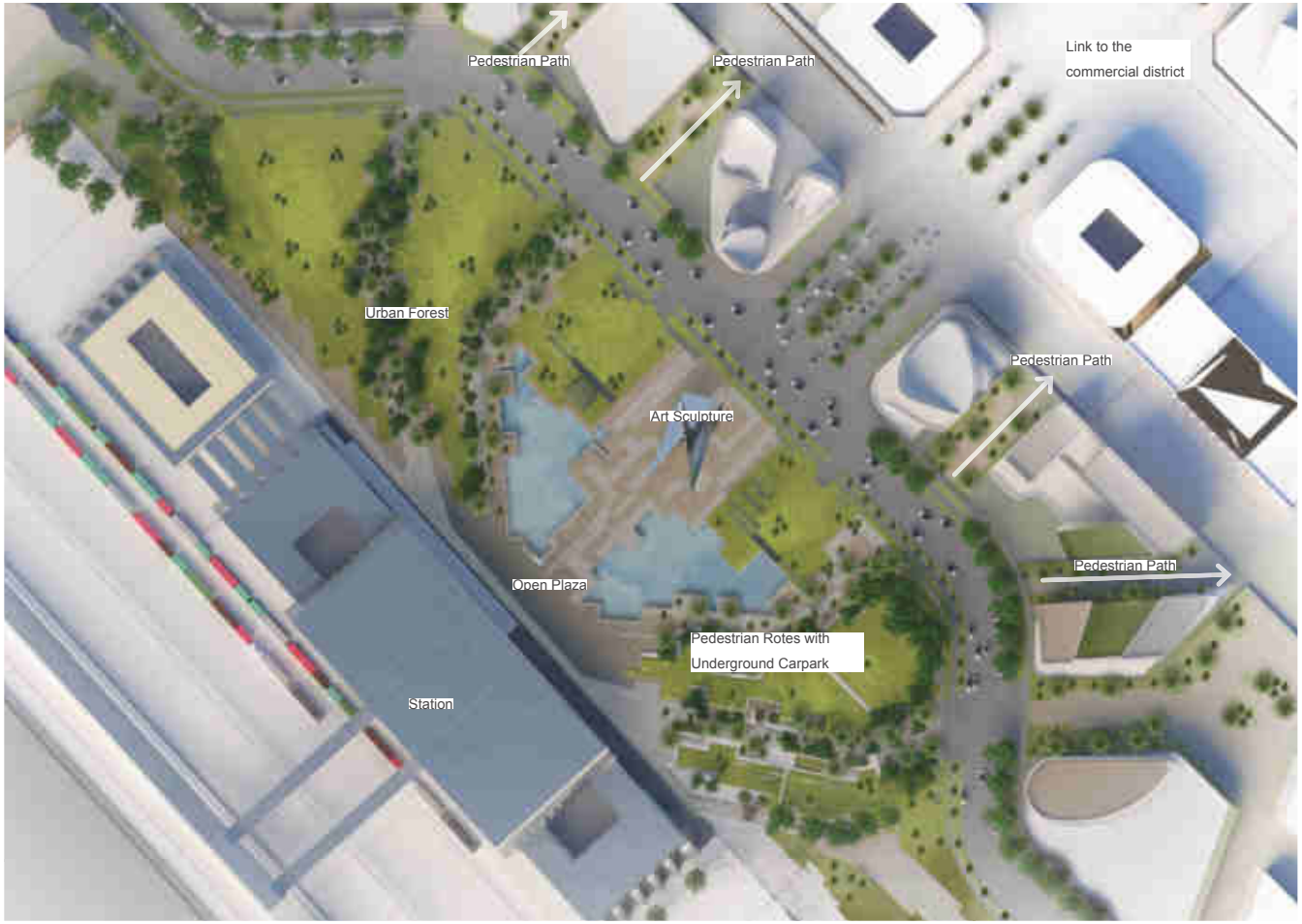


Figure 1.106: Railway Station Plaza - Example of the landscape with a guide lines that are staight.

Key

- Urban Trees
- Palm Trees
- Natural Open Space
- Water Retention and polishing ponds
- Enhancing Hardscape
- Vehicular Road

General Guidelines:

- High quality materials and fixtures.
- Natural stone pavers in light tones with clean contemporary planters.
- A paved open plaza intended for public performances, outdoor movies, recreation and cultural events.
- Interactive water jets in the Amphitheater serving as play elements and attractive sculptural features when events are not taking place.
- A lush but uncomplicated planting palette of deep green species and sculptural plants and shrubs.
- Ensure accessibility is provided for emergency vehicles.

1.6.16 DOWNTOWN PLAZA

Introduction:

The downtown plaza is mainly constructed for the outdoor activities such as yoga, tennis, gym, football. It is surrounded with the residential area and the motorway to the North. This park is the main recreation park and will draw a lot of public use at all times of the day.

The motorway edge to the north of the park has a large vegetated buffer to mitigate the visual, air and noise pollution. The buffer also produces a more naturalistic edge to the design making it feel like a community park.

Figure 1.107: Downtown Plaza - Example of the landscape with a guide lines that are

Key

- Urban Trees
- Water Retention and polishing pond
- Running trail
- Natural Open Space
- Pedestrian footpath
- Cycling trail

General Guidelines:

- Meet all relevant standards and legislation.
- Designed to be accessible to people of all ages and abilities.
- Ensure accessibility is provided for emergency vehicles.
- Provide a clear separation or landscape buffer between sports pitches and circulation routes.
- Align sports pitches and shade with landscape elements to avoid low sun angles commonly 15 degrees west of north.
- Provide shaded spectator areas where required, orientating stands away from the evening sun set.
- Reduce light pollution by not over illuminating sports areas and using light shields to keep lighting directed at the sports areas only.
- Provide safety fencing where appropriate.

1.6.17 GREEN URBAN LINK

Introduction:

The park is located in between of three urban planning approaches, which is why the aesthetics of the park is set to be asymmetric. The park creates the opportunity for alternative of the pedestrian movement through the

The movement corridor is an isolated linear park with cyclist road and railway to the South of it.

Figure 1.108: Green spine

General Guidelines:

- Creates pedestrian linkages
- Connects the master plan together with main cyclist route running though the corridor.
- Delivers the recreational activities and landscaped
- Hardscaped and softscaped spaces—including sports fields, community gathering areas, decorative/experiential landscape, and park areas

Key

- Urban Trees
- Natural Open Space
- Water Retention and polishing pond
- Pedestrian footpath
- Running trail
- Cycling trail

1.6.18 GATEWAYS

Design Intent

The gateways are the places where visitors get their first impressions of Embakasi. In these locations a higher quality materials and more intensive planting will be used to create an immediate visual impact on the commuter passing though. The Gateways can also be used as a security check point if needed in situations like public events or such as festivals.

The Gateways will also act as a wayfinding method and will resemble the three Landscape designs concept Formations

For example:

Informal, Semi formal and Formal

General Gatwway Guidelines:

- •Gateways to include arm barrier for security check points.
- Ensure accessibility is provided for emergency vehicles.
- Gateways to cater for HGV vehicle height and width limitations.
- Gateway design must adopt landscape design concept of informal semi formal and formal forms.
- Gateway to be constructed from High quality materials and fixtures.

FORMAL

The rectangular gateway.

SEMI FORMAL

Gateway with a spike.

SEMI FORMAL

Asymmetric gateway.

INFORMAL

Smooth, organic, gateway.

1.6.19 VIEWING PLATFORM

Design Intent

The Cowie Viewing platforms have been proposed to utilize the extensive views looking out to Nairobi national park from the end of the Valley Park. The platforms will be elevated 7.5m to give to impression there is no boundary fence making the experience feel like you are within the National park.

There is a real need to utilize the public parks on the boundary of the National park as a large percentage of the boundary is taken up by a 50m vegetated buffer along private plots.

. We could combine the viewing platform uses with other functions such as cafe, restaurant, bar as well as for recreation, play and education. The platforms will become destination points encouraging users to enter the site.

General Guidelines:

- Viewing platforms structure will accommodate facilities such as restaurant / cafes, toilets, information/ ecological centre.
- The structures to be made from sustainably sourced timber.
- Provide safety hand rails fencing where appropriate.
- Meet all relevant standards and legislation.
- Designed to be accessible for all ages and abilities.
- Ensure accessibility is provided for emergency vehicles.

Cowie Viewing platform

Ribbon Chapel, Japan

Viewing terrace and Pavilion, Latvia

Viewing Terrace, Loch Lomond

1.6.20 POCKET PARKS

Design Intent

Small public or semi-private spaces located within residential areas for use by the local community. These will have a garden like feel with ornamental plants, open grass areas, contain shade planting and shade structures. These specialist parks will be overlooked by surrounding properties and provide a safe place for children to play and providing a focus for the local area.

John F. Collins Park, USA

Randolph-Franklin Pocket Park

Merchant Square Floating Pocket Park

Jardin ciudadano monterrey

General Fence Guidelines:

- Viewing platforms structure will accommodate facilities such as restaurant / cafes, toilets, information/ ecological centre.
- The structures to be made from sustainably sourced timber.
- Provide safety hand rails fencing where appropriate.
- Meet all relevant standards and legislation.
- Designed to be accessible for all ages and abilities.
- Ensure accessibility is provided for emergency vehicles.

3 design elements PT. I

ROADS

HARSDCAPE

PLANTING

SUDS

BUFFERS

FENCING

RECREATION

DESIGNATIONS →

- Landmark Plaza
- Railway Plaza
- Downtown Centre
- Gateways
- Valley Park
- Pocket Parks
- Buffer Parks
- Open Space Links

1.6.21 LANDSCAPE NETWORKS

1.6.21.1 STREETSCAPES & ROADS

1.6.21.1.1 ROADS HIERARCHY

- Roads are divided into:
  - Primary, including the by-pass road and slip-road;
  - Secondary, including boulevards 1 and 2;
  - Tertiary, including collectors road (1 and 2), local roads and restricted access roads;
- Streetscape strategy develops from a more urban scale size, with tall and large trees along the primary and secondary roads, decreasing to a human scale-size vegetation on the tertiary roads.
- Primary roads include a median adorned by palms, as a statement, that create a sense of place.
- Along the public footpaths, a series of smaller human-scale trees and shrubs, create shaded areas for pedestrians. The comfortable environment is enhanched by human-scale pavement.
- All roads include a buffer zone, of variable dimensions, separating the traffic of the carriageway to the cycle route and pedestrian footpath. This meadure helps reducing the risk of collision and creating a safe and comfortable environment.

Figure 1.110: Streetscapes & roads network

1.6.22 PEDESTRIAN AND CYCLING

Design Intent

Embakasi as a modern development should seek to pioneer urban cycling within Nairobi and create a new vision for clean carbon free transport. The proposed transport network integrates bicyclist's lanes into all the major road typologies creating a very well connected network for commuter.

- Pavements should aim to preserve pedestrian sight lines and visibility in an effort for crime prevention to reduce anti-social behaviour.
- Roadways should be designed to self-enforce an appropriate vehicle speed relating to charter area requirements.
- Adequate lighting to provide essential support to night-time cyclist providing a safe public realm.
- Design cycle ways adequate to cater for all ages an all abilities.

Figure 1.109: Pedestrian and cycling Network

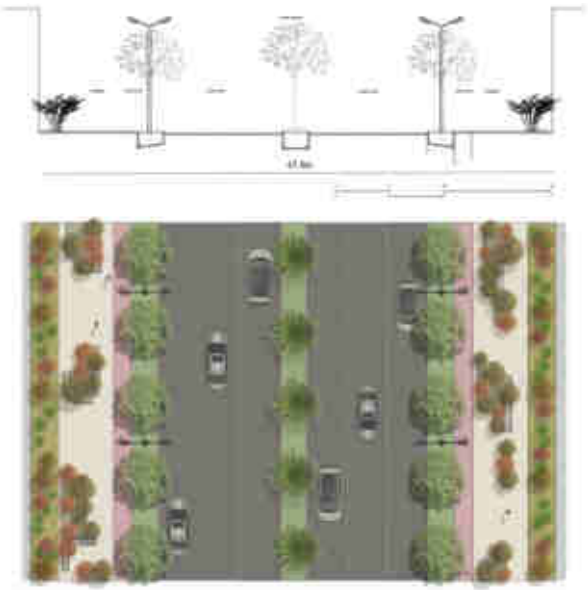
1.6.22.1 BOULEVARDS 1

Design Intent

- Public spaces within the road corridor should not impede through circulation of pedestrians on footpaths and should provide seating and lighting to make them attractive and functional places and can in some cases temporarily occupy the on-street parking lane.
- Create well-lit public seating areas along road to create a more comfortable pedestrian environment.
- Provide a design link to the municipal community plaza and amenities.

Road Requirements:

- 5m public footpath, including seating and flowerbeds planting;
- 2.5m side planting;
- 1.6m dedicated cycle lane (both sides);
- 2.5m buffer planting, including trees and lighting;
- 3 lane road each way. Lane width is of 3.65m;
- 2.5m median, including greenery, palms and swale treatment;



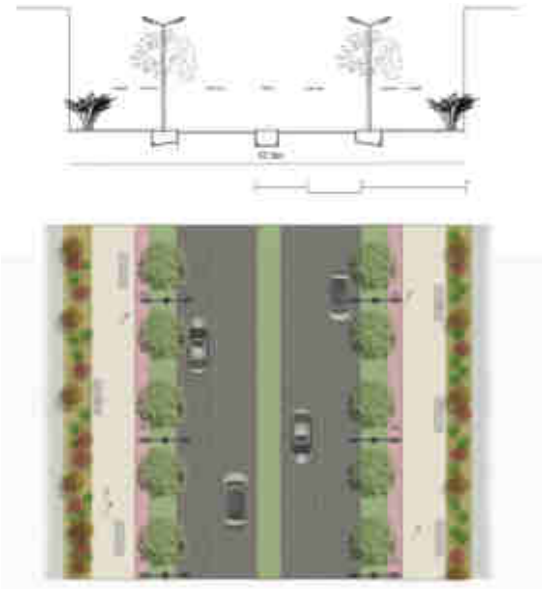
1.6.22.2 BOULEVARDS 2

Design Intent

- Create well-lit public seating areas along road to create a more comfortable pedestrian environment.
- Provide a design link to the municipal community plaza and amenities.

Road Requirements:

- 4m public footpath, including seating and flowerbeds planting;
- 2.5m side planting;
- 1.3m dedicated cycle lane (both sides);
- 2.5m buffer planting, including trees and lighting;
- 2 lane road each way. Lane width is of 3.65m;
- 2.5m median, including greenery and swale treatment;



1.6.22.3 PRIMARY ROAD

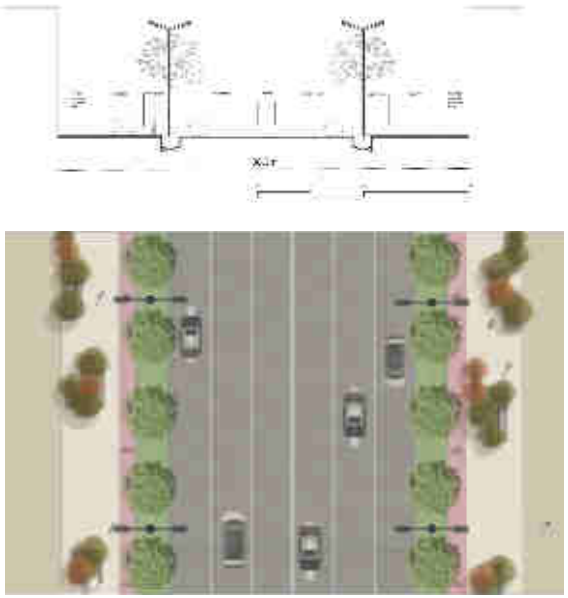
Design Intent

- Create well-lit public seating areas along road to create a more comfortable pedestrian environment.
- Provide a design link to the municipal community plaza and amenities.

Road Requirements:

Including

- 5m public footpath, including seating and flowerbeds planting;
- 2.5m flexible zone for potential F+B;
- 1.6m dedicated cycle lane (both sides);
- 1.8m buffer planting, including trees and lighting;
- 3 lane road each way. Lane width is of 3.65m;
- 2.5m median, including greenery;



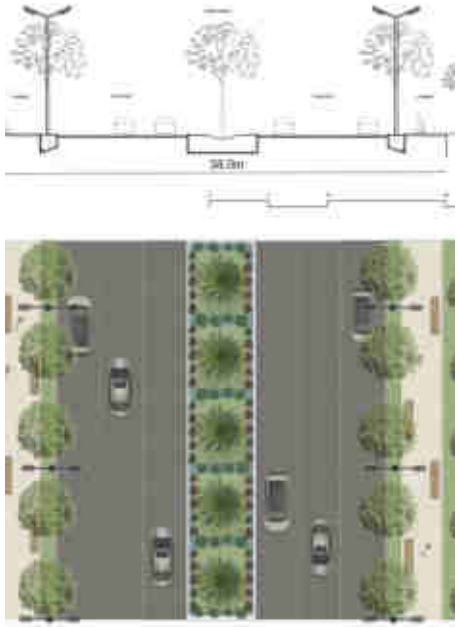
1.6.22.4 BYPASS ROAD

Design Intent

- Provide a vegetated buffer on both sided of Bypass Road to protect adjacent building from noise pollution
- Create well-lit public seating areas along road to create a more comfortable pedestrian environment.
- Provide a design link to the municipal community plaza and amenities.

Road Requirements:

- 3.5m public footpath, including seating and flowerbeds planting;
- 1.5m buffer planting, including trees and lighting;
- 2 lane road each way. Lane width is of 3.65m;
- 6m median, including greenery and swale treatment;

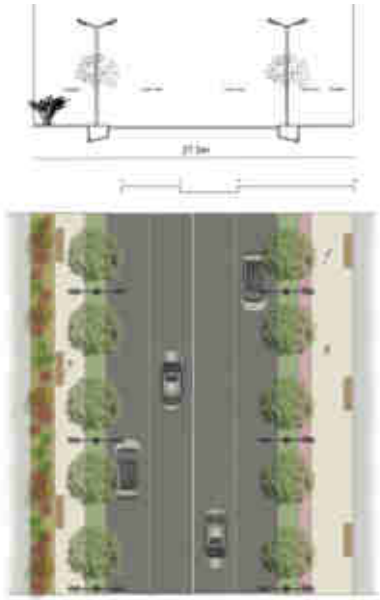


1.6.22.5 COLLECTOR ROAD 1

Design Intent

Road Requirements:

- 2.65m public footpath, including seating and flowerbeds planting;
- 2m side planting (one side only);
- 1.6m dedicated cycle lane (one side only);
- 1.8m buffer planting, including trees and lighting;
- 2 lane road each way. Lane width is of 3.65m;
- No median.



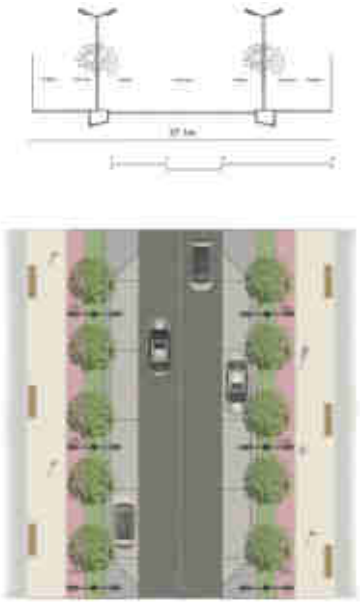
1.6.22.6 COLLECTOR ROAD 2

Design Intent

- Create well-lit public seating areas along road to create a more comfortable pedestrian environment.
- Provide a design link to the municipal community plaza and amenities.

Road Requirements:

- 3.5m public footpath, including seating and flowerbeds planting;
- 1.6m dedicated cycle lane (both sides);
- 1.8m buffer planting, including trees and lighting;
- On-street parking lanes (one on each side of the road);
- 1 lane road each way. Lane width is of 3.65m;
- No median.



1.6.22.7 LOCAL ROAD

Design Intent

- Create well-lit public seating areas along road to create a more comfortable pedestrian environment.
- Provide a design link to the municipal community plaza and amenities.

Road Requirements:

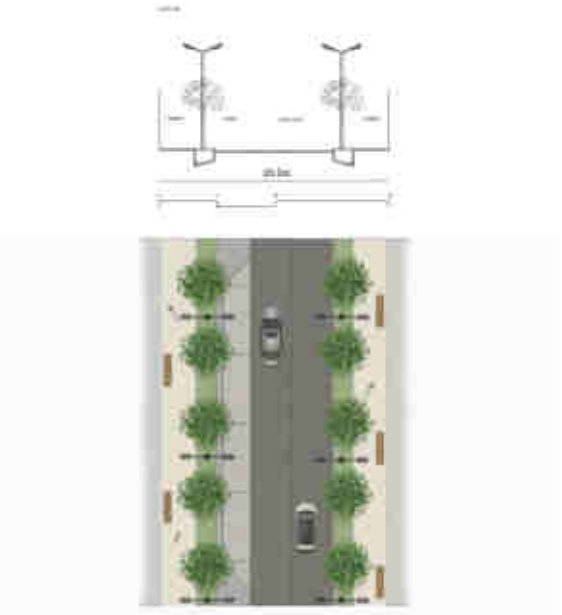
- 3m public footpath, including seating and flowerbeds planting;
- 1.8m buffer planting, including trees and lighting;
- On-street parking lanes (one on each side of the road);
- 1 lane road, one way. Lane width is of 3.65m.

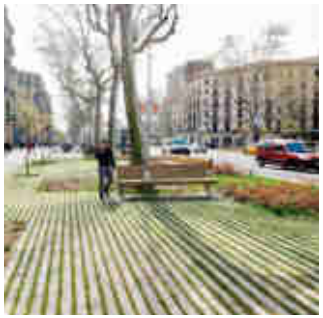
General Road Guidelines:

- Crosswalks are required at all street intersections and mid-block, where needed. Ramps shall be placed at all crosswalks to ensure wheelchair accessibility.
- Parking and loading bays are to be 2.5m wide. Usage and scheduling restrictions for loading should be developed in later project stages.
- Reduce vehicular speeds and promote pedestrianization through the use of shared surfaces.
- Provide pedestrianized access to the neighbourhood centre and residential buildings.
- Provide vehicular and emergency access throughout.

General Cycle Guidelines:

- Cycle parking is an essential element of a cycle network. It should cater for all destinations and be sited close to building entrances where it can be observed by passers by and the building occupier.
- SGR railway station may have a commuter catchment by bike of at least 5 miles radius. Railways present linear barriers to cycle permeability so high quality cycle crossing provision is essential.
- A minimum width of 1.5m vegetated buffer between road and cycle path to be applied through road network.
- Appropriate signage and wayfinding to be applied though development to guide cyclists on their commute.





urban intersection

Road cycle path

1.6.23 HARDSCAPE

1.6.23.1 SURFACE MATERIALS

Typologies:

- Streetscapes
- Public footpaths
- Plazas / Event spaces
- Private open spaces
- Car Parking
- Building curtilage

Design Approach:

Appropriate surface materials need to be selected within the public realm. It is important that materials are stable, delineate zones, provide warning and are not hazardous to the public. Correct material choices are important to help mitigate urban heat island effects and should follow sustainable principles.

It is important that within the open space hardscape creates durable all-weather surfaces able to accommodate pedestrian activity and outdoor gatherings safely. Wherever possible, hardscape materials shall be chosen to increase the previous surface area, allowing storm-water to infiltrate naturally into the ground and reduce potential flood risks.

The character area of the open space must be considered when selecting hard materials as well as the design intent and function. Attention must be given to the transition of hardscape to the surrounding urban context, which may include adjoining streetscapes or public spaces.

General Hardscape Guidelines:

Simplify and limit the use of paving material types, patterns and colours.

- A balance between aesthetics and durability of materials must be considered.
- Ensure the hard surface is accessible to people of all ages and abilities. Include DDA compliant ramps, tactile paving and handrails.
- Surfaces shall be installed by qualified personnel surfaces should be neatly cut and evenly lay surfaces in order to eliminate trip hazards.
- Surfaces shall be installed by qualified personnel surfaces should be neatly cut and evenly lay surfaces in order to eliminate trip hazards.
- Include a matte, slip-resistant finish to avoid glare and slippery surfaces when wet or dusty.
- Chose material that is light coloured to avoid heat absorption.
- Materials shall be resistant to damage caused by salts and chemicals in irrigation water.
- Materials shall be resistant to discolouration caused by intense sunlight.
- Ensure paver's are sourced from sustainable materials.
- The design and combinations of patterns and colours should be simple and complement the character area.
- Contrasting materials may be used to provide visual clues for the purpose or zoning of the space, to highlight landscape features for delineation or to assist with wayfinding.
- Hardscape should accommodate desire lines and be designed to avoid pedestrian's crossing over vegetation to take the most direct routes. This becomes an uncomfortable route for the pedestrian and also damages the soft landscaping.
- All exterior paving is required to carry either a pedestrian or vehicular load depending upon location, and to provide an appropriate durable surface.

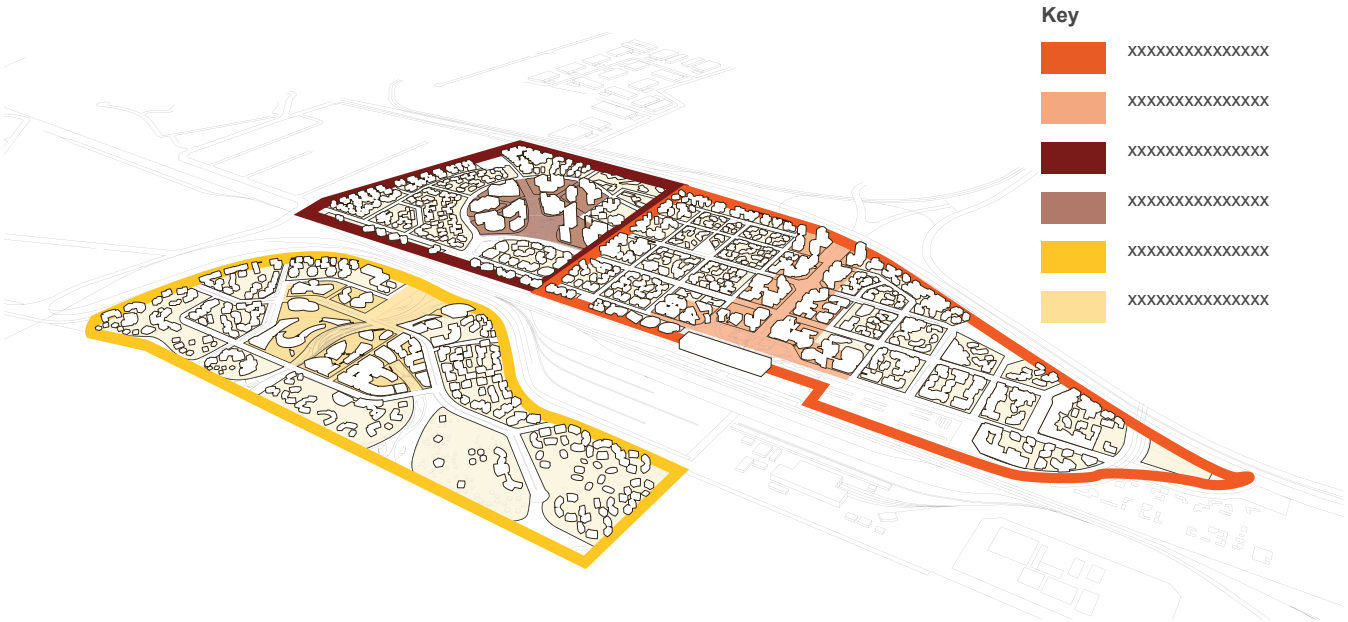


Figure 1.111: Concrete Sets

Figure 1.114: White Granite Paving

Figure 1.117: Blue Star Marble

Figure 1.120: Limestone

Figure 1.123: Compacted Red GRA

Figure 1.112: Karsa, basalt

Figure 1.115: Granite Cobblestones

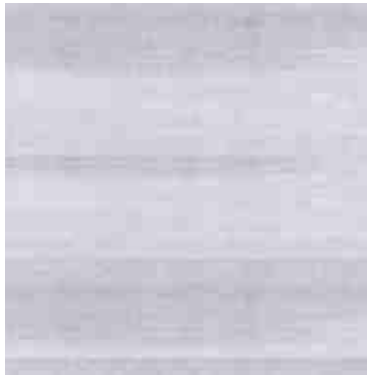


Figure 1.118: Kenya White Marble

Figure 1.121: Coral Stone

Figure 1.124: Rubber Bound Surfacing

Figure 1.113: Granite Cobblestones

Figure 1.116: Granite Bands

Figure 1.119: Calcada

Figure 1.122: Vihiga Grey Granite

Figure 1.125: Resin Bound Gravel

PARK VALLEY

Organic curvy spaces

Streetscapes

Public footpaths

WEST BRIDGE

Straight lines with curvy edges

Plazas / Event spaces

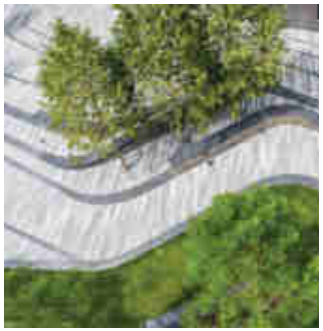
Private open spaces

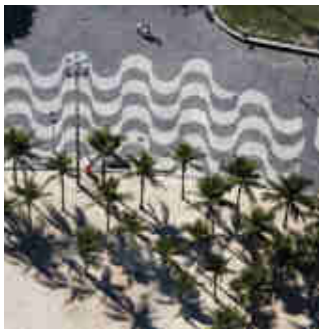
DOWNTOWN EMBAKASSI

Straight lines with straight right angle edges

Car Parking

Building curtilage





1.6.23.2 SITE FURNITURE

Typologies:

- Seating
- Shade
- Planters
- Drinking fountains
- Receptacles / Litter bins
- Tree protection
- Bicycle stands
- Electric car charging points

Design Approach:

The selection of well-designed and appropriate site furniture is an intrinsic part of a successful landscape design. Design elements, materials and colours should be simple, elegant and timeless. Colour, graphics, materials and finish details can be used to customise or differentiate furniture elements to define the character of an area. Common elements will be required to provide cohesion within the open spaces. Maintenance must also be considered by the designer to avoid specifying items that are difficult to replace.

Furniture components should be designed to accommodate people with disabilities. Children and the elderly. Furniture elements located on circulation routes shall not obstruct dedicated pedestrian / bicycle access.

The provision of furniture shall respond to anticipated pedestrian flow in the open spaces. The amount of exterior furnishings should be minimised to avoid clutter and where possible, necessary elements should have multiple uses; for example, retaining walls should be designed with seating incorporated, or signage elements combined with light columns.

General Site Furnishings Guidelines:

- Furniture elements and light fixtures shall not interfere aesthetically with the landscape design. Bollards, benches and bins will complement the surrounding architecture.
- Furniture shall be selected from manufacturers that encourage eco-friendly materials and technologies and reduce the consumption of energy and non-renewable resources.

The following guidelines shall be applied when placing furniture:

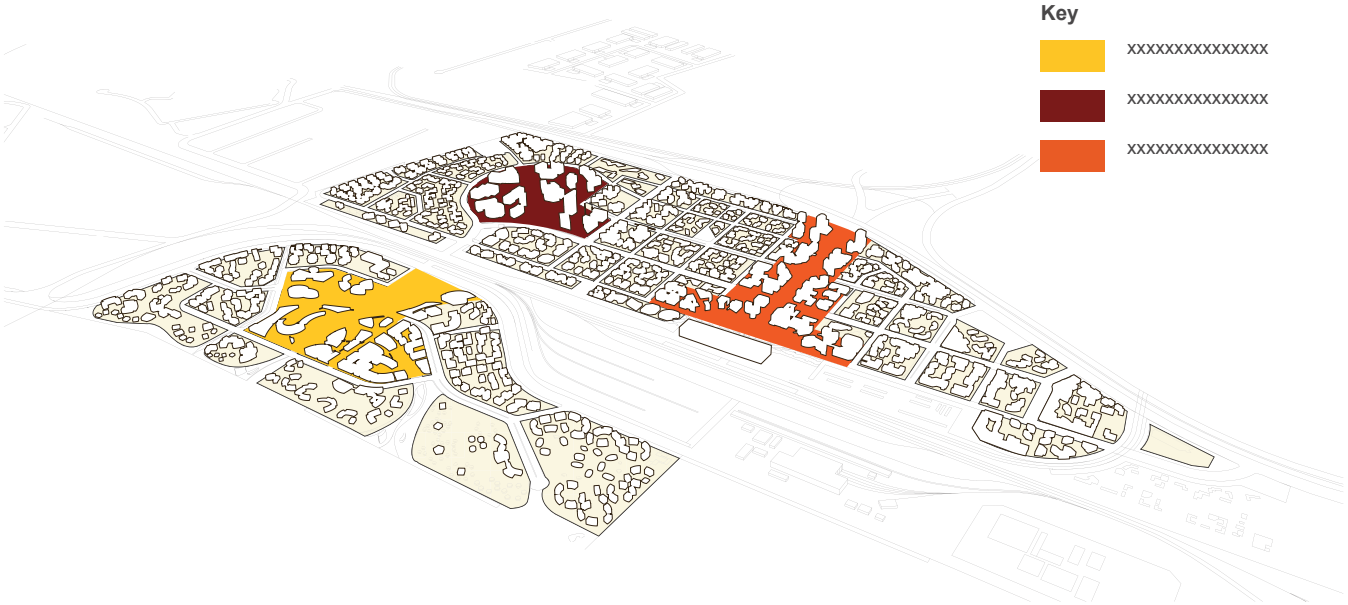
- All furniture must be designed with sufficient clearance to accommodate wheelchair access.
- All furniture must be located at a minimum of 600mm from the edge of the pathway.
- Spacing between elements such as benches and litter bins must be considered.

The following guidelines shall be applied for seats:

- Increase the number of seats in areas of high pedestrian traffic and areas of congregation such as gathering spaces, entrances to the buildings, playgrounds, along tracks and picnic areas.
- Seating should be located under trees and shade structures wherever possible.
- Informal seating may be incorporated with elements such as raised planter edges and low walls.
- Seating should be placed to face the direction of interest, such as waterfront, water features, public art, etc.

The following guidelines shall be applied for Receptacles / Litter Bins:

- Receptacles with recycling provision should be located at areas of major social interaction and near entrances to open space.
- Increase the number of receptacles in areas of high pedestrian traffic and in seating areas to meet the requirements.
- Have an opening height of between 700-1200mm which is easy to use with only one arm movement.



PARK VALLEY

Organic curvy spaces

Seating

Shade

Planters

WEST BRIDGE

Straight lines with curvy edges

Drinking fountains

Receptacles / Litter bins

DOWNTOWN EMBAKASSI

Straight lines with straight right angle edges

Tree protection

Bicycle stands

Electric car charging points

1.6.23.3 SIGNAGE

Typologies:

- Building ID
- Route Marker
- Pedestrian Directional
- Street name post
- Vehicular Directional
- Parking ID
- Welcome ID
- Community ID
- Area ID

Design Approach:

Signage refers to the physical elements used to convey or communicate a message. Within the open spaces, signs are often used at entrances and need to be legible to all user groups. It is a powerful platform for conveying overall brand identity of the Embakasi Masterplan within the public realm. Establishing a hierarchy for signage is critical to maintaining visual order and clarity. This order can be achieved through rules that dictate the location, size and number of signs.

PARK VALLEY

Organic curvy spaces

Building ID
Route Marker
Pedestrian Directional
Street name post

WEST BRIDGE

Straight lines with curvy edges

Street name post
Vehicular Directional
Parking ID

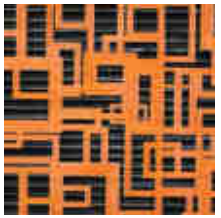
DOWNTOWN EMBAKASSI

Straight lines with straight right angle edges

Welcome ID
Community ID
Area ID

General Signage Guidelines:

- The scale of signage should be proportional to buildings' locations and should not overpower the architectural elements.
- Building signage shall not obstruct the pedestrian or cycle routes.
- The signage should be designed and located sensitively to avoid visual clutter.
- All directional and way-finding signage will be clearly visible and unobstructed. Its aesthetic will be contemporary, to reflect the overall design character of the development.
- Avoid conflicts with underground utilities and other landscape components.
- Co-ordinate with lighting strategy and ensure that signs are well lit at night
- Provide flexibility for expansion and change in the signage as required.



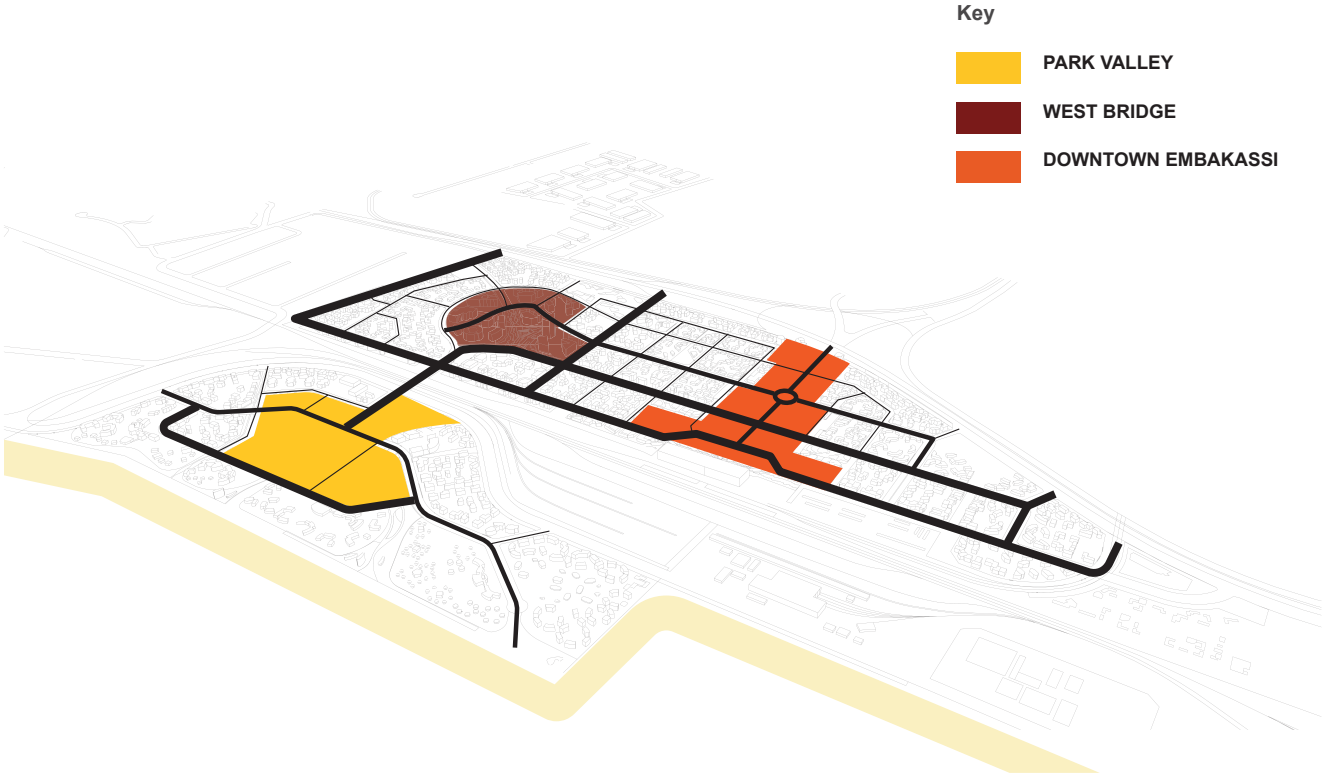
1.6.23.4 LIGHTING

Typologies:

- Street lighting
- Pedestrian lights; lighting bollards, up-lighting, pole lights
- Feature lighting
- lighting bollards
- up-lighting

Design Approach:

One of the key components of a memorable environment is lighting. Providing strong atmospheric lighting elements for the character areas will enhance the quality of Embakasi and its open space. Lighting features will also be used in key signature areas.



General Lighting Guidelines:

- Smart systems and new technology are recommended to reduce energy consumption, i.e. motion sensor lighting that turns off when no human or vehicular presence is detected, or solar lighting poles that collect daylight can be reused during night-time.
- Energy saving lamps are recommended.
- Meet all standards and legislation.
- The designer shall ensure that lighting fixtures are located adequately for the intended use and achieve the desired intention.
- Use fixtures that minimise light glare and trespass of light.
- Lighting fixtures shall form part of the same suit as the furniture and should reflect the character area.
- All signage to be suitably illuminated to ensure full night-time legibility.
- Consider the aesthetics of lighting fixtures during day time.
- Solar powered lighting may be used in appropriate areas.

PARK VALLEY

Organic curvy spaces

Aquatic lighting

Street lights

Uplighters

Strip lighting

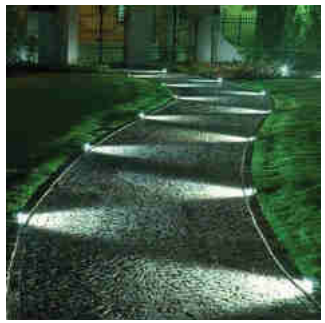
WEST BRIDGE

Straight lines with curvy edges

Street lights

Strip lighting

Lighting columns



DOWNTOWN EMBAKASSI

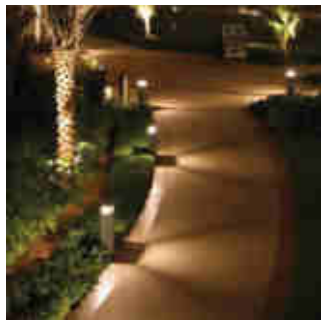
Straight lines with straight right angle edges

Street lights

Uplighters

Strip lighting

Sports Flood lights



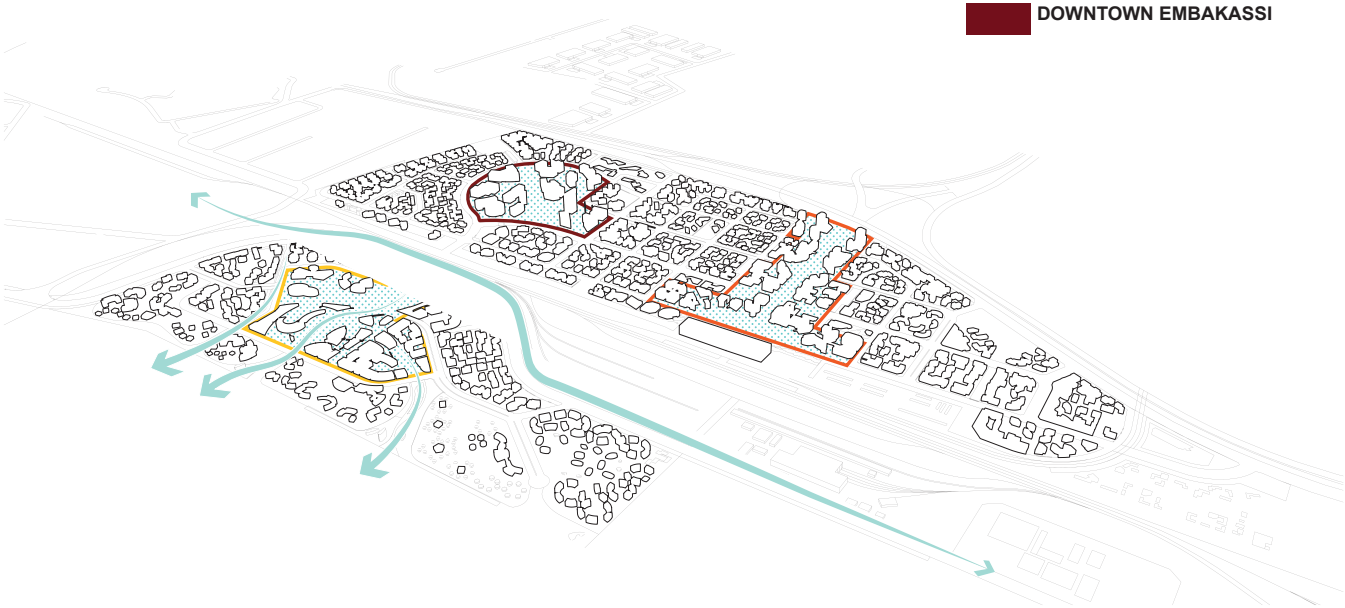
1.6.23.5 WATER ELEMENTS

Typologies:

- Water rill
- Reflective pools
- fountains
- water garden

Design Approach:

Water elements are used only in key feature areas, acting as passive cooling and wayfinding devices in the open spaces. Careful consideration is given to the location, design, installation and maintenance of all water features elements.



General Water Features Guidelines:

- Water must be routinely tested to ensure its microbial quality.
- Water from the features must be collected in a collector tank and chemically treated before returning to the holding tank for recirculation.
- All tanks must be easily accessible for cleaning and to allow water sampling.
- Circulation water must be drawn from a holding tank that must be a minimum size of three times the sum of the flow rates of all pumps and pipes.
- Water from the features must be collected in a collector tank and chemically treated before returning to the holding tank for recirculation. The holding tank must be of sufficient size to permit a turnover rate of 30 minutes at the maximum discharge rate.
- Waste-water must be disposed of as per local jurisdictional requirements.
- All electrical components concerning water features (lighting, pumps, filters) must be fitted and maintained to the current regulations.

PARK VALLEY

Organic curvy spaces

Natural Water Bodies

Water Reserve (see SUDS)

Tranquill Water Features

Wavy Geometries

WEST BRIDGE

Straight lines with curvy edges

Water Rills

Fountains

Playful Features

Interactive

DOWNTOWN EMBAKASSI

Straight lines with straight right angle edges

Landmark Water Feature

Reflective Pools

Water Features at Commercial Plots

1.6.23.6 SECURITY AND FENCING

LANDSCAPE INTERVENTIONS IN PLOT DESIGNATIONS

> Non-Fenced Plots.

Within these areas the development is fully open and accessible for public use. The urban plots and associated open spaces have unrestricted access and have direct physical contact with the associated adjacent open spaces. Public open space in these areas includes plots and their internal networks, the station plaza, green links and avenues, sports pitches, open green spaces, buffer zones and the overall road network. The non-fences plots are located within the city centre and commercial district where open access is paramount for the free flow and movement of people. These open plots allow public access at all times.

> Fenced Plots

There are also particular areas that have limited public access and the plots will be permanently fenced off. This ensures the safety and security of each plot where access into and out of the plots can be managed. These will include residential zones and hospitality zones. The landscape strategy for these areas will be focused on the public access areas outside of the plot zones and associated with vehicular and pedestrian links in-between the plot zones. These areas include main green links and the road network. Within the green links there will also be larger zones available for public access where we can provide district parks and neighbourhood parks

> Semi-Fenced Plots

These zones are envisaged to have a flexible fencing approach. In this scenario the plots will remain fenced off for the majority of the time, but for special events the boundaries of the plots can be opened to adjacent areas to create a much larger fenced off zone. The landscape strategy needs to address movement in the same way as the permanently fenced off plots, but the landscape proposals also need to be coordinated and unified in these areas to ensure the plots work in both an open and closed condition.

Boundary walls to plots should be designed to ensure aesthetic quality and avoid visual clutter. Ideally the boundary walls will complement the architecture and fit in with the landscape character. The boundary to the development site has the purpose of providing security but should also be attractive in appearance and not appear imposing or threatening.

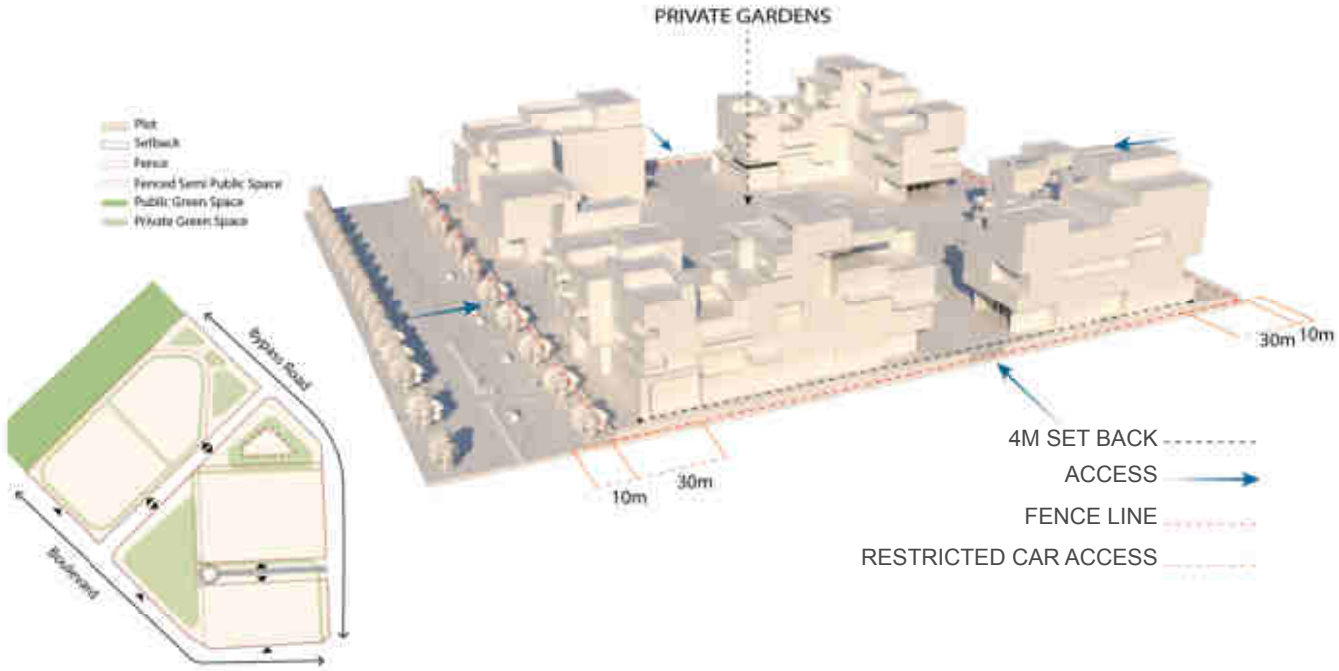
FENCED PLOTS

Typologies:

- Residential
- Education
- Service apartments
- Hospitality

Design Approach:

- Areas that have limited public access and the plots will be permanently fenced off.
- Ensures the safety and security of each plot where access into and out of the plots can be managed.
- The landscape strategy for these areas will be focused on the public access areas outside of the plot zones and associated with vehicular and pedestrian links in-between the plot zones.
- These areas include main green links and the road network. Within the green links there will also be larger zones available for public access where we can provide district parks and neighbourhood parks



General Fence Guidelines:

- Meet all relevant standards and legislation.
- Plot fencing and security gates to always be closed to general public.
- Building footprint setback 4m from plot boundary.
- Fence line on perimeter of boundary.
- Fencing to have adequate security measures, electric wire, barb wire to be applied to the tops of fencing.

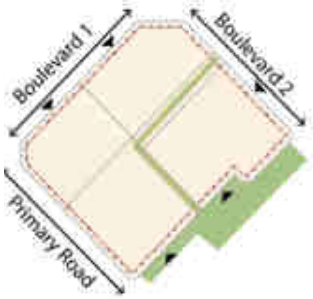
6 SEMI-FENCED PLOTS

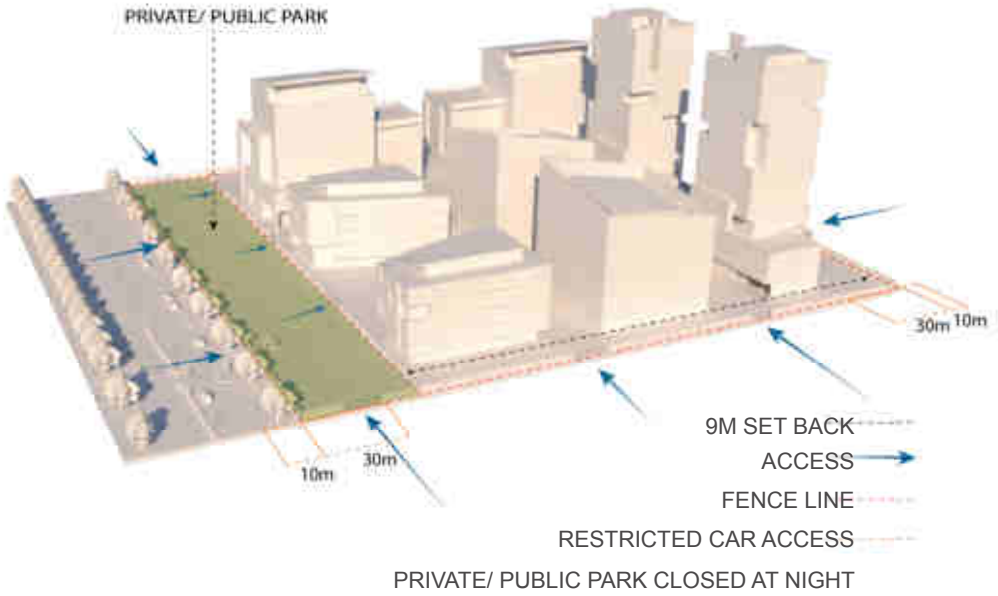
Typologies:

- Commercial- offices
- Retail with leisure
- Mixed use (retail + residential)
- Public purpose/cultural

Design Approach:

- These zones are envisaged to have a flexible fencing approach.
- plots will remain fenced off for the majority of the time, but for special events the boundaries of the plots can be opened to adjacent areas to create a much larger fenced off zone.
- The landscape strategy needs to address movement in the same way as the permanently fenced off plots, but the landscape proposals also need to be coordinated and unified in these areas to ensure the plots work in both an open and closed condition.
- Boundary walls to plots should be designed to ensure aesthetic quality and avoid visual clutter. Ideally the boundary walls will complement the architecture and fit in with the landscape character.





General Fence Guidelines:

- Meet all relevant standards and legislation.
- Plot Private Park with daytime access to general public to be closed at night for security.
- Internal plot fencing and security gates to always be closed to general public at all times
- Building footprint setback 9m from plot boundary.
- Fence line on perimeter of boundary with additional fencing around private park.
- Fencing to have adequate security measures, electric wire or barb wire to be applied to the tops of fencing.

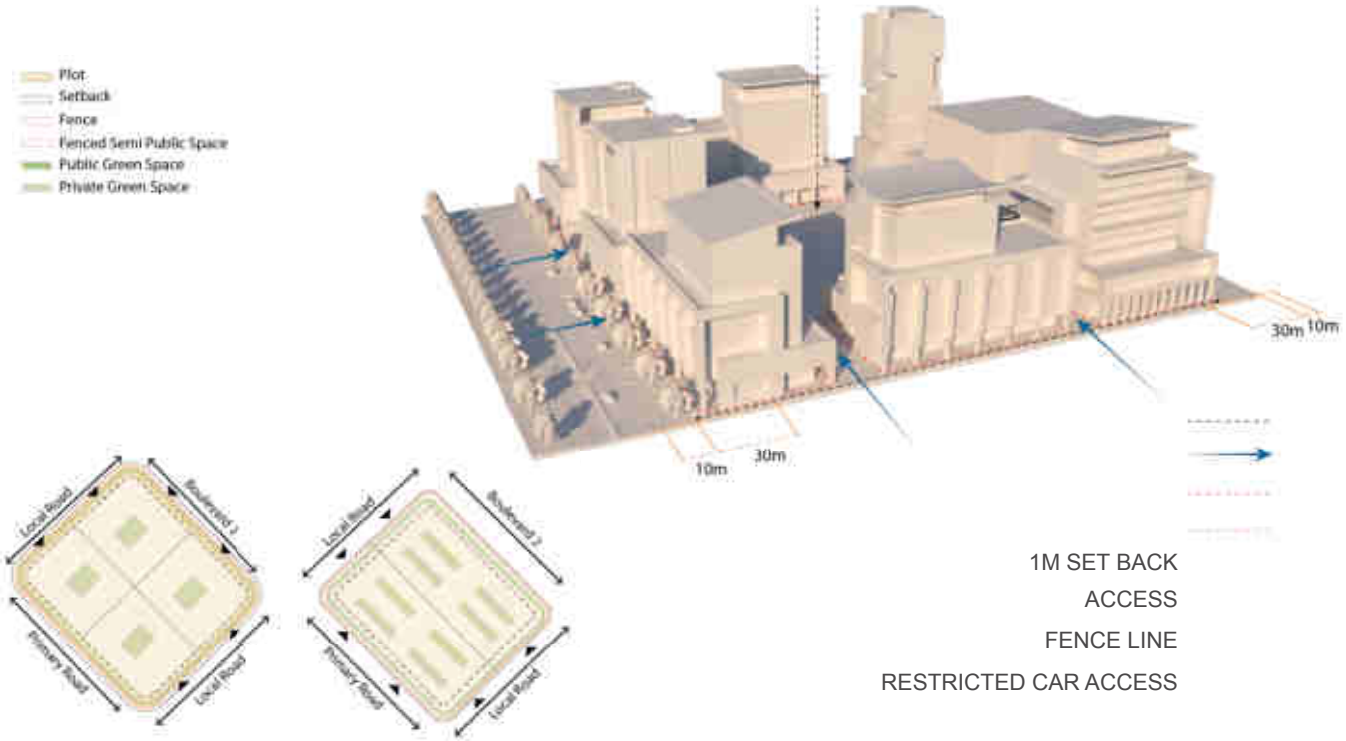
NON-FENCED PLOTS

Typologies:

- Commercial- offices
- Retail with leisure
- Transport Terminus

Design Approach:

- Within these areas the development is fully open and accessible for public use.
- The urban plots and associated open spaces have unrestricted access and have direct physical contact with the associated adjacent open spaces.
- Public open space in these areas includes plots and their internal networks, the station plaza, green links and avenues, sports pitches, open green spaces, buffer zones and the overall road network. The non-fences plots are located within the city centre and commercial district where open access is paramount for the free flow and movement of people.



General Fence Guidelines:

- Meet all relevant standards and legislation.
- Plots are open to the public at all times of the day with building façade acting a security at night.
- Internal plot fencing and security gates to always be closed to general public at all times
- Building footprint setback 1m from plot boundary.
- No Fence line on perimeter of plot boundary.
- Fencing to have adequate security measures, electric wire or barb wire to be applied to the tops of fencing.

1.6.24 SOFTSCAPE

1.6.24.1 PLANTING

Typologies:

- Streetscapes
- Public footpaths
- Plazas / Event spaces
- Private open spaces
- Car Parking

All proposed materials will be specified according to availability in Kenya and production, to prevent big costs for sourcing and transportation.

They will be sourced locally to provide continuity of colours and texture with the traditional urban ambience.

This will also aid the control of hard surface temperatures and the liveability of the urban spaces

Design Approach:

Soft landscape is a key and integral element of an open space environment. The primary purpose of planting material is to enhance the character of an area, promote biodiversity by augmenting the existing plant palette, provide shade and amenity, screen or delineate user zones, create visual identity for spaces within Embakasi and to reinforce the overall design of the open spaces.

Plant selection may serve the following functions:

- Provide shade
- Screen and buffer
- Create special identity
- Form shelterbelts
- Provide visual amenity
- Mitigate pollution

Open spaces shall always endeavour to achieve an interesting and dynamic selection of plants that complement one another and create seasonal interest. They are planted in a visual and functional manner. When selecting the correct planting, the designer shall consider the levels of care required to ensure health and vitality, avoiding high maintenance requirements. Most importantly, the project plant palette should contain a bio-diverse mix of species appropriate to the site context and scale.

Regional planting species that are associated with the area, either as natives or for agricultural purposes are to be promoted within the design. These plants will help to reinforce the unique and special identity of Embakasi and will promote its appeal to visitors and tourists.

Urban scale refers to a mixture of planting typologies which complement the architectural scale.

These planting and tree typologies will provide shade and comfort along wider roads and sidewalks.

This planting palette will comprise smaller trees and shrubs that are more related to the human scale and to the scale of buildings in the areas

General Softscape Guidelines:

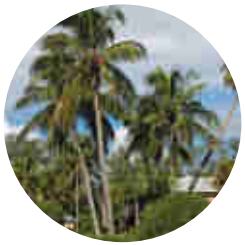
- All tree and plant selection will comply with the latest edition of nairobi's Standard for Nursery Stock.
- A nursery visit should be undertaken during design development to ensure the correct species or equivalents are specified, in line with approved Masterplan concepts.
- Selection of nursery stock shall be approved by a horticulturist or a Landscape Architect. Ensure that stock can be rejected on-site if the tree fails to meet quality standards.
- Water run-off from softscape areas must remain inside the development plot boundaries.
- Designs must ensure that the tree canopy is 1m min from building walls to facilitate air circulation and avoid fungal infections.
- Root barriers are mandatory for all trees planted within 2m of hardscaped or paved areas to avoid the lifting of pavements.
- Tree pits provide the area for root growth for trees to survive. They may be surfaced with urban tree soil and then covered with pavers, gravel or tree grilles in hardscape areas, allowing water to readily flow to the root zone. Alternatively they can be left within the soft-landscape areas and simply mulched to prevent weeds and retain moisture. Tree pits shall be sized to fit the full growth of the mature tree.
- All street tree planting requires a minimum of 2m cubed of unobstructed planting medium and all planter-based trees require a minimum of 1.2m cubed planting medium.
- Softscape shall not block desired views.
- Plant selection shall mitigate the perception of street noise.
- Shrub planting shall be provided to enhance entrances and special features.
- The plant palette shall provide shade for users within the open space.
- Avoid plants with known toxicity, allergens or spines, particularly near areas of children, busy thoroughfares and pathways.
- Avoid invasive species which compete with native or proposed plants.

Trees species

aka senna siamea

aka acacai xanthopholea

Jacaranda mimosifolia


Cocos nucifera

Delonix regia

Shrubs and grasses

Bougainvillea

Scadoxus multiflorus

Passiflora edulis

aryopteris clandonensis

Bulbine

Aquatic plants

Pistia Statites Linn

Cyperus hemisphaericus

Eichhornia Crassipes

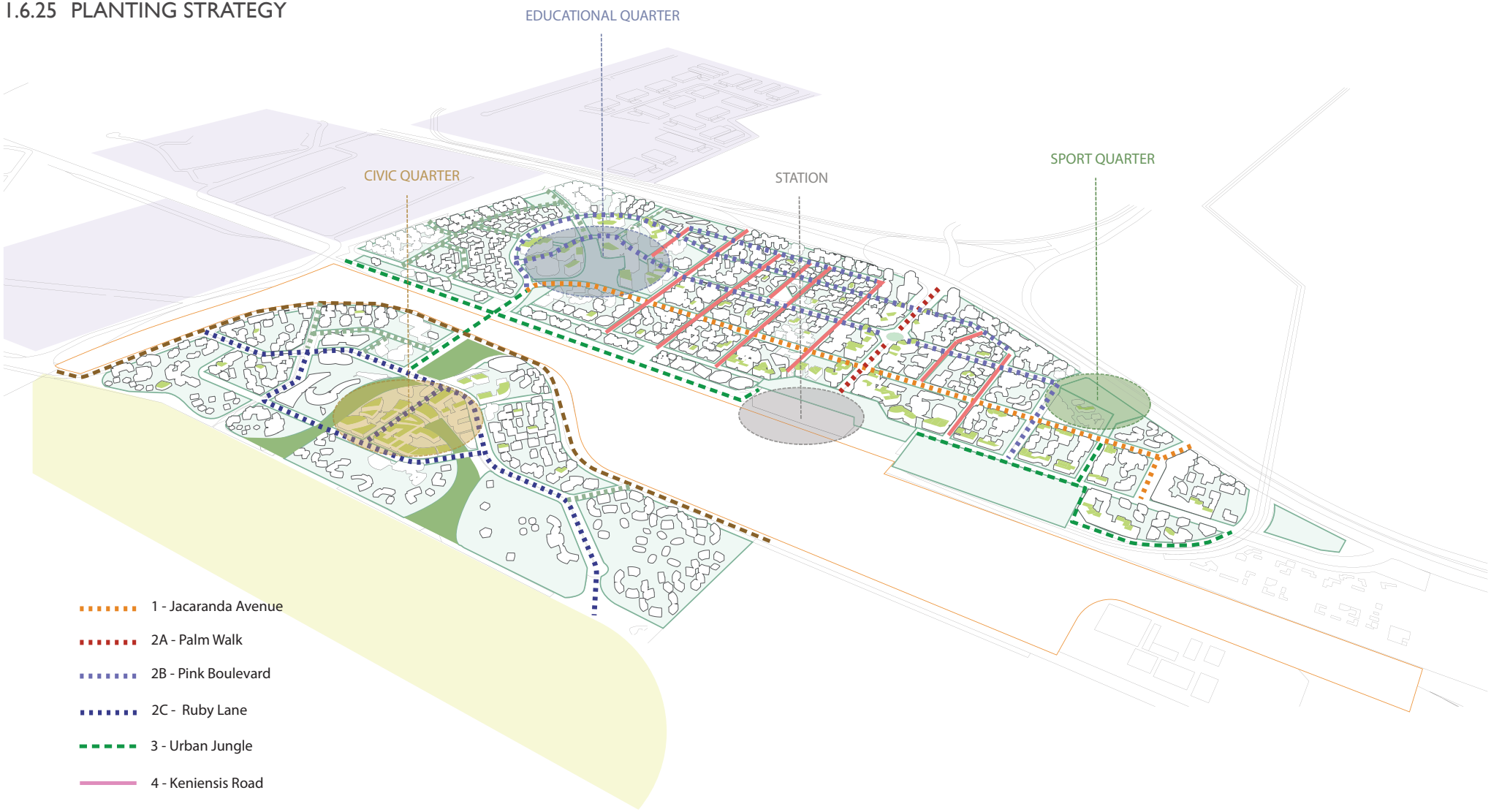
Cyperus aquaiclatus linn

Harpachne schimperi

Open spaces shall always endeavour to achieve an interesting and dynamic selection of plants that complement one another and create seasonal interest. They are planted in a visual and functional manner. When selecting the correct planting, the designer shall consider the levels of care required to ensure health and vitality, avoiding high maintenance requirements. Most importantly, the project plant palette should contain a bio-diverse mix of species appropriate to the site context and scale.

Regional planting species that are associated with the area, either as natives or for agricultural purposes are to be promoted within the design. These plants will help to reinforce the unique and special identity of Embakasi and will promote its appeal to visitors and tourists.

1.6.25 PLANTING STRATEGY

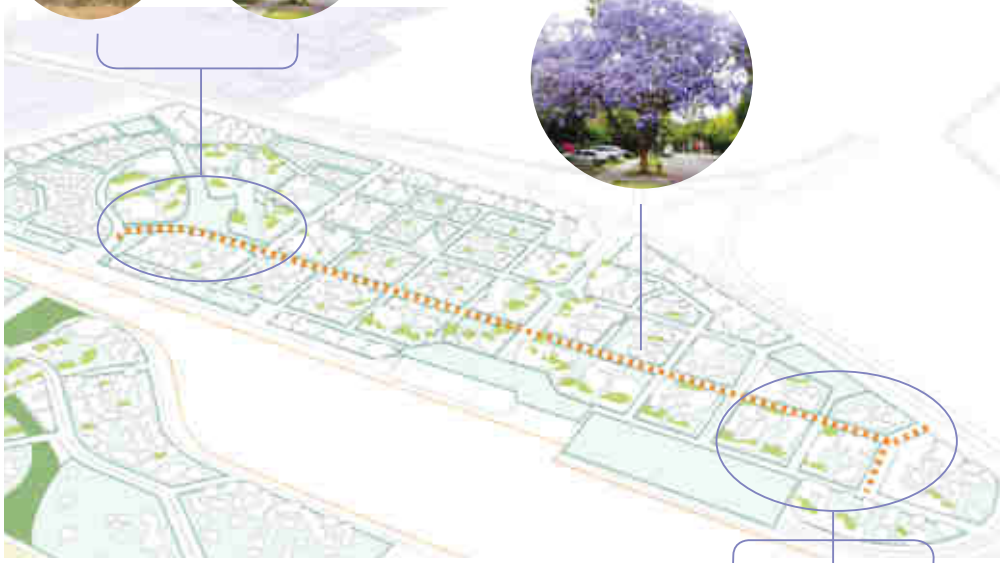


1 - JACARANDA AVENUE

Acacia xanthopholea

Jacaranda mimosifolia

Jacaranda mimosifolia



Jacaranda mimosifolia

Prunus Africana

Jacaranda Avenue represents the main spine through the lenght of the site, connecting the sport quarter and residential area to the educational center.

Jacaranda mimosifolia covers in blue-purple flowers that create a spectacular flowering display in spring to summer, identifying the avenue.

Purple colour is indicative and recurrent within the flowerbeds along the footpath as well.

Shrub species for flowerbeds: Psydrax livida; Buddleja salviifolia; Passiflora edulis; Brachiaria

Grass species for side planting: Bulbine; Andropogon gayanus; Arctostaphylos

2A - PALM WALK

Cocos nucifera

Aloe boinerii

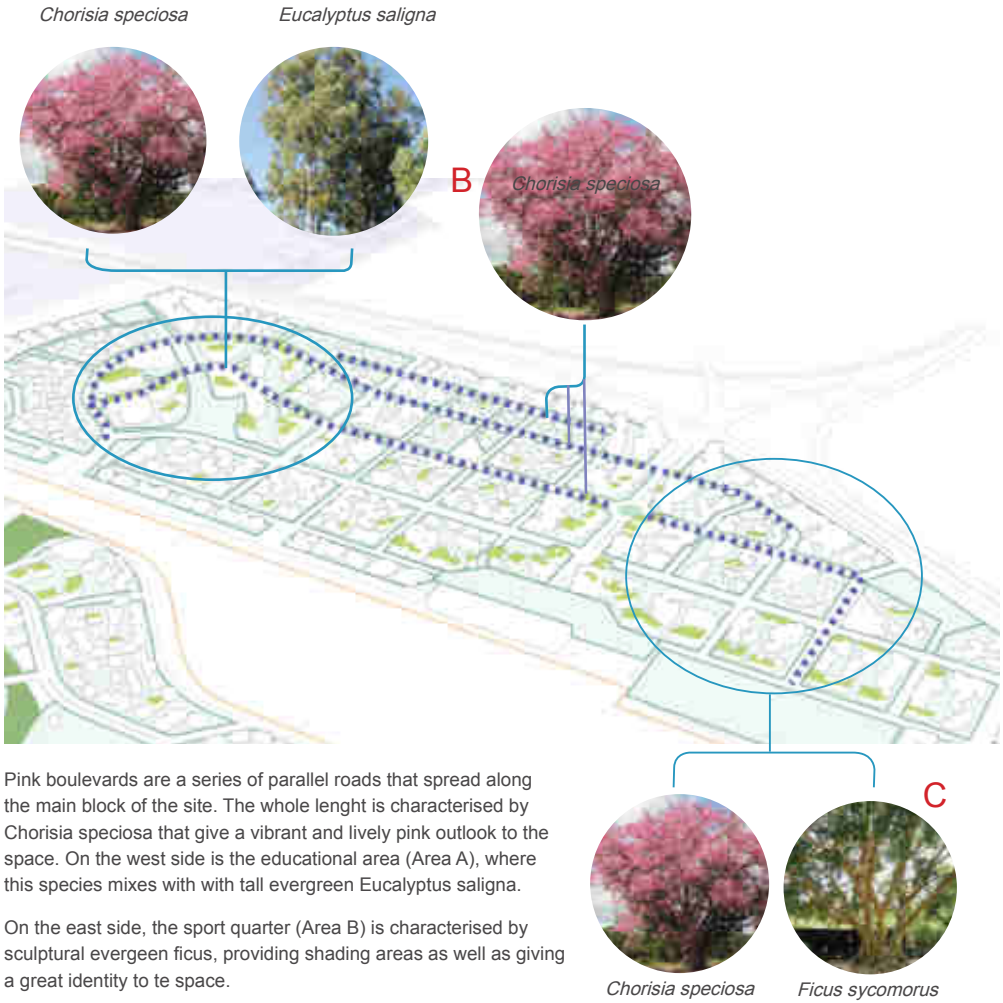
Central reservation

Palm walk is the main boulevard connecting the station to the outer area of the site, in direction of the airport.

The road verges are planted with Coconus nucifera, make the walk stands out. The median, insted, is characterised by sculptural Aloe Boinerii trees, giving identity and movement to the space.

Grass species for side planting: Loudetia spp.; Heliconia spp.; Aloe

2B - PINK BOULEVARD



Pink boulevards are a series of parallel roads that spread along the main block of the site. The whole lenght is characterised by Chorisia speciosa that give a vibrant and lively pink outlook to the space. On the west side is the educational area (Area A), where this species mixes with with tall evergreen Eucalyptus saligna.

On the east side, the sport quarter (Area B) is characterised by sculptural evergeen ficus, providing shading areas as well as giving a great identity to te space.

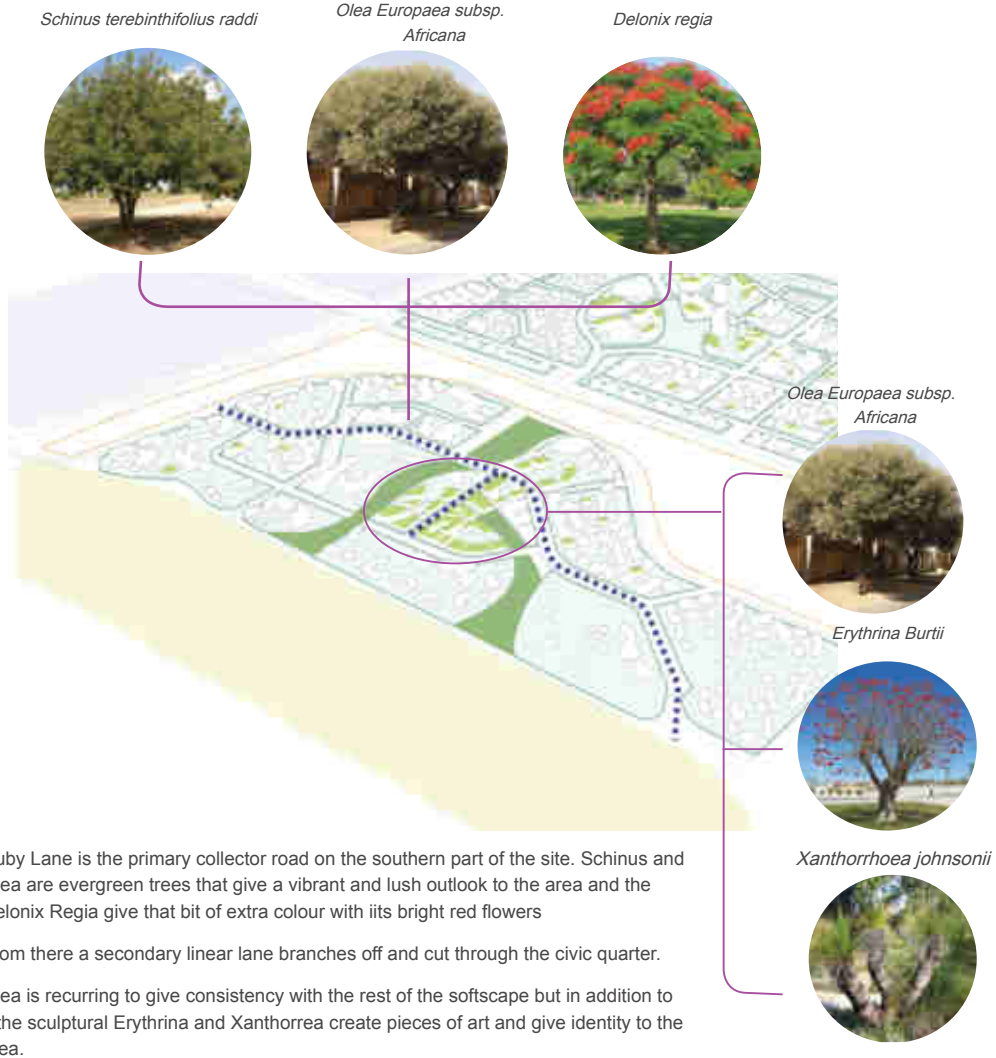
Shrub species for flowerbeds area A: Adenia globosa; Ceanothus; Brachiaria.

Shrub species for flowerbeds area B: Adenia globosa; Dendrosenecio cheranganiensis.

Shrub species for flowerbeds area C: Adenia globosa; Bouganvillea; Arcostaphylos.

Grass species for side planting: Caryopteris cladonensis; Andropogon gayanus; Phytolacca dodecandra.

2C - RUBY LANE



Ruby Lane is the primary collector road on the southern part of the site. Schinus and Olea are evergreen trees that give a vibrant and lush outlook to the area and the Delonix Regia give that bit of extra colour with iits bright red flowers

From there a secondary linear lane branches off and cut through the civic quarter.

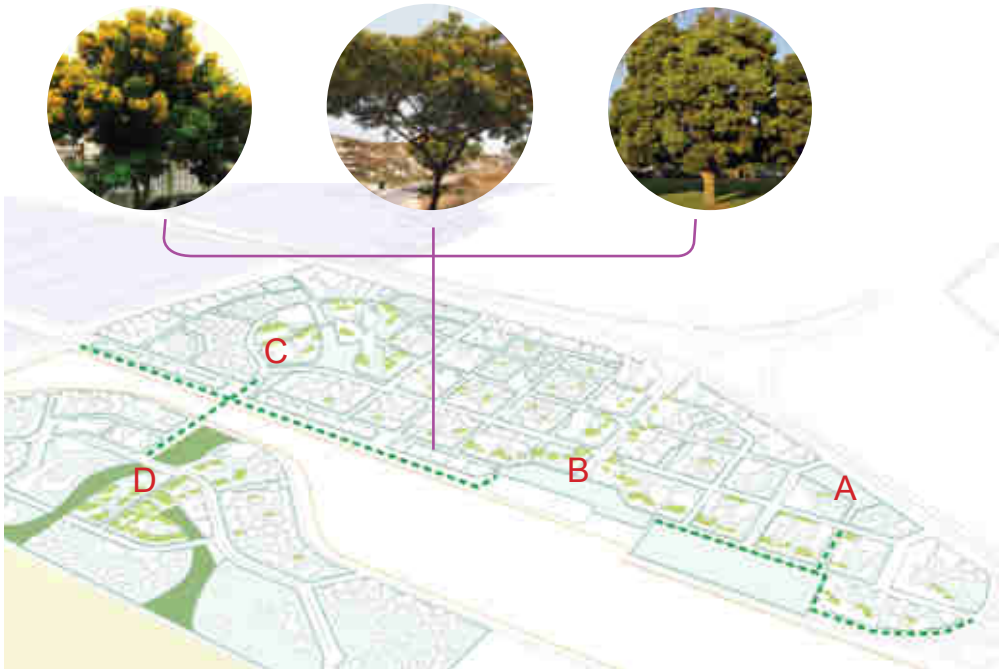
Olea is recurring to give consistency with the rest of the softscape but in addition to it the sculptural Erythrina and Xanthorrea create pieces of art and give identity to the area.

Shrub species for flowerbeds: Heliconia collisiana; Scadoxus multiflorus; strophanthus petersianus.

Grass species for side planting: Hyparrhenia spp.; Brachiaria; Bulbine

3 - URBAN JUNGLE

Senna siamea *Tipuana tipu* *Afrocarpus falcatus*



Urban Jungle is the main green link that connect the 4 major areas of the site: the Sport Quarter (A), the Station (B), the Educational area (C) and the Civic Quarter (D).

The evergreen Arocarpus facatus identify the link for the whole lenght and Senna and Tipuana species are spread along the way, giving colour and movement to the area. These are mainly planted around the playareas and the sport zones.

4 - KENIENSIS ROADS

Vitex Keniensis

Keniensis road are a series of parallel street that lenghten along the main vertical connections from south to north of the site, and vice versa.

Each road will have or a small shrub and 1 type of grass or a single specie identifying it and give colour and movement to each. The species are as follow:

- **4a**: Strophanthus petersianus + Hyparrhenia spp.
- **4b:** White Bougainvillea
- **4c:** Purple Bougainvillea
- **4d:** Strophanthus petersianus + Eulophia streptopetala
- **4e:** Orange bougainvillea
- **4f:** Red Bougainvillea
- **4g:** Strophanthus petersianus + Caryopteris clandonensis
- **4h:** Passiflora edulis + Eulophia streptopetala

5 - PHOENIX CRESCENT

Croton Megalocarpus

Brachylaena helens.r

Phoenix Canariensis

The main southern bypass road is Phoenix Crescent. This is characterised by medium/tall evergreen trees, such as Croton and Brachylaena, giving a naturalistic and wild look to the area approaching the Nature Reserve. The median, insted, is planted with Palm tree that give a sense of elegance and modernity to the space.

6 - EMERALD STREETS

Syzygium guineense

A series of local roads, named Emarald streets, populate the site. These represent a link between the residentlal/ fenced areas and the public/non-fenced zones.

A single species that characterised them is the Syzygium: evergreen and globe-shape tree, ideal for private and public realms.

1.6.26SUDS

1.6.26.1 INTRODUCTION - LANDSCAPE HYDROLOGY STRATEGY

The landscape hydrology strategy proposes the development of a smart blue and green network.

This includes Sustainable Urban Drainage Systems (SUDS) that will create a series of economic, ecological and social benefits for residential, commercial and other users.

Beneifts include:

- Flood mitigation and protection;
- Rainwater harvesting;
- Storage and reuse of rainwater;
- Wastewater remediation;
- Air quality improvements;
- Resilience to Climate Change;
- Micro-climate management;
- Aesthetically pleasing spaces;
- Accessibility and connectivity;

The Blue and Green infrastructure network is formed

of a series of landscape systems, including surface water retention treatment and street drainage (as road SuDS).

BEFORE

AFTER

Pollution in rivers

Cleared river

The Problem:

> The Water pollution in Nairobi is of high concern to public and natural safety. The contamination of water bodies such as lakes, rivers, streams and groundwater caused by human activities can be harmful to organisms and plants which live in these water bodies.

Design Approach:

> One of the overarching landscape strategies looks to utilize and clean water throughout the development with the aim to improve the environmental impact on the landscape and reduce contaminates entering the national park. This is achieved through the various SUDs systems operating through the development to ensure water quality is improved before entering the natural water system.

> The beneficial uses of clean uncontaminated water are substantial, including the use for drinking, domestic purposes, for fisheries, agriculture and for industrial purposes.

Pollution in rivers

Cleared river

GeneralNatural Water Course **Guidelines:**

> The water that makes it to the national park must be of a suitable standard for the effected wildlife to preserve and protect this assets for future generations.

> Industries must be monitored to ensure the discharge they discharge into the watercourse is not polluted.

> Agricultural farmland upstream must be monitored to ensure fertiliser and livestock waste dose not enter the water course too frequently.

> A maintenance program should be introduced to ensure the streams are kept free of waste litter that may have blown into the natural watercourse.

1.6.26.3 SURFACE WATER RETENTION

Typologies:

- Water rill
- Reflective pools
- Dry fountains
- Vegetated cracks in paved surfaces
- Roof Gardens

Design Approach:

- The site contains a series of landscape elements which collect and filtrate rainwater and grey water throught the different areas.
- This water is then distributed to the general drainage network, such as green roofs, infiltration gardens and rain gardens and the street drainage system.
- These zones also provide water management/filtration and flood protection while also creating a healthier local setting and environment for all.
- Flood retention is integrated within the streetscape design and will function alongside the conventional drainage infrastructure.

General SUDs Guidelines:

- All plots should reduce both the volume and rate of existing run-off from site by at least 50% where reasonably practicable through the appropriate incorporation of SuDS.
- Discharge into a surface water body connected to road SUDs network
- Water must be routinely tested to ensure its microbial quality.
- Water from the features must be collected in a collector tank and chemically treated before returning to the holding tank for recirculation.
- All tanks must be easily accessible for cleaning and to allow water sampling.

Vegetated cracks in paved surfaces

Vegetated cracks in decorative rocks

Water rill

Water rill

1.6.26.4 ROAD SUDS

Typologies:

- Swales
- Rainwater Harvesting
- Infiltration trenches
- Permeable paving
- Filter drain
- Tree planting

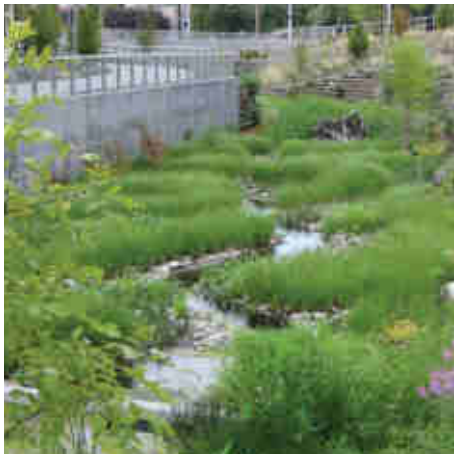
Design Approach:

- Street drainage uses a network of streetscape swales and water retention areas that are integrated in the streetscape framework. These are variable, according to street typologies, and are designed to function with the conventional drainage infrastructure.
- The landscape strategy also includes a Sustainable Urban Drainage System (SUDS).This system works to direct rainwater and run-off away from the industrial premises and into the natural drainage system.The increase in area of hard surfaces will affect the management of the water, and a SUDS system would alleviate potential flooding.

General SUDs Guidelines:

- Discharge to protected waters or protected groundwater may require additional treatment stages and liaison with the environmental regulator.
- Ideally runoff should be stored in shallow landscape features. Where this is not possible,deeper tankor pipe storage must be justified.
- Were necessary permeable paving to be applied walkways to allow road runoff to infiltrate through the surface layer to underlying treatment and storage media.
- SUDs network water to be frequently tested to ensure its pollution levels are to a standard of quality to be discharge back to natural water course.

Rain garden on side of pedestrian path



Rain garden inside the planting bed

Rain garden on side of car parking

Rain gardens forming the pocket parks

1.6.26.5 WATER RETENTION AND POLISHING PONDS

Typologies:

- Greywater System
- Wetland
- Floating gardens
- Retention ponds
- And polishing ponds

Design Approach:

- Channels designed to move water from upper stratum avoiding the accumulation of sediments at the bottom of the canal
- After collection, the water is then aerated and passes through an underground oxygenated gravel bed before entering the wetlands.
- A series of weirs along the way retain the water in a sequence of basins, while the wetland system purifies the water of impurities.
- A uniform distribution of one plant species per basin ensure the correct and efficient plug flow.
- The entire process can take up to a week. At the end of it, the canal water is clean enough for irrigation.

General SUDs Guidelines:

- The treatment required to mitigate pollution depends upon the level of pollution hazard. An adequate number (and type) of SuDS components is required in order to intercept or break down pollutants.
- One in 30 year to one in 100 year stormsshould be managed within the SuDS network or within the site. This must not result in flooding of property, nor should it impact on the function of the street.
- Design must include upstream features or forebays that filter out sediments from storm water before it enters the basin that can affect storage volume, filtration and infiltration rates.
- Designs of detention basin to include submerged anaerobic zones to promote nutrient renewal. Also Reedbeds are to be introduced on the banks of all water bodies as they are highly effective at bioremediation to hazardous contaminants.
- Planting specified should be resilient enough to thrive in drought and flood conditions.

Water retention ponds with vegetation

Water retention ponds fully filled with vegetation

Water retention ponds with part vegetation

Water retention ponds with a decorative design

1.6.26.6 SUSTAINABLE ROOFS

Typologies:

- Extensive Green roof
- Intensive Green roof
- Semi-Intensive Green roof
- Brown roof
- Unvegetated Accesible Roof

Design approach:

The potential of using rooftops for amenity or environmental benefits should be fully explored in the design of buildings types. Roofscapes can activate the upper levels of buildings and create opportunity for views to be enjoyed.

The landscape of the roofscape must follow the design intent of the public open spaces to ensure the proposed flora does not change the aesthetic appearance of the park. Although some roofs may have potential to be fully intensive spaces, there is the sustainable and environmental benefits for buildings to create extensive green roofs or brown roofs and this will be encouraged, especially if it is seen to promote native species and support the local biodiversity.

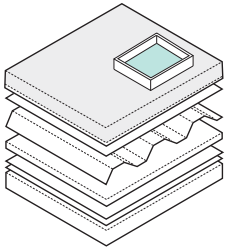


Figure 1.126: Plain Roof Typology Diagram

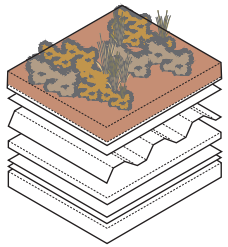


Figure 1.127: Brown Roof Typology Diagram

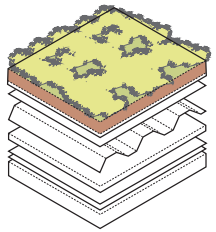


Figure 1.128: Extensive Green Roof Typology Diagram

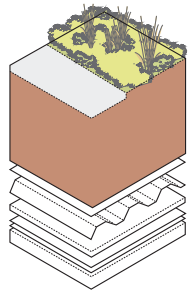


Figure 1.129: Intensive Green Roof Typology Diagram

General Roofscape Requirements:

- All rooftops should be assessed on whether they can contribute to environmental gains.
- Low cost solutions such as brown roofs, can have large benefits to biodiversity and sustainable goals.
- Intensive green roofs should only be used in very special circumstances and where sufficient visitor numbers will benefit.
- Roof construction to be developed with specialist contractor.

1.6.26.7 PRODUCTIVE LANDSCAPES

Typologies:

- Roof agricultural allotments
- vertical farming
- Orchards
- Urban Beekeeping

Design Approach:

- The idea of introducing urban farming within Embakasi seeks to provide residents with ability to produce and consume agricultural products such as food crops contributing to healthy diet and allowing for saving on food expenditures.
- In addition urban farming has the potential to exceed personal consumption giving the ability to produce a source of income, through sale of surplus crops.
- The other benefits this will have within Embakasi Less need for packaging, storage and transportation of food; Potential agricultural-related jobs and incomes; Waste and by-products recycling and re-use possibilities. And finally mental health benefits to local residents

Urban allotment

Orchards

General Urban Farming Guidelines:

- Urban Farms shall be located to maximize sunlight access; with full southern exposure
- Locating urban farms near urban farms be located in a place that provides easy access to a road or lane for the delivery and pick-up needs of the farm; garbage and recycling pick-up
- Locating urban farms near other community food assets, such as: community food markets, community kitchens, community gardens.
- It is recommended that existing on-site soils be tested for toxins (heavy metals, salinity and hydrocarbons) prior to being used in urban farming operations. Imported soil should be clean and produced with organic standards, and it is recommended that imported soil be obtained from local sources.
- Toxic materials, such as pressure treated wood, should not be used where they will come into contact with soils that are growing food.

Vertical Farm

Urban beekeeping

1.6.27BUFFERS

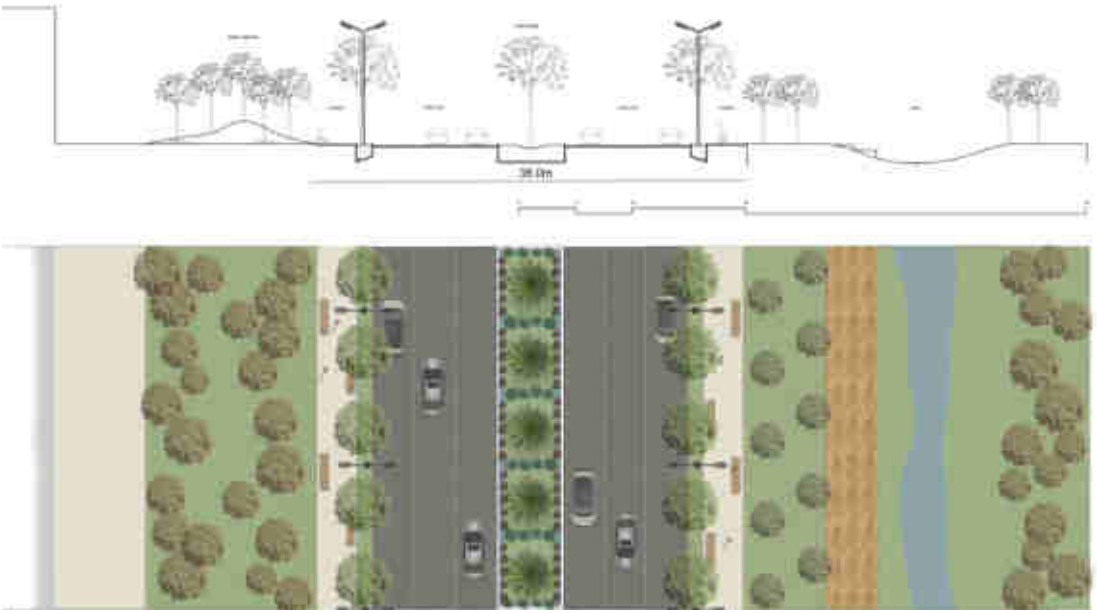
Design Approach:

The buffer zones play an important role in the development of the landscape strategy. The nature of Embakasi means that buffer planting is required not just to surround the development and screen off adjacent roads or visually poor zones, but internal screening is also required along the railway lines itself to provide a buffer here too.

We propose to enhance the capabilities of the buffer planting to provide noise / visual reduction potentials by planting trees and shrubs on raised earth bunds where required.

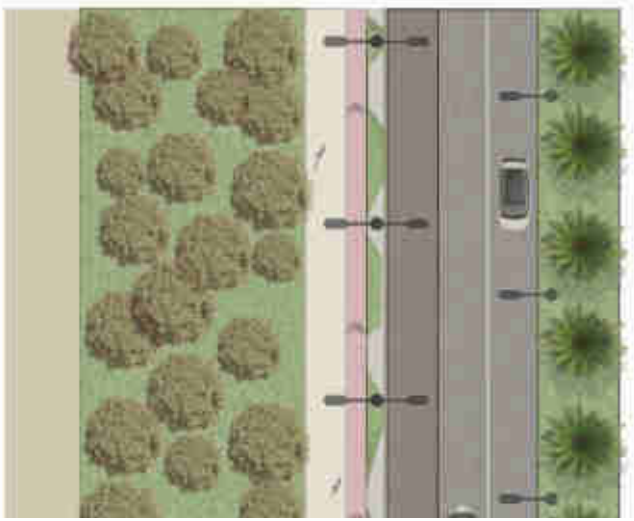
Beneifts include:

- Reduction of noise pollution to the adjacent urban development from roads and railway.
- Reduction of air pollution to the adjacent urban development from roads and railway.
- Increase aesthetical landscape quality by mitigating views towards roads and railway.
- Enhanced ecological corridors.



Key

- 50m national park boundary
- Road buffer
- Railway buffer



The planting strategy is developed in parallel with the land use and character areas.

In the three main urban nodes - commercial hub, civic hub and cultural hub - where the scale of the buildings will be greater and the width of the roads increased, planting types of various sizes will be considered to complement the urban scale as well as for aestethics and for the functional part of absorption of water and provision of shaded paths.

In the neighboring areas, on the other hand, where the urban density decreases and the height of the buildings too, the planting strategy is based on the human scale. Therefore, lower trees will be considered. These smaller trees reposnd to the architectural scale, provide a more comfortable physical environment for the residents and they will be still able to solve the same problems of water absorption and shading at the same time.

As for buffer zones, the three main types are as follows:

- Buffer 1 with the railway
- Buffer 2 with the main roads
- Buffer 3 with the Nairobi national park.

Depending on the type of buffer, different strategies will be implemented.

As for the separation from the railway, the project is to have a mounded vegetated area.

As for the separation from the roads, the strategy is to have a minimum buffer of 8m width and mixed vegetation of trees and shrubs.

For the separation buffer with the National park, more than a buffer that attenuates the visual and the noises, the project provides physical separation that prevents people from crossing in to the National park but the view remains open with viewing platforms at some locations and will contribute to make the zones near the park areas of high value.

The planting selection must reflect the native palette to promote local biodiversity and mitigate as much as possible the effects of increasing hard surfaces, while at the same time reducing the need to implement different green maintenance technologies in the Embakasi district.

The chosen plants must have low maintenance and irrigation needs and suffice in their aesthetic role for the city as well as the one related to SUDS and shading.

Buffer 1 separates the urban areas from the railway line.

In this case, the buffer should be mounded and vegetated with a various palette of trees and shrubs, which shall be native with little or no mainteinace or irrigation requirements.

Buffer 1

Buffer 2 acts as a separation zone from the major roads crossing the site - bypass road - or adjacent to it - slip road.

These buffers shall be minimum 8m wide and planted with native vegetation of various types with little or no mainteinace or irrigation requirements.

Buffer 2

Buffer 3 is a softer typology with lower vegetation that will leave visual openings onto the National Park, through the vegetation and through viewing platforms.

The vegetation shall be of various types with little or no mainteinace or irrigation requirements.

Buffer 3

1.6.27.1 RECREATION

1.6.27.2 SPORTS

Typologies:

- Football
- Rugby union
- Volleyball
- Basketball
- Skateboarding/ BMX
- Tennis

Design Approach:

- The design of Embakasi open spaces encourage sports and activity throughout the city, however formal designated sports areas provide facilities for specific sports use within residential and mixed use plots. The importance of sport helps improve the overall well-being of users and also provides additional recreational activities within Embakasi.

General Sports Guidelines:

- Meet all relevant standards and legislation.
- Designed to be accessible to people of all ages and abilities.
- Located in-situations where they will offer most value and use.
- Provide facilities that will support each type of sport.
- Ensure accessibility is provided for emergency vehicles.
- Provide a clear separation or landscape buffer between sports pitches and circulation routes.
- Align sports pitches and shade with landscape elements to avoid low sun angles commonly 15 degrees west of north.
- Provide shaded spectator areas where required, orientating stands away from the evening sun set.
- Reduce light pollution by not over illuminating sports areas and using light shields to keep lighting directed at the sports areas only.
- Provide safety fencing where appropriate.

Football

Tennis

Basketball

Volleyball

1.6.28RECREATION

1.6.28.1 PLAYGROUNDS

Design Approach:

It is important that a series of guidelines are adhered to in order to provide a suitable and safe play space. A well used and safe environment for children to play and for families to connect with the public space is imperative. Facilities should be provided for all abilities and the play area is fenced for safety. Any softscape should be carefully selected to avoid using any species that are poisonous, toxic or irritants.

General Children's Play Areas Guidelines:

- Sited in open, welcoming locations.
- Play equipment shall be selected based on safety and size appropriateness for the space it occupies.
- All play equipment will be placed on heat tolerant safety surface, with 1.5m min. surrounding clearance.
- Fitted with play equipment, fencing, seating and other fixtures that comply with the latest international standards.
- Planting species shall be chosen that do not to contain any harmful/ poisonous species.
- Equipment must be provided to suit all abilities.
- Designed to respect the surrounding context.
- Provide a wide range of play experiences including sensory, risks and challenges.
- Ensure correct maintenance procedures are in place.
- Allow for visual permeability, providing surveillance and increase the sense of safety.
- Incorporate trees and greenery into the play spaces, but avoid thorny, poisonous plants.

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7

embakasi
STATION AREA
REDEVELOPMENT

SUPPORTING TRANSPORT POLICIES

1.7 SUPPORTING TRANSPORT POLICIES

1.7.1 INTRODUCTION

Among the main policies of the Nairobi Land Use Plan 2030 is to expand and renovate the CBD by redeveloping part of the public institutions and facilities on large size land into new urban land use development, transportation facilities or public activities. Additionally, another policy recognizes the importance of decentralising business, administrative and commerce functions by adopting a new urban transport network along with implementing a sub-centres system to disperse out functions from the CBD.

The land use and transportation proposals are consistent with the NIUPLAN guidelines. However, what´s has been proposed also depends on the accomplishment of the principles for successful development of the region in a sustainable manner. The following guidelines related to transport can be highlighted:

- High efficiency transport network. Among the many goals that it will help to meet, the commuter rail network and the BRT's network major role is to promote a highly efficient linkage between the CBD and other areas. In this sense, the densification plans depend on the implementation of these transport projects to achieve a sustainable urban development in the region. On the other hand, the absence of these high capacity transport service trade off to an excessive volume of cars and matatus occupying the space and degrading the quality of the environment and the mobility of people within the area;
- Diverting through traffic. As in the CBD, the Core Area is bordered by Mombasa Road/ A104 corridor, which covers a significant number of passing vehicles congesting the area and entangling access to those entering the area. Additionally, the study area includes a number of industries, attracted by the ICD and generating slow and heavy good vehicles running along the highway, thus significantly contributing to the frequent traffic jams in the area. One of the proposed transport initiatives to reduce this effect in the Core Area is the implementation of the Truck Bypass Road to enhance the access conditions for cars and buses via Mombasa Road. This project is essential for the success of the urban design

Rapid urbanization in Nairobi associated with an increase in per capita income can generate an increase in the number of cars circulating within the city. Although this impact means a positive change of economic status, with more convenience and comfort to drivers, actually ends up generating many negative effects such as increased consumption of fossil fuels, rising air pollution levels, roads congestion and more car accidents.

As reported previously, Transit Oriented Development (TOD) principles have guided the design of this Master Plan. In summary, TOD urban areas promote sustainable urban growth taking advantage of a significant deal of public transport and of approximated and densified land uses in order to reduce the travel length and number of trips made by cars. Therefore, land use and transport proposals already contemplated this concept.

Additionally, urban design guidelines have been presented, reinforcing relevant urban aspects for projects implementation in the area.

Finally, along with the infrastructure designed to create a pleasant and vibrant space in the region of the study area previously presented, management actions and implementation policies can be adopted to ensure promoting the delivery of an efficient, attractive and sustainable multi-modal transport system. These measures are presented in the following section.

1.7.2 POLICES

incentive policies to promote efficient, attractive and sustainable multi-modal transport system should include a close look at the experiences of each type of user, whether pedestrian, cyclist, the public transport user or particular vehicle driver[1].

- Pedestrian experience
  - Provide **safety** by lowering motor vehicle speeds with traffic calming measures by generating less exposure to conflicts with dedicated space for them, shorter crossing distances and appropriate signal timing where applicable; by providing accessible crossings.
  - Provide **convenience** with appropriate sidewalk widths; crossings design that reflect pedestrian desire lines; streets landscaping; amenities like benches, public art, recycling receptacles.
  - Provide **minimal delay** with frequent opportunities to cross; pre-timed pedestrian lights for every cycle and pushbuttons.
- Transit user experience:
  - Improve **safety** providing less exposure to conflicts with other modes, such as bus bulbs, transit only lanes and far-side bus-stops; providing accessible transit stops.
  - Improve **convenience** providing near connections to other modes like pedestrians and bicycles accommodations; providing comfortable transit stops locations with transit shelters and route information.
  - Provide **minimal delay** with more frequent headways, traffic lights coordination, signal priority and transit-only lanes or queue jump lanes.
- Bicyclist experience:
  - Provide **safety** by lowering motor vehicle speeds with traffic calming measures, by promoting less exposure to conflicts with shorter crossing distances, signal design suitable to bicycles speeds and by providing separation with bicycles lanes, cycle tracks and treatment is separate bicycles crossings.
  - Improve **convenience** with pavement materials that provide quality for cycling and reduced vibration, bicycle parking and connections to other bikeways.
  - Provide **minimal delay** with suitable direct routes and traffic signals.
- Driver experience:
  - Provide **safety** with design that reduce conflicts and severity of crashes by improving visibility, providing dedicated space for all modes and suitable warning signage; By Improving options for turning movements such as phase- separated turning movements and separate turn lanes.
  - Provide **convenience** with good pavement quality and wayfinding signage.
  - Provide **minimal delay** with coordinated signal timing and with responsible loop detectors.

Besides taking care of each mode of transport, becomes more powerful the need to more deeply influence the choice of transport mode, hence the importance of transport demand management concept, which implies the application of strategies and policies to distribute demand in space or in time or even reducing travel demand, especially when choosing less sustainable transport modes.

Giving this context, guidelines were grouped into the following categories:

- Incentives to sustainable travel choices and road safety
- Parking regulation
- Public transport integration strategies
- Other transport demand management strategies
- Addressing transport impacts in the development control process

1. Boston Complete Streets Design Guideline

1.7.2.1 INCENTIVES TO SUSTAINABLE TRAVEL CHOICES

It is essential in the context of TOD that environmental issues are also taken into account in the planning of urban mobility. The masterplan of Embakasi has a vast infrastructure for active transportation and vast potential for the development of environmental-friendly shifts, which should, however, be grounded through a series of incentives or will influence the behaviour of individuals in order to promote more sustainable mobility.

The Active Transportation is in the core of the network planning is sustainable Promoting displacements, its driving therefore shall be reinforced by governmental incentives:

- Policies for promoting displacements by walking:
  - Investments on security of pedestrian routes
  - Regular maintenance of sidewalks pavements
  - Traffic-free maintenance areas
  - Prioritize street design for pedestrian
  - Standardized wayfinding signage for pedestrian
  - Ensuring clear sight-lines and connectivity of pedestrian routes
  - Incentives to health and fitness practices
- Policies for promoting displacements by bicycle:
  - Maintenance of cycle lanes and creation of new ones
  - Security investments on cycle routes and parking
  - Cycle parking & storage
  - Accessibility on public transport
  - Traffic legislation that promotes respect to the cyclists

Policies for ensuring quality of public transport are also extremely important in encouraging sustainable mobility practices to the detriment of cars. Among some possible measures are an efficient Interchange and coordination arrangements discounts, as will be discussed further in this section. Another strategy that might be adopted in the event of major vehicle flows is to use bus priority lanes to guarantee a minimum performance to local feeder bus services.

In addition to the incentive measures of active transport practice, alternative modes of transport should also be encouraged at the detriment of individual private vehicles, which are not only harmful to the environment, but also responsible for the loss of dynamism in the mobility of big city centres. Policies to be taken in this regard include:

- Incentives to bike sharing Initiatives[2], with bicycles or stations dockless systems.
- Car-sharing incentives - the scale, efficiency, availability and pricing of this alternative is directly linked to the regulation policies imposed to it.
- Carpooling incentives such as dedicated lanes for vehicles with 2 or more people, and dedicated parking areas;

Additionally, reducing the necessity of travel-intensive activities is a guideline que can be achieved by different ways - financial and time incentives for online services that replaces unnecessary displacements and promoting quality of online governmental services.

It is up to the Nairobi authorities, along with the creation of infrastructure to sustainable mobility and the development of policies that encourage its use, working alongside with the private sector so that the modal choice to be made by employees of these private sector´s companies are also influenced by the measures adopted by the companies themselves in a way to reduce the use of private vehicles. In this context, it should be encouraged practices such as:

- Employee transit benefits and subsidies
- Employer-organized and hosted vanpools and carpools
- Priority parking for carpools
- Employer assisted housing
- Showers, changing rooms, and secure bike parking to help employees bike to work
- Eliminating or reducing free parking
- Flexible work schedules
- Telework

Information campaigns can and should be a marketing resource to influence the transport mode choice behaviour. Many cities hold events to promote the greater use of sustainable modes and Nairobi authorities may resort to this type of event for people to get used to more sustainable transport alternatives.

The public perception of different transport modes has a large influence on travel behaviour. That way, public awareness campaigns might play a strategic role on promoting sustainable mobility along the implementation phase. Ideally, public awareness campaigns, like a cycling informative campaign about the availability of the cycle tracks, should be combined with more concrete actions, such as the cycling event to overcome the barrier to start cycling.

2. Phil Goodwin - Policy Incentives to Change Behavior in Passenger Transport

The most important objectives are[3] :

- Influence travel behaviour to change the modal split.
- Promote new forms of mobility especially among children and youth.
- Increase the awareness concerning new transport solutions in the city.
- Increase the willingness of car users to shift to other modes of transport.

The success of transport measures highly depends on the attention they get from the public. Therefore, it's important to communicate individual transport initiatives with public awareness campaigns. Promote alternative modes and inform about improvements and extensions, raise awareness for adverse effects of motorized traffic and marketing new public transport services are often the target of these campaigns. The efficiency of this kind of policy can be improved if some factors are important Considered on its implementation[4]:

- Explore low cost source of information (eg websites, maps, leaflets, radio advertising);
- Make use of multipliers (eg the media clubs and teachers);
- Identify your targeted audience to tailor the program design to the group's characteristics, once smaller but more frequent events dedicated to specific target groups rather than the general public seem to be more effective the the message can be more precisely focused;
- Seek for inspiration on successful cases of informational campaigns.

3. CIVITAS Case Study - Campaigns Promoting the use of public transport and cycling in Szczecinek

4. Handbook "Navigating Transport NAMA's" - Annex A

1.7.2.2 CYCLE & PEDESTRIAN SAFETY

The safety of streets can be dramatically improved through Appropriate geometric design and operations. A well-designed roadway Provides appropriate space for all street users to coexist. Roadway design shouldn´t accommodate all users of the street, including bicyclists, motorists, pedestrians, and transit users. Building on the momentum of multimodal streets que Have Been Implemented successfully in different places around the world.

Roadways should be designed to self-enforce an Appropriate vehicle engine speed operating category for the character area. Designers should not base the roadway on existing design operating speeds or speed limits. The speed of motor vehicles impacts all users of the street and the livability of the surrounding area. Lower speeds reduce crashes and injuries for all roadway users.

According to Crime Prevention Through Environmental Design (CPTED) principles, pedestrian areas that are enclosed, poorly lighted or obscured by vegetation (or fencing) can create areas Which make pedestrians more vulnerable to crime and criminal Encourage activity. Therefore, sidewalk designers shouldn´t aim to preserve pedestrian sight lines and visibility of an effort for crime prevention. Some guidelines may support the designing of pedestrian and cycle lane in the study area:

- Street trees and vegetation should not obscure sight distance pedestrian or driver sight lines, particularly at intersections.
- Buildings design at a pedestrian scale, avoiding the installation of fencing and parking lots next to the sidewalk.
- Encourage active uses fronting the street.
- Sidewalks must be accessible for all users, with all ages and physical disabilities. They must have continuous and unobstructed pathways. Materials shouldn't be selected to minimize gaps, discontinuities, rough surfaces or any vibration and be slip resistant. Continuous maintenance is required.
- Sidewalks signs and markings should provide pedestrian and cyclists all the safety information on any location.
- Bollards can be used to improve pedestrians and bicyclists security, like heavy-vehicles Preventing from using sidewalks in commercial and mixed-use areas, protecting space for street furniture and Restricting vehicular access to cycletracks.
- Adequate lighting to provide essential support to nighttime illumination bicyclist, motorist and pedestrian safety.
  - All light sources should provide a warm white (yellow, not blue) color light.
  - Design should report and be coordinated with the design of other streetscape elements
  - As appropriate, sky-compliant lighting dark should be selected to minimize light pollution cast into the sky while maximizing light cast onto the ground.
  - Retrofits of existing street lights and new installations should provide lighting on pedestrian paths.
  - Pedestrian lighting should be added to existing street light poles where feasible.
- Bicycle signal faces may be installed at signalized intersections to improve identified safety or operational problems for cyclists [5].
- Reduce conflicts between bicycles and opening car doors:
  - Colored pavement to bicycles facilities contributes to increase of awareness bicyclists
  - Painted buffer zone between the bicycle lane and the parking lane or the adjacent travel lane
  - Use of intersections to increase awareness of conflict areas by improving visibility
  - Suitable highlight of the cycle lane beginning
  - Proper roadway design to provide the most direct and appropriate bicycle route and avoid out-of-the-way routing
  - Improve visibility by reversed-angle car parking adjacent to design on-street bicycles facilities

1.7.2.3 PEDESTRIAN CROSSING FACILITIES

Several tools exist to improve pedestrian safety and to make crossing streets easier. At this section, some guidelines will be provided to assist the designing process involving the implementation of pedestrian crossing in the study area, ensuring that pedestrians are able to cross all streets safely and meeting the accessibility standards.

- Crosswalks should be considered at mid-block locations where there is strong evidence that pedestrians want to cross there.
- Marked crosswalks and signs should alert drivers to expect crossing pedestrians and direct pedestrians to desirable crossing locations.
- Marked crosswalks shall be provided on all intersection legs controlled by traffic signals, unless the pedestrian crossing is specifically prohibited.
- Signs should often be used to further alert drivers to the presence of a marked crosswalk.
- Legislation should require both motorists and cyclists to stop for pedestrians in crosswalks.
- Candidates for the installation of marked crosswalks include:
  - Signal and STOP controlled intersections
  - High pedestrian traffic generators adjacent to transit stops/stations
  - School walking routes
  - When there is a preferred crossing location due to sight distance
  - Where needed to enable easy, convenient, comfortable and safe crossings of multilane streets between signal-controlled intersections
- Raised crosswalks should be considered on local streets in areas with high pedestrian traffic and where vehicles move slowly and shall not be installed on arterial and collector streets.
- Raised medians might be used in the following situations:
  - Vehicle speeds are high
  - Streets are wide with multiple lanes
  - Traffic volumes are high
  - Sight distances are poor
- Crosswalk accessibility must conform to the surface condition, width and slope requirements for each crossing.

1.7.2.4 TRAFFIC CALMING

Traffic calming measures are composed by some design features that contribute to reduce speeds and so, improve safety and comfort for all users. In a city like Nairobi, with highest levels of walking rates it's very important that vehicles drive at safer speeds. For example, a pedestrian hit by a car travelling 30km/h has a 95% chance of survival, despite it, a pedestrian hit by a 65km/h car has a 15% chance of survival. Therefore, according to Boston Complete Streets Design Guideline, city streets should be designed to not exceed the speed of 40 km/h (exceptions are shared streets, school zones, neighborhood residential areas – with lower limits).

Some traffic- calming objectives[6] are:

- Improve the feeling of "ownership" of the street – if people feel comfortable on the street, they are more likely to walk or bicycle there and to engage in other – street activities
- Enhance aesthetic values and a sense of nature – traffic calming measures like landscaping contributes to that;

5. STREETS ATLANTA - The Design Manual for Streets Multimodal

6. https://safety.fhwa.dot.gov/ped_bike/univcourse/pdf/swless11.pdf

- Reduce crime – make it difficult for people to practice crimes and escape quickly
- Equitable balance among transportation modes
- Increase safety and so, decrease severity of transit crashes – Studies show that with lower speeds, the severity of accidents is less
- Improve air quality and noise levels
- Decrease fuel consumption – by stimulating sustainable modes like walking, bicycling and transit and reducing fuel consumption because of slower traffic speeds

Examples of some traffic-calming devices that can be implemented are[78]:

- Neckdowns: They are curb extensions at opposite sides of the road that contribute to narrow the travel lane, and so reducing vehicle speeds by diverting the driver's path of travel. Also, they could They can be used on two-way streets with one lane, on one-way roads with no more than two lanes and can be combined with medians.

Figure 1.131: Neckdown example

7. Boston Complete Streets Design Guideline

8. https://safety.fhwa.dot.gov/ped_bike/univcourse/pdf/swless11.pdf

- Chicanes: They are a design feature that creates an "S" curve that make vehicles slow down and also can be used to create an alternating parking from one side of the road to the other and be used as an extension of the sidewalk space. Their use is recommended on the same situation of neckdowns.

Figure 1.132: Chicane example

- Center Islands: They are protected spaces placed in the center of the streets to separate opposing directions of traffic movement, They can also be used to narrow the roadway, contributing to lower speeds and improve pedestrians crossings, combined with crosswalks. They can also provide better crossings to bicyclists and opportunities to improve landscaping and absorb stormwater.

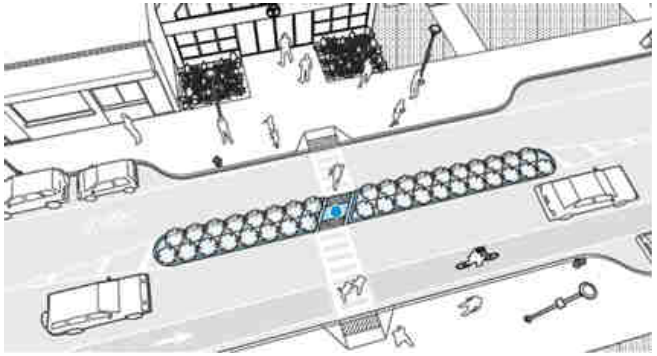

Figure 1.133: Center Island example

- Speed Bumps, Speed Humps and other raised areas: They are raised pavement areas that are designed for vehicles to proceed comfortably at suitable speeds. On high speeds, they cause the opposite effect. There are raised crosswalks too, that are like speed tables with crosswalks. They improve pedestrian visibility to cross, and make it easier because it the raised crosswalk is usually at the same level of the sidewalk.

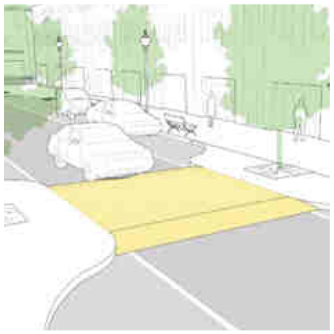

Figure 1.134: Speed table example

- Narrow Traffic Lanes: Wide traffic lanes encourage drivers to move fast. So, especially in residential areas, it is possible to reduce lane widths and raise sidewalks widths, improving the pedestrian path. However, in this case it is important to restrict on-street parking.
- Traffic Diverters: They are physical barriers installed at intersections that restrict vehicle movements in selected directions.The traffic diverters could force turns to one direction but could still allow bicyclist and pedestrians to access through.

Figure 1.135: Traffic diverter example

Source: National Association of City Transportation Officials (United States), 2013

> Roundabout: One specific type of turning-movement diverter is a roundabout, widely used in Nairobi. It is a channelized intersection which all traffic moves clockwise around a central traffic island. It contributes to lower speeds and reduce traffic conflicts. Studies show that accidents reduce a lot after its implantation in comparison to traffic signs.

1.7.3 PARKING REGULATION

Regulation for urban parameters in Nairobi consists of the "Planning and Building Regulations" (2009)[9] , published by the Ministry of Housing. This document provides minimum car parking requirements for the building According to building classification and other parking recommendations.

Table 1.14: Kenya Car Parking requirements (adapted from National Planning and Build Authority, Ministry of Housing, Republic of Kenya, 2009)

Car parking spaces per 100 m2 of gross built area	Building Classification	Occupancy
1 (one)	A1,A2,A3,A4,A5, B1.B2, B3, C1.C2, D1,D2,D3,E1,E3, F3, H3, H4	Entertainment and public assembly, Theatrical and indoor sport, places of instruction, worship, outdoor sport, Commercial Services, Exhibition hall, Museum, High risk Industrial, Moderate risk Industrial, Low risk industrial, Place of detention, Other institutional (residential), wholesalers store, domestic residence, dwelling house
2 (two)	E2,F1,F2,H1	Hospital, Large Shop, Small Shop, Hotel
2.5 (two and a half)	G1	Offices

The new draft, named "Physical Planning Handbook", currently in use by the city planners provides different parameters regarding parking polices. This Physical Planning Handbook recommends the provision of public parking spaces in urban areas within residential areas, industrial zones, commercial zones and social facilities, recreation and sports areas. In the central commercial and business zones, multi-storey car parking should be considered as a long-term prospect. In residential areas, where on-street parking is not practicable, public car parks should be provided.

It also provides dimension recommendations for flush and angle parking and standards for car park requirements according to land uses. However, none of the plans differentiate parking rates for central or peripheral areas of the city or by other criteria.

9. http://www.kpda.or.ke/documents/Policies/Building%20Code%202006.pdf

Table 1.15: Standards for car parking requirements

Usage	One Car space for every usage
Housing	2 houses or lodgings
Specialized market place	50 to 60sq. m of covered area
Market	30 to 50 sq. of covered area
Office and Administration	50 to 60 sq. m of covered area
Hotel	5 to 8 beds
School	(a) 0.5 classroom/secondary school and above (b) 1.0 classroom/ below secondary school level
Restaurant, Cinema and Theatre	12 seats
Mosque / churches	10 to 12 prayer space
Hospital	5 to 10 beds
Sports field	10 to 20 seats or spectators
Industrial establishment and workshops	6 to 10 workers

Source: Physical Planning Handbook, Draft, 2012

Therefore, Kenyan legislation does not yet cover a breakdown for the parking differentiated policies for regions with TOD developments.

The Nairobi Integrated Urban Development Master Plan (NIUPLAN) also does not provide suggestions as to the observation of these parameters in the regions of the city. It just brings in a diagnosis on the actual lack of parking spaces at the CBD, as shown in the following tables 3 and 4.

Table 1.16: Estimation of the number of parking spaces in CBD

	Multi-level Parking	Open-air Parking
Area	152,842 m^2	31,779 m^2
Parking Space	5,095 spaces	1,059 spaces
Total	**6,154 spaces**	

Source: NIUPLAN, 2014

Table 1.18: Comparison between Japanese and Kenyan Standard Parking Regulation

Japanese Standard		Kenyan Standard	
Land Use	Floor Area for 1 parking Space	Land Use	Floor Area for 1 parking Space
Commercial & Hospital	250 sqm	Commercial & Public	50 sqm
Office	300 sqm	Office	25 sqm
Residential and Others	300 sqm	Residential and Others	100 sqm
Result	**14,129 spaces**	**Result**	**128,906 spaces**
Gap	**7,975 spaces**	**Gap**	**122,752 spaces**

Source: NIUPLAN, 2014

In a comparison with parking regulation Japanese parameters, you can draw two conclusions:

> Japanese parameters would generate a smaller supply of car spaces than Kenyans parameters - about 9 times more parking spaces would be needed according to the Kenyan parameter;

> Even applying the same Japanese parameters, there is still a gap of parking spaces in the CBD.

You can see that parameters from other countries around the world vary. There are cities with more restrictive parameters as Mumbai, which has adopted TOD principles in its development plans for 2014-2034. On the other hand, US cities such as Savannah, with parameters that enable the provision of many more parking spaces by use. As an intermediate parameter, but also more restrictive than the current Kenyan parameters there is the example of Zurich.

Table 1.17: Parking regulations for other countries (source: ITDP, Embarq India and Savannah Mobility Department

User	Parking regulations - Units per parking space		
	Mumbai (India)	Zurich (Switzerland)	Savannah (USA)
Residential	140m² - 160 m²	120m²	0,5 dwelling unit
Commercial	75m² - 265 m²	120m² - 210m²	20 m²
Retail		100m² - 160m²	20 m²
Mixed	150m² - 245 m²		

Parking plays an important role in the success of cities, communities and places, as well as in the development of mixed-use projects and sustainable transportation.

Excess parking at residential properties correlates with higher automobile ownership rates, vehicle miles travelled, congestion, greenhouse gas emissions and housing costs. It also results in lost development opportunity because any extra parking could have been used for residential or commercial development or for public spaces. Therefore, the high cost of land required to provide parking significantly increases the cost of transit-oriented development.

Excess parking also has environmental consequences, including:

- Excessive land consumption.
- Increased stormwater flow.
- Degraded water quality.
- Exacerbated heat island effects.

Sustainable policies of parking management generally take into account:

- The minimum requirements for parking subsidize, in a way, the direction of vehicles, since transferring certain costs of car use for urban development and the population that does not drive often.
- The obligation to build parking spaces imposes negative externalities; car owners should absorb these costs, not the general public.
- Plenty of parking prevent easy access. When there is more well planned parking requirements, the better the conditions for walking, cycling and using public transport, in contrast to those who undertake to provide a minimum of places to park, unlike the situation in which it is offered little room
- The increase in supply leads to reduction of tariffs and stimulates increased parking demand.
- The parking demand is influenced so much the price as the transport options.
- The supply and price of parking areas on public roads and parking off-street influence each other.
- Enforcement is a crucial component for a parking policy is effective. Without effective supervision, it is impossible to generate positive effects.

Thus, the management of parking spaces offered in urban centralities must rely on regulatory measures to control the use of the car parks by different groups of individuals, to ensure that the quantities offered vacancies is appropriate to ensure the fluidity of mobility by means of vehicles individuals and their integration with other modes. In addition, standing in a context of TOD, should offer strategic means to discourage the use of private vehicles on routine trips, valuing healthy practices to the population and the environment.

Off-street parking is also key legislation guaranteeing the correct provision of parking in each of the regions of the Core Area. The provision of this type of car is taken from the developed zoning, adjusting the supply of places to land use in which it is inserted. In order to promote a more sustainable and with reduced use of private vehicles mobility is important that parking policies are inclined in this direction, focusing on regions which have the characteristic of great attraction for travel with work motivation.

The rationale for creating parking minimums stems from the concern that new developments will fail to provide adequate parking, based on the assumption that this lack of parking will create traffic congestion. Although, the results of minimum parking regulations impose major societal costs and undermine efforts to create balanced, sustainable transportation systems, creating a cycle that encourages transportation by private automobile.

Minimum parking requirements are especially damaging to central business districts (CBDs), reducing density and degrading the pedestrian environments duo to the extension of the areas required for parking. Therefore, this kind of policies should not take place in a TOD context.

Regarding the Study Area, this new sub-centre has both hub and centrality functions and so, it should paradoxally provide parking for park and ride trip attraction while should not encourage too much parking for local use. Giving that park and ride structures will be provided under the proposed plaza in front of Nairobi Terminus and local parking requirements can be reduced.

Although parking requirements must have to be evaluated from a city wider perspective, the following table provides a local parameters suggestion to discourage car use near Nairobi Terminus' TOD, based on Core Area urban planning parameters. Outside the 800m radius from Nairobi Terminus, parking requirement should remain as stated on Kenya authorities' planning books.

Usage	Maximum standards for car parking requirements within 800m radius from Nairobi Terminus
Residential	1(one) Car parking space per 2 houses or lodgings
Commercial	1(one) Car parking space per 100 m² of gross built area
Retail	1(one) Car parking space per 100 m² of gross built area
Community Facilities	1(one) Car parking space per 100 m² of gross built area

Besides, parking lots should be located off main streets, away from front lot lines in TOD, behind buildings, or in the interior of a block in order to alleviate their negative visual impact and to prevent pedestrians from having to walk through lots to access a building's main entry. The use of alleys or driveways off side streets for access to parking lots located at the rear of buildings should be encouraged.

In terms of on-street parking regulation, some well-established practices should be applied to manage the parking demand on the commercial areas of Embakasi:

- Metering the curb – Detailed studies shows that underpriced curbs led to high occupancy which, in turn, resulted in cruising for a bargain. In comparison with time limits impositions, high peak hour metering generally shows superior results, as demonstrated by the Nobel prize winner Willian Vickery in 1954. Issues linked to time limit practices, like the periodical displacement of the vehicle to different parking spaces to avoid being ticketed, has repeatedly proven those practices to be ineffective and difficult to enforce, while metering the curb can be taken as the closest solution to those problems.
- Pricing – Parking pricing can be adjusted in response to parking demand. For example, increasing prices along commercial corridors or during peak hours, and lower at off-peak hours and weekends.

In order to achieve the ideal demand management on the parking spaces at commercial zones, it's important for the stated policies to be sustained by guidelines on the charging methods and traffic control. The desirable curb occupancy for high demand zones will be defined here as 85% of the total parking spaces, based on Donald Shoup's proposal, this rate has been adopted by a large number of specialists around the world duo to its optimal practical results.

The meter rates, therefore, should be set in a price that results in an 85% occupancy, ensuring that the drivers don't spend long periods of time seeking for spaces while stucking the traffic behind him. Sensors installed in on-street parking spaces indicating real-time parking occupancy of each space, and dynamically variable parking charges according to demand for on-street metered parking spaces can also work in that direction and should be considered along with the pricing strategy. (Pierce and Shoup 2013).

A practical method of charging is the use of smart meters that accept prepaid cards, payment by mobile phones and allow for variable pricing.

Besides that, it is important to provide parking spaces to sustainable modes like bicycles. It could be achieved with a provision of bicycle share stations or on-street bicycle parking. In bicycle share stations systems, participants usually access a bicycle with a card, and can use the bikes for a period and then return them to any station that belongs to the network. The location of the stations must be studied, to encourage first and last mile trips.

The on-street bicycle parking is composed by bicycle racks usually on sidewalk. It's important to mention that replacing one vehicular parking space to a bike parking create about 10 to 14 bikes parking spaces.

1.7.4 PUBLIC TRANSPORT INTEGRATION STRATEGIES

Full-scale multimodal integration is characterized by two key features: integration of mass transport modes with each other, and integration of mass transport modes with other “feeder” modes such as buses/matatus, taxis, shared-mobility services like car-sharing and bike-sharing, walking, and cycling – all of which help provide first- and last-mile connectivity.

Transfer of passengers between buses and commuter rail should be designed to be convenient and direct without detracting from pedestrian oriented.

The recommended policies in order to build a high-quality integrated multimodal hub has to go beyond the study area approach and requires coordinating between the city county metropolitan authorities. Measures in the following categories can be highlighted to foster seamless connectivity between different transport modes:

- Infrastructure and operational integration
- Fare integration
- Information integration

1.7.4.1 INFRASTRUCTURE AND OPERATIONAL INTEGRATION

The transportation hubs offer high frequency of services in respect to other locations. Another advantage is the impressive development of an efficient distribution system simply because the transportation hubs can handle more traffic. Most of the transportation hubs make use of the shared transshipment facilities and so, the people can avail higher quality infrastructures at lower costs.

The concept of efficiency features, among other attributes, the controlling power, the speed of transfer, short distances to travel by vehicles and pedestrians and minimum intervals between buses feeders and trunk.

Many aspects however, depend on an appropriate functional and architectural design, on the one hand equate aspects inherent in the terminal design and its physical design: the layout of the tracks and platforms; support areas; lighting, ventilation, comfort, identity, beauty and pleasantness of the site; and on the other, provide adequate conditions for operating activities which it should occur.

The implementation of the transfer terminal is an impedance to the user translated the act of transhipment and the inclusion of additional access times, circulation and waiting for the bus, which must be minimized, both in determining the supply, as in the terminal project. Therefore, the project should be avoided to the maximum long physical distances separating the services provided by transfer, transfer areas open and devoid of external climate protection, poorly synchronized transfers, creating long waiting times between one service and another and the lack of integration tariff, which charges the user[10] .

At this point, it emphasizes the importance of the proposed bus service network. It differs from the operation performed today by matatus and should follow some operational rules for their success. While the service of matatus usually shows lack of schedules, fluctuating fares, poor working conditions, competition, formation of cartels and unpredictable stops and routes, the ideal proposed bus service is regular, with fixed stops and with quality infrastructure, services comply the fixed route and departures are regular and pre-established, with information available to the user to plan your trip.

1.7.4.2 FARE INTEGRATION

The concept of integration has come up with the need that large cities develop when they begin to structure their mass transit systems. Once the model of individualized lines implies in less savings (“diseconomies”) as the city expands too much, the system turns out to produce saturation of the road system with excess vehicles in road corridors, mismatched in their occupation.

As mass transit systems have a rigid physical structure of permanent way and require high levels of investment, its implementation becomes restricted to a few lines and only applicable for high loads. Then comes the need to complement these systems for power networks operated by bus. In systems that provide integration between lines or different modes of transport, the integration points can be physical, where there are certain points where the user exchange mode of transport in a “paid area” or can be made through any electronic system that allows electronic billing tariff.

The most used way of integrated payment solutions are smart cards, which allow seamless access and payment across different modes. The main benefits of adopting smart cards are reducing queues, guaranteed by fast shipping due to the lack of change in the passage and the reduction of burglaries, because there is no more movement of cash inside the bus.

However, fare integration depends on a systemic tariff policy, covering the entire city to function properly, since the distribution of amounts collected within the system needs to be centralized in a central entity. This becomes an even greater challenge to Nairobi, which transport sector actually has poor regulation over the public transport services.

10. WRIGHT, Lloyd. HOOK, Walter. BRT manual. Rapid Transit Bus. Planning Guide, 2008.

1.7.4.3 INFORMATION INTEGRATION

Information systems help service providers Achieve operational integration in addition to providing real-time information to passengers on various modes Regarding connectivity options, routes, schedules, and fares.

The information the user can be static and dynamic. still are aired before the start of the trip as for example with information on terminals, stations, routes, bus scheduling, planned duration of the trip, connections and tariffs. They may be disclosed in specific sites of the transport system.

Dynamic information is updated in real time and are generally used during the course of the trip to inform updated operational information, arising from the difference between the scheduled times and the traffic situation at the time of consultation. Are available at strategic points such as the vehicle itself in specific location or along the route - on panels variable message (Variable Message Signs VMS), totems type flag, screens, displays or paging system (eg on highways or at the station), radio equipment (Radio Data System / Traffic Message Channel - RDS / TMC) and even on portable devices like mobile phones or embedded in vehicles. Example of dynamic information received at the station or boarding platform are weather information for arrival of the next vehicle, or when stopping the service for a specific line at a specific station.

Figure 1.136: ITS scheme: Information During the trip.(Source: ANTP - Technical Notebook 8 - Intelligent Transport Systems)

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Moreover, according to this study, with regard to the technology used by gains user to information systems represent a 25% cost reduction compared to the electronic ticketing system (35%), fleet management (18%), automatic dispatch (10%) and intelligent vehicle management (12%).

Investments in information to the user, with regard to operational information may also allow the implementation of institutional and business information, enabling the generation of ancillary revenue through media and propaganda, and thus generating cost savings with institutional communication managers and operators. It is important however, to note the ethical use of the placement of this information, the joint implementation of measurement and control mechanisms.

It is important to mention that for the user information system to function properly it must provide accurate information. Otherwise, this can generate user-system escape and investment is lost because the user is particular about the quality of information. It even impacts the quality of services because, since the information is disclosed, the agents of operation tend to be motivated to work for the program to be fulfilled. Regarding integration with new media such as mobile phones, it allows you to establish contact with different user profiles, including some without the use habit of public transport, but with the availability of information start to use the services. Therefore, the quality of information allows passengers to better plan your trip, reducing the waiting time for shipping and is able to attract more potential passengers, maximizing the impact of mass transport and enabling sustainable urban mobility.

On the figure bellow, it is possible to see the application of an information system applied at a bus stop. It includes information about Which bus lines pass there and Their schedule (static information). Also it includes real-time information about the arrivals (dynamic information) and marketing about the service bus. It is an example of a good visual language.

Figure 1.137: Example of bus stop providing lines and schedules information and real time arrivals in Rio de Janeiro, Brazil.

Additionally, the key enabling feature to Achieving integration at These levels is the presence of a strong institutional framework, such as the Unified Metropolitan Transportation Authority, which can plan, coordinate, execute, and monitor the implementation of the above aspects.

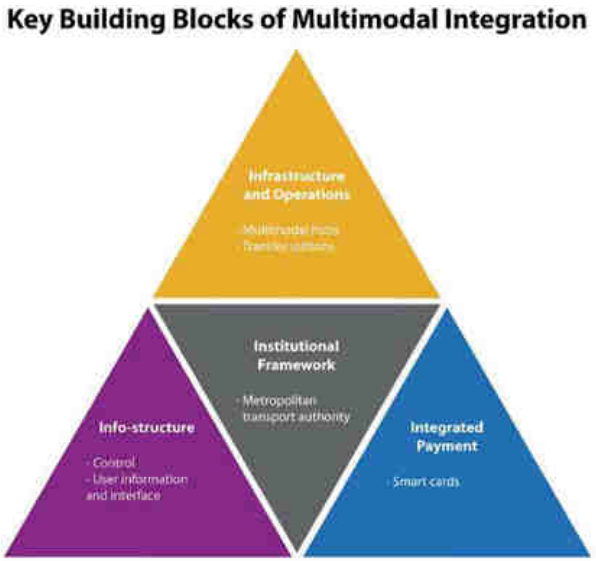

Figure 1.130: Key Building Blocks of Multimodal Integration. Source: EMBARQ.

One example of transportation agency across the world is Transport for London That Is Responsible for transport planning strategy for London. It is Responsible to run the day-to-day operation of the capital's public transport network and manage London's main roads. Also It is the authority who Provide modern ways to pay through Oyster and contactless payment cards and Provide information in different formats to help people move around the city.

The table below highlights some of the key cities in the developed world have que Achieved integration across various modes of mass transport.

NAMATA (Nairobi Metropolitan Area Transport Authority) is the Government agency responsible for transportation issues of Nairobi City, Kiambu, Kajiado, Machakos and Murang'a. It was established on 2017 and its main goal is formulating a sustainable integrated public transport strategy. It aims to develop an urban mobility plan for the Metropolitan area, an Integrated Mass Rapid Transit System Strategy and strategies to overall traffic management improvement.

Table 1.19: Examples of Multimodal Integration (source: EMBARQ).

City	Institutional Framework	Multimodal infrastructure elements	Info-structure elements	Integrated payment solutions
London	Transport for London (TFL)	Metro; bus; light rail; trams; taxis	(Bus) Web and mobile information systems	Oyster smart card
Paris	STIF	Metro; tram; bus	DIAGE project (real time traffic information)	Navigo pass
Singapore	Land Transport Authority (LTA)	Metro (MRT); bus; light rail; taxis	Web-based and mobile (How2Go) information systems	EZ-Link; NETS FlashPay
Hong Kong	Transport Department, Government of Hong Kong	Metro; bus	New Train mobile app; passenger information display systems	Octopus smart card
New York City	New York Metropolitan Transportation Authority (MTA)	Metro; BRT; local and express bus	MTA Bus Time	MetroCard

Therefore, NAMATA seems to be a strong candidate authority to embrace this strategy orientation in its attributions. Besides, some of its strategies which have been already disclosed are aligned with the policies proposed at this document.

As the responsible for metropolitan area strategies as a whole, it is important to coordinate proposed strategies for the core and broader area with short, medium and long-term general strategies for the city.

1.7.5 OTHER DEMAND MANAGEMENT POLICIES

1.7.5.1 ROAD MANAGEMENT

Various organizations around the world engage in road network management by creating centers dedicated to traffic control systems for urban network, motorways and other strategic roads, as well as for any existent transportation infrastructure such as bridges and tunnels. In the context of Nairobi's road network, like for any other city that requires a solid and sizable road management organization, policies should explicitly state the goals and objectives of that organization in regard to road asset management, and procedures should detail exactly how the Road Management System (RMS) will be used to achieve these goals. Here, the RMS will be defined as any system that is used to store and process road inventory, condition, traffic and related data for road network planning and programming, and its major activities will include:

- Constant needs assessment;
- Strategic Planning, including budgeting for development and asset preservation;
- Development, under budget constraints, of multi-year works expenditure programs;
- Collection of Data. All of the above activities need data. Major data items include road inventory condition, traffic, and economic data.

According to the World Bank Transport Note nº TRN-29, three key factors are responsible for making an RMS successful, and that way must be supported by the local legislation to guarantee the efficiency of all three: Processes, People and Technology. The first two factors stated are essentially institutionalization components, which can be considered the major success factor for the implementation of the RMS. It is therefore important to have:

- Business Plans, using 'Asset Value' and other Key Performance Indicators derived from the RMS. This is an executive and managerial responsibility. It also helps put focus on the RMS itself, and improves the chances that budget and funds are available to run the system.
- Institutional support consisting of high-ranking decision-makers fully-committed to the asset management/asset preservation 'philosophy'.
- Regular briefings given to ministers and other high government officials on the importance of asset preservation, and what is being done to make sure that the preservation of the road infrastructure is dealt with satisfactorily.
- Have specific and realistic key performance indicators and targets to measure their asset value and to preserve/enhance that value. Monitor those targets, and assess at the end of each year whether they have achieved them or not, and take appropriate action. By publishing this information in Annual Reports, the agency is accountable for it.
- Have annual budgets in place for data collection and operation of the RMS. Even if this initially requires donor funding support, there should be a phased increase in local budgeting to ensure that the RMS is self-funding within a given timeframe.
- There should be an organizational unit established with specific responsibility for the RMS.
- There should be a budget for the operation of the system, including all staffing, equipment, data collection (contracted or in-house), field travel, quality assurance etc.
- There should be a continual training and development program (and budget) for staff to deal with staff turnover and re-training where necessary.
- Jobs should be filled with appropriately qualified personnel, with good management skills, and with access to, and control over, their budget.
- Job responsibilities should explicitly include:
  - Management of the Road Network Referencing System - control, verification, education and dissemination to other stakeholders.
  - Data Collection, planning, management, supervision and coordination.
  - Data Quality Assurance verification and checking of all data.
  - Management Reporting - reporting and presentation to management.
- Strong contract management skills are necessary especially for agencies that contract out portions of data collection.
- The agency should follow good basic management principles, covering procedures, records, auditing etc.
- There should be a commitment to Continual Quality Improvement[11].

1.7.5.2 ROAD MAINTENANCE

For all the extension of Embakasi´s road network, the rolling surfaces must be kept in a condition to provide safe and comfortable trips to its users at the respective speed limit. With that in mind, some pavement maintenance guidelines should be followed:

- Regular inspections of all paved road surfaces will be carried out by both department staff and the maintenance contractor.
- Areas showing breaks or distortions must be identified and attended immediately.
- Until the necessary repair work is done, warning signs must be placed on each side of break or distortion area.
- The permanent repair of all serious pavement break areas and distortions must be completed as quickly as possible.
- In addition to the daily/weekly routine inspections, all pavements on the Provincial highway network will be subjected to a detailed Surface Condition Rating (SCR) every two years.
- Pavement distresses that require treatment would include:
  - Pot holes
  - Subgrade failures
  - Alligator cracking
  - Settlements/distortions (i.e. Culvert dips)
  - Wheel path cracking
  - Spalling and ravelling
  - Depressed transverse cracking
  - Rutting
- Inspections may occur more frequently if required due to changing traffic volumes or excessively wet conditions.
- The rate of blading shall be enough to maintain the required level of service, for which traffic volumes, traffic type, weather, and general road conditions shall all be considered.
- The minimum frequency of blading operations will be once per week or as required based on the road inspections.

11. McPherson, K. and Bennett, C. R. - Success Factors for Road Management Systems

1.7.5.3 DATA COLLECTING SYSTEM

The perspective on the significance of Intelligence Transport Systems (ITS) applications and services on network management diverge for each organization, but the fact is that those applications can provide relevant improvements in the network efficiency. For example:

- Through traffic management and other measures – like speed and access control, or public transport priority measures – that help deliver transport policy goals, such as eco-driving and the safe and efficient use of road space;
- by monitoring the status and condition of the network in real-time for rapid detection of incidents, emergencies and weather events;
- with electronic payment technologies that enable toll charges and demand management measures to be implemented flexibly;
- through multi-modal information and payment systems that will promote inter-modal transfers and road transport that is better integrated with other modes;
- by improving the safety and efficiency of their maintenance and service operations[12].

Such a sizable organization like the one responsible for the implementation of Embakasi's RMS requires a separate IT division supported by specific policies on the technological field. To avoid a profusion of different infrastructure software on the operating systems, databases and GIS explicit technology standards and directions should be present on the Data Collection Policies in order to guide management in ensuring that there is sufficient budgeting and staff made available for the activities required to implement these policies.

From an IT perspective, a series of factors are also necessary for ensuring the success of the RMS:

- Terms of Reference should explicitly reflect the IT support in the agency, they should not implement a system in isolation from the IT strategy of the agency. If necessary, assistance must be provided to define an IT strategy and to implement it.

12. World Road Association - ROAD NETWORK OPERATIONS & INTELLIGENT TRANSPORT SYSTEMS

- Road agencies should consider outsourcing or external hosting of their systems where possible, but this depends on the technical capabilities of the private sector and the road agency's organizational policies.
- All IT implementations should use commercial off-the-shelf (COTS) products wherever possible.
- For any future implementation of an RMS, a set of functional and technical requirements should be drawn up. Functional requirements should include the functions that the software should perform.
- Agencies should develop and adhere to a long-term IT budget strategy that includes costs of hardware and software maintenance agreements (in addition to hardware replacement strategies).
- Terms of Reference requiring 'integration' other applications, such as HDM-4, with an RMS should be more precise, to raise client awareness of the issues, and will enable the consultant to get a clearer understanding of the client's needs prior to bidding.
- The real requirements for web-enabling of systems should be more carefully assessed, and explicitly stated in Terms of Reference. The client also needs to make sure that their IT infrastructure (including hardware, systems software, databases and GIS) is able to support what they wish to do with a web-enabled system.

1.7.6 ADDRESSING TRANSPORT IMPACTS IN THE DEVELOPMENT CONTROL PROCESS

1.7.6.1 2.5.1. TRANSIT IMPACT ANALYSIS (REGULATION)

In the context of urban development of the study area, should be provided for the creation of enterprises that are by nature the high potential generator of travel, can significantly impact the projected road network and public transportation systems that serve. It is necessary for projects of this kind the development of Traffic Impact Analysis (TIA) to assess network capacity to support them in the way you give the operation of these on the accessibility and compliance with safety standards.

The design of access points as well as being instrumental in the assessment of impacts to local traffic, ensure accessibility to pedestrians, cyclists and people with reduced mobility. The application of robust management principles can access often minimize any potential adverse impacts to roadways adjacent to the site. Therefore, location and design of the site access should count on clear guidelines and regulations provided by local authorities:

- The number of access points should be limited to minimize traffic conflicts.
- Access points should intercept traffic approaching the site in an efficient and safe Manner. The location should minimize impacts to traffic operations on the adjacent highway. The site plan should align opposing access points where possible.
- The site plan should provide / maintain adequate spacing between adjacent streets and driveway intersections. Factors to consider when evaluating intersection spacing include, but are not limited to, the following:
  - Intersection spacing That Should be such blockage is driveway minimized
  - ntersection spacing requirements depend on roadway classification, posted speed and influence of adjacent intersections.
- The department should encourage joint and / or cross access between adjacent properties.
- The on-site circulation pattern Shall integrate the access point locations to allow for efficient ingress and egress, and to avoid queuing on the adjacent highway.
- Turning lanes Shall Provide adequate storage lengths. Provide acceleration and deceleration lanes the necessary.
- The design of the access points Shall ENSURE adequate sight distance.
- The design of the width and radii of an access point should accommodate entering and exiting vehicles efficiently and safely.
- Access points should generally intersect the adjacent roadways at a 90-degree angle.
- Where applicable, the site plan is multimodal Should Provide access between the right-of-way and the development (multimodal facilities Shall consider pedestrians, bicycles and transit).

1.7.6.2 COORDINATION AND COMMUNICATION BETWEEN DEPARTMENTS

Transportation agency must build strong partnership with land use planning agency to set coordinate control tools to evaluate planning proposals and its adherence to urban planning and transport guidelines from master plan. Some of the following criteria can be checked when the forwarding of specific projects proposed:

- Current coherency with national, regional, county and transport policy site.
- Whether the movement of people and vehicles from developments can fit onto proposed roads. If not, officers may request developers to Carry Out or road transport improvements to enable Their developments.
- The acceptability of the parking arrangements against county standards.
- That developments Encourage walking, cycling and use of public transport.
- That accesses new road, new roads and junctions are safe. And que developments have acceptable vehicle turning and servicing facilities.
- That's not Necessary developments occupy parts of main roads. Affect or land reserved for road improvements.

Many strategies are solely within the control of transportation agencies, que but some are outside their immediate control underscores the importance of coordinating with land use planning efforts agencies.

Periodic inspections can be made to monitor possible deviations from compliance with rules, with punishment fines and design adequacy requirement.

1.7.6.3 MONITORING AND REVIEW THE PLAN ALONG TIME

Ultimately, strategies are necessary to ensure that transportation projects do not affect land use in undesirable ways. Transportation projects may carry the potential to create undesirable land use effects even if they arise from integrated planning processes.

Several strategies are available to land use and transportation agencies for addressing such effects. Such strategies are strongest when shaped and informed by community planning processes and can be applied to address impacts relating to the particular transportation project, or can be applied to part of a broader strategy to ensure That land use and transportation interactions occur in a way que supports economic, social, environmental and community goals.

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AIRPORT PLANNING CONSIDERATIONS

1.8 AIRPORT PLANNING CONSIDERATIONS

1.8.1 INTRODUCTION

This section outlines the key airport planning considerations that have been considered when preparing the Core Area Masterplan. It is important that these continue to be considered during future detailed design and implementation.

A thorough analysis of airport planning considerations has been undertaken in the preceding stages of the project. This has included an analysis of the Kenya National Aiports System Plan (September 2010) and the JKIA Masterplan (no date).

This has been informed by the guidance material of ICAO Doc 9184, Airport Planning Manual, Part 2 — Land Use and Environmental Control and the safety compatibility zoning guidelines contained in the California Airport Land Use Planning Handbook.

1.8.2 OBSTACLE LIMITATION SURFACES

The Consultant has considered the possible implications of the Obstacle Limitations Surfaces (OLS) for the Airport that were obtained from the Kenya Airports Authority.

The OLS is a series of imaginary surfaces in the airspace surrounding the Airport which define the limits to which objects may project into the airspace in order to avoid adverse effects on the safety and regularity of aircraft operations at the Airport. Objects penetrating these surfaces are considered Obstacles to air navigation and should be removed. The height of objects and structures within the subject development in the vicinity of the Airport shall be restricted and controlled so that they do not protrude above the OLS.

There are two groups of OLS, as shown in the figure below. Group I addresses approach and take-off surfaces. These are:

- Approach Surface
- Transitional Surface
- Take-off Climb Surface

Group II addresses surfaces that protect the airspace for circling aircraft. These are:

- Inner Horizontal Surface
- Conical Surface

Airport Reference Point (ARP)

The ARP in WGS84 is as follows: ARP HKJK-JKIA UTM E=268928.484 N=9854201.434 ELEV=1624.584m.

Height Restrictions

The proposed heights for the development shall stay below these OLS heights. As noted above, there are various scenarios regarding the approach/ take off surfaces depending on which runway is used, wind conditions which influence the direction of approach/take-off, and whether the approach or take-off are being considered.Safety Compatible Zones

Table 1.20: Height Restrictions in OLS Zones

OLS SURFACE	SURFACE HEIGHT (FROM MSL)
Outer Horizontal	1,769.584m
Inner Horizontal	1,669.584m
Conical	From 1,669.584m to 1,769.584m
Transitional Surface	From runway strip level to 1,669.584m
Approach 06R	From 1,663.024m to 1,673.076m
Take-off 24L	From 1,663.159 to 1,673.211m
Approach 06L	From 1,697.260 to 1,715.501m
Take-off 24R	From 1,695.073 to 1,710.024m
Approach 24L	Within Airport limit, 1,693.289m
Take-off 06R	Within Airport limit, 1,692.496m
Approach 24R	From 1,643.194m to 1,704.606m
Take-off 06L	From 1,652.083m to 1,699.111m

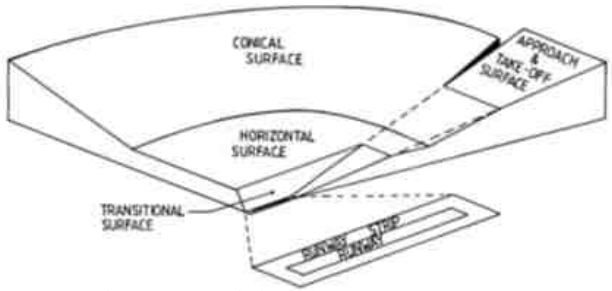

Figure 1.138: Obstacle Limitation Surface

1.8.3 SAFETY COMPATIBLE ZONES

ICAO provides guidance on this subject and is contained in Doc 9184, Airport Planning Manual, Part 2 — Land Use and Environmental Control. The manual deals with alleviating the impact of aircraft noise in the vicinity of airports and describes practices adopted for land-use planning and management by some States. ICAO does not provide its own measures.

The ICAO member states shall develop their own land use planning measures around airports without contravening the ICAO Obstacles Limitation Surfaces and guidelines. As such the Consultant sought guidance from the California Airport Land Use Planning Handbook on safety compatibility zones.

The California Airport Land Use Planning Handbook SCZ diagram - relative to Large Air Carrier Runways such as JKIA - divides the runway vicinity into 5 safety zones. These are described below and shown in relation to the Core Area in Figure 1.139:

- Zone 1: Runway protection zone — very high risk / prohibit all new structure
- Zone 2: Inner approach/departure zone — Substantial risk / prohibit residential uses except on large, agricultural parcels - limit nonresidential uses to activities which attract few people
- Zone 3: Inner turning zone — limit residential uses to very low densities / avoid nonresidential uses having moderate or higher usage intensities
- Zone 4: Outer approach/departure zone — in undeveloped areas, limit residential uses to very low densities / Prohibit children's schools, large day care centers, hospitals, nursing homes
- Zone 5: Side-line zone — Encompasses close-in area lateral to runways / Avoid residential uses unless airport related and Allow all common aviation-related activities provided that height-limit criteria are met.

The shapes and sizes of the zones are largely based upon the accident data collected and analysed in California Airport Land Use Planning Handbook. The flight paths which aircraft typically follow when approaching and departing a runway—particularly at less than traffic pattern altitude—are also considered. Several other factors deserve consideration when defining safety zones. These factors involve characteristics of the airport environs such as Airport Area Topography, Geographic Features and Existing Urban Development.

Development shall be planned in accordance with the guidance on land use categories and detailed factors, such as density, for the relevant zone within which development is being planned.

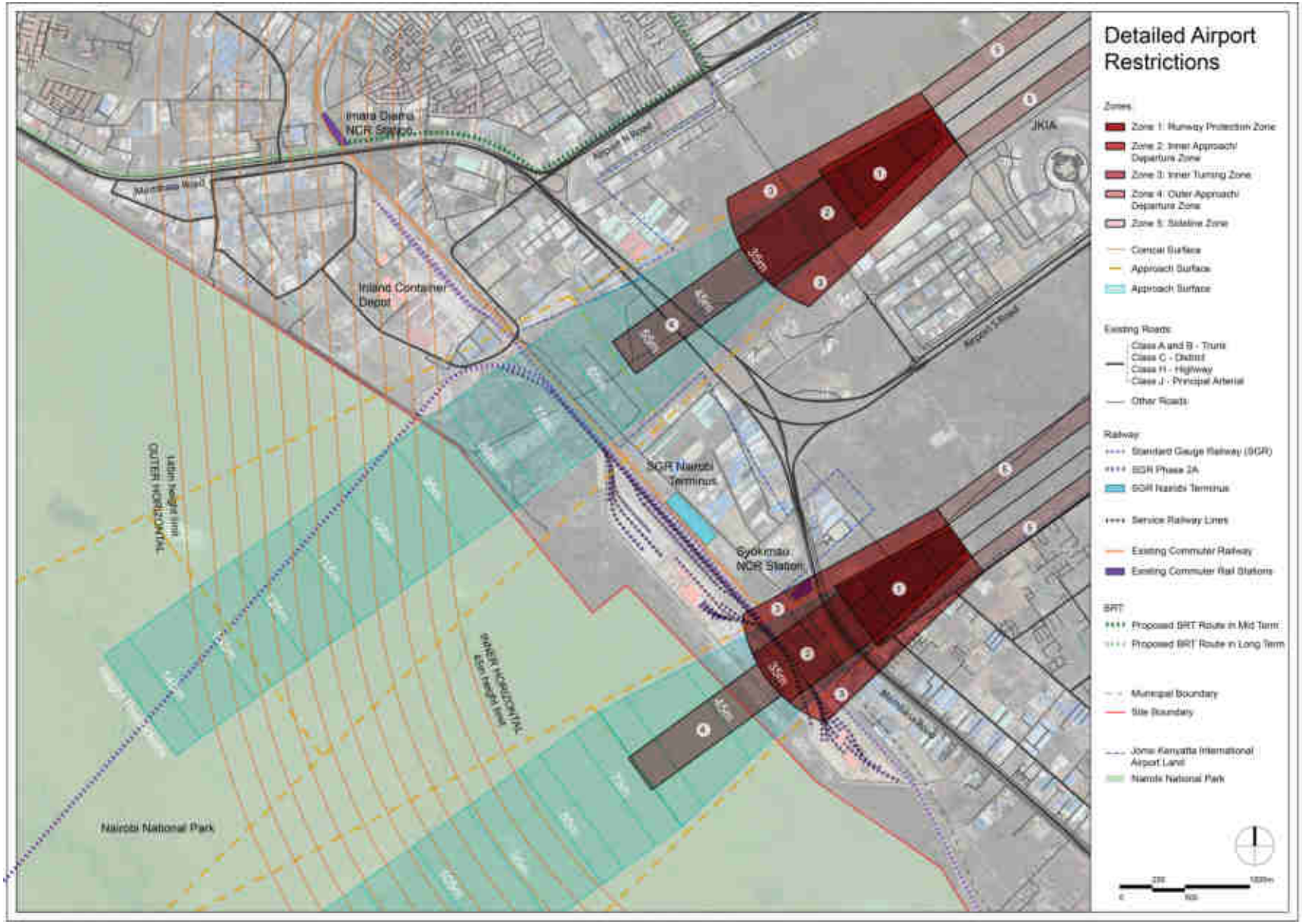

Figure 1.139: JKIA: Airport Restrictions Detailed Map (Source: Consultant Study Team adapted from KAA data)

1.8.4 SECURITY

A study was carried out tby the Consultant to explore different security counter measures that can be applied to mitigate threats of ground to air attacks on aircraft landing and taking off at JKIA. These are described below.

1.8.4.1 "AIR-BASED" COUNTER-MEASURES

Requiring action from aircraft manufacturers, airlines and airport authorities, these counter-measures include:

- Aircraft improvement and equipment: Equipping aircraft with flares, laser jammers, "camouflaging" techniques etc.
- Pilot Training: Enhancing pilot training by incorporating simulation exercises using missile attack scenarios.
- Air Traffic Procedures: Adopting spiral descent for landing and take-offs at steep angles.

Adopting the above techniques on a wide scale for civilian aircraft remains difficult, as the integration of such technologies and techniques into civilian aircraft is technically challenging, not to mention as well the large costs and fear and uncertainty that will be promoted among the general public.

Figure 1.140: Flares as a counter measure against missile attacks

1.8.4.2 "GROUND-BASED" COUNTER-MEASURES

A core pillar of "ground-based" counter-measures, should be to propose land uses and zoning and planning measures in a way that ensures maximum security in the vicinity of the airport. As such, land uses allowing the areas to be bonded and have a controlled access should be favored, whereas land uses with higher development and population densities should be placed further away.

In line with this idea, the Proposed Land Use Plan includes mainly warehouses in the areas close to the airport. There is scope to fence these areas and provide controlled access points.

A threat and vulnerability assessment involving airport and airspace managers and security forces should be conducted, taking into consideration the new proposed land uses, in order to determine the high threat areas. Based on such assessment multiple security measures should be implemented:

- Highly monitor the places that are identified as favourable to launch an attack from, and if possible control or restrict access to them.
- Secure the area by performing both regular and unscheduled patrols.
- Conduct searches of any potential suspicious activity.
- Remove any potential site feature that might conceal or hide a potential attack position.
- Install permanent security posts and systems such as video surveillance etc.
- Prior identification of High-risk/VIP flights, for which special security measures should be taken.
- Tighten security measures around the immediate airport boundaries.
- Increase the coordination between airport officials and local and national law enforcement.
- Raise public awareness / vigilance among the local community regarding the safety of aviation and encourage cooperation with the airport authority to report on suspicious activity in the area.

1.8.4.3 BENCHMARKS

Throughout the world, having populated areas in the immediate vicinity of the airport is not uncommon. JKIA's case was benchmarked against multiple airports world wide. With a distance of 1200 m between the runway threshold and populated areas (in JKIA's case), such distance is in line with worldwide common practice (Dubai: 980m, Heathrow: 1,290m and Lagos: 1,200m).

Figure 1.141: Jomo Kenyatta Airport

Figure 1.142: O.R. Tambo International Airport, Johannesburg, South Africa

Figure 1.143: Orly International Airport, Paris, France

Figure 1.144: Dubai International Airport, Dubai, UAE

Figure 1.145: Heathrow International Airport, London, UK

Figure 1.146: Murtala Muhammed International Airport, Lagos, Nigeria

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