



Republic of Kenya



Kenya Railways



Nairobi City County



Machakos County



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

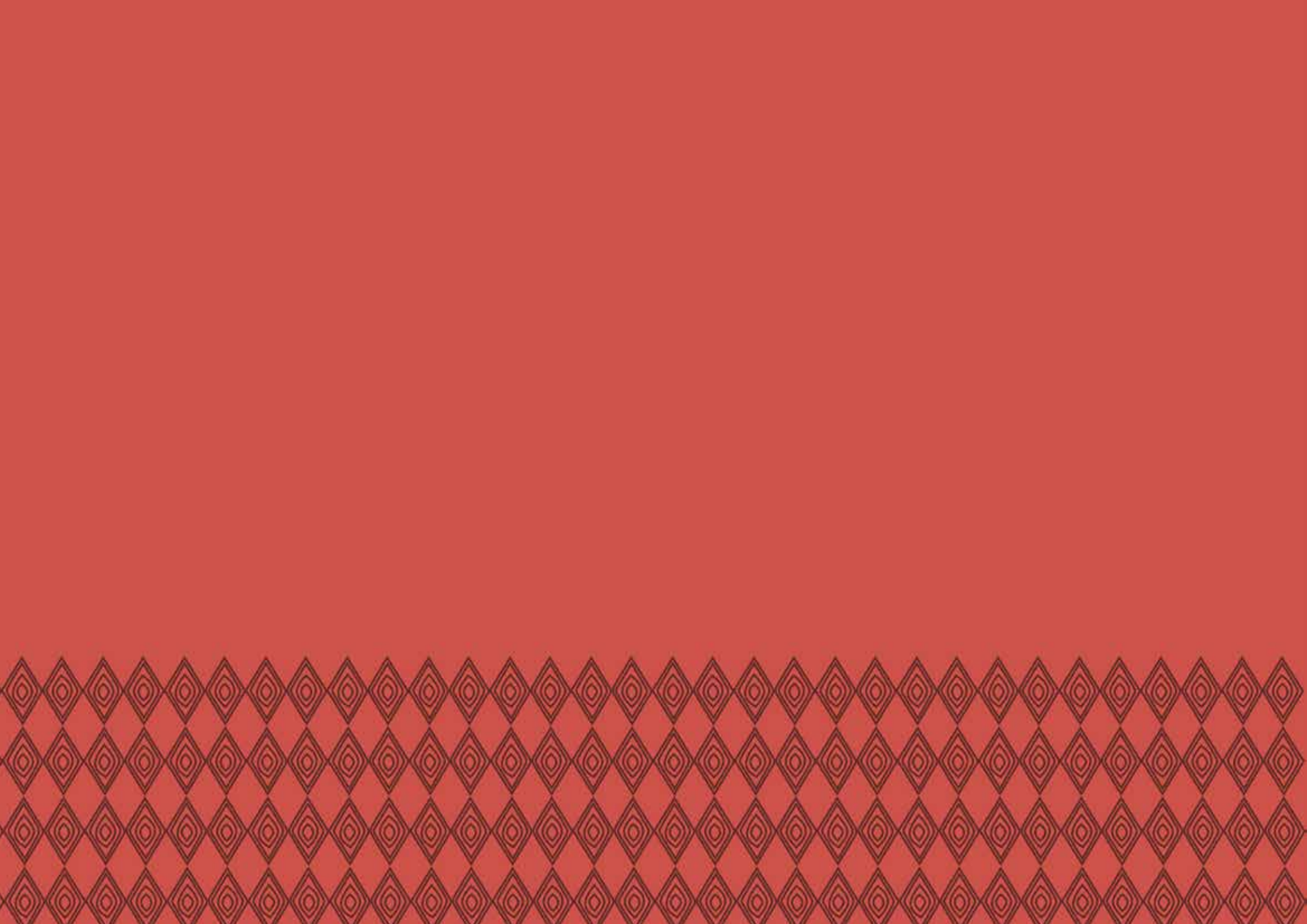
Volume I of 4

Inter-County Physical and Land Use Development Plan
for Nairobi SGR Terminus and Adjoining Areas (2020-2035)

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KEI7123-0100D-RPT-PM-I3-VI/4 – Rev 3 / 23 September 2020







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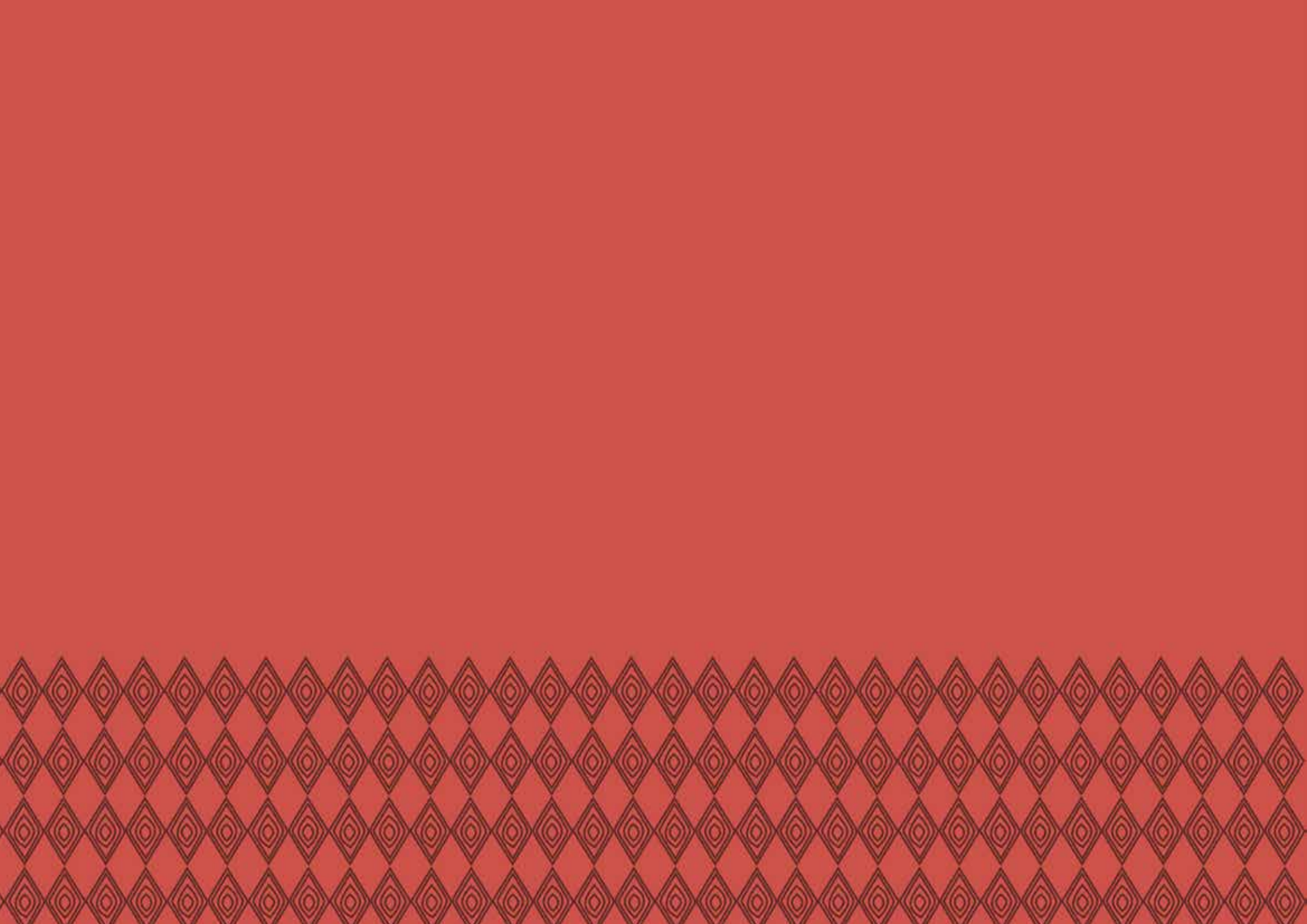
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Inter-County Physical and Land Use Development Plan for Nairobi SGR Terminus and
Adjoining Areas (2020-2035)



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Foreword

Nairobi stands on the threshold of a new era in its economic history and has the potential to benefit from a significant opportunity. The completion of Phase I of the Standard Gauge Railway (SGR) from Mombasa to Nairobi in May 2017 and construction of the new state-of-the-art SGR station at Embakasi has unlocked the unique prospect to redevelop the area around the Nairobi SGR Terminus, opening up future trade links for Nairobi with the landlocked countries of the Great Lakes Region - Burundi, Democratic Republic of Congo, Rwanda, and Uganda.

The Inter-County Physical and Land Use Development Plan for the Nairobi SGR Terminus Sub-Centre and Adjoining Areas (2020-2035) delivers an ambitious blueprint to create an integrated and sustainable world-class gateway focussed around the Nairobi SGR Terminus Area. The preparation of the Plan is part of the wider Nairobi Metropolitan Services Improvement Project (NaMSIP), a World Bank-funded project. It is through the NaMSIP Project that key stakeholders including Kenya Railways Corporation, Nairobi City County and Machakos County have come together to start the development of the Nairobi SGR Terminus Area and provide the stimulus for physical transformation of the area to provide a high-quality gateway to the city and beyond.

The Plan aligns with Kenya Vision 2030, the country's long-term development blueprint, and will contribute to achieving the 'Big Four' outlined in the Third Medium Term Plan 2018-2022: Industrialization, Manufacturing and Agro-Processing; Affordable Housing; Food and Nutrition Security; and Universal Health Coverage. It seeks to implement policies contained in the National Spatial Plan, which gives spatial realisation to the development proposals in Vision 2030. The Plan builds on the Nairobi Integrated Urban Development Master Plan (NIUPLAN) strategy of decentralizing services away from the Nairobi CBD and sets out the overall strategy for the Planning Area, including strategic policies to guide future detailed planning, and provides an Action Plan focussed on the Core Area around the Nairobi SGR Terminus. A framework for dealing with the Planning Area challenges is provided through

the formulation of planning and development strategies and policies that provide the overarching structure under which future Action Plans and priority programmes can be implemented over the next 15 years.

The Plan has been developed in close co-ordination with the project stakeholders and is focussed on a long-term vision, supporting sectors that will generate jobs and growth in the years ahead. With the right support, the jobs created in key sectors will have positive consequences elsewhere – in housing, retail, leisure and in the critical professional services market, where those who work in property, architecture and construction will be able to benefit from opportunities to develop projects within the Planning Area. Transportation proposals advocated in the Plan include road proposals that will ease congestion, junction upgrades, facilitation of multi-modal transport activities and BRT routes and integrating proposals for encouraging the use of non-motorised transport. The Plan delivers improvements to pedestrian, cyclist and traffic flows through the Planning Area with a high-quality active travel network accompanied by green amenities. Utilities infrastructure proposals ensure the new development will have adequate recourse to essential services.

The Plan Vision, 'An Integrated and Sustainable World Class Gateway' establishes aspirations for a new Nairobi neighbourhood that symbolises the city's diversity, vitality, and ambition, leveraging the Planning Area's strategic location to unlock its inherent potential. The Action Plan advocates the transformation of the Nairobi SGR Terminus into a new urban district that will be the heart of a community with a diverse population that gradually occupies a new, dense, and mixed program of uses. The Action Plan places a strong emphasis on functional, high quality design, that is distinctive while respecting and complementing adjoining uses, such as the Nairobi National Park. Much needed affordable town centre homes are provided, as is logistics space, commercial and retail uses, high-quality residential developments and generous public open space. Within this mixed-use district, housing and office space are accompanied by a strong retail

offering and new civic infrastructure comprised of high-quality education and cultural facilities, which will embed liveability into the scheme from its early phases of development.

One of the most important factors of success is recognising the complexity of the Plan – it is often seen that the larger the project, the greater the number of challenges. Similar to a biological ecosystem, a city's urban tissue is highly complex, with many stakeholders, existing infrastructures, collaborations between the public and private sectors, planning procedures, and financing options. This Plan delivers benefits that will be felt across Nairobi, Machakos and the wider Kenyan urban areas. But in order to succeed, the Plan will need the active and ongoing participation of the public and private sector communities to be part of delivering significant and sustainable growth. The invaluable and essential power of human involvement is evident in every successful urban redevelopment project and the success of the Inter-County Plan for the Nairobi SGR Terminus Sub-Centre and Adjoining Areas will be dependent on the collaboration between the public and private sectors and the local communities in Embakasi.

Preface

The Inter-County Physical and Land Use Development Plan for the Nairobi SGR Terminus Sub-Centre and Adjoining Areas (2020-2035) is an ambitious plan to maximise the advantage of the strategic location of the Nairobi SGR Terminus as a catalyst for local and regional development. The objective of the Plan is to develop the Nairobi SGR Terminus Area with a view to creating a new urban sub-centre within Nairobi, providing inter-linkages among the various existing modes of transport and facilitating seamless connectivity for both passengers and freight.

The Planning Area spans across both Nairobi City County and Machakos County, and is situated within the constituencies of Embakasi East and Embakasi South in Nairobi City County and Mavoko in Machakos County. The Planning Area includes commercial, industrial and residential estates, the Inland Container Depot and the overall site extents of Jomo Kenyatta International Airport.

The Plan sets out the overall strategy for the Planning Area, including strategic policies to guide future detailed planning, and provides an Action Plan focussed on the Core Area around the Nairobi SGR Terminus. The Inter-County Proposals include an overview of the economic development recommendations, a spatial development strategy for achieving these, a summary of the transport strategy and supporting guidance, and land use strategies for the proposed centres. The proposals include high-level, strategic policies with associated policy guidance. The purpose of these is to guide the future development of the Planning Area. The policies and guidance should be used to inform planning decisions until such a time that detailed plans (e.g. Action Plans), policies and guidance have been prepared.

The Plan also sets out an Action Plan for the Nairobi SGR Terminus Sub-Centre, that includes development recommendations based on market studies, the land use plan and phasing proposals, public facilities provisions, transport and utilities studies, and the implementation strategy. Detailed design studies and urban design guidelines have been

undertaken to guide the development proposed. Detailed engineering studies have also been prepared for five priority road projects within the Planning Area.

The Plan has been supported by extensive stakeholder engagement. The Inter-County Proposals and Action Plan have been informed by the major stakeholder engagement events undertaken in the project, which include the Launch of the Planning Process, the Visioning Workshop, and two Stakeholder Workshops.

The Plan provides confidence and certainty to residents, stakeholders and investors by being clear about its ambitions, plans and vision for the Nairobi SGR Terminus Sub-Centre and Adjoining Areas. Creating jobs and ensuring sustainable, long-term growth in the Kenyan economy, based on the opportunities provided by the newly-built SGR Terminus, is vitally important and the Plan defines the route map to achieve it. It clearly defines plans for future development and investment by providing the robust evidence base, sound principles and strategic drivers on which to plan the future redevelopment of the Nairobi SGR Terminus Sub-Centre.

Building on the Plan vision to achieve an “Integrated and Sustainable World-Class Gateway”, the proposals set out in the Plan are based on an assessment of what is realistically deliverable, but these opportunities will require focused energy and resources from a range of partners including the private sector to ensure they achieve their potential and meet the expectations of the Kenyan people.

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Executive Summary

The Inter-County Physical and Land Use Development Plan for Nairobi SGR Terminus and Adjoining Areas (2020-2035) is a 15-year strategy that seeks to achieve sustainable growth and transformation around the Nairobi SGR Terminus. This is a nationally-significant development opportunity which, if carefully planned and implemented, has potential to bring major benefits to Nairobi and beyond. The Plan must be monitored continuously and be subject to partial or full reviews if considered necessary. As a minimum, the Plan must be fully reviewed after 10 years. The Plan aligns with Kenya Vision 2030, the country's long-term development blueprint, and seeks to implement policies contained in the National Spatial Plan, which gives spatial realisation to Vision 2030's physical development proposals. The Nairobi Integrated Urban Master Plan (NIUPLAN) had foreseen the development opportunity and the Plan builds upon the concepts it contained.

The Plan contains an area-specific strategy for this part of Nairobi. For the Core Area, anchored by the Nairobi SGR Terminus, it provides a detailed and implementable action plan to create a new urban sub-centre, which sits within a broader, conceptual development strategy for the Inter-County area. The overriding aim is to provide an action plan to develop the Nairobi SGR Terminus area with a view to providing inter-linkages among the various existing modes of transport. Key objectives are:

- > To envision the positioning and main development goal of the Planning Area;
- > To propose a mobility plan for the area, including alternative roads/circulation plans to support A104 and connectivity improvements;
- > To integrate transport modes for seamless connectivity for both passengers and freight;

- > To determine infrastructure needs for electricity, water, sewerage, solid waste management and storm water drainage and determine requirements of the County and National Government services;
- > To prepare urban plans and urban designs for the Core Area and integrate these with the land use plans for the surrounding areas and the Nairobi Metropolitan Region; and
- > To explore programming and development options for Adjoining Areas, including residential, retail, recreational, and other uses, and support a live and work environment.

The Plan is organized into three sections. Part 1 (Chapters 1 to 4) provides the situational analysis. Part 2 (Chapters 5 to 7) provides the inter-county planning proposals. Part 3 (Chapters 8 to 16) provides the action plan for the Nairobi SGR Terminus Sub-Centre.

Chapter 1 Introduces the Plan, covering the Planning Area location and boundary, strategic importance of the Plan, purpose and scope of the Plan, an overview of the Plan preparation process and stakeholder engagement undertaken, the final Plan documents and approval process.

Chapter 2 provides an overview of the main plans that cover the Planning Area and have directly affected the planning proposals. Together with this Inter-County Plan, they form the planning framework that will guide planning decisions related to the Planning Area. Following this, the legal and institutional frameworks for planning in Kenya are set-out. These discuss the key laws and organisations that have shaped the planning process.

Chapter 3 provides information pertaining to the existing environmental, social and economic conditions in the Planning Area. It commences with a contextual analysis of land use in Nairobi, followed by a detailed analysis in the Planning Area. The environmental and physiographic characteristics of the Planning Area are then discussed. In terms of social and economic conditions, this chapter covers population,

employment, communities, social infrastructure and the macroeconomic situation. Finally, physical infrastructure and transportation are discussed. The chapter concludes with a synthesis of emerging issues, opportunities and challenges facing the Planning Area.

Chapter 4 summarises the market assessment conducted to evaluate the key asset class development required by the expanding market and industry opportunities. It contains an overview of the asset classes and quantum of development recommended for new development in the Planning Area.

Chapter 5 explains the proposals for the Planning Area, which together form the spatial development strategy that provides the overall framework for development in the Planning Area. Some of the proposals continue and enhance themes developed by existing plans for Nairobi. Some are to ensure consistency with other emerging plans for parts of the Planning Area. The remaining proposals have all been developed in response to the specific issues, opportunities and challenges facing the Planning Area. The Proposals include strategic policies with associated policy guidance. The purpose of these is to guide the future planning of the Planning Area.

Chapter 6 explains existing transport projects already in the pipeline. The transport proposals for the Planning Area are then explained, including the interface with existing transport networks and projects.

Chapter 7 sets-out the land use strategies for five of the centres in the Planning Area. These provide area-specific visions and a framework for future detailed planning. They are supported by strategic policies with associated policy guidance. The purpose of these is to guide the future planning of these centres.

Chapter 8 describes the detailed site analysis undertaken for the Core Area. This was informed by a series of field reconnaissance and surveys conducted with the principal aim of developing an understanding of the physical, topographical and environmental setting of the Site.

Chapter 9 describes the design parameters and that have shaped the Sub-Centre proposals. It commences by explaining the stakeholder visioning process that was undertaken and how the vision was developed to identify principles and precedents to inform the design. The key design informants specific to the site are then explained, followed by the design options that were considered for the site.

Chapter 10 presents the proposals for the Nairobi SGR Terminus Sub-Centre, covering Key Design Elements, Land Use, Urban Design Guidelines Overview, Landscape Strategy, Transport Strategy, Utilities Strategy, Air Traffic Risk Mitigation Strategy, and Strategic Planning Assessment of the Sub-Centre Proposals.

Chapter 11 presents key public realm proposals, building on the Landscape Strategy in Chapter 10. Place-making and urban design best practice have been considered in shaping the final framework for the Sub-Centre to create a unique and distinct area with its own identity. The overall design objectives are explained, followed by three defined focus areas in more detail.

Chapter 12 covers the transport studies for the Sub-Centre cover the proposed road network, including different road types; public transport network, including rail, BRT and bus feeder route proposals; non-motorised transport infrastructure; connectivity between the Sub-Centre and Adjoining Areas; summary of the network analysis undertaken; and priority projects.

Chapter 13 discussed the full range of utilities networks required to serve the Sub-Centre. These are water supply, wastewater, stormwater drainage, solid waste, power and telecommunications. For each utility, demand estimates have been calculated and a conceptual design for the necessary infrastructure is described.

Chapter 14 analyses the land requirements in order to deliver the development proposed for the Sub-Centre, specifically the

ownership characteristics and the quantity of land that may need to be acquired from public organisations and private landowners. The methods used to collect data on existing ownership and the overarching approach to land acquisition are explained. The findings resulting from a comparison between the Proposed Land Use Plan and existing ownership data is then set-out.

Chapter 15 presents the financial pre-feasibility of the Nairobi SGR Terminus Sub-Centre proposals and provides an assessment of its financial performance. The results and observations in this chapter are the focus of the financial model that employs the necessary methodologies to ensure financial rigour.

Chapter 16 presents the recommended implementation planning requirements for both the priority projects and other land uses. The purpose is to convey the key details in a form that, as closely as possible, follows the Project Implementation Team's preferred structure of an implementation plan. This is within the context that an 'implementation plan' requires considerable certainty of the likely outcome of 'go/ no go' decision. In light of this provision, this discussion is designed to provide guidance on the initial processes required to implement the project.

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ABBREVIATIONS AND ACRONYMS

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



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SITUATIONAL ANALYSIS

I. INTRODUCTION AND PLANNING CONTEXT

I.1 OVERVIEW

The Inter-County Physical and Land Use Development Plan for Nairobi SGR Terminus and Adjoining Areas (2020-2035) (hereafter referred to as 'the Plan') is a 15-year strategy that seeks to achieve sustainable growth and transformation around the Nairobi SGR Terminus. This is a nationally-significant development opportunity which, if carefully planned and implemented, has potential to bring major benefits to Nairobi and beyond.

The Plan aligns with Kenya Vision 2030, the country's long-term development blueprint, and seeks to implement policies contained in the National Spatial Plan, which gives spatial realisation to Vision 2030's physical development proposals. The Nairobi Integrated Urban Master Plan (NIUPLAN) had foreseen the development opportunity and the Plan builds upon the concepts it contained.

The Plan contains an area-specific strategy for this part of Nairobi. For the Core Area, anchored by the Nairobi SGR Terminus, it provides a detailed and implementable action plan to create a new urban sub-centre, which sits within a broader, conceptual development strategy for the Inter-County area.

Dar Al Handasah Consultants (Shair and Partners) were commissioned to provide consultancy services in preparing this Plan. The planning of Nairobi SGR Terminus and Adjoining Areas is part of the wider Nairobi Metropolitan Services Improvement Project (NaMSIP), which is an integral element of the World Bank's Country Partnership Strategy (CPS) 2010-2013.



Figure 1.1: The Standard Gauge Railway defining the Northern Corridor (Source: DAR)

1.2 PLANNING AREA LOCATION

Nairobi is both a city and county, located close to the centre of the southern half of Kenya (see Figure 1.1). It is the capital and most populous city in Kenya. The city county boundary borders the counties of Kiambu to the north and west, Kajiado to the south and Machakos to the east. However, the built-up area of the city extends into some of these counties.

The focal point of the Planning Area is the Nairobi SGR Terminus, located to the south-east of the built-up area of the city, approximately 11 kilometres from the Central Business District (CBD). It is just 4 kilometres south-west of Jomo Kenyatta International Airport (JKIA), Kenya's flagship airport and a hub for East Africa. The SGR Terminus is located close to the boundary of Nairobi National Park, which is 1 kilometre to the south-west. The National Park extends to 117 square kilometres, running along the southern edge of the built-up area of the city.

The SGR Terminus and JKIA currently form an axis which separates the built-up area of Nairobi city to the north-west from Syokimau and Mlolongo, which are in Machakos County, to the south-east.

1.3 PLANNING AREA BOUNDARY

The Planning Area includes the following key urban facilities, and the areas located within a one kilometre radius of these:

- > Nairobi SGR Terminus – marshalling yard and passenger terminal
- > Embakasi Village Commuter Railway Station
- > Syokimau Commuter Railway Station
- > Imara Daima Commuter Railway Station
- > Inland Container Depot (ICD)
- > Proposed Airport City
- > Mlolongo Freight Logistics Area
- > Relevant sections of Highway A8 (previously A104)

Figure 1.2 shows the features described above and the Planning Area boundary. The boundary is largely defined by existing physical and land use features. This is considered optimum as it provides a clear definition of the area covered by the Plan. The north-west and south-west extents follow the Ngong River and the Nairobi National Park boundary, respectively. The south-east extent runs along the edge of the built-up area of Syokimau, then to the east follows the JKIA boundary.

Within the Planning Area, a Core Area is identified around the Nairobi SGR Terminus. The purpose is to define the immediate area of influence should major development take place around the Terminus. Again, the boundary is largely defined by existing physical features. The south-west extent follows the Nairobi National Park boundary, whilst the north-east extent follows Mombasa Road, except for one part which extends further north-east to align with Airport South Road.

The boundary of the Planning Area was confirmed in the project Inception Report (June 2018).

The Planning Area lies in both Nairobi City 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 Planning 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).

Legend:

- Standard Gauge Railway (SGR)
- Nairobi Commuter Railway (NCR)
- Core Area Boundary
- Planning Area Boundary
- Water Courses
- A104 (Mombasa Road)
- Jomo Kenyatta International Airport
- Nairobi National Park
- Marshalling Yard
- ICD
- Airport City
- Syokimau/Molongo Weigh Bridges

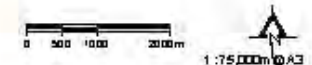


Figure 1.2: Planning Area Location, Boundary and Key Facilities, including Core Area Boundary. (Source: DAR)

1 1.4 STRATEGIC IMPORTANCE OF THE PLAN

1.4.1 ALIGNING WITH KENYA VISION 2030

The Kenya Vision 2030 is the country's long term development blueprint. It aims to transform Kenya into an industrialised middle-income country by the year 2030. The Vision is being implemented through successive five-year medium term plans, the latest of which is the Third Medium Term Plan 2018-2022. The plan has a particular focus on achieving the 'Big Four': 1) Industrialization, Manufacturing and Agro-processing; 2) Affordable Housing; 3) Food and Nutrition Security; and 4) Universal Health Coverage.

One of the major projects conceived and delivered during the Second Medium Term Plan 2013-2017 was Phase I of the Standard Gauge Railway (SGR) from Mombasa to Nairobi, which was completed in May 2017. The next phase is presently being developed. The SGR is a high capacity, high speed railway for passenger and freight transportation, which is bringing about a step-change in the efficiency of transporting people and goods.

The SGR has a wider strategic importance as it is being developed as part of the Northern Corridor (see Figure 1.1). Emanating from Vision 2030, this is a multi-modal 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).

Vision 2030 aspires to Nairobi being an inter-connected capital city through a network of roads, railways, ports, airports, waterways and telecommunications. The SGR traverses the south-east part of the built-up area of Nairobi, where part of it runs in parallel to the Nairobi Commuter Railway (NCR). The NCR network has also been the subject of a study covering the upgrading of the existing metre

gauge line and future extensions, which was seen by Vision 2030 as being a flagship infrastructure project for the nation. 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 interface of these two railway systems creates an interdependence and synergy that will have a considerable impact on the transport system and urban development of metropolitan Nairobi. Added to this is the close proximity of Jomo Kenyatta International Airport (JKIA) and the Inland Container Depot (ICD), providing global connections and freight processing capacity.

1.4.2 IMPLEMENTING NATIONAL SPATIAL PLAN POLICIES

The National Spatial Plan was a flagship project of Vision 2030, to give spatial realisation to proposed physical development activities in Kenya.

The purpose of the National Spatial Plan is to provide a spatial structure that defines how space is utilized to ensure optimal and sustainable use of land and land based resources. As a broad physical planning framework, it provides policies to support economic and sectoral planning and also guide the preparation of regional, county and local physical development plans.

The National Spatial Plan contains policies covering eight thematic areas deemed necessary to achieve the goals identified in the Kenya Vision 2030, as follows:

- > Enhancing national competitiveness;
- > Managing human settlements;
- > Modernising agriculture;
- > Diversifying tourism;
- > Managing human settlements;

- > Integrating the national transportation network;
- > Providing adequate infrastructure; and
- > Strengthening and promoting industrialisation.

The transportation policies hold particular importance to the south-east part of Nairobi, where the SGR, NCR and JKIA are in proximity to one another. The National Spatial Plan promotes integrated land use and transport planning at national, regional and local levels. This Inter-County Plan seeks to realise the land use development opportunities aligned with these transport systems, and provide a strategy that will benefit not only the Planning Area, but the wider Nairobi Metropolitan Region.

1.4.3 DEVELOPING THE NIUPLAN CONCEPTS

Although prepared before the SGR had become a committed project and before the National Spatial Plan, the Nairobi Integrated Urban Master Plan (NIUPLAN) had considered development concepts for the city that seek to significantly enhance the mass public transport network and develop corresponding areas of the city.

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

A cluster of sub-centres are proposed in the south-east part of Nairobi, anchored by JKIA, the NCR, and the now-constructed SGR.

This Inter-County Plan is an important step in developing the NIUPLAN concepts further. It considers an area-specific strategy for the Planning Area, carrying forward the NIUPLAN concepts and building upon them where opportunities exist. For the vital Core Area, anchored by the SGR Nairobi Terminus, it provides a detailed and implementable action plan.

I.5 PURPOSE AND SCOPE OF THE PLAN

The Plan provides a 15-year strategy for the Planning Area which seeks to accommodate identified development opportunities and achieve sustainable growth. The Plan must be monitored continuously and subject to partial or full reviews if considered necessary. As a minimum, the Plan must be fully reviewed after 10 years.

The overriding aim is to provide an action plan to develop the Nairobi SGR Terminus area with a view to providing inter-linkages among the various existing modes of transport. Key objectives are:

- > To envision the positioning and main development goal of the Planning Area;
- > To propose a mobility plan for the area, including alternative roads/circulation plans to support A104 and connectivity improvements;
- > To integrate transport modes for seamless connectivity for both passengers and freight;
- > To determine infrastructure needs for electricity, water, sewerage, solid waste management and storm water drainage and determine requirements of the County and National Government services;
- > To prepare urban plans and urban designs for the Core Area and integrate these with the land use plans for the surrounding areas and the Nairobi Metropolitan Region; and
- > To explore programming and development options for Adjoining Areas, including residential, retail, recreational, and other uses, and support a live and work environment.

I.6 PLAN PREPARATION PROCESS

The Plan preparation process commenced in July 2018. This was over a year before The Physical and Land Use Planning Act 2019 came into force. However, the Plan fulfils the requirements of Clause 30 of the Act, which refers to the scope of an Inter-County Plan, and the process undertaken is in general accordance with what is set-out in Clauses 31 and 32. Copies of the Notice of Intention to Plan and Notice of Completion of the Plan are contained in Appendices 3 and 4, respectively.

The project was set out in three stages covering a total of 34 Tasks, an outline of which is below. The detailed methodology is contained in Appendix 1. A timeline showing key milestones is set-out in Figure 1.3.

Stage 1: Data Collection, Review of Existing and Ongoing Development Plans

- Task 1 - Project Inception Meeting
- Task 2 - Stakeholder Engagement
- Task 3 - Capacity Building Programme
- Task 4 - Data Collection
- Task 4B - Development of Communications Strategy
- Task 5 - Field Reconnaissance and Survey
- Task 6 - Setup of the GIS System and Project Protocols
- Task 7 - Assessment of Existing Conditions and Data
- Task 8 - Stakeholder Engagement: Presentation of Findings
- Task 9 - Inception Report

Stage 2: Broader and Core Areas Development Framework (Conceptual Level)

- Task 10 - Market Analysis and Development Recommendations
- Task 11 - Spatial Development Strategy
- Task 12 - Strategic Environmental Assessment
- Task 13 - Social Impact Assessment
- Task 14 - Land Use
- Task 15 - Resettlement Action Plans
- Task 16 - Concept Landscape Proposals
- Task 17 - Transportation

- Task 18 - Utilities Infrastructure
- Task 19 - Land Acquisition Analysis
- Task 20 - Concept Master Plan Options (Only Core Area)
- Task 21 - Financial Feasibility Analysis and Delivery Structures
- Task 22 - Second Stakeholder Workshop
- Task 23 - Finalised Concept Master Plan and Feasibility Report

Stage 3: Detailed Master Plan and Urban Design for the Core Area

- Task 24 - Detailed Master Plan
- Task 25 - Update of the Financial Pre-Feasibility Study
- Task 26 - Supporting Policies and Guidelines
- Task 27 - Access Strategy for Flight Path Areas
- Task 28 - Identification of Priority Investments
- Task 29 - Detailed Design for Identified Priority Projects
- Task 30 - Implementation Strategy for Priority Projects
- Task 31 - Final Stakeholder Workshop
- Task 32 - Finalise Detailed Master Plan and County Authorities Approval
- Task 33 - Final Report

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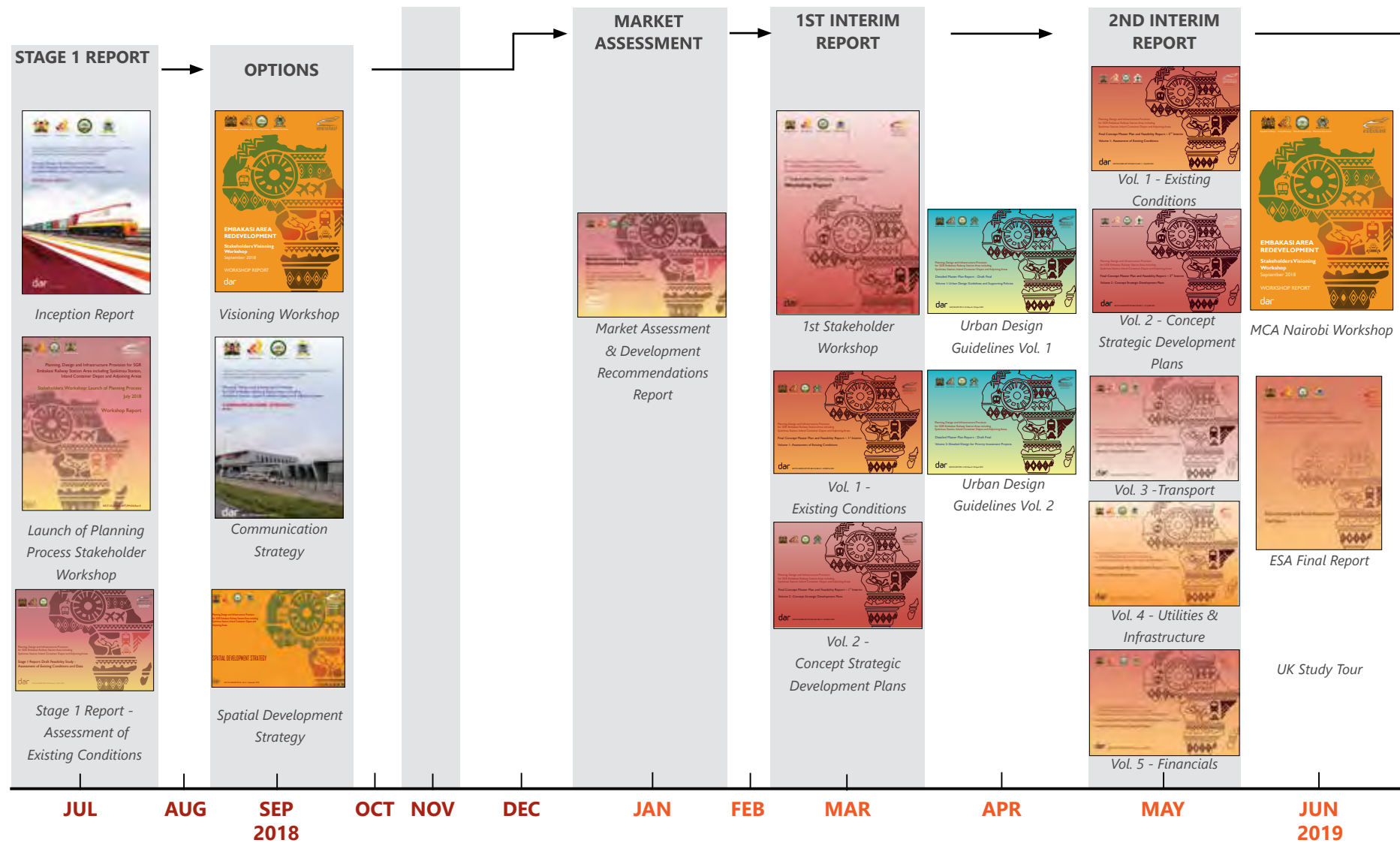
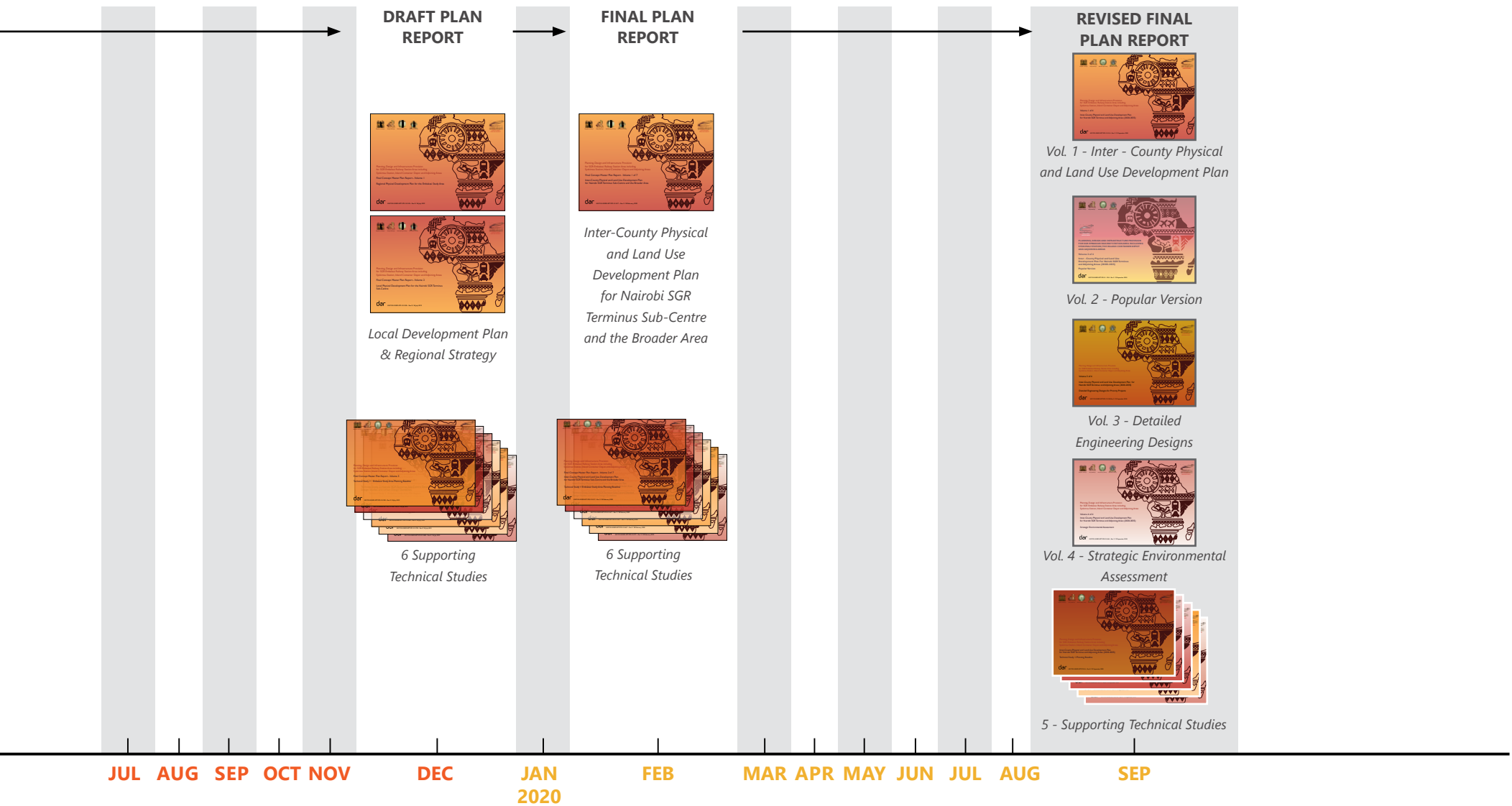


Figure 1.3: Plan Preparation Timeline



1.7 STAKEHOLDER ENGAGEMENT

The preparation of the Plan has been supported by stakeholder engagement. 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 Planning Area.

The planning proposals have been informed by the major stakeholder engagement events undertaken in the project, which include the Launch of the Planning Process, Visioning Workshop, 1st and 2nd Stakeholders Workshops.

Stakeholders engaged included:

Nairobi City County Government
Machakos County Government
Mavoko Constituency
Nairobi City Water and Sewerage Company (NCWSC)
Directorate of Urban and Metropolitan Development
Ministry of Transport, Infrastructure, Housing and Urban Development
National Environmental Management Authority (NEMA)
Kenya National Bureau of Statistics (KNBS)
Kenya Railways
Kenya National Highways Authority (KeNHA)
Kenya Urban Roads Authority (KURA)
Northern Corridor Transit and Transportation Coordination Authority
Kenya Ports Authority

Kenya Civil Aviation Authority
Kenya Airports Authority
Athi Water Services Board
Kenya Wildlife Service (KWS)
Kenya Tourist Board
National Environmental Management Authority (NEMA)
Communications Authority of Kenya (CAK)
Kenya Power and Lighting Company (KPLC)
Kenya Association of Manufacturers (KAM)
Kenya Association of Hotelkeepers and Caterers (KAHC)
Kenya Alliance of Resident Associations
Syokimau Resident Association (SRA)
Imara Daima Estate Association (IDEA)
Nyayo Estate Residents Association

An outline of the stakeholder engagement events undertaken is set-out below. Full details of all engagement activities are contained in Appendix 2.

Launch of the Planning Process

The purpose of the first stakeholder engagement event was to formally launch the planning process. At the event, the site assessment and analysis of existing conditions was presented by the Project Team. Stakeholders from various sectors were invited to provide their feedback and input, and their expectations for what the Plan may achieve.

Visioning Workshop

The second event had the aim of generating a vision for the future of the Core Area. A recap of site conditions, existing plans and strategies covering the area was provided. This was followed by highly interactive multi-sector discussions, where each group formulated its preferred vision.

1st Stakeholders Workshop

Following completion of the 1st Interim Report, a stakeholders workshop was held to explain emerging proposals and how the vision for the Core Area had been interpreted spatially. Stakeholders were invited to provide feedback in both an open forum setting and in thematic groups.

2nd Stakeholders Workshop

Taking account of the feedback received at the previous workshop, the planning proposals were refined and developed, and formed the 2nd Interim Report. A similar stakeholders workshop was held to the previous one, with feedback informing the final Plan.



Figure 1.4: Discussions at the Visioning Workshop



Figure 1.5: Discussions at the Visioning Workshop

1.8 FINAL PLAN DOCUMENTS

The final Plan documents are in four volumes, as follows:

- Volume 1: Inter-County Physical and Land Use Development Plan for Nairobi SGR Terminus and Adjoining Areas (2020-2035);
- Volume 2: Popular Version of the Inter-County Physical and Land Use Development Plan;
- Volume 3: Detailed Engineering Designs for Priority Projects; and
- Volume 4: Strategic Environmental Assessment.

This is Volume 1 and comprises three sections, as follows:

1. Situational Analysis

The first section sets out the planning analysis work that has been undertaken. It provides information pertaining to existing plans and strategies along with existing site conditions and a legal and institutional framework. Also included is a summary of the Market Assessment, detailing the justification and opportunity of specific land uses planned for the Planning Area.

2. Inter-County Planning Proposals

Sets out the overall proposals for the Planning Area (Core Area and Adjoining Areas combined). It includes a spatial development strategy, a summary of the transport strategy and supporting guidance, and land use strategies for the proposed centres. The Proposals include high-level, strategic policies with associated policy guidance. The purpose of these is to guide the future planning of the Planning Area.

3. Action Plan for the Nairobi SGR Terminus Sub-Centre

The Action Plan focuses on the Core Area within the Planning Area, providing the layout, phasing proposals, public facilities provision, transport and utilities studies, and public realm guidance.

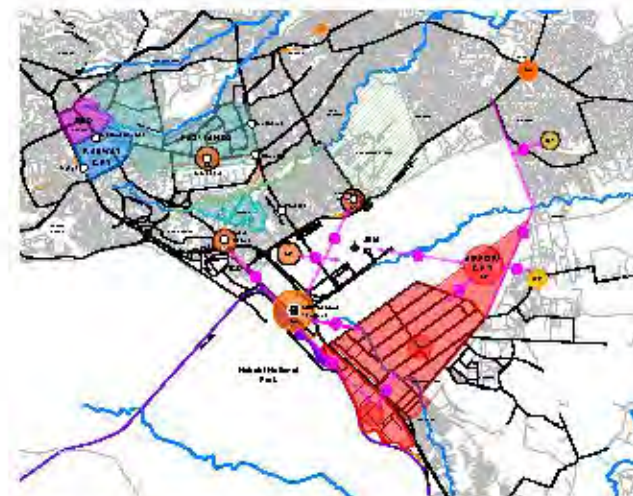


Figure 1.6: Inter-County Spatial Development Strategy



Figure 1.7: Action Plan Proposed Land Use

1.9 THE TECHNICAL STUDIES

The Plan is supported by five technical studies, as shown in Figure 1.8 and described below:

- > Technical Study 1 presents the existing urban and environment conditions, and socio-economic and planning baseline. It includes a review of these existing conditions into a SWOT Analysis which feeds onto the visioning and development options.
- > Technical Study 2 provides information regarding the detailed design within the Action Plan for the Nairobi SGR Terminus Sub-Centre.
- > Technical Study 3 sets out detailed studies and technical background relating to existing transport networks, the likely impact of proposed development (including a traffic simulation model) on those networks.
- > Technical Study 4 presents the Financial Feasibility Analysis undertaken for the Action Plan for the Nairobi SGR Terminus Sub-Centre.
- > Technical Study 5 sets out detailed studies and technical background relating to utilities and infrastructure for the Action Plan for the Nairobi SGR Terminus Sub-Centre.

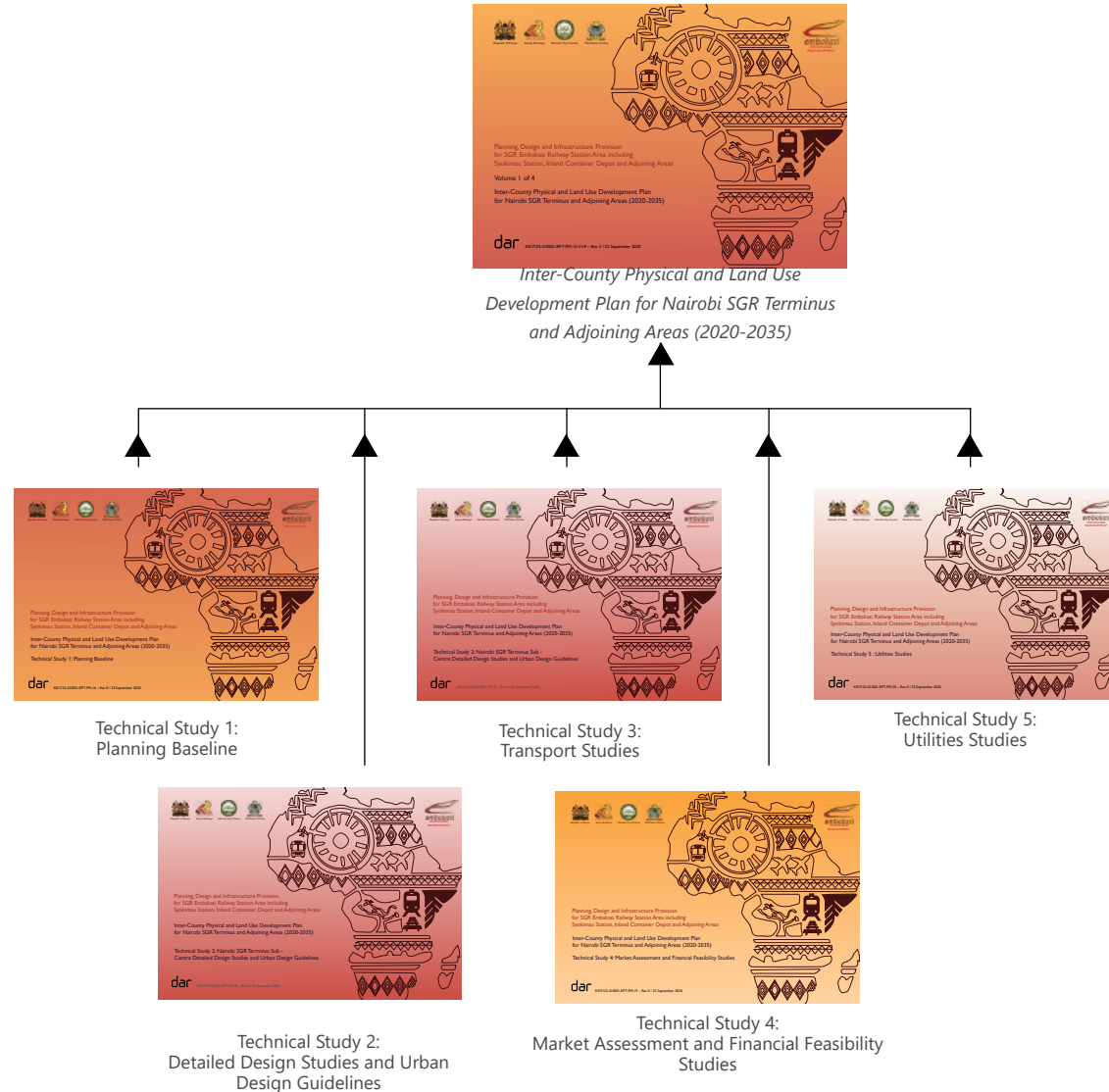


Figure 1.8: Structure of the Plan and supporting Technical Studies

I.10 PLAN APPROVAL PROCESS

Clause 33 of The Physical and Land Use Planning Act 2019 sets out the approval process for an Inter-County Plan. In summary, the steps to be followed for the Inter-County Plan for Nairobi SGR Terminus and Adjoining Areas (2020-2035) are as follows:

- > Submit the Plan to Nairobi City and Machakos County Assemblies for approval.
- > Submit the Plan to the Director-General of Physical and Land Use Planning for certification.
- > Within 30 days of certification, publish a notice in the Gazette and at least two newspapers of national circulation informing the public that the Plan is available for perusal, including the place and time this can take place.
- > Organise a joint-meeting of the Governors of Nairobi City and Machakos Counties to adopt the Plan.
- > Deposit the Plan with the Nairobi City and Machakos County Directors of Physical and Land Use Planning, who shall submit certified copies of the Plan to the Director-General of Physical and Land Use Planning and the National Land Commission.

It should be noted that Nairobi City County Government's Health, Transport, Public Works, and Planning and Development services have recently been transferred to National Government. A new 'Nairobi Metropolitan Services' public office has been created to deliver the transferred services. Therefore, Nairobi Metropolitan Services will perform the plan approval roles allocated to Nairobi City County Government above.

2. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 INTRODUCTION

Technical Study 1 contains an in-depth analysis of all the government plans and studies that have some relevance to the project, Planning Area and surroundings. The planning proposals set-out in subsequent sections of this report have been formulated in the context of these plans and studies.

This section provides an overview of the main plans that cover the Planning Area and have directly affected the planning proposals. Together with this Inter-County Plan, they form the planning framework that will guide planning decisions related to the Planning Area. These plans are:

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

Following this, the legal and institutional frameworks for planning in Kenya are set-out. These discuss the key laws and organisations that have shaped the planning process.

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

Six Metropolitan Regions were identified under Kenya Vision 2030, for which metropolitan and investment plans should be prepared. The SPC is one of those plans covering the Nairobi Metropolitan Region.

In summary, the SPC 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 Planning Area 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.

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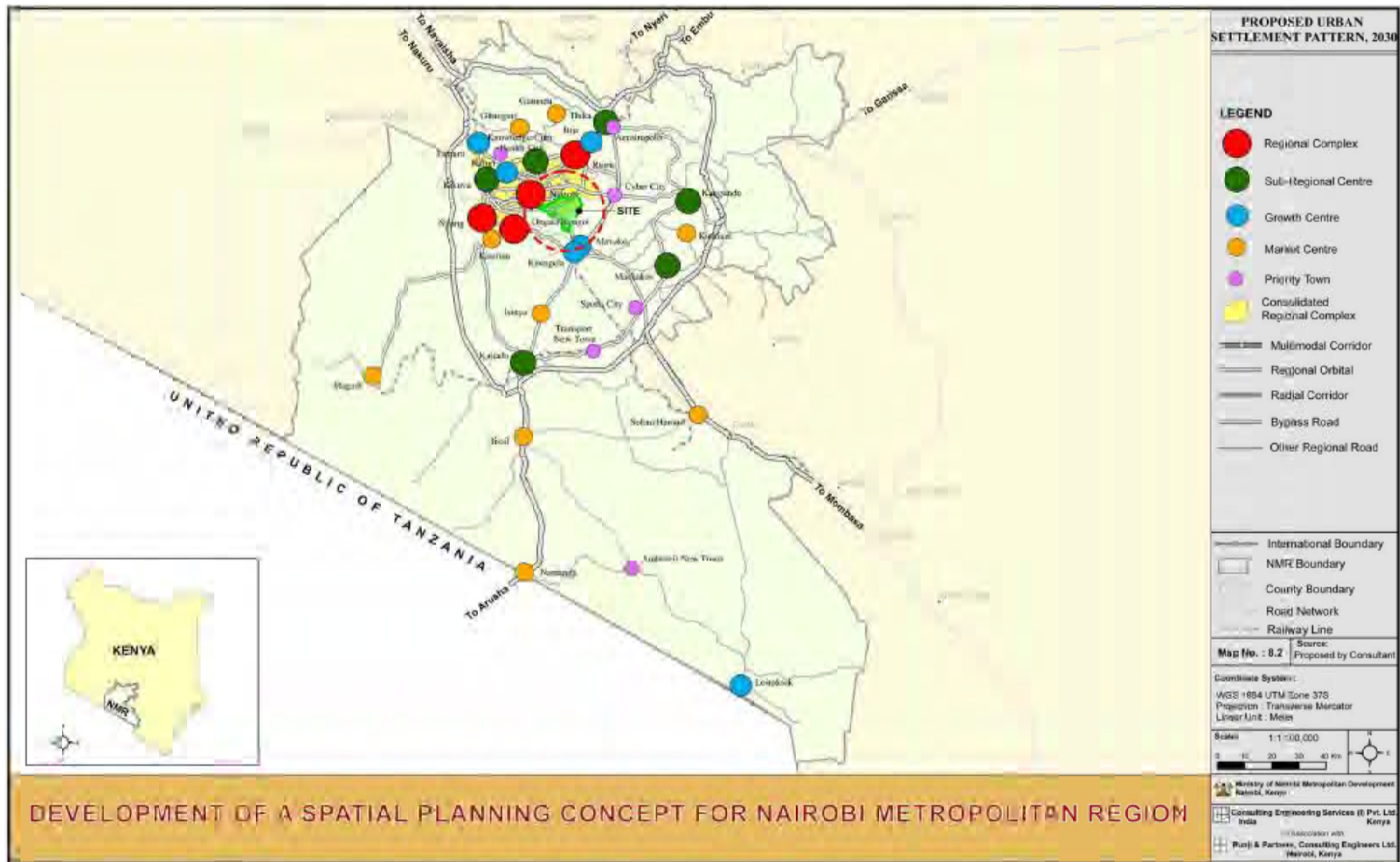


Figure 2.1: Proposed Urban Settlement Pattern for NMR in 2030 (Source: adapted from SPC, 2012)

2.3 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 Planning Area in the light of the completion of the SGR train line and railway station.

Principal Policies from the NIUPLAN Land Use Plan 2030

The Planning 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.

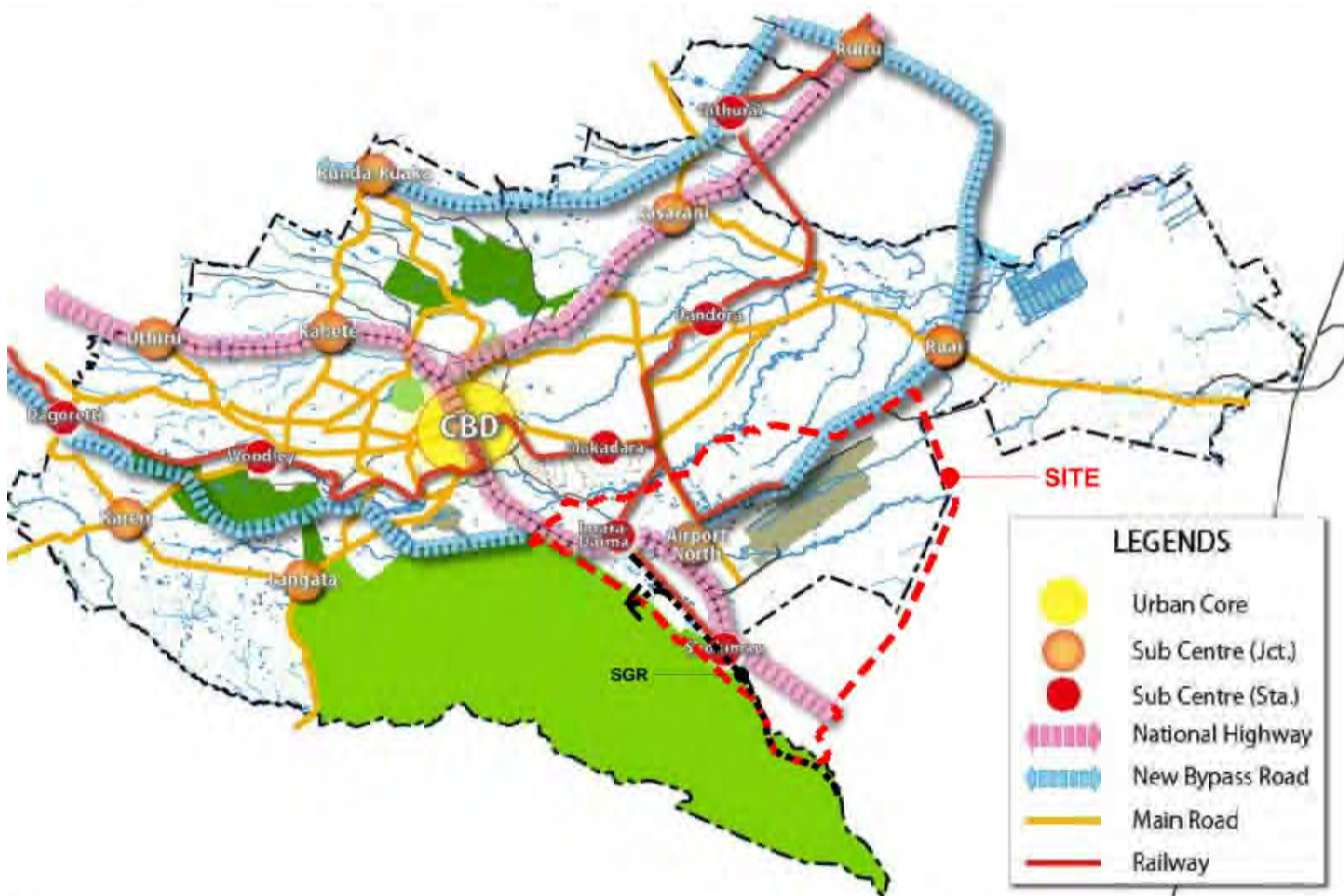


Figure 2.2: Proposed structure plan for Nairobi and SGR with Planning Area Boundary (Source: NIUPLAN, 2014)

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. Throughout the plan, it acknowledges how it is

responding to Vision 2030 objectives and aspirations.

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

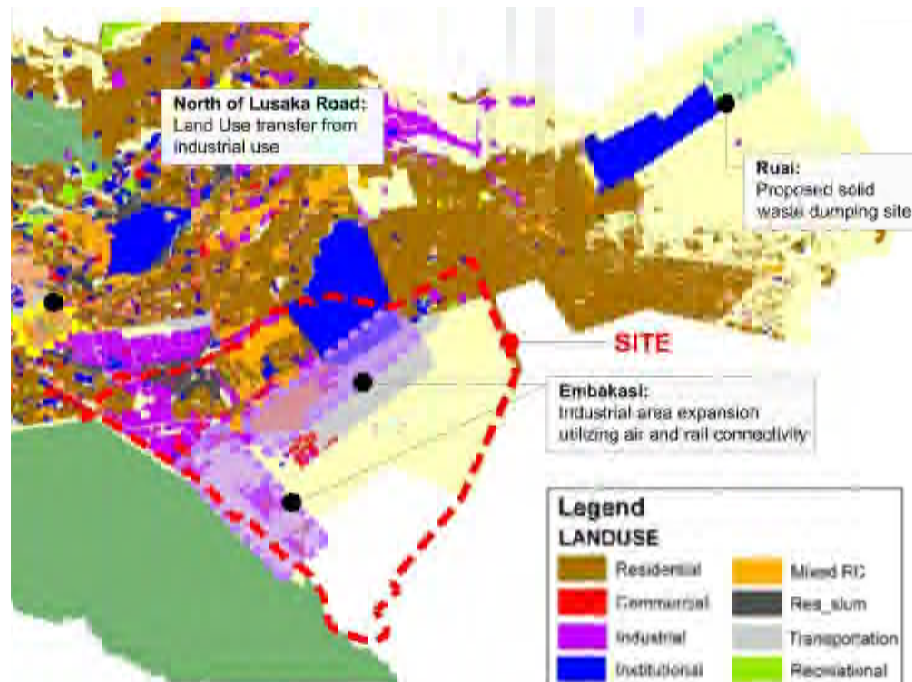


Figure 2.3: Existing land use and industrial restructuring proposal (Source: NIUPLAN, 2014)

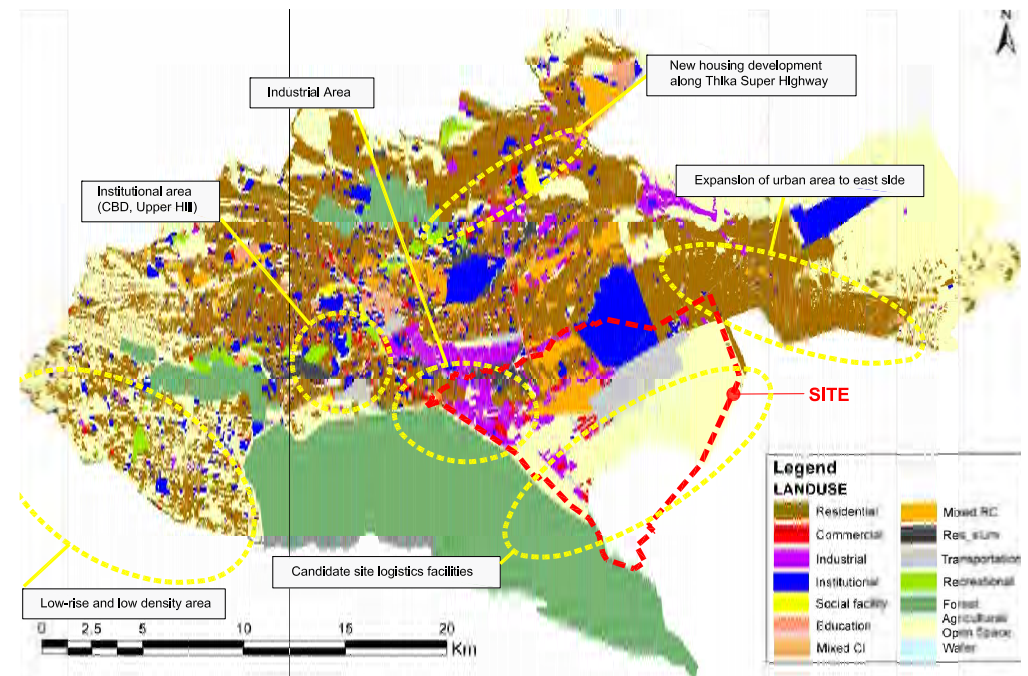


Figure 2.4: Distribution of current land use of Nairobi City and their features (Source: NIUPLAN, 2014)

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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 Planning 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 Technical Study 3.

2.4 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:

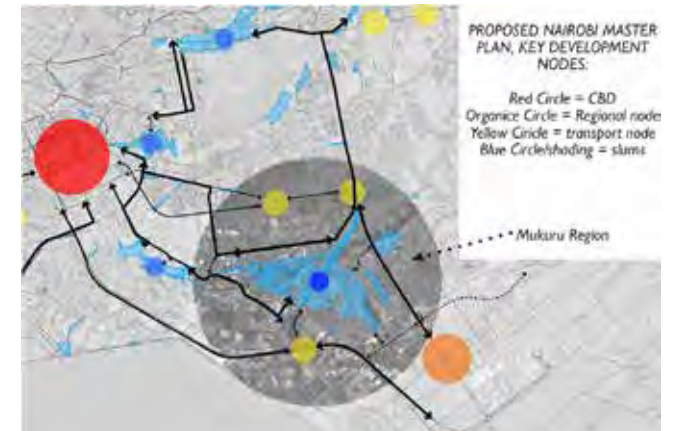
- > Provision of water dispensers/waste management (Immediate);
- > Water and garbage collection require urgent attention (short term);
- > Providing adequate living conditions for residents;
- > Essential community facilities to be within walking distance of residents;
- > Provide adequate utilities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

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 NIUPLAN, 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.



(Source: Mukuru Inclusive City Report, 2014)

Figure 2.5: Proposed strategy to incorporate slums into the surrounding urban areas



Figure 2.6: Proposed Master Plan for Mukuru

Note: No Legend was available for this Figure.

2 2.5 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.

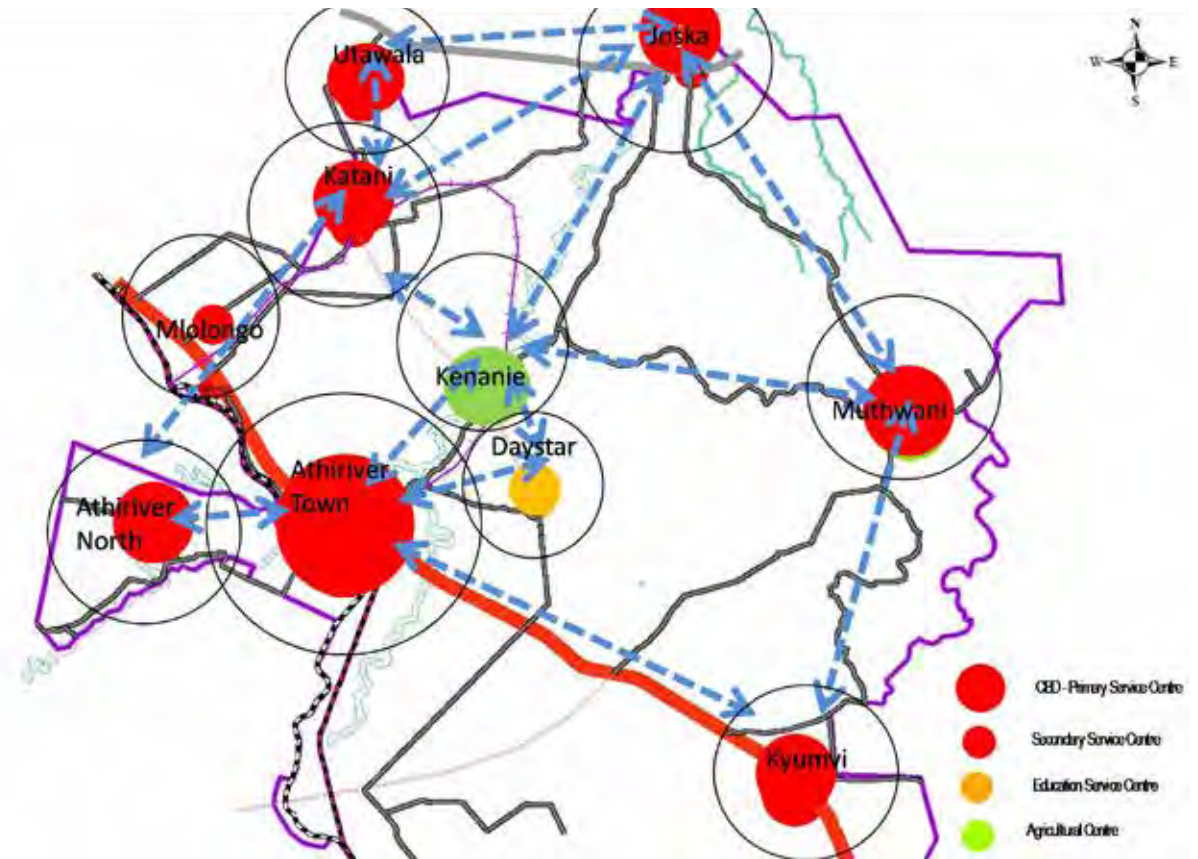


Figure 2.7: Strategic Connections within Mavoko County (Source: ISUDP Working Documents)

- > 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 area 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 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 north-eastern 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 north-eastern 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 north-eastern 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.

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 on 11th October 2018 and analysed. 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

2

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 integrated. 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 2.8. 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 2.8 and Figure 2.9). 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 Kangundo 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 2.9).

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.

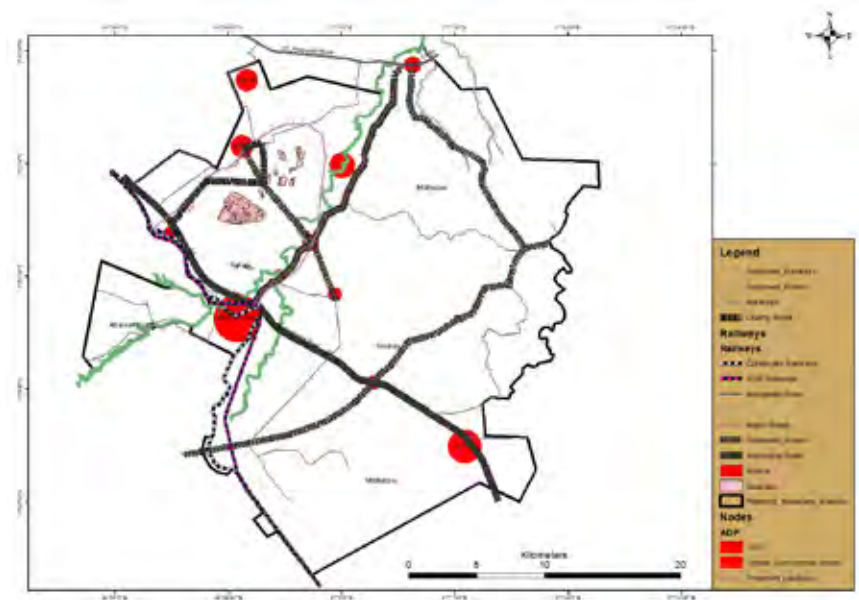


Figure 2.8: Existing and Proposed Roads in Mavoko Area (Source: ISUDP Working Documents)

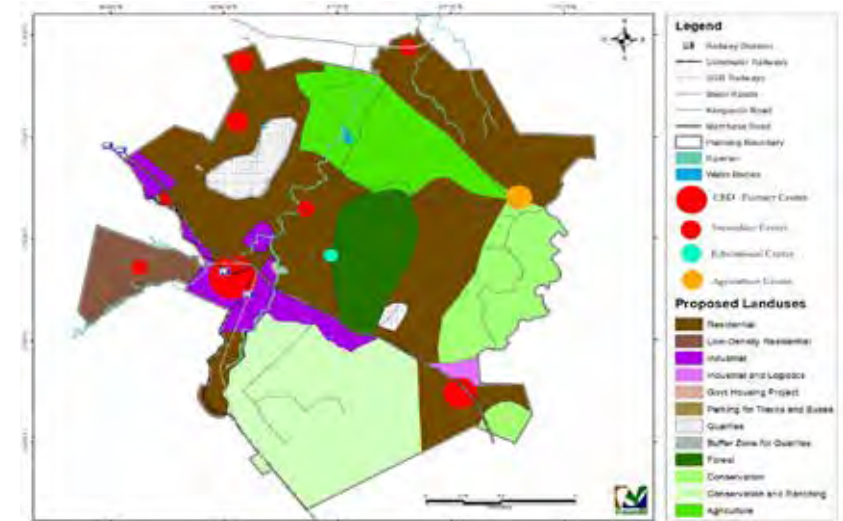


Figure 2.9: TOD Model of Mavoko Planning Area (Source: ISUDP Working Documents)

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.

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 Silicon 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.

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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 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.

2.6 JKIA INDICATIVE MASTER PLAN

The latest master plan for JKIA, although not prepared as part of the National Airports Systems Plan and therefore not being an approved master plan, does represent KAA's latest thinking regarding future development at JKIA.

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 solar farm of 100 hectares 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.

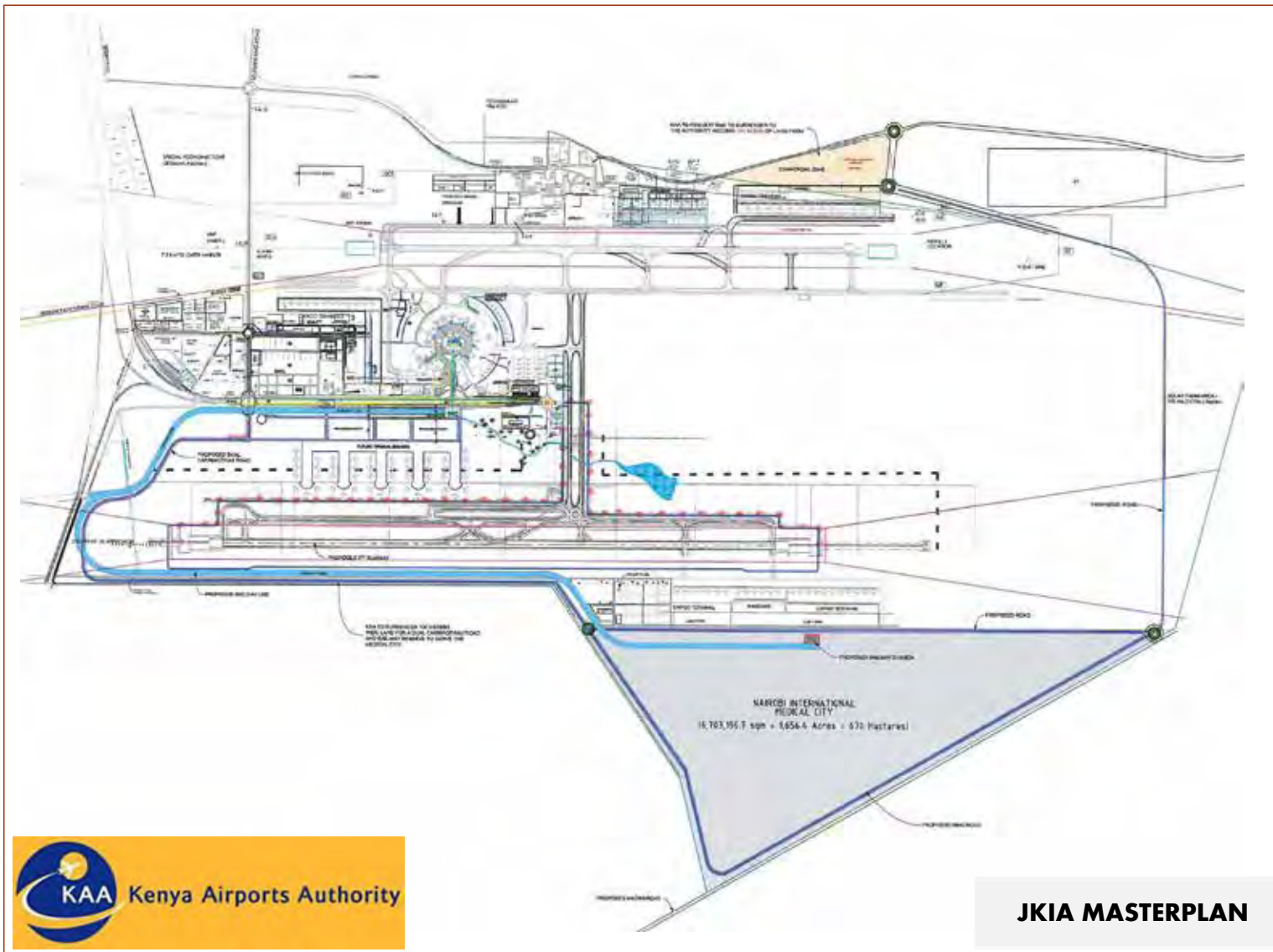


Figure 2.10: JKIA Indicative Master Plan (Source: KAA)

2 2.7 SUMMARY OF THE MAIN PLANNING PROPOSALS

The analysis of the various aspects of the committed plans and studies that are related to the Planning Area are summarised below. Figure 2.11 shows existing land use within the Planning Area alongside proposed land use in the JKIA Indicative Master plan and emerging Mavoko ISUDP, to demonstrate the implications of these plans.

SPC - Refer to Section 2.2

- > 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 Planning 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 Planning Area (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 Planning 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 - Refer to Section 2.3

- > 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 Planning 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 Planning Area;

Mukuru Special Planning Area - Refer to Section 2.4

- > 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 - Refer to Section 2.5

- > 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 Planning 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 Planning Area development.

JKIA Indicative Master Plan - Refer to Section 2.6

- > The JKIA Indicative Master Plan, whilst not an approved master plan, provides a broad overview of development around the airport. This has been factored into the wider strategic plan for Embakasi.

Influence on the Inter-County Plan

Where possible, the Inter-County Plan 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.

Legend:

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Core Area Boundary
- Planning Area Boundary

Existing Land Uses

- Residential (Informal)
- Industrial / Warehouses
- Public Purpose
- Commercial (Offices)
- Public Utility
- Transportation
- Agriculture
- Mixed Use (Residential/Recreation/Rehab)
- Undeveloped Land
- Borrow Pits

Proposed Land Uses (ISUP Master Land)

- Residential (Low / Medium / High Density)
- Industrial / Warehouses
- Education
- Public Purpose
- Commercial (Offices)
- Transportation
- Agriculture
- Mixed Use (Residential/Recreation/Rehab)
- Proposed Centres

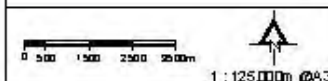


Figure 2.11: Planning Area Existing Land Use and Emerging Movoko ISUP Proposed Land Use [Source: DAR and VisionRI]

2.8 LEGAL FRAMEWORK

This Inter-County Plan 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 constitution under Article 187 allows for transfer of functions and powers between the National and County governments. This is the postulate upon which NCCG transferred some of its functions, including the County Planning and Development function to the National Government. An Executive order No. 1 Of 2020 was released by the President which established the Nairobi Metropolitan

Services (NMS) as the institution to execute the transferred functions.

Pursuant to the constitution, the statutes governing land use have been enacted in the plan.

The Physical and Land Use Planning Act, 2019

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

The Act 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.

The Act under the first schedule has provided guidelines for the contents of an Inter-County Physical and Land Use Development Plan which this plan has incorporated. The Act has also provided the procedure for the approval of this plan, this will be followed in the approval process.

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 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.

The above stated Sections of the Act are of key relevance to this project as they give the County Government authority to prepare such a plan to guide, harmonize and facilitate development within a county. This plan is guided in the functions and roles of the various institutions towards actualization of the proposed developments.

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.

In Pursuant of the Act, the plan recognises the governance of both Nairobi and Machakos Counties in guiding the development process and also guided the public participation process during the preparation of the plan. The plan further provides various land uses and infrastructure to service the population in the area as required by this Act.

Environmental Management and Coordination Act, EMCA 1999

This Act 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 Planning 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.

In pursuant of the Act, the plan has proposed environmental management measures to protect the environment especially during the implementation stage. To ensure sound environmental management, the plan includes an assessment and mitigation measures of the environmental impacts likely to result from actualization of the proposed developments.

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 Planning Area. Guidance on acquisition from the Act has been considered in cases where private land has been proposed for public use within the plan.

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 Commission and 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 land as the main resource. Land within the Planning Area is comprised of both public and private land. The Act provides for management of public land and acquisition of private land where required. Therefore, constant coordination with the National Land Commission is important.

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

2 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.

In pursuant of the Act, the plan proposes guidelines to regulate and manage water resources in the supply of water and sewerage services to the Planning Area.

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 are 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;

The Nairobi National Park is located adjacent to the planning area hence the act is essential in ensuring its management and conservation. Interaction between the planning area and the surrounding park have been guided by the Act including consultations with KWS.

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.

The plan has incorporated the Act in proposing the kind of infrastructure and utilities which will be developed therefore public health and safety will be guaranteed.

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.

2.9 INSTITUTIONAL FRAMEWORK

1. County Governments

> 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.
- > 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 Planning 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

> 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.

> 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.

> Kenya Railways

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.

> 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). Mombasa Road is managed by KeNHA, hence the institution will play a role in the redesigning and incorporating the highway within this Inter-County Plan.

> Ministry of Lands and Physical Planning

This ministry has three directorates under it. The Directorate of Land is charged with the responsibility of ensuring the efficient administration and sustainable management of the land resource in the country. Its mandate is to formulate and implement land policy, undertake physical planning, register land transactions, undertake land surveys and mapping, land adjudication and settlement, land valuation and administration of public and community land.

The Directorate of Physical Planning aims at achieving a balanced regional development over the national geographic space for the benefit and welfare of all. Key activities include: preparation of development plans, feasibility studies into matters concerning physical planning and advising on matters concerning the alienation of land and the most appropriate use of land such as change of user, extension of user, extension of leases, subdivision of land and amalgamation of land.

The Directorate of Housing is charged with the responsibility of facilitating and coordinating the housing sector in Kenya.

Its overall objective is to facilitate Kenyans to access quality housing.

This Inter-County Plan relies heavily on the Ministry of Lands and Physical Planning in every stage of its preparation and implementation. The ministry under its mandate should provide for:

- > Provision of advisory and National Physical Planning services, general principles on land planning in terms of policies, standards and guidelines and technical assistance and capacity building on physical planning matters.
- > Ascertainment of land rights and interests, land consolidation and adjudication and acquisition of land where necessary.
- > As the official government agency for land surveying and mapping, it's responsibilities include production, maintenance and distribution of accurate geographical data in form of various types of both analogue and digital maps in full range of scales which are essential for the preparation of this Inter-County Plan.
- > Administration and management of private land, control and regulation of land use and property in respect of all categories of land and maintenance of land records.
- > Valuation of land and assets for stamp duty, government leasing including foreign missions, asset valuation, rating and development of National Land Value Index within the Planning Area.
- > Registration of land transactions and other legal documents, and determination of land and boundary disputes in collaboration with the Surveys Department.
- > 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.

> 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 Planning Area.

> 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.

> 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.

> 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 Planning Area therefore a major decision-making authority in the project.

> 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.

> 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.

> 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 the Planning Area of the project. Therefore, the agency is highly involved in the planning process for this Inter-County Plan.

> 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.

> 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

> *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 consultation.

> *Neighbourhood Associations*

The planning area is situated in an area that has several adjacent residential neighbourhoods, such as Syokimau, Imara Daima, Utawala and Nyayo high-rise 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.

> *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.

3. EXISTING CONDITIONS

3.1 INTRODUCTION

This chapter provides information pertaining to the existing environmental, social and economic conditions in the Planning Area.

It commences with an contextual analysis of land use in Nairobi, followed by a detailed analysis in the Planning Area. The environmental and physiographic characteristics of the Planning Area are then discussed.

In terms of social and economic conditions, this chapter covers population, employment, communities, social infrastructure and the macroeconomic situation.

Finally, physical infrastructure and transportation are discussed. The chapter concludes with a synthesis of emerging issues, opportunities and challenges facing the Planning Area.

3.2 LAND USE

3.2.1 NAIROBI LAND USE CONTEXT

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

Nairobi's Central Business District (CBD) is located in the Metropolitan Core, 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.

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).

3.2.1.1 Land Use Changes

The NIUPLAN highlighted substantial changes that have taken place and transformed the land use pattern. 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 independence. Recently low-rise detached houses for single families are converting into high-rise apartments or offices; and
- > **River bank to informal settlements:** Informal settlements on river banks are still spreading rapidly.

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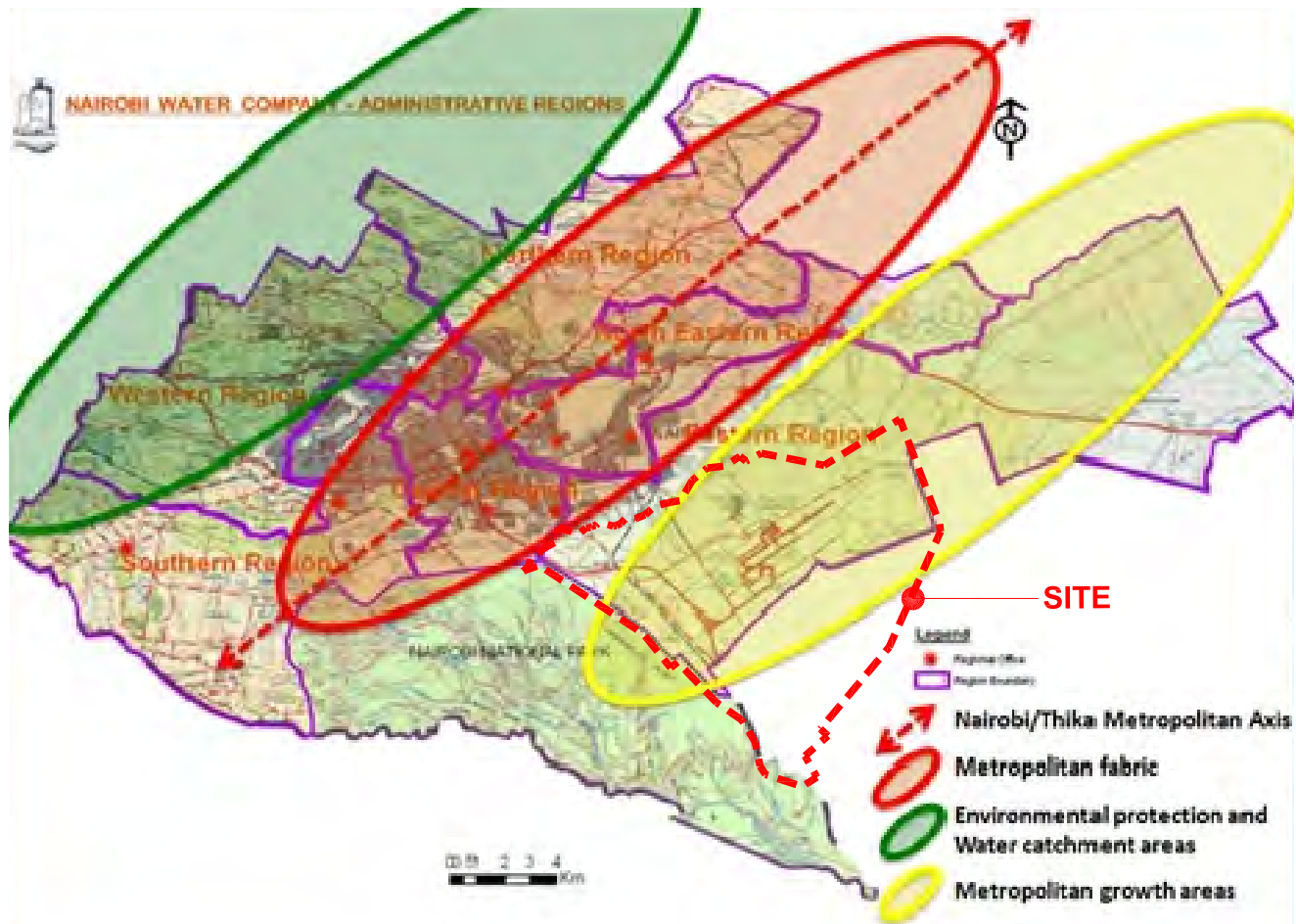


Figure 3.1: Basic Urban Character with Planning Area Boundary (Source: NIUPLAN, 2014)

3.2.2 PLANNING AREA LAND USE

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

- > Recording physical characteristics;
- > Visually verifying existing structures and general land use activities for the Planning Area and in greater detail for the Core Area, based on publicly available satellite imagery;
- > Identifying areas of opportunities and constraints; and
- > Identifying environmentally important features within the Planning Area.

The Land Use distribution within the Planning Area is indicated in Table 3.1, with the subsequent pages providing the overall Land Use Plans as well as detailed assessments of the various land use zones.

The Planning Area 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.

There is currently vacant land towards the centre of the Planning Area, 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. This could 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 NCR ridership.

The Inland Container Depot to the west of the Planning Area, 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.

Table 3.1: Broad Land Use Distribution within the Planning Area

Land Use Type	Areas (ha)	Percentages
0 - Residential (Informal)	1,386.7	13.2%
0 - Residential (Formal)	430.3	4.1%
1 - Industrial / Warehouses	867.6	8.3%
4 - Public Purpose	99.8	1.0%
5 - Commercial (Offices)	254.3	2.4%
6 - Public Utility	581.1	5.5%
7 - Transportation	4,627.1	44.1
8 - Agriculture	55.4	0.5%
9 - Undeveloped Land	1,798.1	17.1%
11 - Mixed-use (Residential / Recreation / Retail)	388.5	3.7%
Total	10,488.8	100.0%

GENERAL EXISTING LAND USE MAP

Legend:

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Core Area Boundary
- Planning Area Boundary

Existing Land Uses

- Residential (informal)
- Residential (formal)
- Industrial/Warehouses
- Public Purpose
- Commercial (Offices)
- Public Utility
- Transportable
- Agriculture
- Mixed Use (Residential/Recreation/Retail)
- Undeveloped Land
- Borrow Pits

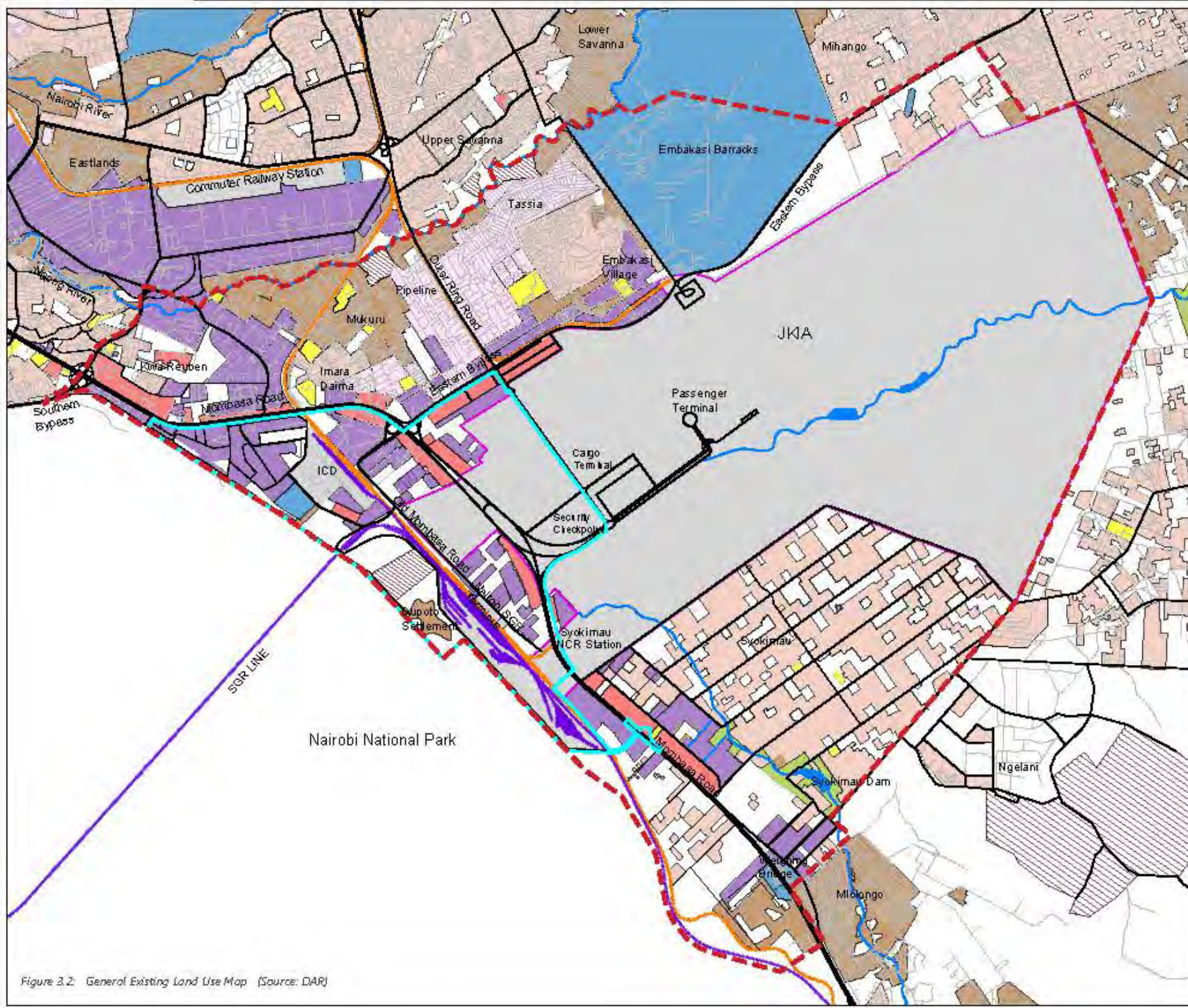


Figure 3.2: General Existing Land Use Map (Source: DAR)

3.2.3 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 Planning 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 NIUPAN 2014 proposals.



Figure 3.3: Location of Mombasa Road North (Source: DAR)

3.2.4 MOMBASA ROAD SOUTH

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



Figure 3.4: Location of Mombasa Road South (Source: DAR)

3.2.5 KENYA RAILWAYS TRANSPORT FACILITIES

The Kenya Railways-owned land within the Planning 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 Kenya Railways land to the ICD and the industrial development existing to the north-west of the Planning Area.



Figure 3.5: Location of Kenya Railways Transport Facilities (Source: DAR)

3.2.6 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 links to JKIA Airport.

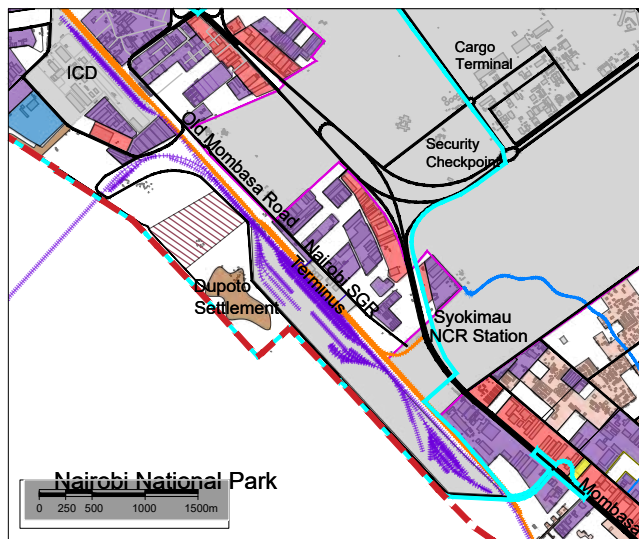


Figure 3.6: Location of SGR Nairobi Terminus (Source: DAR)

3.2.7 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 NIUPAN 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.

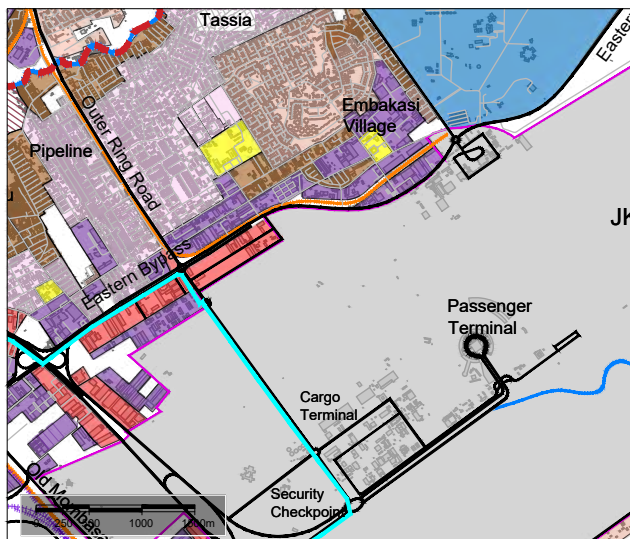


Figure 3.7: Location of Airport North Road (Source: DAR)

3.2.8 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.

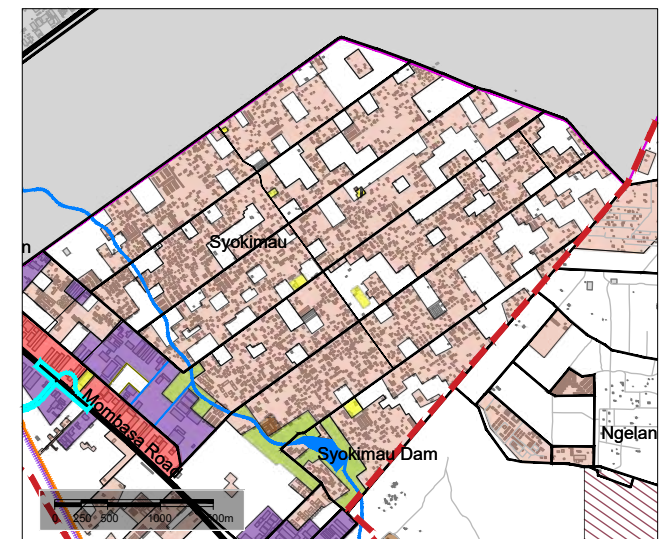


Figure 3.8: Location of Syokimau Residential area (Source: DAR)

3.2.9 EMBAKASI VILLAGE STATION

The Embakasi Village NCR is accessible 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 3.9: Location of Embakasi Village Station (Source: DAR)

3.2.10 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 issues.



Figure 3.10: Location of Mlolongo Industrial Area (Source: DAR)

3.2.11 IMARA DAIMA STATION

NIUPLAN 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. 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 proposes that direct access roads to the station from Mombasa road. It is necessary to renovate and widen the underpass below Mombasa Road for pedestrians.



Figure 3.11: Location of Imara Daima Station (Source: DAR)

3.2.12 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 along the link between the two stations;
- > 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; and
- > The road connectivity of the station to the residential areas north of the Mombasa road is inadequate.



Figure 3.12: Location of Syokimau Station (Source: DAR)

3.2.13 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. This has been covered in greater detail in the transport section.

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. This has also been covered in greater detail in the transport section.



Figure 3.13: Location of JKIA (Source: DAR)

3.2.14 ICD

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) in Embakasi in order 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 3.14: Location of ICD (Source: DAR)

3.3 ENVIRONMENTAL AND PHYSIOGRAPHIC CHARACTERISTICS

3.3.1 TOPOGRAPHY

Slope is a measure of steepness of a surface. It is expressed in percent or horizontal to vertical ratio. In Figure 3.15, the red cells show gentle to mild slope areas and the green cells show flat areas. Hence, the Planning Area is considered predominantly flat with minor variations in slope that rarely exceed 4%, rendering it generally buildable.

Table 3.2: Topography Grades

SLOPE	SLOPE TYPOLOGY	BUILDABLE QUALITY
0 – 4%	Generally flat	Highly buildable
4 – 8%	Gently rolling	Buildable
8 – 16%	Gentle to mild slopes	Moderately Difficult to build
16% and over	Mild to Steep slopes	Difficult to build

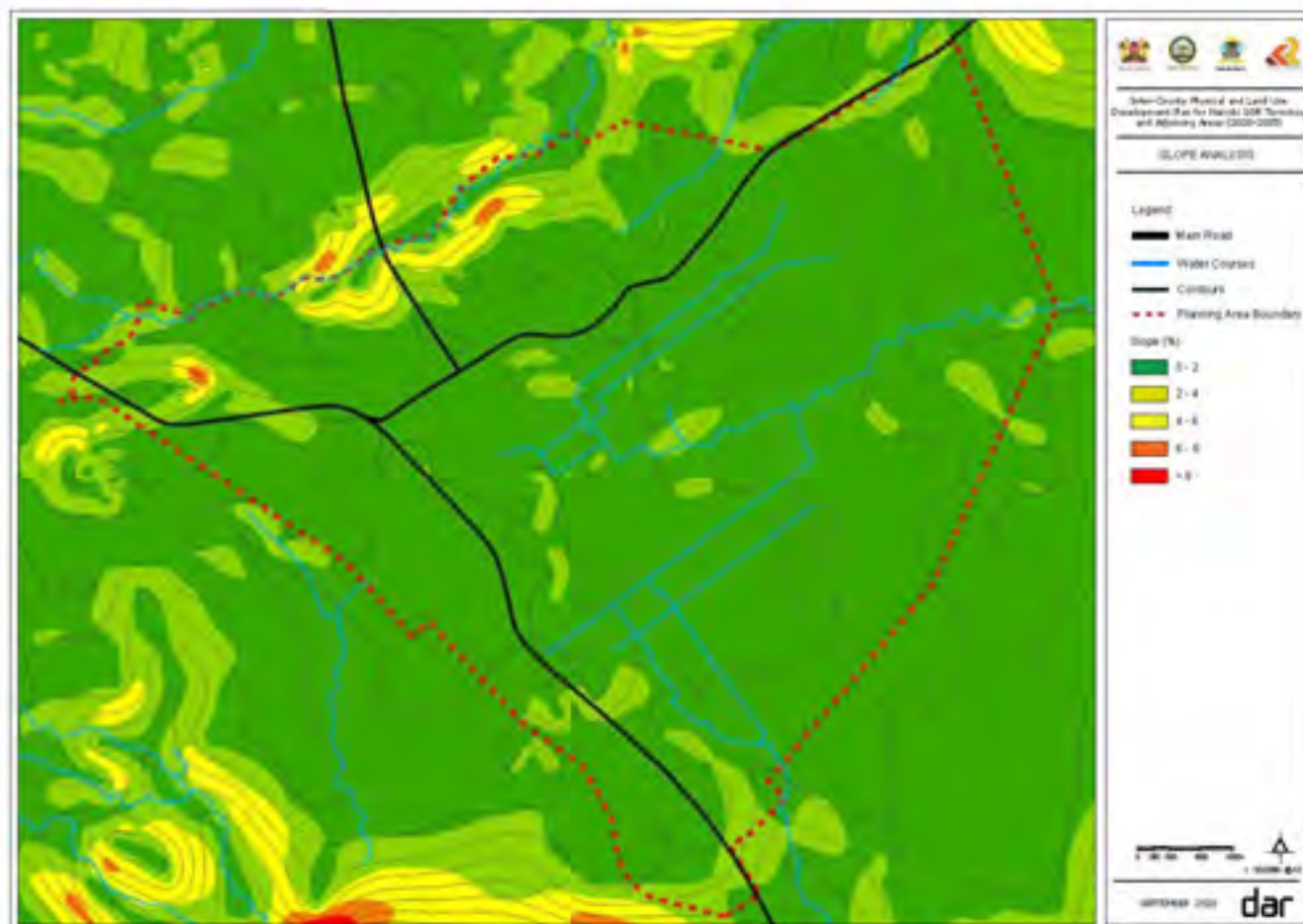


Figure 3.15: Slope Analysis (Source: DAR)

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3.3.2 ELEVATION

The elevation of a geographic location is its altitude above or below a fixed reference point. The reference point used here is earth's Mean Sea Level defined at geodetic datum WGS 84.

Table 3.3: Elevation Analysis

ELEVATION(M)	COVERAGE (M ²)	COVERAGE(%)
1570 – 1580:	3,512,275 m ²	3.4%
1580 – 1590:	6,747,616 m ²	6.5%
1590 – 1600:	8,719,162 m ²	8.4%
1600 – 1610:	25,052,658 m ²	24.1%
1610 – 1620:	26,413,025 m ²	25.4%
1620 – 1630:	19,127,865 m ²	18.4%
1630 – 1640:	10,202,569 m ²	9.8%

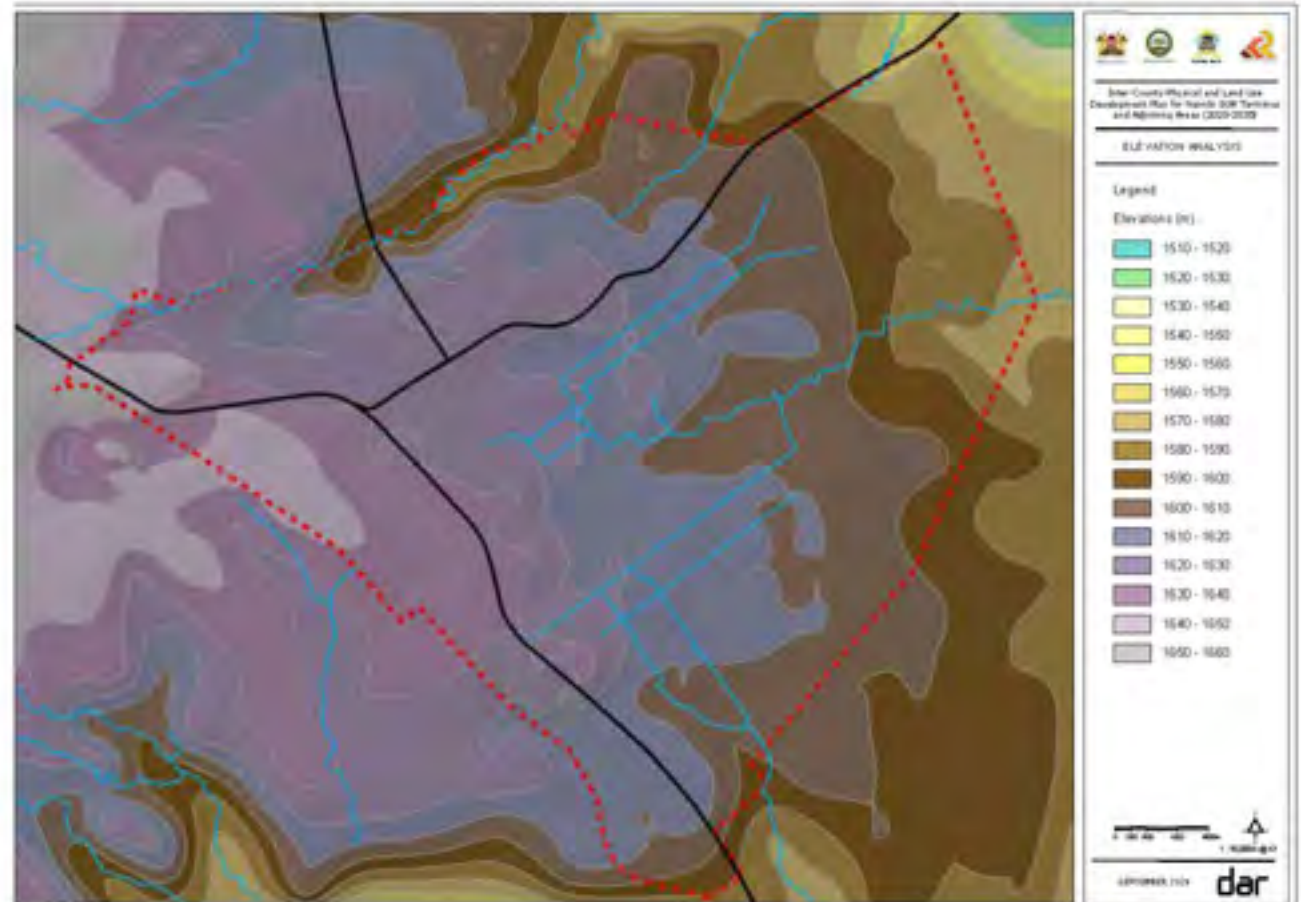


Figure 3.16: Elevation Analysis (Source: DAR)

3.3.5 SOILS

The Planning Area lies within an area of Rhodic Nitisols, as shown in Figure 3.18 (Jones et al., 2013). The World Reference Base for Soils (IUSS Working Group WRB, 2015) describes Nitisols as “deep, well-drained, red tropical soils” which are typically rich in iron, with at least 30% clay and among the most productive of the humid tropics. Nitisols are quite resistant to erosion due to the stable soil structure and have fair water holding properties. They are widely used for food crop production and plantation crops such as coffee and rubber (IUSS Working Group WRB, 2015).



Figure 3.18 Soil Map of Kenya, Ethiopia, Somalia, Tanzania

3.3.6 HYDROLOGY AND HYDROGEOLOGY

3.3.6.1 Surface Water

No primary data is available on the surface water within the Planning Area. Analysis of satellite imagery has identified two watercourses within the Planning Area: a tributary of the Athi River and a tributary of the Nairobi River which both flow east out of the Planning Area.

3.3.6.2 Groundwater

The Nairobi groundwater basin extends from the zone of north-south rift faulting west of the city (with an elevation of about 2,400 m ASL) towards the Athi river floodplain (with an elevation of 1,500 m ASL) east of the city centre (Foster and Tuinhof, 2005). The volcanic activity which has controlled the geomorphologic evolution surrounding Nairobi has resulted in a wide range of porosity and permeability leading to the development of aquifer units separated by lower permeability strata. The aquifers are mainly comprised of the Kericho Valley Series and Upper Athi Series.

Groundwater recharge occurs predominantly in the rift zone, west of Nairobi, where numerous streams related to fault lines and weathered zones of the previous land surfaces form an important source of aquifer recharge. In this area good recharge conditions are present due to the higher rainfall, permeable soils and dense vegetation. Infiltration of wastewater, leakages from water mains and excess rainfall in Greater Nairobi also contribute to aquifer recharge, however it is not known how much reaches the groundwater and how much is intercepted by localised perched aquifers and discharged locally to springs and streams (Foster and Tuinhof, 2005).

The natural groundwater flow is predominantly directed east-south east from the main recharge area in the rift zone towards the Athi floodplain, where most of the groundwater formerly discharged as springs or seepages into local streams and depressions. As a result of the high rates of groundwater

abstraction through the many water wells in Greater Nairobi the majority of the natural flow is intercepted before it can be naturally discharged (Foster and Tuinhof, 2005).

It is reported that the natural groundwater is of good quality and reaches the drinking water standards for most constituents, with the exception of fluoride which often exceeds 1 mg/l (Foster and Tuinhof, 2005; Onyancha, 2012).

3.3.7 CLIMATE

Nairobi has an average altitude of 1,695 m and under the Köppen-Geiger climate classification the Planning Area has a warm temperate climate and sits within Cfb (warm temperate, fully humid, warm summer) and Cwb (warm temperate, winter dry, warm summer) (Kottek et al., 2006). The wider Planning Area encompasses JKIA and therefore the data collected from the weather station at the airport is considered to be representative of Planning Area conditions. Table 3.4 on the next page presents the mean monthly rainfall at JKIA from 1980 to 2017 (KMS, 2018). Nairobi experiences two distinct wet seasons, the heaviest rainfall is during the spring months from March to May and there are shorter rains during November and December.

Table 3.5 on the next page presents the average monthly temperatures for five years from 2012-2016, recorded at JKIA Meteorological Station (National Climatic Data Centre).

Table 3.4: Average Monthly Rainfall Data 1980-2017 at Jomo Kenyatta International Airport (Source: KMS, 2018)

MONTH	MEAN MONTHLY RAINFALL (MM) 1980-2017
January	53
February	41
March	72
April	137
May	109
June	21
July	8
August	15
September	18
October	45
November	117
December	109

Table 3.5: Average Monthly Temperature Data 2012-2016 at Jomo Kenyatta International Airport (Source: National Climatic Data Centre)

MONTH	MEAN MONTHLY TEMPERATURE (°C) 2012-2016
January	20.72
February	21.26
March	21.79
April	20.33
May	19.34
June	18.10
July	17.72
August	18.12
September	19.29
October	20.80
November	19.86
December	19.71

The ecological status of the Planning Area is not known, however analysis of satellite imagery has identified areas of land to the south of JKIA which are undeveloped. Nairobi National Park covers an area of 117 km² and borders the south of Nairobi City, shown in Figure 3.19 relation to the Planning Area.

Nairobi National Park is part of the Athi-Kaputiei Ecosystem, which includes the park at the northernmost extent and the Athi-Kaputiei Plains (AKP) to the south. The National Park is not large enough to support viable populations of large herbivores (Nkedianye et al., 2009; Matiko, 2014). As a result migratory herds of wildebeest and zebra use the National Park during the dry season and move south during the wet season onto open pastoral lands for calving and foraging (Matiko, 2014). The National Park is fenced around the western, northern and eastern boundaries of the Park, with the southern boundary unfenced for 12 miles (Ogutu et al., 2013; Seiff, 2016) allowing the free movement of wildlife between the National Park and the AKP.

The National Park is predominantly open grass plains with scattered Acacia trees. The park supports over 400 species of bird (KWS, 2016) including the White-backed vulture (*Gyps africanus*) and Rüppell's vulture (*Gyps rueppelli*) which are listed as Critically Endangered on the International Union for Conservation of Nature and Natural Resources (IUCN) Red List. Mammals recorded within the National Park as of February 2018 (KWS, 2018) include the Critically Endangered Black Rhinoceros (*Diceros bicornis*), the cheetah (*Acinonyx jubatus*), lion (*Panthera leo*) and leopard (*Panthera pardus*), the three of which are listed as Vulnerable on the IUCN Red List.

The Nairobi National Park is also classified as an Important Bird Area (IBA) due to it being of great importance for range restricted species such as Jackson's Widowbird (*Euplectes jacksoni*) which breeds within the Park (Birdlife International, 2018). The National Park is under very high pressure due to the rapid population growth and development of Nairobi. The

AKP dispersal area south of the Park is also being divided by urban sprawl, subdivision or blocked by fenced land parcels. In addition to the land take pressures, the Park is being affected by pollution of the watercourses which run through it as a result of the illegal dumping of waste, raw sewage discharge and poor waste management practices (Feyers, 2015).



Figure 3.19: Nainital National Park. (Source: DNR)

3.4 POPULATION AND EMPLOYMENT

3.4.1 POPULATION AND DEMOGRAPHICS

The population of Kenya grew from 38.6 million in 2009 (2009 Kenya National Population and Housing Census) to 46.6 million in 2017, registering a compound annual growth rate of 2.4% during the period 2009 to 2017. Population growth slowed down in line with declining fertility rates, which decreased from 4.6 children per woman in 2009 to 3.9 children per women in 2014 (2014 Kenya Demographic and Health Survey).

Additionally, Kenya has witnessed growing urbanisation: The urban-rural split of the population increased from 32%/68% in 2009 to 36%/64% in 2017 in tandem with the country's favourable macroeconomic prospects. Another key driver of this shift towards urbanisation is the increased role played by urban centres as major economic and employment drivers. However, the country's urbanisation is more or less a consequence of a rural push rather than an industry pull: While the share of the urban population increased over the years, the contribution of industry and services of total GDP decreased over time (from 74% in 2009 to around 64% in 2017 as discussed previously).

From a sub-national perspective, population is distributed over 47 counties, and is predominantly concentrated in Nairobi City, which hosted around 10% of Kenya's total population in 2017, being the capital and economic hub of the country. Furthermore, the county experienced rapid population growth outpacing national averages: In 2009, Nairobi City hosted a total population base of 3.1 million, which reached 4.4 million in 2017, as per the County Integrated Spatial Plan. A key determining factor of such growth, which averaged 4.5% per annum, is the rural-urban migration phenomenon as Nairobi City continues to attract a large proportion of job-seekers from other parts of the country. This has resulted in an increased pressure on the capital's infrastructure and resources – including real estate (and, particularly, housing).

Breaking this down further, it is worth noting that Nairobi City is sub-divided into nine constituencies, including Embakasi, the most populous locality in the county: Around 30% of Nairobi's population were hosted in Embakasi in 2009. The locality's population is projected to reach 1.3 million in 2017, based on the data in the Analytical Report on Population Projections, published by Kenya National Bureau of Statistics (KNBS).

The age distribution of the population in Nairobi City and Embakasi in particular reveals a relatively young population, consistent with national trends.

Around 53% of the county's population is under the age of 25. The presence of a large youthful population will typically influence the scale of demand for leisure and retail developments; and, the majority of the population (around 71%) is of working-age. While this puts additional pressure on the creation of new employment opportunities, it provides a valuable asset in terms of the future labour force which will absorb the employment opportunities created by the Project.

Additionally, the country's demographics have been influenced by a variety of economic, cultural and social factors. Lifestyle changes and increasing costs of living have resulted in smaller household sizes. In 2009, the average household size was around 4.4 in Kenya (3.2 in Nairobi City); by 2017, this rate declined to 3.9 in Kenya and 2.9 in Nairobi City. Embakasi was estimated to have a total average household size of 3.12 as per the 2009 Population Census. It is considered that this figure is underestimated as it was reported that Embakasi hosted around 27% of informal settlements in the county as per the 2012 Cross-sectional Slums Survey. Such factors will directly impact the scale and segmentation of demand for housing units.

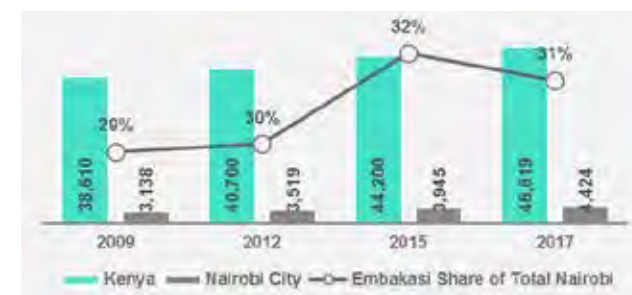


Figure 3.20: Population Trends in Kenya and Nairobi City (in Thousands), 2009-2017 (Source: Kenya National Bureau of Statistics, and Consultant Analysis)

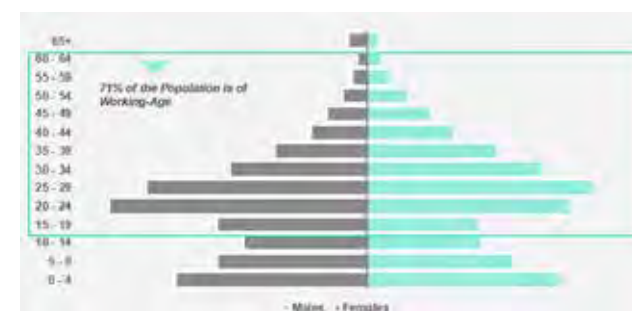


Figure 3.21: Population in Nairobi City by Age Cohorts, 2017 (Source: Kenya National Bureau of Statistics)

Table 3.6: Labour Force Indicator in Kenya, 2009-2017

	2009	2016	2017*	CAGR (2009-2017)
Working-Age Population (in Thousands)	20,684	24,955	25,642	3.1%
Labour Force Participation Rate	76.7%	77.4%	-	-
Labour Force (in Thousands)	15,865	19,315	19,846	2.8%
Inactive Population (in Thousands)	4,819	5,640	5,796	2.7%

(Source: Kenya National Bureau of Statistics, Kenya Integrated Household Budget Survey (KIHBS) Labour Force Basic Report, and Consultant Analysis)

(*) Consultant's Estimations

3.4.2 LABOUR FORCE AND EMPLOYMENT

Kenya's labour force grew more rapidly than the population: The country's workforce grew from 15.8 million people in 2009 to around 19.8 million people in 2017, registering a CAGR of 3.2% over the period 2009 to 2017, in line with the increasing labour force participation rates, as illustrated in the table below.

In 2017, the total unemployment rate in Kenya was estimated at around 7.5%. However, the breakdown of unemployment by age reveals a high unemployment rate among the youth (notably those aged between 20 and 24), which stood at 19% in 2017, compared to 11% in East Africa on average. The high unemployment rate among young Kenyans comes as a consequence of large population changes - namely with the youthful population migrating from rural to urban areas seeking employment opportunities. This stimulated urban job creation; however, it was not sufficient to absorb the growing demand levels.

Despite the prevalence of a high unemployment rate, Kenya experienced increasing employment to population ratios: This ratio was estimated at 72% in 2017, increasing from 69.3% as recorded in the 2009 Population and Housing Census. Accordingly, the employed population grew from 14.3 million in 2009 to 18.4 million in 2017, recording a CAGR of 3.1% over the period 2009 to 2017. Despite the recorded growth, Kenya had lower employment rates in comparison to regional averages. Additionally, the employment-to-population ratio among youth (20-24 years old) was particularly low; it declined from 64% in 2009 to around 57% in 2017. On one hand, this can be related to the high youth unemployment, as previously mentioned; on the other, it can be largely attributed to the high enrolment and retention in primary and secondary education (which stood at 53% in 2017). This reflects the reforms undertaken within the education sector as part of the Vision 2030 goals:

- > The Ministries of Education and Labour have been collaborating to elaborate a skills development policy which aims to ensure the alignment of the skills acquired in education with those required by the marketplace; and;

- > There have been several initiatives to address the high youth unemployment, through the establishment of partnerships with the private sector to focus on industry-relevant curricula and develop innovative business models.

Breaking this down further, it should be noted that such employment growth was fuelled by the expansion witnessed within the informal sector. In fact, it was reported that the informal sector employed more than 83% of total Kenyan workers in 2017. The informal sector employment grew by 2 percentage points above its formal counterpart over the period 2009 to 2017. The majority of jobs created pertain to the informal sector, crowding-out formal jobs: Around 787,000 jobs were created in the informal sector, versus 110,000 jobs in the formal sector in 2017 as illustrated in the graph below.

This suggests that the informal economy is absorbing about 88% of new employment opportunities in Kenya. This observed disparity is indicative of an increasing shortage for low-skilled labour such that these job-seekers resort to the informal sector. This can be potentially explained by the falling share of manufacturing with respect to total output. The dominance of the informal sector more likely reflects the general socio-economic situation with low average incomes, weak domestic demand and low institutional capacity for starting a business, underpinning few opportunities in the formal sector. It is worth noting that the formal sector employment growth was fuelled by the private sector, which constituted more than 70% of total wage employed in the country in 2017.

From a county perspective, Nairobi City registered a slightly higher growth in its employed population, as the number of employees in the county grew from 2.6 million in 2009 to 4.4 million in 2017. Such rapid growth is the result of the urban-rural migration witnessed in the county (mentioned earlier). Similar to national trends, the informal sector dominates the labour market in the county, employing around 85% of the workers in 2017. The number of employees in the informal sector grew by a CAGR of 7.8% over the period 2009 to 2017, versus 3.6% in the formal sector.

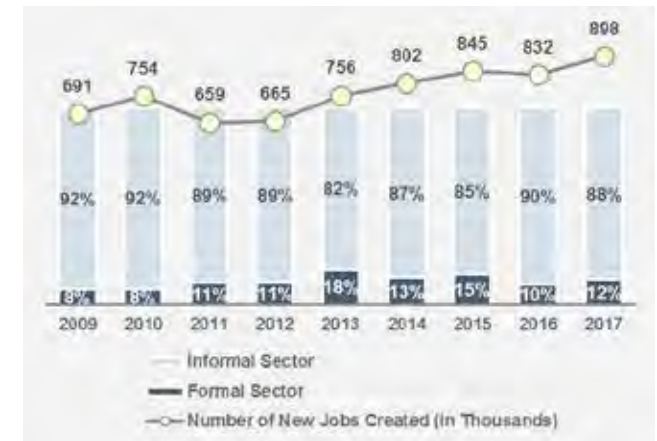


Figure 3.22: Number of New Jobs Created (Thousands) by Informal-Formal Split, 2009-2017 (Source: Kenya National Bureau of Statistics, and Consultant Analysis)

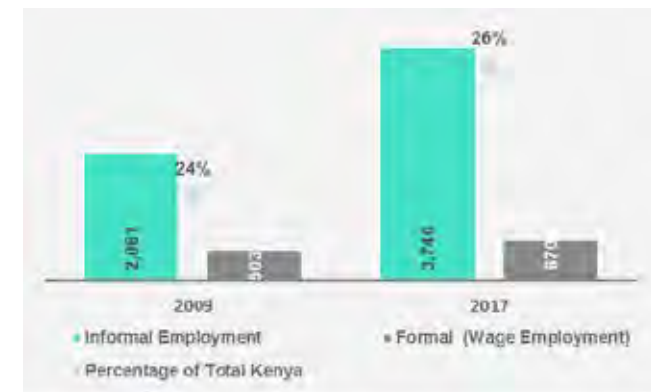


Figure 3.23: Formal and Informal Employment Figures in Nairobi City (in Thousands), 2009-2017 (Source: Kenya National Bureau of Statistics, and Consultant Analysis)

3.4.3 EMPLOYMENT BY ECONOMIC ACTIVITY

The breakdown of employment by economic activity in Kenya should be disaggregated to reflect the formal/informal split of the labour market. Accordingly, the Economic Survey 2018 illustrates the distribution of wage employment (a major constituent of formal sector employment) by industry in 2017. It should be noted that as the wage employment covers 16.5% of total employment in Kenya, the distribution of employment by economic activity will not be fully reflective of the relative size of the various sectors; however, wage employment figures will be used as a proxy to cover for data limitations.

As illustrated in the below graph, wage employment in Kenya was mainly concentrated in five sectors, which accounted for 58% of the sector's total employment in 2017:

- > Education hosted the largest concentration of wage employees with a share of 21% in 2017. This is partly correlated with the Government's increased role in promoting education. Public spending on education and training increased over the years, highlighting the Government's commitment to providing free primary education and improve the personnel's compensations;
- > Agriculture was the second largest employer with a share of 12% of total wage employees in 2017. The sector remains one of the major contributors to employment although the focus has been gradually shifting from agricultural activities towards industrialisation;
- > Manufacturing was the third largest contributor to formal employment in the country, employing 11.4% of total wage employees in 2017. It is worth noting that the share of manufacturing in formal employment marginally declined over the years. This can be attributed to the sector's employment experiencing slower growth rates relative to other service sectors: Employment in manufacturing grew by a CAGR of 1.7% between 2009 and 2017 while sectors including administrative and support service activities and financial and insurance activities recorded an employment growth of 13% and 7% respectively over the period (2009-2017);

- > Public administration and defence accounted for the fourth largest source of employment in Kenya with a total contribution to formal employment of 10% in 2017. The sector accounted for more than 33% of formal public employment in the country in 2017;
- > Wholesale and retail trade was the fifth largest contributor to formal employment in Kenya with a share of 9.4% of wage employment in 2017. The sector's contribution to formal employment was increasing throughout recent years owing to the increased role played by the small and medium scale enterprises (SMEs) as these constitute the largest number of players in the sector.

In Nairobi City, in particular, the latest statistics (2011) on the breakdown of wage employment by aggregate sector indicate that the largest contributors to wage employment were the social and personal services sector, manufacturing and the retail sector (accounting for 70% of total wage employment). This trend was also representative of Kenya during the same time frame, indicating similarities with the national formal employment structure. It is considered that this will persist over time, owing to the county's growing momentum with regards to employment contribution at the national level.

When it comes to the informal sector employment breakdown by industry, county data has not been made available. However, it was estimated that 60% of Kenya's informal employment was concentrated in the wholesale and retail trade sector in 2017, followed by the manufacturing sector (20%) and community, social and personal services sector (9%).

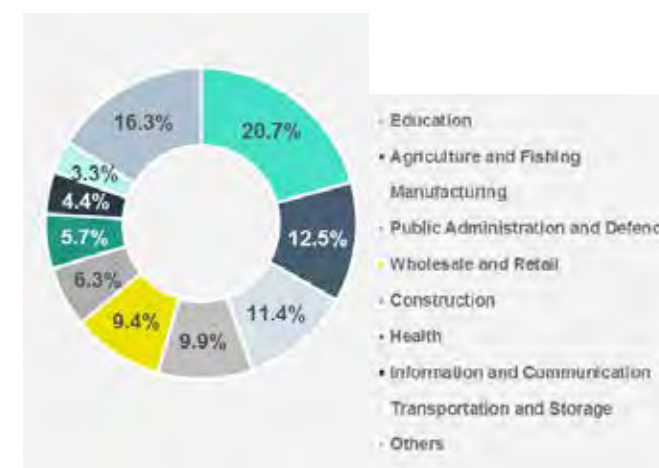


Figure 3.24: Breakdown of Wage Employment by Economic Activity in Kenya, 2017 (Source: Kenya National Bureau of Statistics, and Consultant Analysis)

3.5 COMMUNITIES AND SOCIAL INFRASTRUCTURE

This section provides an analysis of the major residential communities and social infrastructure in the Planning 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.

3.5.1 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 Planning Area 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.

3.5.2 MUKURU

Mukuru is situated towards the North West of the Planning 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.

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. 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. Community based organisations are attempting to reconcile some of the hardships that the residents of Mukuru face. For example, the Reuben Centre has strategies for strengthening the relationship that exists between the Centre and the local community (Reuben Centre, 2018).

3.5.3 PIPELINE

Pipeline is located close to the north-west boundary of the Planning Area, running adjacent to Outer Ring Road. Development is dense and buildings are predominantly mid to high rise. There is extensive commercial activity at ground floor level and spilling onto road sides. It is understood that many residents have chosen to live in Pipeline due to the proximity to employment opportunities in the industrial areas in the north-west part of the Planning Area, those around Embakasi Village, and at JKIA.

3.5.4 EMBAKASI VILLAGE AND TASSIA

Embakasi Village and Tassia are 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. The term Embakasi covers a range of administrative/political scales in the 2009 Census, but it is understood that the residential community around Embakasi Village and Tassia had a population of 65,034.

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.

3.5.5 SYOKIMAU AND MLOLONGO

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 km². Syokimau is the fastest growing residential area and the latest suburb of the 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 Planning Area visit identified Syokimau Police Post and six other community facilities.

Mlolongo is divided into two parts by Mombasa Road. The eastern part is outside the Planning Area. This is a densely developed area including extensive informal development.

The western part is inside the Planning Area. Currently, it is 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.

3.5.6 SOCIAL INFRASTRUCTURE OVERVIEW

Social infrastructure comprises the facilities and services required by people as part of their day-to-day lives. This includes health, education, convenience retail, leisure and culture. Facilities and services across both Machakos and Nairobi counties are run by a mix of government authorities, private companies, faith-based organisations and non-governmental organisations. Information on current provision is provided in the counties' respective Integrated Development

Plans 2018-2022, which are referenced below.

As reported by Vision 2030, Kenya has one of the strongest and most diverse human resources pools in the region and government expenditure, as a percentage of GDP, is high in the Africa context. However, Vision 2030 identified the need to bridge disparities between the country's regions, income levels and sexes, by building schools and providing support for children from vulnerable households. A similar issue was noted regarding university-level education, with the high cost limiting access to a large number of qualified students. This is compounded by a shortage of capacity in existing universities.

Nairobi has 2,924 public and private education facilities at pre-school, primary school, secondary school and vocational levels. There are 12 public and private universities. In Machakos, there are 3,016 public and private education facilities, and 3 public and private universities.

Vision 2030 explains that the process to reform Kenya's system of Government-provided health care has already begun. However, as with education, there are disparities in access to quality health care based on income, gender, regions, and rural versus urban areas.

Health facilities range from large hospitals to local clinics. Currently, Nairobi has 871 facilities, whilst Machakos has 367 facilities.

As noted earlier, leisure and culture opportunities are an element of the social infrastructure required by people to ensure a good quality of life. In Vision 2030, they are closely related to investments in gender and youth development programmes, to further contribute to reducing disparities.

In Nairobi County, there are 10 museums, 40 heritage and cultural sites, 31 large sports facilities and 6 libraries. Machakos County has 1 museum, 7 heritage and cultural sites, 7 large sports facilities and 3 libraries.

RESIDENTIAL NEIGHBOURHOODS IN THE STUDY AREA

Legend:

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Core Area Boundary
- Planning Area Boundary

Existing Land Uses

- Formal Residential
- Informal Residential

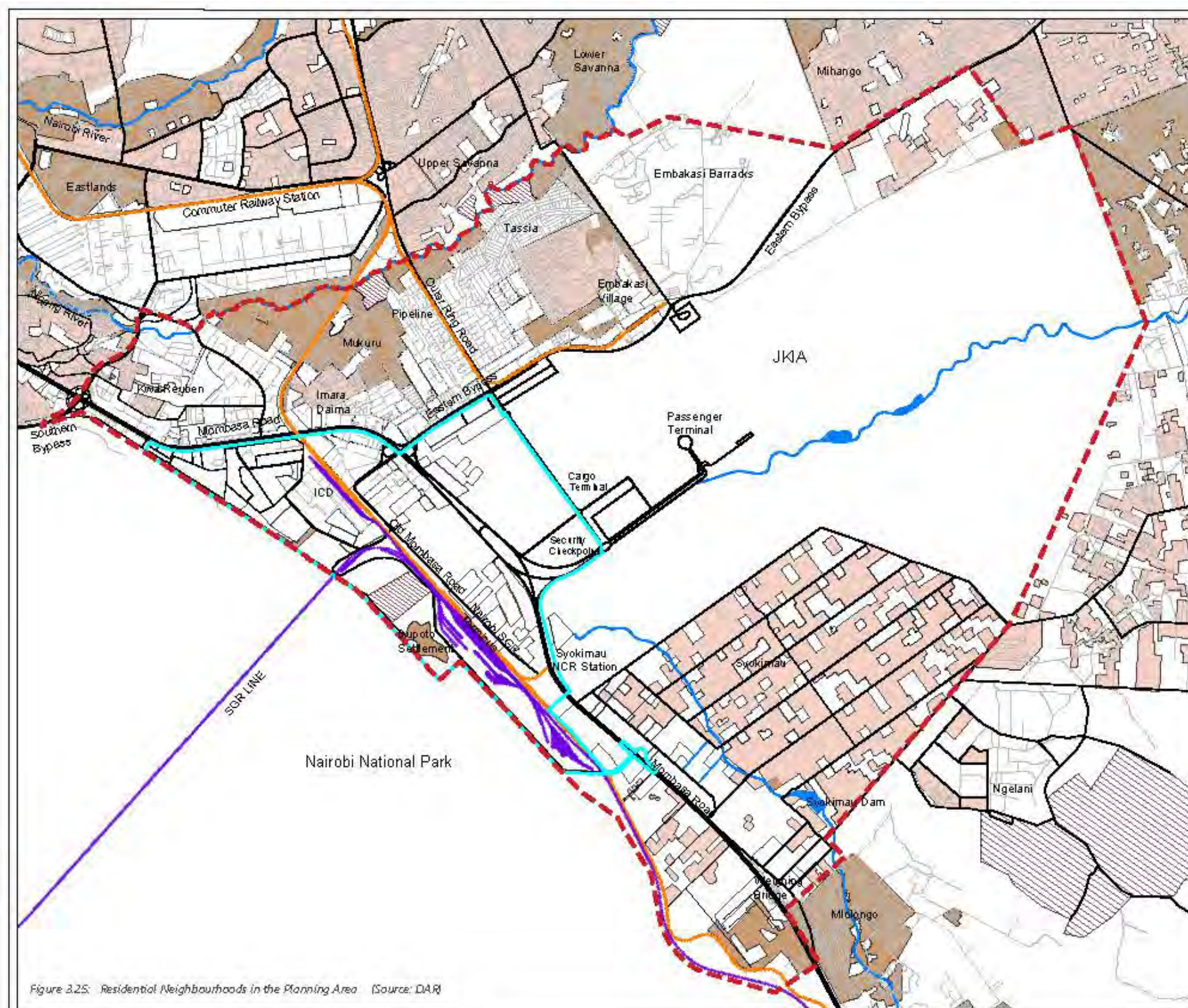


Figure 3.25: Residential Neighbourhoods in the Planning Area (Source: DAR)

3.6 MACROECONOMIC ANALYSIS

3.6.1 GDP AND INFLATION

Kenya is one of Africa's more diversified economies. It is ranked as the largest economy in East Africa and a top 10 economy in the continent in terms of output. The country's resilience to the 2016 downturn in the region highlights the nation's ability to maintain production and sustain growth. According to World Bank figures, while Sub-Saharan Africa's output grew by a modest 1.2% in 2016, Kenya's economy achieved robust growth, 5.9%, marking it as an economic stronghold in the region. Additionally, the Kenyan economy registered steady growth with a CAGR of 5.8% over the period 2009 to 2017. The Kenya Vision 2030 provides encouraging prospects for the country's growth as it aspires to transform the country into a newly-industrialised upper-middle income economy with a competitive global outlook.

Disaggregating output into its constituent sectors, it is apparent that agriculture held the largest share of GDP in 2017 at 31.5%, and grew most rapidly from a contribution of 24.8% in 2010. Manufacturing accounted for the second largest output share of the economy, with 8.4% of GDP in 2017; however, this represents a decline from its 2010 share of 11.3%. The notably large disparity between the top two sectors is expected to diminish as services and manufacturing further increase their presence in the economy. These top two contributing sectors are key sources of exports. This is an opportunity for the Project as the development of a railway station area to potentially facilitate and promote transport of local and regional production to proximate airports and ports at the coast.

Transport and storage was the third largest contributor in 2017, reflecting strong demand for storage and logistics services on the back of growing domestic consumption and trade. Financial intermediation activities grew from a share of 5.6% in 2010 to 7.5% in 2017, demonstrating the growing importance of the service sector.

Kenya's GDP per capita grew at a steady rate with a CAGR of 2.6% over the period 2010 to 2017. IMF figures ranked the country in the top 20 for nominal GDP per capita in all of Africa for 2017. Further, Kenya recorded the third highest nominal GDP per capita in East Africa as of 2017 after Seychelles (1st) and Djibouti (2nd). The stable upward trend in output per person favours growing disposable income and personal consumption. While GDP per capita is below that of the Sub-Saharan Africa average, there is an opportunity for Kenya's economy to expand as more resources are utilised in the variety of economic sectors and as the Kenya Vision 2030 is implemented.

Inflation in Kenya has been relatively high with prices exceeding the conventional "healthy" rate of 2% on a persistent yearly basis. Prices picked up again in 2017, the highest rate of increase since 2013, partially accounted for by a drought that elevated food prices. This is especially relevant as agricultural production is a predominant contributor to economic output and shocks to this sector resonate at a national level. A direct effect of persistent high inflation is the depreciation of the real value of Kenya's exchange rate, which places upward pressure on input costs for firms that depend on imported intermediate goods. Nairobi City, as the economic hub of Kenya, exhibits inflation rates that are highly correlated with that of the nation.

3.6.2 TRADE AND FDI

Kenya's trade balance recorded a persistent and growing deficit over the period 2009 to 2017 reflected by a CAGR of 12.4% during the same period. This is due to the high level of imported products such as petroleum, industrial machinery, road motor vehicles, iron and steel and fats and oils. This reliance on imports is indicative of the economy being unable to satisfy local demand through domestic production. This is primarily due to a shortage of industrial supplies, fuel and lubricants, machinery, and transport equipment hampering the growth of domestic manufacturing. In light of this, the development of railway solutions will serve to reduce logistics costs in the capital city. This fundamental cost improvement

will encourage the expansion of production such that local firms will be better positioned to capture more of the domestic market.

While Kenya is active in the international market, a considerable amount of this presence is in the form of imports. Kenya's trade balance with all regions has historically been negative. The only exceptions have been with Africa where



Figure 3.26: GDP (KSh Trillion) and GDP Growth, 2009-2017 (Source: Kenya National Bureau of Statistics)

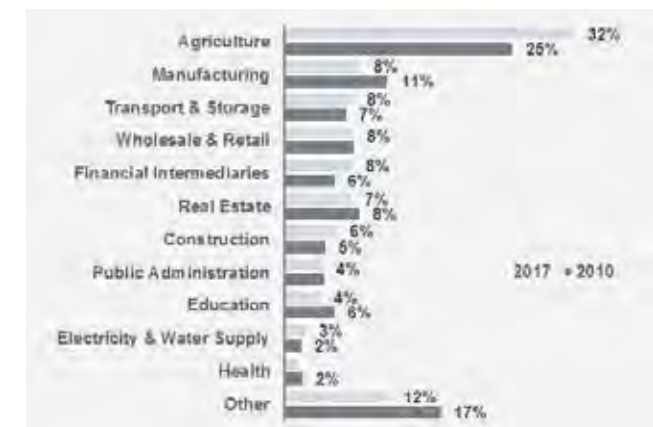


Figure 3.27: GDP by Economic Activity, 2010-2017 (Source: Kenya National Bureau of Statistics)

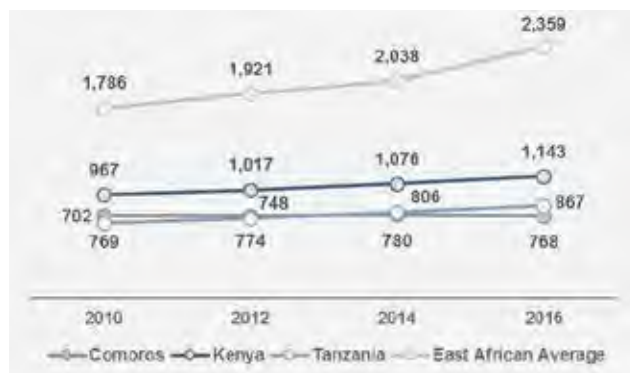


Figure 3.28: GDP per Capita in Selected East African Countries (Constant USD 2010), 2010-2016 (Source: World Development Indicators)



Figure 3.29: Kenya's CPI and Inflation Rates, 2009-2017 (Source: Kenya National Bureau of Statistics)

a modest trade surplus has occurred on an inter-temporal basis which endorses the circumstance that Kenya's import dependence is largely on trade from outside of Africa. Part of the Kenya Vision 2030 aspires to reach globally competitive status, implying an improvement in the country's trade balance. As noted previously, the development of the railway will facilitate accessibility and connectivity allowing local producers to engage more easily in trade. Key sectors that are expected to benefit from this are steels and metals, chemicals and pharmaceuticals, logistics, cement and ceramics.

While there is already a Nairobi-Mombasa railway that was recently upgraded, it has not been particularly successful in moving freight. However, it is expected that the rail connection at Embakasi will exploit its proximity to industrial and logistics zones, as well as JKIA. These synergies are especially plausible given that Embakasi possesses part of Nairobi's industrial area. The possibility for a storage and warehousing area also improves prospects of the railway as it promotes efficiency and convenience for moving freight, especially in bulk quantities.

Kenya's exports are largely dependent on food and beverages, and industrial supplies. These two categories comprised the largest share of exports, accounting for roughly 70% in both 2009 and 2017. The structure of trade was relatively stable between these two years. Therefore, it has been these sectors that have kept the trade balance from falling even further into deficit. Moreover, these exported goods are dependent on transportation and incur logistics costs. The introduction and enhancement of a railway connection provides an opportunity to promote cost efficiencies and facilitate the transport of products.

Shifting the focus to imports, Kenya's largest source of demand for international production lies in industrial supplies, fuel and lubricants, and machinery. This pattern did not exhibit dynamic behaviour over the period 2009 to 2017. While industrial products have experienced high levels of export, they have been imported at higher relative volumes and values. Nonetheless, this implies the upside is the presence of inter-industrial trade. This is a typical outcome of industrial supplies as they tend to be highly differentiated, necessitating

the demand for goods from abroad. It also reflects high importation of the intermediate and capital goods required to manufacture basic consumer goods.

Foreign Direct Investment (FDI) in Kenya experienced sizable variation from 2009 to 2016. Net FDI peaked in 2011 reaching 3.46% and then experienced a steady decline to only 0.56% of GDP in 2016. However, FDI inflows experienced a sizable increase in 2017 owing to strong domestic demand and inflows directed towards the ICT sector. Interestingly, this pattern is similar to that of the manufacturing share of GDP. While this is not to say that FDI is concentrated in the manufacturing sector, there does exist a degree of correlation that provides evidence that the manufacturing sector is a target for foreign investment. According to calculations, the correlation coefficient between the two series is a substantially positive value of roughly 0.63, indicating relatively strong positive co-movements between the two. Assuming that this linear association is expected to continue in the future, the Vision 2030's goal to promote industrialisation coupled with the facilitation of transport through rail are expected to improve the prospects for foreign investment in this sector, and potentially others. Transport may increase economies of scale and lower cost of access to domestic consumer and intermediate goods producers. This enables FDI in larger manufacturing plants.

In terms of providers of FDI inflows, the most active countries over the period 2009 to 2012 were European economies and China. FDI inflows into Kenya were driven by infrastructure, manufacturing, communications and information technology, and transport and logistics. While divestment in the Kenyan economy occurred from abroad, plans to industrially expand and reach global competitive standards provide encouraging prospects for future international investment. A railway station in the capital city that grants a productive boost to these sectors will enhance their attractiveness to international investors.



Figure 3.30: Kenya's International Trade Profile (KSh Billion), 2009-2017 (Source: Kenya National Bureau of Statistics)

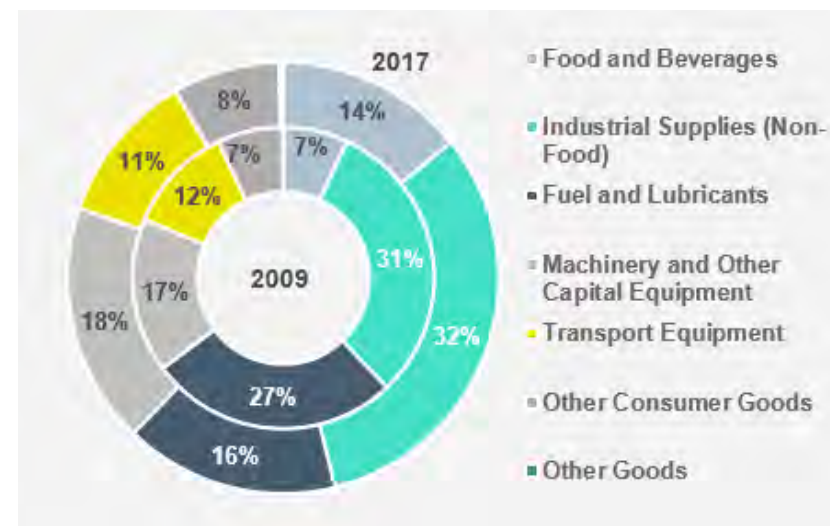


Figure 3.32: Breakdown of Exports by Category, 2009-2017 (Source: Kenya National Bureau of Statistics)



Figure 3.31: Kenya's Bilateral Trade Balances (KSh Billion), 2009-2017 (Source: Kenya National Bureau of Statistics)

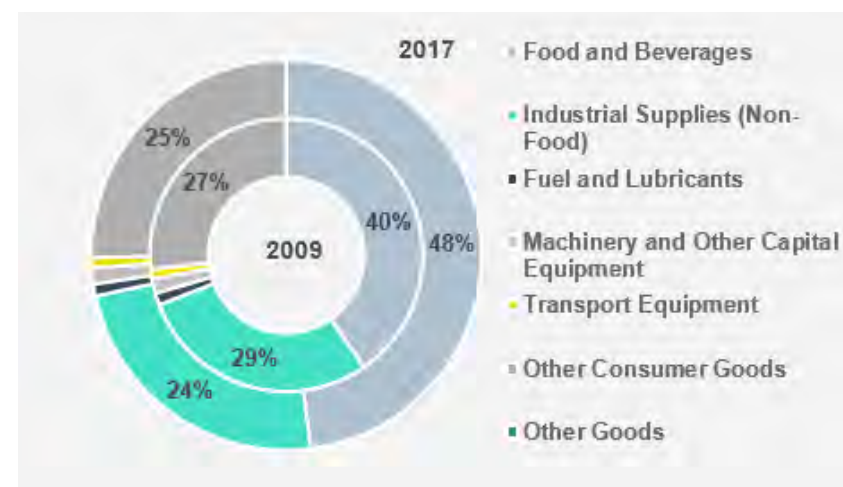


Figure 3.33: Breakdown of Imports by Category, 2009-2017 (Source: Kenya National Bureau of Statistics)

3

3.6.3 BUSINESS ENVIRONMENT

Based on the Ease of Doing Business Index (Table 3.7), Kenya holds the 80th position in the global rankings in 2018. However, with respect to Sub-Saharan Africa, Kenya occupies a competitive position with the 3rd spot. The country has improved in virtually all categories of the index with key reforms made in 2018 including the following:

- > Starting a business: Kenya eased the process to start a business by merging procedures required to start-up;
- > Dealing with construction permits: Construction permits were made less expensive by eliminating clearance charges from the National Environment Management Authority (NEMA) and the National Construction Authority (NCA);
- > Electricity connections: Investment in distribution lines and transformers by setting up a specialised squad to restore power during outages bolstered infrastructure of electricity;
- > Accessing credit: Access to credit information by distribution of data from two utility companies improved transparency;
- > Paying taxes: Tax payments became automated using online platforms for filing and paying taxes; and,
- > Trading across borders: Time for import documentary compliance was reduced by utilising a single-window system, which allows for electronic submission of custom entries.

Out of 11 provinces, in the country, Nairobi has particular advantages in registering property, making it the easiest locality to do so. Starting a business and enforcing contracts are relatively competitive with the Kenya 2030 plan expected to increase the attractiveness for business to be done in the capital city as the industrial base is expanded.

In terms of global competitiveness, Kenya ranks 91st globally according to the World Economic Forum for 2017/2018 (Figure 3.34). Key advantages, however, lie in Kenya's labour market efficiency, in which the market retains a strong degree

of flexibility (33rd) and ability to efficiently use talent (30th). Additionally, Kenyan innovation ranks 37th in the world. One reason for this, is that the Kenyan Government retains the ability to effectively procure advanced technology products (21st), and the relatively high degree of university-industry collaboration in R&D (32nd). The infrastructure indicator includes transportation, which is currently ranked at 62nd globally. This points to capacity to develop transportation in Kenya, suggesting that the implementation of a railway area is key to satisfy this deficiency.



Figure 3.34: Global Competitiveness Index 2017) (Source: World Economic Forum, and Consultant Analysis)

Table 3.7: Ease of Doing Business in Kenya, (Source: World Bank, and Consultant Analysis)

	Global Ranking	Sub-Saharan Africa Ranking	Nairobi (National Ranking)
Overall Rank	80	3	-
Starting a Business	117	18	5
Dealing with Construction Permits	124	19	11
Getting Electricity	71	3	-
Registering Property	125	21	1
Getting Credit	29	5	-
Protecting Minority Investors	62	5	-
Paying Taxes	92	14	-
Trading Across Borders	106	9	-
Enforcing Contracts	90	10	6
Resolving Insolvency	95	12	-

3.7 PHYSICAL INFRASTRUCTURE

3.7.1 POTABLE WATER

Water Supply Networks

The existing water supply networks are located in the northwest of Planning Area. The remaining land has little or no water distribution network as seen in Figure 3.36. Given this situation, water supply networks proposed to support the new developments will need to be integrated with the existing network. Where possible the existing network should be maintained, improved, and extended to service the entirety of the Planning Area. If deemed necessary by the design requirement, some existing infrastructure could be removed and rebuilt.

Potable Water Sources

The nearest water source available for supply to the Planning Area is Kiambu Reservoir (Capacity 59,000 m³), Kasarani Reservoir (Capacity 11,000 m³), Karura Reservoir (Capacity 9,000 m³), Ring road water supply tower (Capacity 450 m³) and Wilson Reservoir.

3.7.2 SEWAGE NETWORK

The northwest part of Planning Area has an existing sewage network, while the remaining part has fewer or no sewer network (Figure 3.37).

Sewage Collection Network

No data is available on wastewater and sewage generation within the Planning Area.

Existing Sewage Treatment Plant

There are 24 existing sewage treatment plants in Nairobi. Among them major STPS are Dandora STP (120,000 m³/day) and Kariobangi STP (32,000 m³/day). Dandora STP is the nearest to the Planning Area and also waste water from major part of the Planning Area can be conveyed by gravity towards Dandora STP.

3.7.3 STORM DRAINAGE NETWORKS

Rainfall data for the Planning Area is shown in Figure 3.35. The areas closest to the airport are at the highest elevation. The catchment area and drainage pattern of streams is shown in Figure 3.38 (Source: SRTM). From the drainage pattern, it is clear that the entire Planning Area drains into three different water sources: Ngong River, Nairobi River and Athi River. Accordingly a storm drainage network shall be proposed and developed in co-ordination with already existing networks.

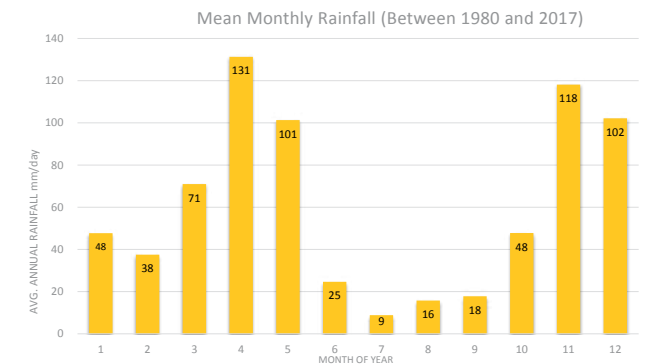
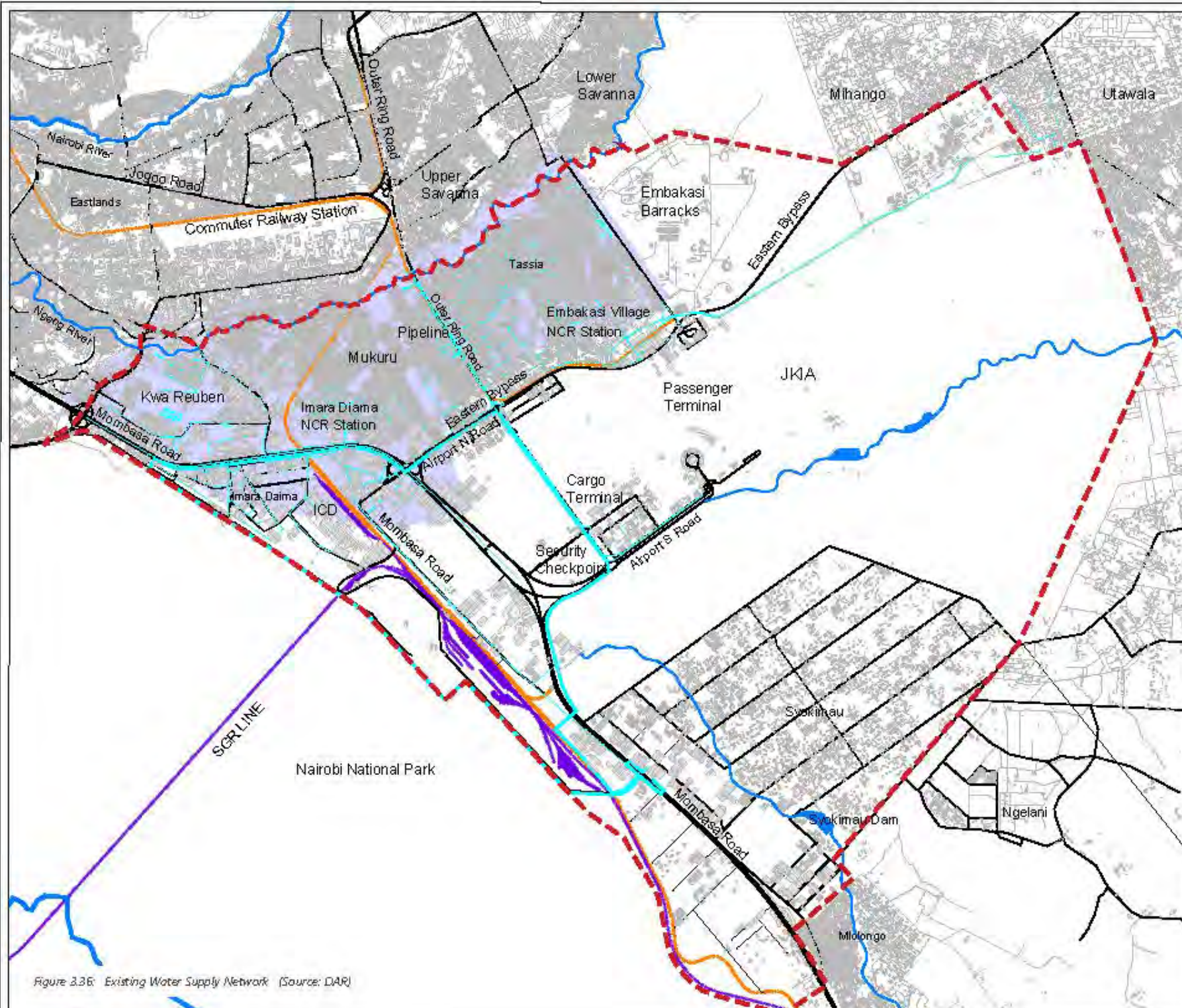


Figure 3.35: Rainfall data from J.K.I.A Meteorological Station from Year 1980 to 2017 Station

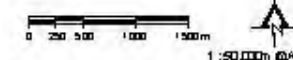


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EXISTING WATER SUPPLY NETWORK

LEGEND:

- Main Road
- Secondary Road
- Standard Gauge Railway (SGR)
- Nairobi Commuter Railway (NCR)
- Core Area Boundary
- - - Planning Area Boundary
- Water Courses
- Existing Water Supply Network



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Figure 3.36: Existing Water Supply Network (Source: DAR)

EXISTING SEWAGE NETWORK

Legend:

- Main Road
- Secondary Road
- Core Area Boundary
- Planning Area Boundary
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Existing Water Supply Network

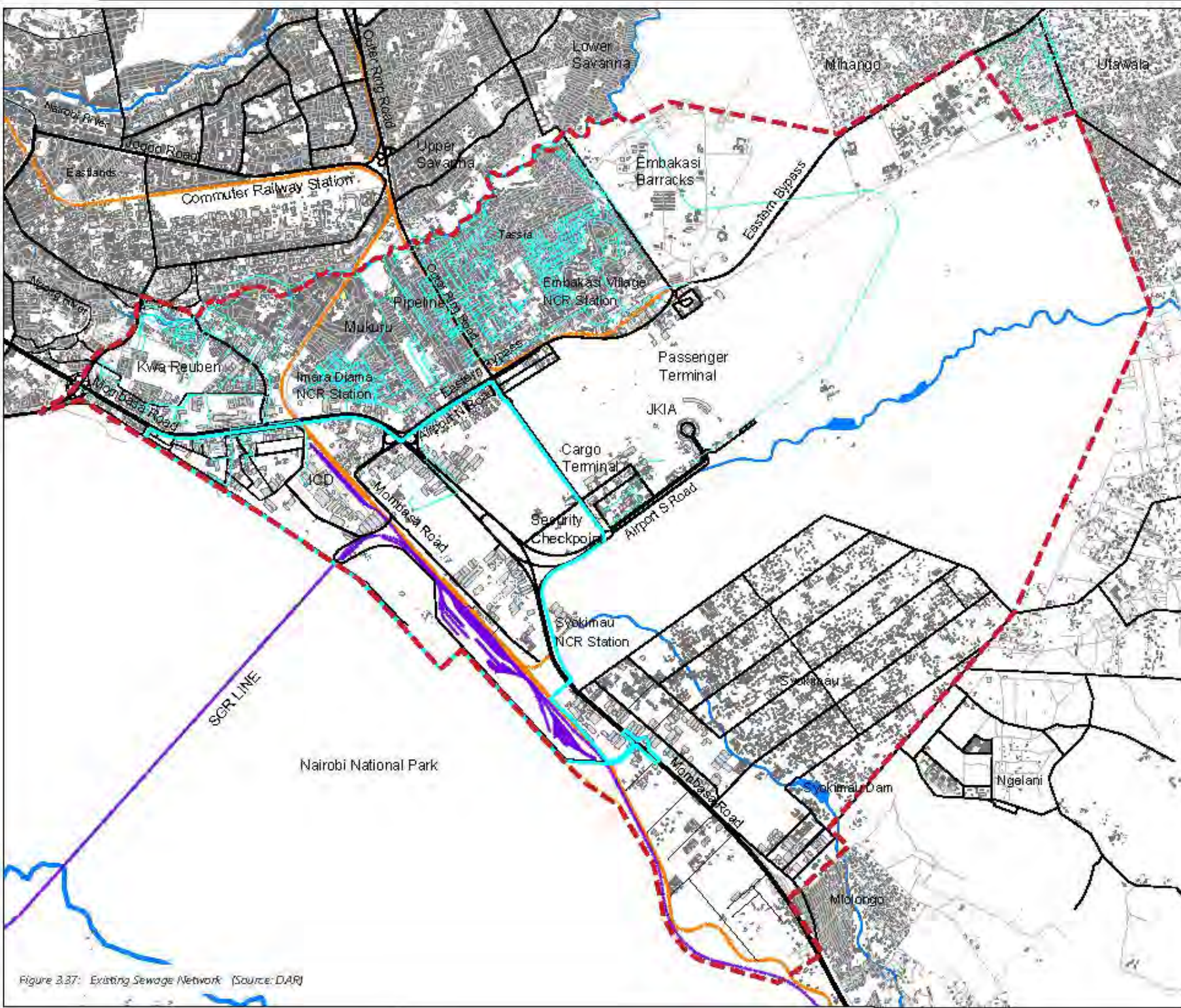


Figure 3.37: Existing Sewage Network (Source: DAR)

CATCHMENT AREA AND DRAINAGE

Legend

- Main Road
- Secondary Road
- Standard Gauge Railway (SGR)
- Nairobi Commuter Railway (NCR)
- Core Area Boundary
- Planning Area Boundary
- Water Courses
- Existing Water Supply Network
- Stream
- Catchment Area
- Flow Towards ATHI River
- Flow Towards Nairobi River
- Flow Towards NGONG River

Figure 3.38: Catchment Area and Drainage Pattern (Source: DAR)

3.7.4 POWER

This section describes the details of existing electrical utilities located within the Planning Area.

3.7.4.1 Core Area

EHV Substations:

The existing Embakasi (220/66kV) substation is located within the project Core Area, with an installed capacity of 3x90MVA i.e. 270MVA and maximum demand load of 240 MVA.

HV Substations:

Existing HV substations located within the Core Area are:

- > Fire Stone (66kV/0.415kV)
- > Villa Franca (66kV/11kV)
- > Mombasa Road (66kV/33kV/11kV)
- > Kapa Oil Refineries (66kV/0.415kV)

3.7.4.2 Adjoining Areas

The developmental framework for Adjoining Areas can be planned from any of the below EHV/HV substations located within/in the vicinity.

EHV Substations:

- > Kitengela (220/66kV)/Athi River Substation
- > Dandora (220/132kV) Substation

HV Substations:

- > Juja Substation (132/66kV)

- > New Airport (66kV/11kV)
- > Kenya Pipeline (66kV/0.415kV)
- > JKIA (66kV/11kV)
- > N.S.S.F (66kV/11kV)
- > Nairobi South (66kV/11kV)
- > Orbit Chemicals (66kV/66kV)

3.7.4.3 Probable Power Supply Sources for Core Area and Adjoining Areas

The electric power sector of Kenya is under the jurisdiction of the Ministry of Energy (MOE). The sector comprises of Kenya Power Generating Company (KenGen), Kenya Power, Independent power producers (IPP), Kenya Electricity Transmission Company (KETRACO), Geothermal Development Company (GDC), and Rural Electricity Authority (REA). As an independent regulatory body, Energy Regulation Commission (ERC) is supervising the sector.

The overall spare capacities along with the nominal operating voltages for transmission and distribution substations operated and owned by Kenya Power (formerly known as Kenya Power and Lighting Company - KPLC) are summarised in Table 3.8.

Based on the geographical location, the existing Embakasi substation (220kV/66kV), may be considered as the main source of power supply to accomplish the long term power supply requirements of the proposed developments inside the Core Area. However, other EHV/HV substations as mentioned above, which fall inside or adjacent to Adjoining Areas, may also be considered as potential sources of power supply to achieve short term and medium term power supply requirements of the Core Area. Based on the built up areas, final demand load of the Core Area and spare capacities of substations.

Approximate identification of Core Area and Adjoining Areas and all available substation locations inside/adjacent, are represented in Figure 3.39.

Table 3.8: Substation Nominal Operating Voltages and Spare Capacities

System Description	Nominal Operating Voltages (kV)	Spare Capacity (MVA)
Extra High Voltage (EHV)	220 and 400	160
High Voltage (HV)	132 and 66	60
Medium Voltage (MV)	11	60
Low Voltage (LV)	0.240/0.415	-

EXISTING SUBSTATION LOCATION LAYOUT

LEGEND

-  Main Road
-  Secondary Road
-  Standard Gauge Railway (SGR)
-  Nairobi Commuter Railway (NCR)
-  Core Area Boundary
-  Planning Area Boundary
-  Water Courses
-  HV SUBSTATION
-  EHV SUBSTATION

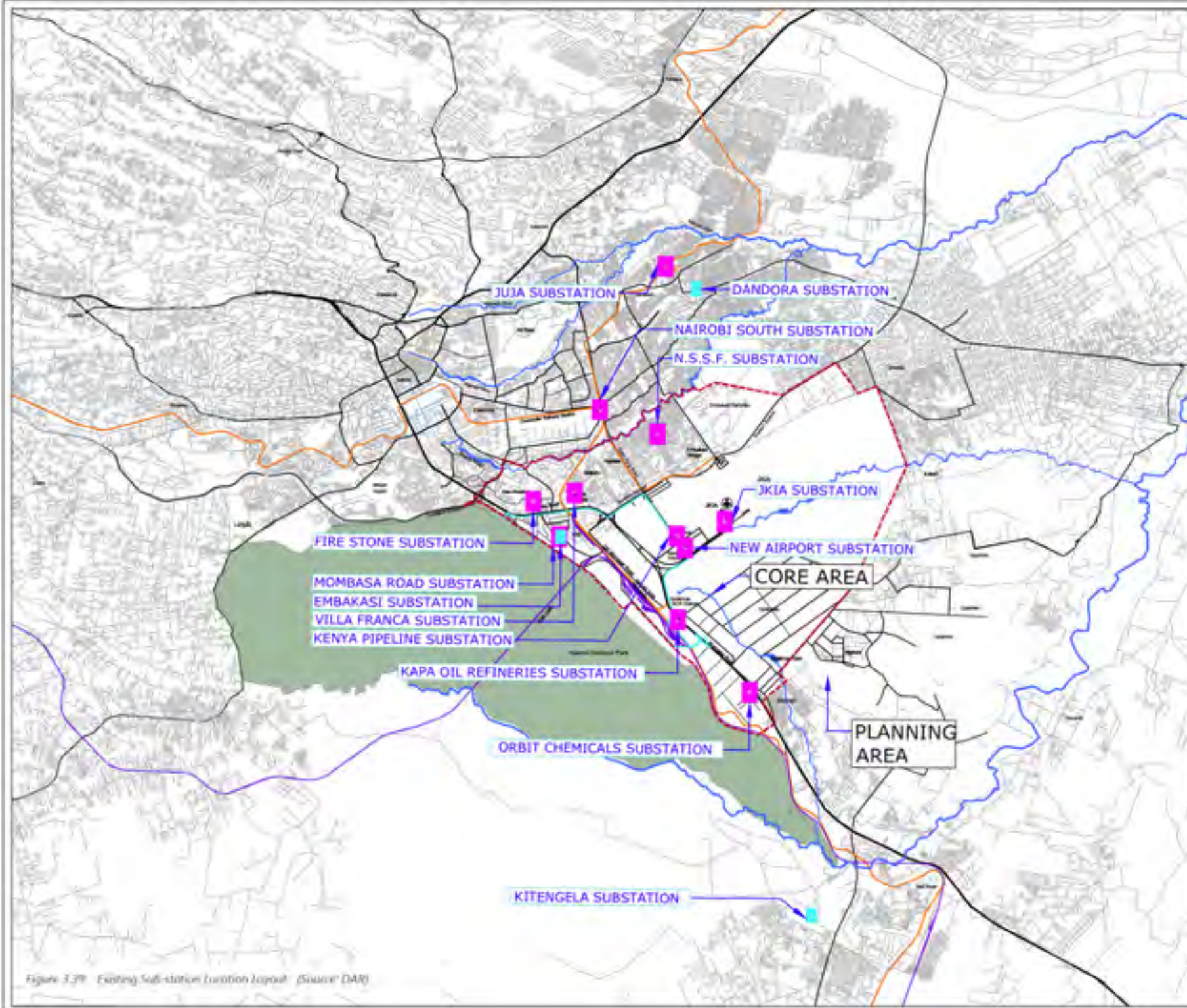


Figure 3.39: Existing Substation Location Layout (Source: DAR)

3.7.5 TELECOM NETWORK

This section describes the existing telecom utilities located within the Planning Area.

3.7.5.1 Telecom Service Providers

The objective of the service provider is to provide quality and reliable fixed telecom services such as data, voice and video to their customers.

There are three telecom service providers, providing telecom networks within/adjacent to the Planning Area:

- > Liquid Telecom Network;
- > Wananchi Group;
- > Telkom Kenya.

The following information is available for the service providers.

Liquid Telecom:

Fibre cables routes and joint box (manholes/handholes) locations are provided for in the Planning Area:

Wananchi Group:

There are two existing telecom networks provided in the Planning Area:

- > 36 core DWDM fibre has been routed in the north-west part of the Planning Area;
- > Another existing HFC network has been routed from the same service provider.

Three data centre locations namely Gateway Business Park, Embakasi Sub Station and Fedha are provided by Wananchi group.

Telkom Kenya:

This service provider has its existing infrastructure civil work for telecom network with available information as follows:

- > Telecom exchange offices: Athi River, Kajiado, Highway, Embakasi, EADC, JKIA (RSU), Parkside, Nairobi South, Kariobang;
- > Metro Route;
- > BB route;
- > BTS (Base transceiver station) locations;
- > MSAN (Multi Service Access nodes) Location.

Mobile communication data regarding technologies, capacity, transmission media, service providers, current offered telecommunication services and physical site locations for Airtel are provided.

The service provider for Airtel is Liquid Telkom (LTK). Transmission media used for Airtel is FTTX connection.

3.7.5.2 Core Area

The civil work of telecom network Infrastructure (duct and manholes) for Telkom Kenya service provider are shown on main roads in the Core Area.

The following telecom networks are available in the Core Area:

- > 36 core DWDM fibre is routed from Gateway Park Telecom exchange of Wananachi group service provider in Northwest part of the Core Area;
- > HFC fibre is routed on main road from Wananchi group service provider;
- > Existing telecom fibre network is routed on main road from Liquid Telecom service provider.

Two telecom exchanges are available within / in the vicinity of the Core Area:

- > Telkom Kenya Exchange office: EADC;
- > Wananchi group exchange office: FEDHA (WGK).

Following are other two telecom exchanges may be considered in vicinity of the Core Area:

- > Telkom Kenya Exchange office: Highway Exchange;
- > Wananchi group exchange office: Embakasi Exchange.

As per the available information, there are three telecom service providers (Liquid telecom, Wananchi group and Telkom Kenya) and every service provider is having independent telecom network infrastructure in the Core Area. From an operational point of view, it will be very difficult to maintain independent infrastructures for all service providers.

3.7.5.3 Adjoining Areas

The civil work of telecom network infrastructure (duct and manholes) for Telkom Kenya service provider are shown on main roads in.

The following telecom networks are available in Adjoining Area:

- > 36 core DWDM fibre is routed from Gateway Park Telecom exchange of Wananachi group service provider in the north-west part of Planning Area;
- > HFC fibre is routed from Wananchi group service provider;
- > Existing telecom fibre network is routed in north-west and south-east part of the Planning Area by Liquid Telecom;

Six (6) telecom exchanges are available within/ in vicinity of Adjoining Areas:

- > Telkom Kenya Exchange offices: Parkside Exchange, Highway Exchange, Embakasi Exchange, JKIA (RSU) Exchange;
- > Wananchi group exchange offices: Gateway Park Exchange, Embakasi Exchange.

Figure 3.40 presents the available telecom exchange offices within/in the vicinity of the Core Area and Adjoining Areas. Figure 3.41 presents existing fibre route for Liquid Telecom, Figure 3.42 presents the existing telecom network for Wananchi Group and Figure 3.43 presents the civil infrastructure for telecom network of Telkom Kenya.

EXISTING TELECOM EXCHANGE
OFFICES

LEGEND

- Main Road
- Secondary Road
- Core Area Boundary
- Planning Area Boundary
- Water Courses
- Highway (NCR)
- Railway (SGR)
- Kenya Telecom Exchange
- WANANCHI Group Telecom Exchange

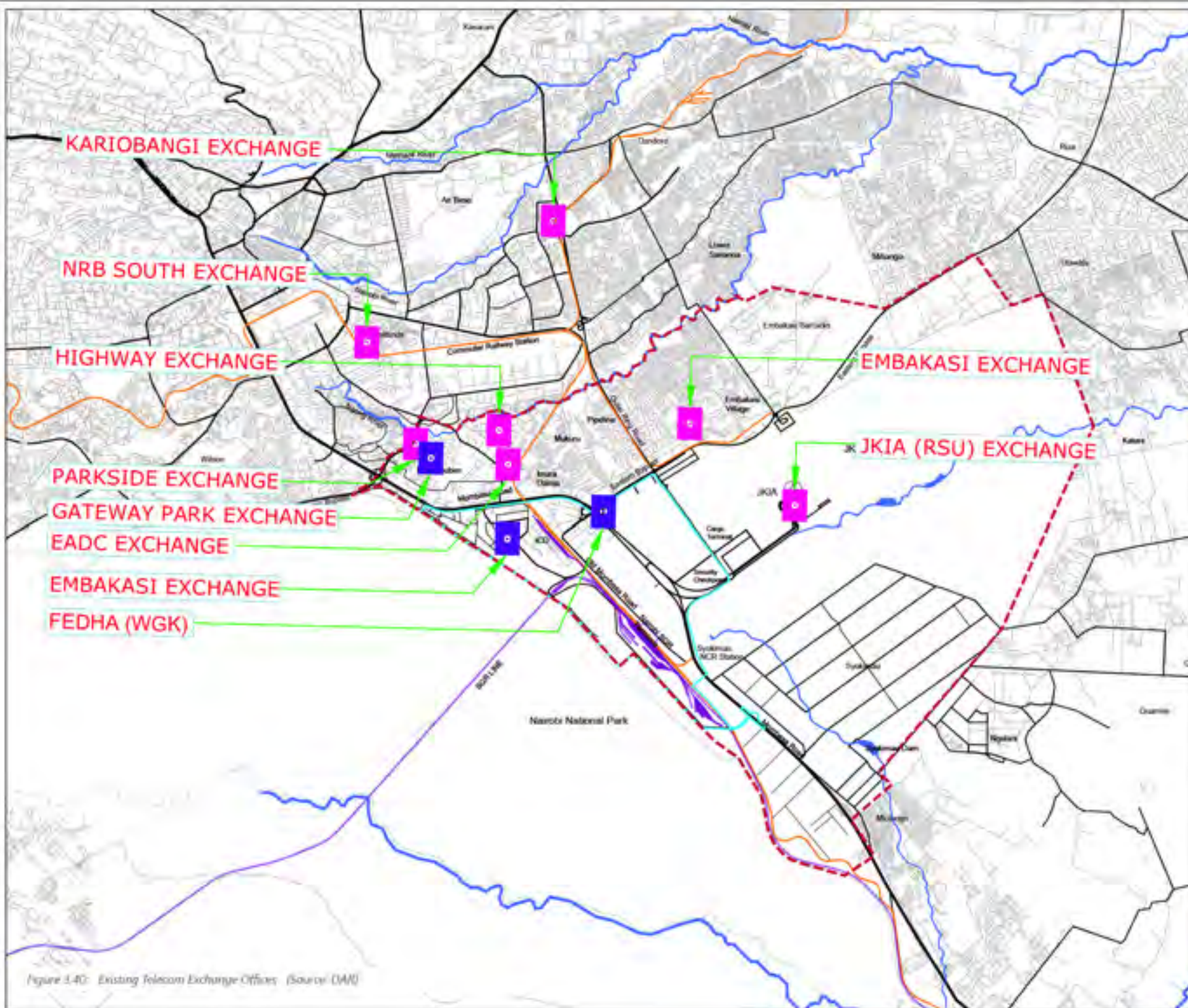


Figure 3.40: Existing Telecom Exchange Offices (Source: DAR)



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EXISTING FIBRE ROUTE FOR LIQUID TELECOM

LEGEND

- Main Road
- Secondary Road
- Standard Gauge Railway (SGR)
- Nairobi Commuter Railway (NCR)
- Core Area Boundary
- - - Planning Area Boundary
- Water Course
- Existing Liquid Telecom
fibre route



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Figure 3.41: Existing Fibre Route for Liquid Telecom (Source: DAR)

EXISTING TELECOM NETWORK FOR WANANCHI GROUP

LEGEND:

- Main Road
- Secondary Road
- Standard Gauge Railway (SGR)
- Nairobi Commuter Railway (NCR)
- Core Area Boundary
- Planning Area Boundary
- Water Courses
- 36 Core DWDM fiber route
- HFC fiber route

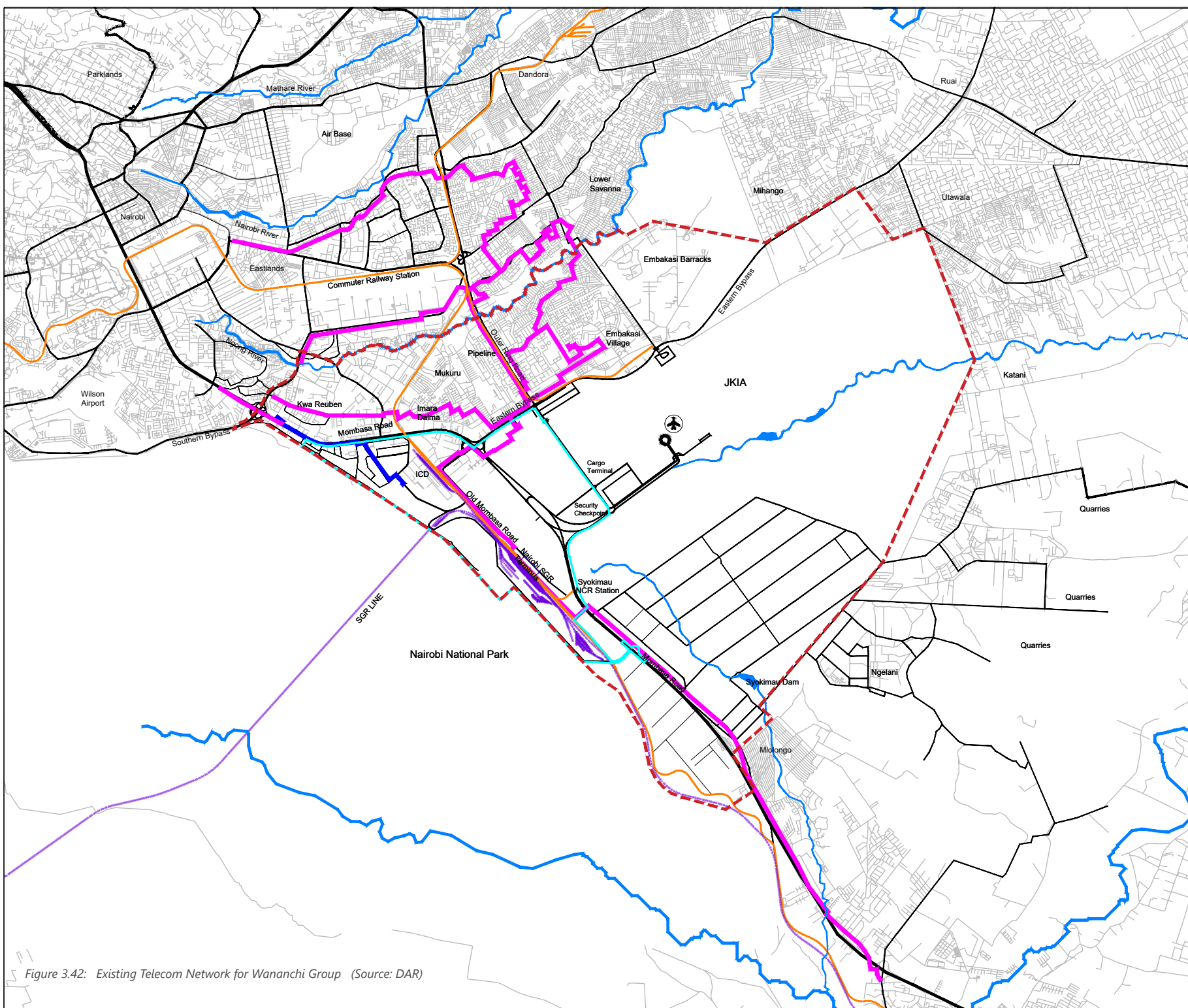


Figure 3.42: Existing Telecom Network for Wananchi Group (Source: DAR)

LEGEND

- Main Road
- Secondary Road
- Standard Gauge Railway (SGR)
- Nairobi Commuter Railway (NCR)
- Core Area Boundary
- Planning Area Boundary
- Existing Telecom Infrastructure

Figure 3-43: Existing Telecom infrastructure for Telkom Kenya (Source: DAR)

3.8 TRANSPORTATION

3.8.1 THE STRATEGIC ROAD NETWORK

3.8.1.1 Existing Conditions

The current road network in the County is inadequate in terms of coverage to meet current and future demands as envisaged in Kenya Vision 2030. There is heavy congestion on most of the city roads especially during the morning and evening peak hours, particularly, on Mombasa Road. International traffic between Mombasa Port and the neighbouring land locked countries of Uganda, Rwanda, South Sudan and Ethiopia has to pass through the city because there are no orbital roads.

According to the Spatial Plan Concept study (2012), motorised trips and public mass transport comprising matatus and buses account for about 70% of the motorised trips and nearly 4 million passengers per day. Traffic analysis indicates that passenger vehicles predominate on city roads while goods traffic does not exceed 20% of the total traffic. The role of railways in enabling regional commuter movement is very limited. Additionally, 47% of trips are by walking.

The Planning Area is situated on the eastern side of Nairobi City, advancing to Machakos county to the south-east. The area is crossed by two main roads:

- > Mombasa Road: A104 stretch, one of the main roads of the country, crossing Nairobi from northwest to southeast and connecting Nairobi and Mombasa. The stretch inside the Core Area is 3 lane dual carriageway and connects Embakasi, Syokimau and JKIA to the CBD; and
- > Eastern Bypass/Airport North Road: complementary routes that connect longitudinally distinct sectors from the Planning Area. Airport North Road is a 2 lane dual carriageway and starts at Mombasa Road junction inside the Core Area, following a north direction to a roundabout at the airport where some airport facilities and an army area are situated. From that point on, the road is named

Eastern Bypass and has only 2 lanes and crosses Ruai, going through Kangundo Road and heading north and later to the west up to an intersection with Thika Road. Thus, it is an alternative route to access Core Area region for those who come from Ruiru, without crossing the CBD.

The Outer Ring Road and Airport South Road can also be highlighted. The first connects Embakasi Village to the north of Nairobi; and the second provides access to the airport main entrance together with the B10 road. Another stretch from Airport South Road, goes in parallel to Mombasa Road in what could be the continuation of the Outer Ring Road, but it seems to be only used for airport service vehicles. The detailed road network is shown in Figure 3.45.

3.8.1.2 Pedestrian accessibility

For pedestrians, the only structures are the crosswalk of Mombasa Road and two other walkways close to Airport North Road junction. Mombasa Road and the railways form large longitudinal barriers along the Core Area. At the moment, most of the roads do not have pedestrian footpaths, leaving pedestrians with an unpleasant and often dangerous walking environment.

3.8.1.3 Main issues regarding roads

Main issues identified were:

- > Congestion on Mombasa Road, the main road of Core Area;
- > Poor Connectivity;
- > Lack of parking space for trucks around the ICD and need for additional connectivity; and
- > Poor pavement conditions.



Figure 3.44: Road conditions at ICD surroundings, (Source: DAR)

ROADS : EXISTING CONDITIONS

- Legend:**
- Municipal Boundary
 - Standard Gauge Railway (SGR)
 - Nairobi Commuter Railway (NCR)
 - Core Area Boundary
 - Planning Area Boundary
 - Water Courses
 - Jomo Kenyatta International Airport
 - Nairobi National Park
 - Existing Commuter Rail Stations
 - SGR Nairobi Terminus
 - Jomo Kenyatta International Airport
 - Land
- Existing Roads:**
- Class A and B - Trunk
 - Class C - District
 - Class H - Highway
 - Class J - Principal Arterial

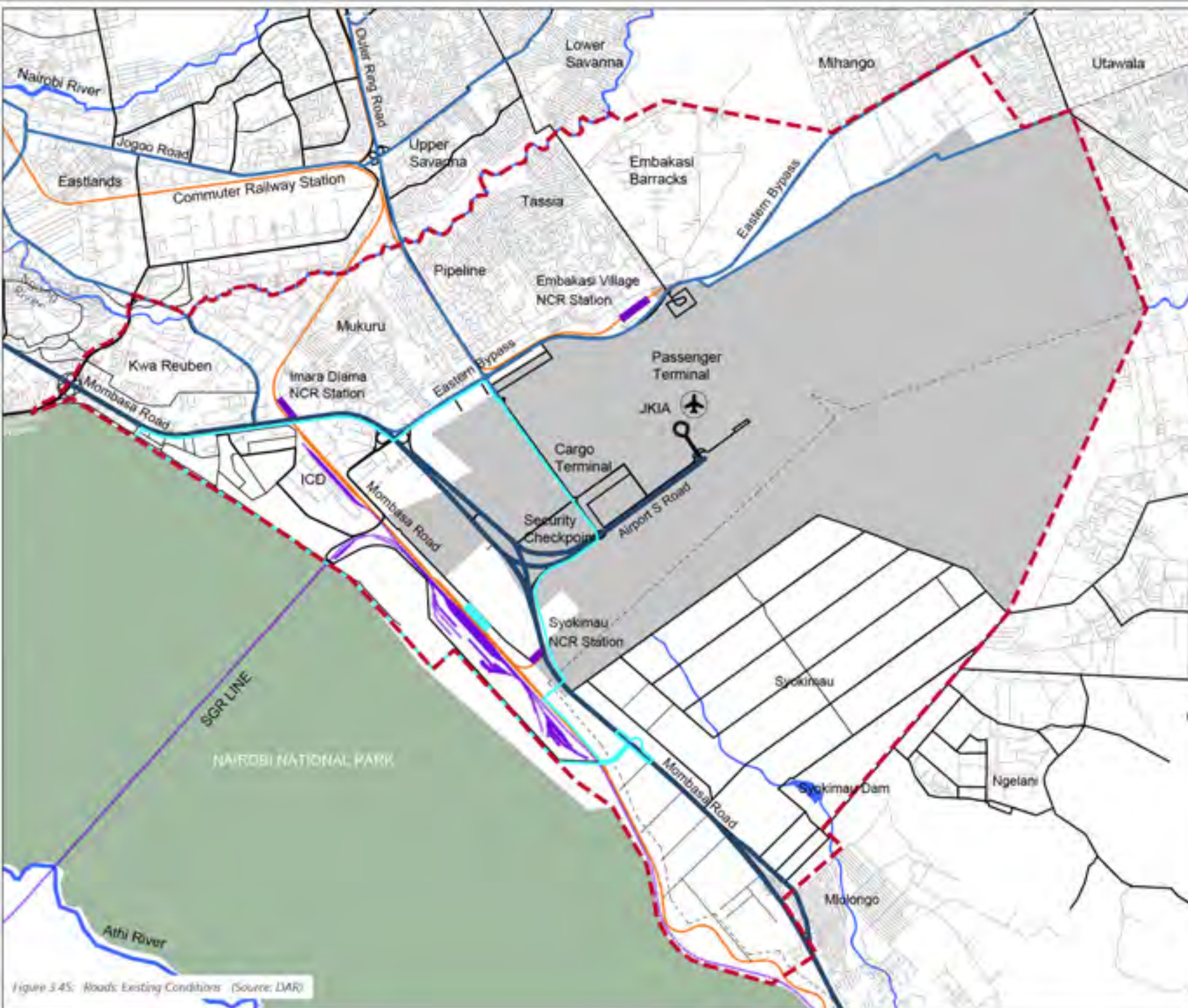
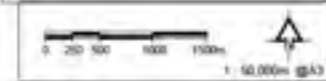


Figure 3.45: Roads Existing Conditions (Source: DAR)

3.8.2 PUBLIC TRANSPORT

Buses

Kenya Bus Service Management Ltd (KBSM) was founded in 2006. The operating concept brings together individual bus operators and micro bus operating companies in a franchising arrangement. KBSM (the franchisor) acts as an agent for bus business owners (the franchisees). In this arrangement, franchisees are granted the right to engage in the business of offering, selling or distributing transport services under a marketing plan, system, license and method as prescribed in substantial part by the franchisor.

Route Structure and Usage

Routes are mainly radial, they start in the city centre at a terminal or bus stage and work out along agreed routes to a terminal in the suburbs. Buses wait at the start to fill up before commencing the journey and travel on the 50 commuter bus routes in Nairobi. There are only 18 official termini within the CBD.

The bus system only handles 4% of the total commuter traffic, meaning there is large scope for expansion. However, there is a need to combat congestion in order to facilitate this, meaning cooperation between bus operators, local authorities and traffic police. Government support for mass transit policies is also necessary.

Main Issues

- > Inefficient network of buses and matatus - operating on high demand corridors leads to competition amongst providers rather than the complementary service provision that is necessary;
- > No social obligation - buses and matatus are private sector, so operate purely from a business/commercial perspective;
- > De-regulated operating environment - licensing board does not play a proactive role and supervision is left to the traffic police;

- > Absence of user-oriented policy;
- > Absence of bus incentive policy e.g. fiscal incentives;
- > Absence of bus priority policy e.g. exclusive bus lanes; and
- > Lack of policies to combat transport related issues e.g. traffic management and environment.

Data for the above are based on the MRTS Feasibility Study of 2011.

Matatus

Matatus account for nearly 90% of the public transport system. They are privately operated, so operators have full freedom over prices and timings. The Transport Licensing Board grant individual operators a license on a specific route, but the traffic police are left to enforce this. Public information about routes, operation, fares and co-ordination with other modes is absent. Associations representing operators' interests are in existence.

Legislation has been enacted to improve the safety and quality of service provided by matatus. This has increased prices as operators have had to implement measures to comply, but matatu usage continues to grow due to the gap in supply from other forms of public transport.

Route Structure and Usage

Matatu routes tend to be based on a radial pattern, flowing to/from the CBD, but are subject to change depending upon passenger demand. Most east-west routes overlap bus routes, leading to strong competition. Passenger flow is between 12,000 and 60,000 passengers a day. Owners are given permission by local authorities to use termini, usually located in congested spots. In the CBD, matatus are given permission to establish termini. There is no agency with responsibility for providing customer information.

Services usually commence at 5am and finish at 10pm. The number of trips is variable, dictated by the operators. No authorities hold data on the performance of matatus.

Main Issues

- > Limited information available on the 130 routes or stops;
- > Routes always evolving;
- > Fares at the matatu owners discretion;
- > Informal transport system, so not accommodated in transport planning; and
- > Usually display erratic driving and stopping behaviour, ignoring traffic laws.

Data for the above are based on the MRTS Feasibility Study of 2011.

Taxis

There are two classes of taxi: 1) taxis used by tourists for long distance visits; and 2) taxis used in Nairobi city for local visits. There are no fare meters, so the customer has to negotiate and finalise the fare before the journey.

Route Structure and Usage

4,000 taxis are operating in the city. The major locations for availability are: airports, international hotels, supermarkets and taxi ranks. Taxis which are legal use a yellow car, as suggested by the transport department. Management is self-regulated by trade associations and the Government has a non-interference policy.

Main Issues

- > Some drivers deceive customers, creating a bad reputation for the industry;
- > No fare meters mean customers bargaining without limits;
- > Problems with security and theft;
- > Cost for vehicle insurance very high for operators;
- > Unauthorised taxis account for 30% of the total- often undercut licensed taxi fees;
- > Fierce competition; and
- > No mechanism for redress of issues.

Data for the above are based on the MRTS Feasibility Study of 2011.

Tuk-Tuks

Tuk-tuks operate similarly to taxis, but with cheaper fares (generally one third to half of a taxi). It is primarily the local population that utilise this mode. Operating from termini, the total number of Tuk-tuks is estimated at 200. Demand is usually high due to the gap in supply from other public transport modes.

Main Issues

- > Not aesthetically pleasing,
- > Not stable; and
- > General perception is that this mode should not be encouraged as it is unsuitable.

Data for the above are based on the MRTS Feasibility Study of 2011.

Boda-Bodas

Boda-Bodas are motorcycles used for public transport. They are more popular in the surroundings of the city where there is no conventional public transport. Drivers pick passengers up at their homes. Growth of motorcycle ownership has been large due to their public transport role and the employment opportunities provided for young people.

Below are the operating characteristics of a typical Boda-Boda:

- > Require licenses and vehicle inspections, but many do not have them;
- > Many drivers do not have driving licenses and have learned informally;
- > Maintenance is costly due to operation on bad roads and a limited supply of spare parts;
- > Life of vehicles is less than five years.

Data for the above are based on the MRTS Feasibility Study of 2011.

3.8.3 RAILWAY NETWORK

Currently, there are four commuter train lines operating in the Nairobi Metropolitan Region (NMR), radiating outwards from the Nairobi Central Station:

- > Nairobi - Syokimau, via Makadara (16.6 km);
- > Nairobi - Embakasi Village, via Makadara (12.6 km);
- > Nairobi - Kikuyu, via Kibera and Dagoretti (31 km); and
- > Nairobi - Ruiru (32 km).

Commuter rail services are currently operated by Kenya Railways. Most urban commuters do not use the commuter rail due to the following issues: (Source: Spatial Plan Concept - SPC):

- > Lack of safety;
- > Lack of comfort;
- > Limited number of routes and services;
- > Inadequate intermodal transfer facilities; and
- > Long walking distance between the railway station and places of work.

Existing Conditions: Commuter rail

The Planning Area is currently served by two commuter railway lines. Although the current trip offer is very low, there is an expectation for future improvements in infrastructure and rolling stock to increase the number of daily journeys.

One line is the Embakasi Village line located north of JKIA and opposite to the existing road access to the airport. This line offers one trip per day per direction to Nairobi Central Station. The other line is the Syokimau line within the Core Area and runs three daily trips to Nairobi Central Station. Within the Planning Area is also the Imara Daima Station and the Nairobi Standard Gauge Railway (SGR) terminus.

Existing Conditions: Standard Gauge Railway

The Planning Area also has the SGR linking Nairobi to Mombasa, with both cargo and passenger services. The Nairobi Terminus is dedicated to passengers only. A platform located in the back of the main entrance of the terminus allows the integration in a much improvised way to the commuter rail line from Syokimau.

Nairobi Terminus can be accessed by car, using the south access of Mombasa Road located between Syokimau Station and Airport Junction. Pavements on the route from this access up to the station are in good condition.

Nairobi Terminus is a large station with modern amenities such as a large waiting lounge and ticket office, a large parking area for cars and bus interchange area. Other amenities include toilets and public announcement system. Part of the station is reserved as an operations control centre.

The cargo running on the SGR tracks uses the ICD. The spacious yard of 29 hectares located in the industrial area off Mombasa Road can accommodate a throughput of over 180,000 TEUs per annum.

The expansion on the SGR network, currently under construction, follows southwest crossing through part of the Nairobi National Park until it diverts towards Kampala, Uganda. The Commuter Railway Master Plan (CRMP) is also currently under development and the demand forecast in the Planning Area suggests that expansion from Syokimau to JKIA and to Kitengela will be possible with a greater frequency service than that expected in the Harmonisation Study.

EXISTING RAILWAYS, SGR EXPANSION AND FUTURE BRT CORRIDORS

Legend

- Municipal Boundary
- Core Area Boundary
- Planning Area Boundary
- Water Courses
- Railway**
 - Standard Gauge Railway (SGR)
 - Nairobi Commuter Railway (NCR)
 - SGR Nairobi Terminus
 - Existing Commuter Rail Stations
- BRT**
 - Proposed BRT Route in Mid Term
 - Existing Commuter Rail Stations
- Existing Roads:**
 - Class A and B - Trunk
 - Class C - District
 - Class H - Highway
 - Class J - Principal Arterial
 - Other Roads
- Jomo Kenyatta International Airport
- Nairobi National Park
- Existing Commuter Rail Stations
- Jomo Kenyatta International Airport Land

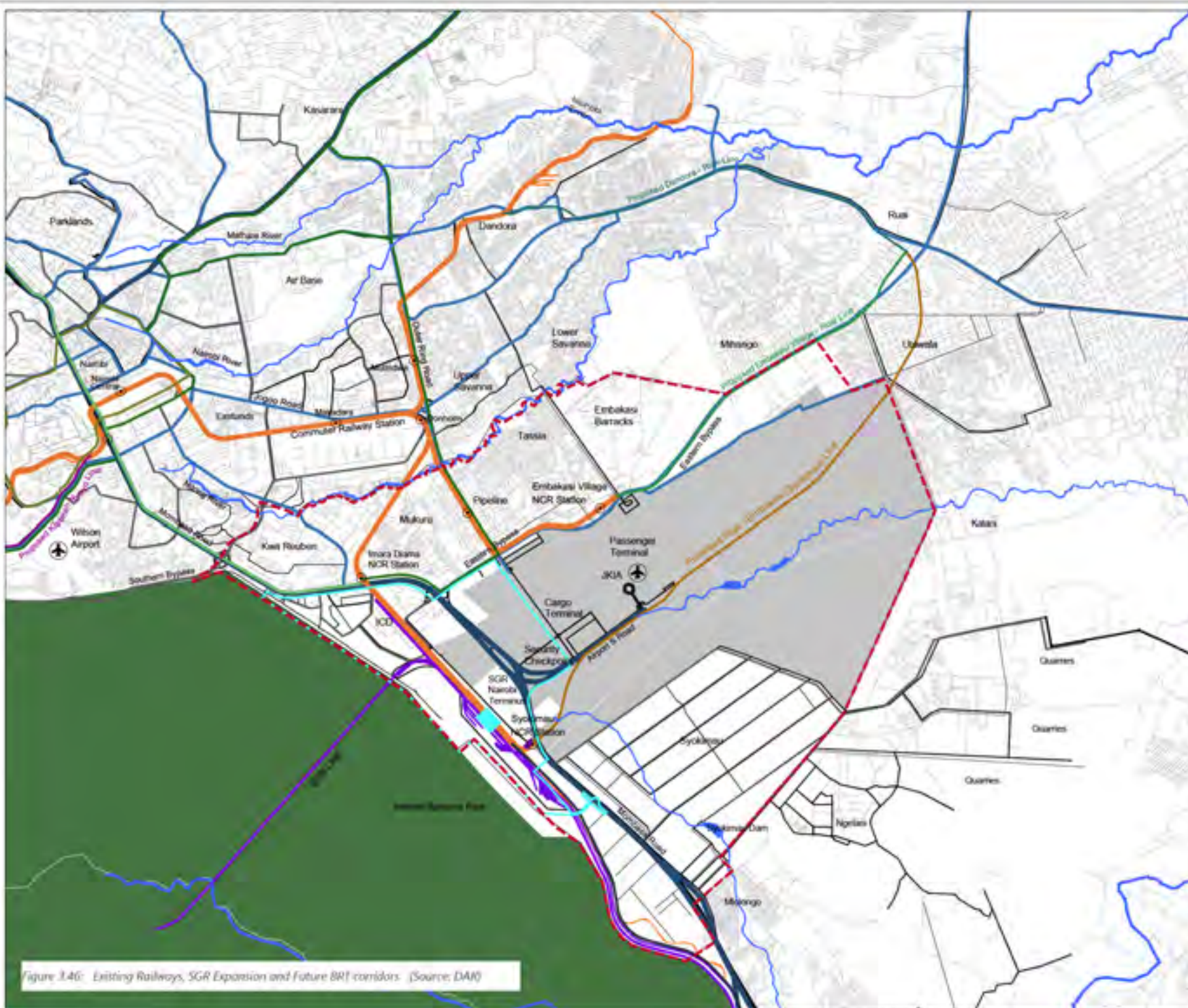


Figure 3.46: Existing Railways, SGR Expansion and future BRT corridors. (Source: DAR)

3 3.9 SYNTHESIS OF EMERGING ISSUES, OPPORTUNITIES AND CHALLENGES

The NIUPLAN identified some of the emerging issues, opportunities and challenges facing Nairobi City. These are summarised below and supplemented by findings specific to the Planning Area covered by this Plan.

3.9.1 LAND USE

> Un-Managed Urban Growth

Prior to NIUPLAN, Nairobi lacked an up-to-date strategy for managing urban growth. This was compounded by inadequate development control and enforcement of planning requirements and regulations. As a result, the city has expanded outwards with extensive areas of informal development, sometimes in locations that are unsuitable. Particular examples in the Planning Area are the informal development alongside the Ngong River, which are likely subject to flood risk. This un-managed growth has had other knock-on effects, discussed under subsequent headings below.

> Poor Quality Development and Public Realm

Inadequate development control and enforcement, as referred to above, has resulted in some development providing poor quality living conditions for residents, and poor quality working conditions for employees. The visual quality of development and the public realm has also suffered. The Pipeline community is an example of this in the Planning Area.

> Prevalence of Car-Oriented Development

Much of the formal development in Nairobi has been designed around the private car. Opportunities for walking and cycling within communities have not been capitalised on, both in the way land uses are distributed, but also due to insufficient provision of safe and attractive walking and cycling routes.

3.9.2 ENVIRONMENTAL AND PHYSIOGRAPHIC

> Proximity to Nairobi National Park

The Planning Area is directly adjacent to Nairobi National Park which is an important habitat for wildlife of the Athi-Kaputiei Plains Ecosystem and also serves as a major tourist attraction. The National Park is currently under threat from urban and industrial growth and this Inter-County Plan must be developed in such a way so as not to exacerbate this. The Plan presents an opportunity to go further, by enhancing the surrounding environment to the National Park. This may include retaining some areas of natural vegetation within the Planning Area which could serve as ecological corridors or creating open areas which can be used by the local community for recreation and leisure.

> Sustainable Urban Drainage Systems

There is an opportunity to develop sustainable urban drainage systems (SUDS) in the Planning Area, to mitigate the risk of flash flooding and provide environmental enhancements to the area. All drainage systems should drain east and south-east, away from the Nairobi National Park. It is recommended that the surface water courses within the Planning Area are retained. The tributaries of the Athi and Nairobi Rivers have the potential to serve as ecological corridors as well as maintaining the natural drainage flow within the Planning Area.

3.9.3 COMMUNITIES AND ECONOMICS

> Fear of Crime

Safety and security are understood to be significant social concerns relevant to both Nairobi and the Planning Area. Poor planning, design and management of the public realm has contributed to crime and fear of crime.

> Insufficient Housing Supply and Mix

Nairobi has a large and growing un-met need for formal housing as supply has been insufficient for many years.

Constrained supply leads to higher prices and rents as formal housing is at a premium. For those who cannot afford such prices and rents, they are generally forced to accept poor quality alternatives, such as over-crowded housing or informal housing. This has been a driving factor behind the un-managed urban growth referred to above.

Within formal housing developments, it is understood that the mix of housing caters primarily for middle and high incomes. Affordable housing for low incomes is rarely present. Again, this forces those who cannot afford into poor quality alternatives as described above.

> Insufficient Social Infrastructure Facilities and Capacity

Linked to the un-managed urban growth referred to above, social infrastructure provision has not been aligned with housing growth. Residents are not able to easily access the facilities required for day to day living. The quality of existing facilities suffers as they are forced to operate above capacity.

> Large Labour Supply and Unemployment

From a socio-economic perspective, Kenya, and Nairobi City in particular, host a growing and youthful population. Additionally, the growth in the labour force has been exceeding that of the population, which implies the presence of a large labour supply. However, many of these people are currently unemployed or working in the informal sector. The Plan can provide lucrative opportunities to stimulate economic growth by improving internal and regional connectivity, capitalising on industrial and logistics synergies and promoting employment generation within the formal sector.

> Industrial Development Opportunities

The Government's endeavours to promote the country's industrial base and reach upper-middle income status will boost the manufacturing sector's performance, despite recent declines in its shares of output. Furthermore, the transport and the storage sector has been capturing an increasing share of total output, which should be capitalised on by the Plan.

> Economic Resilience

Kenya presents a favourable macroeconomic and socioeconomic climate, possessing the ability to attract infrastructure investment and developments. The country's economy has proven to be resilient against external shocks and has engaged in a number of ventures with the aim of improving its global competitiveness.

3.9.4 PHYSICAL INFRASTRUCTURE

> Insufficient Physical Infrastructure Networks and Capacity

Linked to the un-managed urban growth referred to above, physical infrastructure provision has not been aligned with urban growth. Many developed areas, both formal and informal, rely on private supply of utilities, for example boreholes for water and septic tanks for sewage, or simply do not have access to such utilities.

3.9.5 TRANSPORTATION

> Inappropriate Freight and Logistics Routes

Many articulated vehicles use Uhuru Highway, part of the main road connecting Mombasa to Kisumu (the northern economic corridor), which passes through the centre of Nairobi city. This exacerbates an already congested route, making it inefficient for freight and logistics movements. As their destination is generally not the CBD and is further afield, opportunities to divert such traffic should be explored.

> Poor Quality, Low Capacity and Poorly Integrated Public Transport Network

The poor quality and low capacity public transport network does not encourage ridership. Insufficient integration between routes makes it difficult for users to reach their destination, again discouraging use. Potential users resort to using the private car, as it currently provides a more pleasurable and convenient form of transport.

> Insufficient Road Capacity

The mass use of the private car has pushed the road network

to be operating over-capacity during peak hours. Additional road capacity may be part of the solution, but the most significant contribution would be as a result of improvements to the public transport network, which is a far more efficient mode of transporting people.

4. DEVELOPMENT OPPORTUNITIES

4.1 INTRODUCTION

As an integral aspect of the Project design, a market assessment has been conducted to evaluate and recommend the key asset class development required by the expanding market and industry opportunities. Full details of this exercise can be found in Technical Study 4.

In summary, the Core Area is well-positioned to be developed into a major transshipment hub between Mombasa Port and neighbouring regions. By capitalising on the enhanced railway offering, the Inland Container Depot (ICD) and proximity to the international airport (JKIA), the Project has the potential to generate employment opportunities for the local economy. These developments will encourage demand for other amenities including residential, commercial, retail, hospitality, MICE, leisure and community facilities. The key implication is that the Core Area can become an Economic Hub in its own right.

Capitalising on infrastructure developments - namely the completion of Phase 1 of the SGR, the expansion of the JKIA and road network improvements - Adjoining Areas are well placed to enhance their position from peripheral (commuting) nodes to established economic centres within the capital city. Moving forward, Adjoining Areas are expected to attract more diversified economic activities which will drive the need for the development/expansion of a number of real estate asset classes.

Set-out below is an overview of the asset classes which are recommended for new development in the Planning Area. The chapter concludes with a summary table showing the quantum of development recommended within each class

4.2 INDUSTRIAL

The Planning Area is well-positioned to absorb industrial/manufacturing facilities. The area could host a specialised industrial hub which promotes iron and steel production as well as other manufacturing activities anchored around machinery and spare parts. This is aligned with the objectives of the Kenya Vision 2030 which promotes the development of manufacturing clusters and the establishment of industrial parks.

Additionally, the Planning Area could absorb a construction materials zone as per the feedback from meetings with key stakeholders and on-the-ground market research. The zone would help minimise costs and create economies of scale benefiting small-scale suppliers.

The expansion/development of industrial and logistics space within the Planning Area would allow a potential shift of industrial activities from already established nodes to a decentralised setting providing ease of access to transport arteries.

4.3 WAREHOUSING & LOGISTICS

Addressing the shortage in the storage sector, warehousing facilities could be developed to bridge the market gap and meet the tenants/ owners' operational and cost requirements.

An emphasis on warehousing and logistics is placed in the Core Area to benefit from the connectivity of the railway and the proximity to Mombasa Road, as the area is emerging as a priority node for logistics and a main transshipment hub, as mentioned earlier. Nonetheless, it is suggested that a smaller share of the development be located within the boundaries of Adjoining Areas.

It is recommended that warehousing and logistics facilities be developed close to manufacturing areas to capitalise on potential synergies created between the two components/ uses.

A high-level benchmarking exercise has been conducted of local and international industrial developments that provide additional support to the proposed recommendations.



Figure 4.1: iPort, Doncaster, United Kingdom

Occupying a total area of 2 million sqm in South Yorkshire, UK, iPort comprises a 1.36 million sqm intermodal logistics park which hosts 557,400 sqm of grade A warehousing spaces equipped with a Strategic Rail Freight Interchange (SRFI). The Park is well-connected to major highway networks (the Great Yorkshire Way) and is located 5 miles away from the Doncaster Sheffield International Airport.

The park provides flexible and fully customisable warehousing solutions with units varying in size from 4,645 sqm to around 93,000 sqm.

As of Q3 2016, occupancy rates exceeded 91%. It is estimated the park will generate up to 5,000 new employment opportunities.



Figure 4.2: The Glasgow Business Park Logistics Park, Scotland

The Glasgow Business Park boasts a strategic location similar to that of the Planning Area. The park is located within driving distance to the Glasgow International Airport and is adjacent to a main line railway. The core of the park spans above 100,000 sqm with additional space along the periphery.

The park has an especially strategic placement with a kilometre frontage at the M8 Motorway and direct access to motorway junctions 8, 9, and 10. The main entities present pertain to manufacturing and warehousing that occur in proximity to one another to add additional connectivity. Additionally, a trade park is present on the site to leverage a logistics and storage functionality.



Figure 4.3: Tatu Industrial Park, Kenya

Located in Nairobi City, Tatu Industrial Park includes 1.9 million sqm of serviced land for light industrial, warehouses and logistics. The industrial park leverages its proximity to the Jomo Kenyatta International Airport, the Thika Superhighway and the Northern and Eastern Bypasses. It is also in vicinity to the Standard Gauge Railway ("SGR") station. The synergies created will enable the development/expansion of decentralised industrial and logistics nodes (away from the CBD) in addition to reducing traffic. As of 2017, more than 66% of developable land has been sold to international and regional players including Unilever, and Bidco.

As mentioned, Africa Logistics Properties ("ALP") is developing a 50,000 sqm grade-A logistics park on 90,000 sqm parcel, due in Q4 of 2018.

4

4.4 RESIDENTIAL

The Planning Area is subject to height restrictions and noise pollution given its location in an airport area and an industrial node. Consequently, it is considered that the development of residential units should be considered carefully.

Generally, residential assets could encompass apartments and, to a much lesser extent, bungalows, maisonettes and other stand-alone facilities in addition to affordable housing. Offerings would benefit from the Project's proximity to the main transport infrastructure and employment demand generators.

The residential component would cater to the demand preferences of residents, including those employed in the area as demonstrated by the i-Park (Senai Airport City) in Malaysia. Further, as shown in Park West in Ireland, residential uses could complement and support industrial and commercial assets.

A relatively small share of the developments could be absorbed by the Core Area to minimise congestion due to pre-existing residential nodes and to allow for convenient proximity to transport facilities.

Nonetheless, the residential component should be considered secondary to other uses in the Core Area. As such, the development of housing units in the area should be treated as a high-level recommendation. The latter will be subject to spatial constraints as other components are likely to take priority in occupying vacant land within the area.

4.5 COMMERCIAL

A business hub that includes a variety of office types, notably Grade B offices, could be developed in Adjoining Areas. The latter is expected to complement the industrial uses and act as a secondary commercial node which could boast back-office functions and other supporting facilities. The business hub could house SMEs which are key drivers of growth in the commercial sector.

The Core Area could absorb a substantial portion to benefit from the mixed-use environment and leverage its proximity to the railway and main demand generators, as demonstrated by Cork Airport Business Park in Ireland, the i-Park in Malaysia, as well as Park West. These have benefited from a strategic location and an increased connectivity generated by key transport infrastructure developments.

Additionally, a training centre for freight, logistics and air operations could be introduced. The centre would capitalise on the large number of blue collar employees who are expected to occupy a portion of the employment opportunities generated by the Project.



Figure 4.4: Park West, Dublin, Ireland

Located in West Dublin with convenient access through excellent air, road and rail connections, Park West is Ireland's largest business and industrial park. Covering a total land area of around 930,000 sqm, Park West is a mixed-use facility with integrated retail, leisure and hospitality amenities. To date, Park West:

- > Boasts around 477,000 sqm dedicated to the industrial uses including both offices and warehouses;
- > Hosts around 85,000 sqm of commercial assets with over 300 local and international companies (total employment around 10,000);
- > Accommodates over 1,000 residents in 3 residential apartment complexes spread over a total area of 47,000 sqm. The residential component largely supports the industrial and commercial uses;
- > Lodges 1 hotel with 147 keys on a site of 6,000 sqm; and,
- > Hosts a 12,000 sqm retail mall.



Figure 4.5: Cork Airport Business Park, Ireland

Cork Airport Business Park in Ireland is positioned adjacent to Cork Airport, enhancing the connectivity of businesses to the rest of the UK. It is also along the N27 highway that leads to the city centre, enhancing accessibility to its neighbouring urban locality.

The success of the park has attracted a variety of multinationals – notably, Amazon, IBM, and Intel. Cork Airport Business Park is also home to the Cork International Hotel, which accommodates business travellers and supports MICE activities for the various events located on campus.



Figure 4.6: The i-Park (Senai Airport City), Malaysia

The i-Park (Senai Airport City) is one of three industrial park developments in Iskandar, Malaysia. It aims to provide industrial infrastructure and services in line with international standards and boasts an environmentally conscious design.

The goal of this development is to deliver competitive connectivity, through its geo-strategic positioning, and to provide infrastructure that not only emphasises on production, but also on breeding a hub for businesses, ensuring long-term success.

Additionally, the Park is 6 km away from Senai International Airport, 32 km from Johor Port, 39 km from Port of Tanjung Pelepas, and 42 km from both the Tanjung Langsat and Jurong Ports. The site is also only 25 km away from Singapore, one of the largest importers in the region, facilitating trade relations for member organisations. As part of the employee services, the site offers workers' dormitory accommodation, within walking distance from the workplace, with a capacity of 2,520 beds, to eliminate the burden of commuting.

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4.6 RETAIL & LEISURE

A sizeable mall containing an array of leisure and retail facilities could be developed in the Planning Area (e.g. similar features, albeit smaller, to the Mall of the Emirates, Dubai, UAE, and the Mall of America, Minnesota, USA). In terms of entertainment, the mall could include a large-scale cinema, indoor theme park, entertainment areas for children, as well as nature and wild life educational centres. It is worth noting that the introduction of wildlife-themed amenities under the roof of malls would be a newly-introduced concept to Nairobi City. This aspect supports education and maintenance of its internationally renowned natural and environmental attractions.

The mall could include line shops to cater to the needs of residents and workers; it could also accommodate open space formats such as open-air market facilities to stimulate footfall.

Retail assets should be developed in tandem with the anticipated residential and tourism growth to generate a persistent community culture and sustainable living environment that establishes the Planning Area as a long-term attraction.

While the linkages between the leisure component and its retail counterpart are apparent, complementary leisure amenities, independent from retail facilities could also be developed. Occupying the Planning Area, subject to space limitations, these facilities could include public parks and arts museums.



Figure 4.7: Mall of America, Minnesota, USA

The Mall of America (Minnesota, USA) includes the largest indoor theme park, an indoor water park, the Escape Game, and a Lego Store among other entertainment amenities. The presence of an indoor aquarium within the mall demonstrates that wildlife attractions can be leveraged within indoors and retail centres, allowing Embakasi to leverage its main attractions with an added degree of modernity and convenience.

Its size is a total of 230,000 sqm, which is able to be absorbed by the gap captured by the Planning Area.



Figure 4.8: Mall of the Emirates, Dubai, UAE

The Mall of the Emirates (Dubai, UAE) offers an effective mix of retail and leisure offerings. Some of these themes include an indoor ski slope and a large-scale movie theatre. The variety of shopping outlets offer product diversification that are coupled with leisure to attract domestic and international visitors to the premise.

In 2005, the mall was named as the World's Leading New Shopping Mall and is ranked within the top 5 in the UAE.

4.7 HEALTH

Health facilities could be hosted in the Planning Area to complement the expected developments. These should also be co-located between the Core Area and Adjoining Areas. Accordingly, the Core Area could house two average-sized hospitals catering to different target populations. One hospital would target the residents while the other node would cater to the needs of workers and visitors providing an opportunity for medical tourism.

4.8 HOSPITALITY (INCL. MICE)

Hospitality offerings would benefit the area and capture/retain both the incoming tourism and international business activity. Segmentation would include budget hotels, and serviced apartments. In addition, hospitality facilities would cater to other visitors such as tourists seeking leisure activities.

Despite market saturation, the locational advantages offered by the Planning Area – namely its proximity to the JKIA in addition to other demand generators – could induce demand for additional 4*/5* facilities in the medium to long term.

The hospitality segment would also benefit from the Core Area's demand generators - namely the existing commercial and leisure activities, such as Nairobi National Park to capture a share of those utilising the transport hubs.

4.9 EDUCATION

The large youth population in the Planning Area, along with increasing enrolment rates, necessitate the introduction of a tertiary education facility to accommodate the increase in student numbers. Optimally, the education component should be co-located between the Core Area (20%) and Adjoining Areas (80%). The Core Area catchment would benefit from existing residential activity and commercial activity to promote R&D and job creation. Due to competing space needs, however, the presence of a university in the Core Area should not be considered a binding requirement.

Additionally, a vocational training centre could complement the proposed education facilities and local industrial development. This would benefit from the availability of unskilled labour force in vicinity to the Planning Area.

4.10 SUMMARY OF DEVELOPMENT OPPORTUNITIES

Table 4.1: Summary of Development Opportunities

ASSET CLASS	UNIT	2020	2025	2030
Adjoining Areas				
Manufacturing	Land Area (sqm)	-	473,400	2,387,000
Warehousing	Land Area (sqm)	111,100	629,900	2,271,500
Residential	Housing Units	199,300	304,000	413,300
<i>Bungalows</i>	<i>Housing Units</i>	<i>20,000</i>	<i>29,100</i>	<i>37,700</i>
<i>Maisonettes</i>	<i>Housing Units</i>	<i>9,800</i>	<i>13,200</i>	<i>15,700</i>
<i>Apartments/ Flats</i>	<i>Housing Units</i>	<i>169,500</i>	<i>261,700</i>	<i>359,900</i>
Commercial	GLA (sqm)	9,600	103,300	275,800
<i>Grade A</i>	<i>GLA (sqm)</i>	<i>960</i>	<i>10,330</i>	<i>27,580</i>
<i>Grade B</i>	<i>GLA (sqm)</i>	<i>7,680</i>	<i>82,640</i>	<i>220,640</i>
<i>Grade C</i>	<i>GLA (sqm)</i>	<i>960</i>	<i>10,330</i>	<i>27,580</i>
Hospitality with MICE	Keys/ Units	-	420	1,370
<i>3 stars</i>	<i>Keys/ Units</i>	<i>-</i>	<i>-</i>	<i>150</i>
<i>Apartments</i>	<i>Keys/ Units</i>	<i>-</i>	<i>420</i>	<i>1,220</i>
Retail with Leisure	GLA (sqm)	-	63,700	191,100
Education - University	Campus Space (sqm)	732,600	948,200	1,239,300
Health - Hospitals	Hospital Beds	2,000	2,400	2,900
Core Area				
Manufacturing	Land Area (sqm)	-	-	-
Warehousing	Land Area (sqm)	94,500	535,400	1,930,800
Residential	Housing Units	4,200	7,000	10,300
<i>Bungalows</i>	<i>Housing Units</i>	<i>400</i>	<i>700</i>	<i>900</i>
<i>Maisonettes</i>	<i>Housing Units</i>	<i>200</i>	<i>300</i>	<i>400</i>
<i>Apartments/ Flats</i>	<i>Housing Units</i>	<i>3,600</i>	<i>6,000</i>	<i>9,000</i>
Commercial	GLA (sqm)	7,700	82,700	220,700
<i>Grade A</i>	<i>GLA (sqm)</i>	<i>800</i>	<i>8,300</i>	<i>22,100</i>
<i>Grade B</i>	<i>GLA (sqm)</i>	<i>6,100</i>	<i>66,100</i>	<i>176,500</i>
<i>Grade C</i>	<i>GLA (sqm)</i>	<i>800</i>	<i>8,300</i>	<i>22,100</i>
Hospitality with MICE	Keys/ Units	-	290	960
<i>3 stars</i>	<i>Keys/ Units</i>	<i>-</i>	<i>-</i>	<i>110</i>
<i>Apartments</i>	<i>Keys/ Units</i>	<i>-</i>	<i>290</i>	<i>850</i>
Retail with Leisure	GLA (sqm)	-	25,500	76,500
Education - University	Campus Space (sqm)	146,500	189,600	247,900
Health - Hospitals	Hospital Beds	540	540	540



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INTER-COUNTY PLANNING PROPOSALS

5. SPATIAL DEVELOPMENT STRATEGY (STRATEGIC POLICY 1)

5.1 INTRODUCTION

This chapter explains the proposals for the Planning Area, which together form the spatial development strategy that provides the overall framework for development in the Planning Area. Some of the proposals continue and enhance themes developed by existing plans for Nairobi. Some are to ensure consistency with other emerging plans for parts of the Planning Area. The remaining proposals have all been developed in response to the specific issues, opportunities and challenges facing the Planning Area.

The Proposals include strategic policies with associated policy guidance. The purpose of these is to guide the future planning of the Planning Area.

5.2 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.

5.3 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 Planning Area:

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

Airport North and Syokimau are within the Core 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 Nairobi SGR Terminus. An Action Plan has been prepared which discusses this sub-centre and Airport North.

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

5.4 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 West, as proposed within the emerging Mavoko ISUDP. This is a new centre proposed in addition to those in the Spatial Planning Concept. It is understood that it would be classified as a growth centre. It is discussed in the Land Use Strategies chapter below.

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

- > Syokimau Town; and
- > Airport City.

Like Mlolongo West, Syokimau Town is envisioned as a growth centre based on its strategic location close to the Nairobi SGR 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.

**SPATIAL DEVELOPMENT
STRATEGY WITHIN THE WIDER
PLANNING CONTEXT**

Legend:

- Nairobi City County
- Inter-County Plan Boundary
- Arterial Roads
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- SGR Nairobi Terminus
- Airports
- Nairobi CBD
- Nairobi Railway City
- Mukuru Special Planning Area
- Eastlands
- Nairobi National Park
- Sub-Centres and Growth Centres**
- SGR Masterplan
- NIUPAN
- Mivoko ISUEP

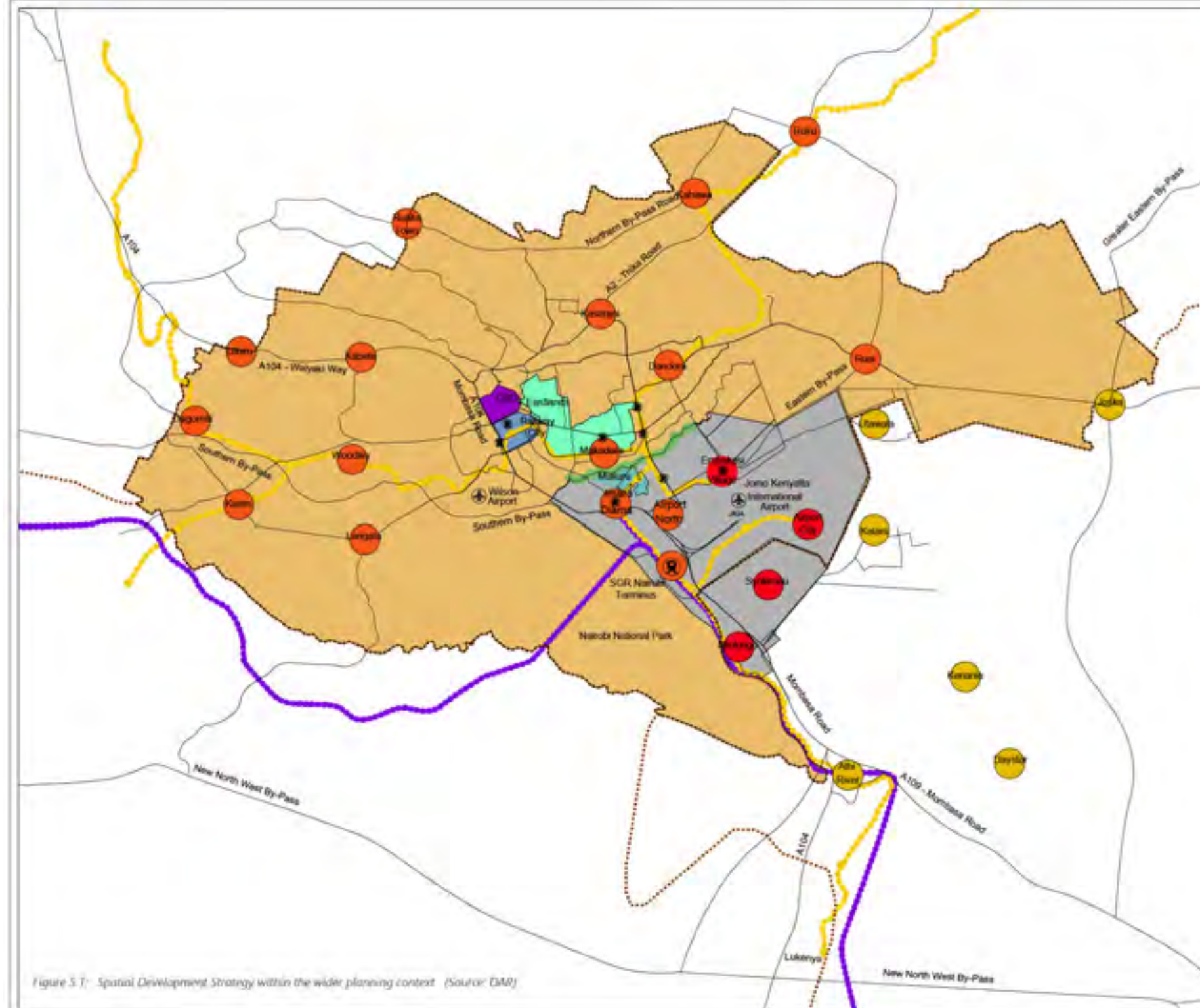


Figure S.1: Spatial Development Strategy within the wider planning context (Source: DAR)

5.5 HIERARCHY OF CENTRES

Although the NIUPLAN originally identified the sub-centres, it does not include a hierarchy of sub-centres. The NIUPLAN appears to consider all of them to be of importance to achieve the strategy of decentralisation. Likewise, the emerging Mavoko ISUDP does not include a hierarchy of growth centres.

The strategic importance of the established and additional sub-centres and growth centres in the Planning Area has been considered. The Nairobi SGR Terminus and Airport City both have special characteristics that distinguish them from the other centres. They are the two areas 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. Nairobi SGR Terminus Sub-Centre (incorporating Airport North)
2. Airport City Growth Centre
3. Other Growth Centres (Mlolongo West and Syokimau Town)
4. Other Sub-Centres (Imara Daima and Embakasi Village)

5.6 FUNCTION OF CENTRES

5.6.1 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 for the Nairobi SGR Terminus sub-centre, explained in the Action Plan for that area, it is envisioned to be 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.

5.6.2 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 the proposed growth centres at Mlolongo West and Syokimau Town.

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.

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.

5.7 INTER-CONNECTIONS

The spatial development strategy, when combined with the NIUPLAN and the 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 Planning 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 of 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 Nairobi SGR Terminus and JKIA are particularly strong focal points and the visioning process has demonstrated that stakeholders consider their inter-relationship to be important.

5.8 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 Planning Area, it is important to ensure that there are strategic and physical connections with areas outside the Planning Area.

The western zone of the Planning 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 them.

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 Planning Area development opportunities identified. 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 Planning 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, 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 Nairobi SGR 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 Nairobi SGR Terminus.



Figure 5.2: Connections between the Planning Area and external areas.
(Source: DAR)



Inter-County Physical and Land Use
Development Plan for Nairobi SGR Terminus
and Adjoining Areas (2020-2035)

SPATIAL DEVELOPMENT STRATEGY DIAGRAM

- Main Road
 - Secondary Road
 - Core Area Boundary
 - Planning Boundary
 - Water Courses
 - Key Inter-Connections to be Developed
 - Existing SGR Network
 - Existing Commuter Rail Network
 - Existing Rail Stations
 - Existing Airport (JKIA)
 - Undeveloped Buffer
 - Nairobi CBD
 - Nairobi Railway City Project
 - Makeni Special Planning Area
 - Proposed Linear Park (Ngong River) (DAR)
- Proposed Sub-Centres**
- NIUPLAN**
 - N1 Innes Daina
 - N2 Airport North
 - N3 SGR Nairobi Terminus (Previously Referred to as Syokimau)
 - N4 Ruai
 - N5 Makadara
 - SGR Masterplan (DAR)**
 - S1 Embakasi Village
- Proposed Growth Centres**
- SGR Masterplan (DAR)**
 - S2 Airport City
 - S3 Mlolongo (Also Proposed in Mavoko ISUDP)
 - S4 Syokimau Town
 - Mavoko ISUDP**
 - M1 Utakwa
 - M2 Katari



SEPTEMBER 2020

dar

Figure 5.3: Spatial Development Strategy Diagram (Source: DAR)

5.9 OTHER PROPOSALS

5.9.1 BRT LINE 1 - TRANSIT ORIENTED DEVELOPMENT CORRIDOR (STRATEGIC POLICY 2)

5.9.1.1 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 land use and transportation plans have been identified and reviewed within Technical Studies 1 and 4. 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 recent 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 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

As explained in Technical Study 3, the design for BRT Line 1 is advancing. This passes along Mombasa Road through the Planning 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



Figure 5.4: BRT Line 1 (Source: NIUPLAN)

5 traverses' southwards, the land uses are predominantly industrial/warehouses near Syokimau and Mlolongo, gradually transitioning to residential at the southern extent of the Planning Area.

5.9.1.2 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.

Integrated Transport Network - 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 (TOD).

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.

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, Bogotá 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 meant 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.

Lagos BRT – Lagos, Nigeria

The Lagos BRT is a 22km 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 through regulatory reform and a combination of traffic management and implementation of a high quality, high performance 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

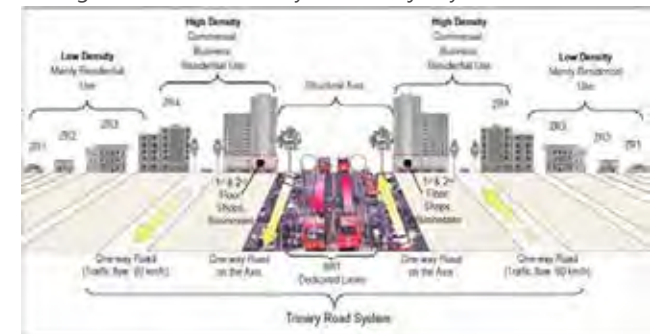


Figure 5.5: Diagram showing Curitiba BRT system and surrounding land use proposals

tertiary sector services occur. This aids in allowing citizens to travel from the residential outskirts 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.

5.9.1.3 Proposed Strategy

Because Mombasa Road passes through the heart of the Planning 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 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 MRTS 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, non-motorised transport (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.

In Mlolongo West, the Transport Strategy includes a new public transport interchange to integrate the BRT with trips from smaller capacity transport systems such as matatus



Figure 5.6: Illustrative Diagram of BRT Catchment Areas
(Source: MRTS Harmonisation Study)

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.

WALK**DEVELOPING NEIGHBORHOODS THAT PROMOTE WALKING****OBJECTIVE A.** The pedestrian realm is safe, complete, and accessible to all.**OBJECTIVE B.** The pedestrian realm is active and vibrant.**OBJECTIVE C.** The pedestrian realm is temperate and comfortable.**CYCLE****PRIORITIZE NONMOTORIZED TRANSPORT NETWORKS****OBJECTIVE A.** The cycling network is safe and complete.**OBJECTIVE B.** Cycle parking and storage is ample and secure.**CONNECT****CREATE DENSE NETWORKS OF STREETS AND PATHS****OBJECTIVE A.** Walking and cycling routes are short, direct, and varied.**OBJECTIVE B.** Walking and cycling routes are shorter than motor vehicle routes.**TRANSIT****LOCATE DEVELOPMENT NEAR HIGH-QUALITY PUBLIC TRANSPORT****OBJECTIVE A.** High-quality transit is accessible by foot. (TOD Requirement)**MIX****PLAN FOR MIXED USES, INCOME, AND DEMOGRAPHICS****OBJECTIVE A.** Opportunities and services are within a short walking distance of where people live and work, and the public space is activated over extended hours.**OBJECTIVE B.** Diverse demographics and income ranges are included among local residents.**DENSIFY****OPTIMIZE DENSITY AND MATCH TRANSIT CAPACITY****OBJECTIVE A.** High residential and job densities support high-quality transit, local services, and public space activity.**COMPACT****CREATE REGIONS WITH SHORT TRANSIT COMMUTES****OBJECTIVE A.** The development is fit, or next fit, an existing urban area.**OBJECTIVE B.** Traveling through the city is convenient.**SHIFT****INCREASE MOBILITY BY REGULATING PARKING AND ROAD USE****OBJECTIVE A.** The land occupied by motor vehicle is minimized.

Figure 5.7: TOD Planning Principles (Source: TOD Standard, 3rd Edition, 2017)

5.9.2 INTEGRATING MUKURU (STRATEGIC POLICY 3)

5.9.2.1 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 the Planning Context, Mukuru has been designated as a 'Special Planning Area'. It faces different planning challenges to other parts of the Planning 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 this Inter-County Plan can plan for Mukuru as a composite part of the Planning Area. Proposals for Mukuru itself that provide for the needs of its residents will be covered by the Special Planning Area project.



Figure 5.8: Mukuru Existing Conditions (Source: Mukuru Situational Analysis, 2017)

5.9.2.2 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.

5.9.3 EMBAKASI BARRACKS - UNDEVELOPED BUFFER (STRATEGIC POLICY 4)

5.9.3.1 Summary of Existing Conditions, Plans and Studies

At the north-east of the Planning 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 Planning 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'.

5.9.3.2 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.



Figure 5.9: Embakasi Barracks Undeveloped Buffer Concepts



Figure 5.10: Embakasi Barracks Undeveloped Buffer Concepts

5.9.4 NGONG RIVER - LINEAR PARK (STRATEGIC POLICY 5)

5.9.4.1 Summary of Existing Conditions, Plans and Studies

Much of the northern boundary of the Planning Area is formed by the Ngong River. The southern banks of the river, which are within the Planning Area, are predominantly occupied by informal housing with some evidence of historic and existing quarrying activities. The northern banks of the river, outside the Planning 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 currently an environmental hazard in many ways.

5.9.4.2 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.

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 Planning Area.



Figure 5.11: Ngong River Existing Conditions



Figure 5.13: Ngong River Linear Park Concepts



Figure 5.12: Ngong River Linear Park Concepts

5.10 STRATEGIC POLICIES FOR SPATIAL DEVELOPMENT

Strategic Policy 1: Spatial Development Strategy

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

Imara Daima, Airport North, Nairobi SGR Terminus and Embakasi Village shall be planned and function as Sub-Centres. Mlolongo West, 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 West 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 Spatial Planning Concept and the NIUPLAN.

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.

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 addressed in this Inter-County Plan. One of the main challenges that can be addressed by this Plan is the issue of transportation, as set-out in this Strategic Policy.

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 Planning 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 Planning 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.

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.

6. TRANSPORT STRATEGY

6.1 INTRODUCTION

A Transport Strategy was created due to the need for a uniform, comprehensive approach on the transport solutions within the Planning Area. A summary of the transport proposals is listed below, with a full detailed analysis carried out in Technical Study 3. Transport Guidance is also provided in the Technical Study and will assist with future detailed planning and managing the impacts of development.

The chapter begins by explaining existing transport projects already in the pipeline. The transport proposals for the Planning Area are then explained, including the interface with existing transport networks and projects.

6.2 EXISTING ROAD PROJECTS

Mombasa Road is the main route crossing through the Planning Area and is the backbone to the transport design considerations that follow. Considering the current traffic conditions, Mombasa Road has been heavily congested during peak times due to its importance within the national and local level networks.

A list of concept level proposals were set out in NIUPLAN aimed at trying to de-congest this major road to ease the flow of traffic.

Two roads were envisaged in the Nairobi Road Improvement Programme to divert through traffic from passing into the CBD. These roads have the potential to reduce the volumes of traffic passing along the Mombasa Road. These are the “Newroad” and Greater Eastern Bypass. Based on collected information at meetings held with local infrastructure public agencies, Figure 6.2 displays where these new routes could be located.

The Newroad diverts from Mombasa Road to southern Nairobi near Kyumvi. There could be another exit from Mombasa Road to the Newroad near Athi River and from this junction on, the Newroad alignment follows north-west to join the Old Naivasha Road, thus serving as a bypass around southern Nairobi.

The Greater Eastern Bypass provides a much wider ring route than the existing Eastern Bypass. This road departs from an intermediate location between Kyumvi and Athi River to the north to join the A3 Road and the A2 Road near Makuyu.

Additionally, within the Planning Area there are under construction, projects to enlarge the Outer Ring Road, the Airport North Road and Eastern Bypass Road. Those will have four lanes per direction.

Another initiative is the committed project to link the South Coast Road and the Park Road along the boundary of the national park thus providing an alternative route to Mombasa Road.

More specifically related to the Mombasa Road, there is the proposed detailed design of A104 carriageway by GIBB Africa. According to those plans, there should be an increase to four express lanes and two additional slip roads per direction and a segregated BRT central corridor thus substantially increasing the road capacity and also organising traffic by segregating local traffic from through traffic and dedicating road space to public transport. This concept is retained within this Inter-County Plan and the same cross section typology has been expanded to near a new proposed BRT Terminal at Mlolongo West – this terminal will be further elaborated on in the following sections within this transport report.

Another key component that has been kept from GIBB Africa, is the new ICD connection with Enterprise Road. This connection also fosters connectivity to other local roads surrounding the ICD and improves the road capacity of Enterprise Road. The proposed detailed design raises the



Figure 6.1: Truck parking alongside roads near ICD (Source: DAR/GPO Team).

at grade Mombasa Road onto a flyover section so that a roundabout can be constructed underneath. The roundabout will allow drivers from Mombasa Road to access both the ICD and Enterprise Road and to also possibly turn back to the Mombasa Rd. Complementing this will be the new ICD access route. Additionally, designed road plans include a new junction on the proposed Southern Bypass to create access to the ICD area.

An important contributing factor to congestion within the Planning Area is the parking of trucks along local roads, which impede traffic flow. However, there have been no existing proposals to address this problem.

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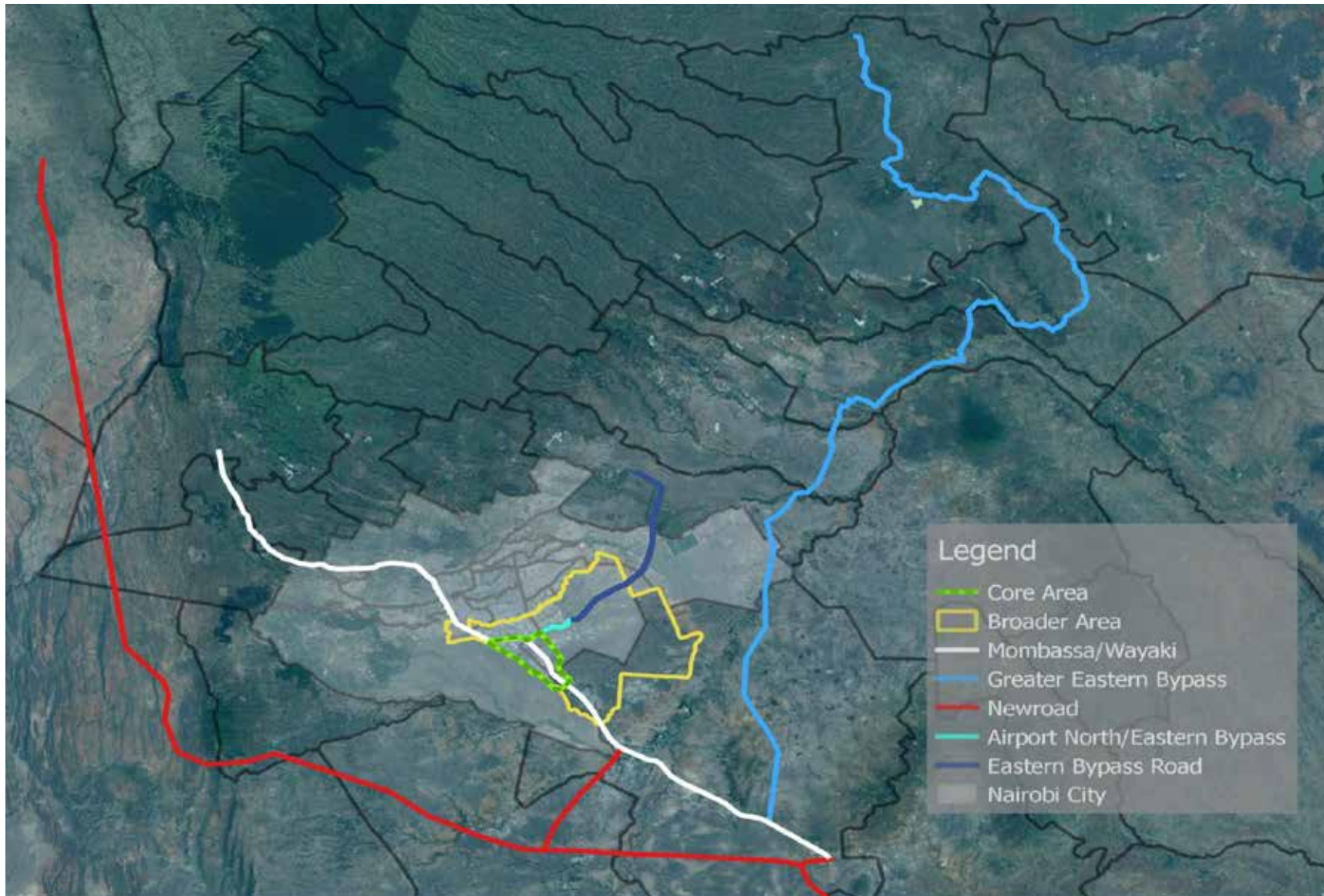


Figure 6.2: New major routes for the Nairobi Road Improvement programme (Source: DAR/GPO Team, with information provided by NaMSIP).

6.3 EXISTING PUBLIC TRANSPORT PROJECTS

Two transport systems are being developed to provide a mass transport network to the Nairobi Metropolitan Region: The Nairobi Commuter Rail Service (NCRS) network and the BRT network. The 2030 NCRS network is composed of 6 lines. The system will be integrated with the BRT lines and the SGR.

Three NCRS lines and two BRT lines are planned to serve the Planning Area. These two public transport modes can provide high-frequency services but only the NCRS will reach the centre of the Core Area. NCRS Line 3 runs from Lukenya to the Nairobi Central Station, passing through the Nairobi Terminus station. According to the Commuter Rail Master Plan (CRMP), service frequency in 2030 will be 2 trains per hour for the entire line and an additional 3 trains per hour running between Athi River and Nairobi Central Station. This service pattern will result in 5 trains per hour at the peak time running along the tracks within the Planning Area boundaries. Users of this line departing from Lukenya will take approximately 33 minutes at am peak hour to Nairobi Central, approximately 18 minutes to Nairobi Terminus, and nearly 22 minutes to Imara Daima.

NCRS Line 4 runs from JKIA to Nairobi Central Station, also passing through Nairobi Terminus station. According to the CRMP, service frequency in 2030 will be 6 trains per hour for the entire line at the peak time. Users departing from JKIA will take approximately 19 minutes at am peak hour to Nairobi Central, approximately 5 minutes to Nairobi Terminus and nearly 8 minutes to Imara Daima.

The two lines run along the same section of track from Nairobi Terminus to Nairobi Central, providing users in the surroundings of the Nairobi Terminus with 11 trains per hour. The CRMP has proposed to remove the existing Syokimau station due to the rail crossing of Mombasa Road needing to be grade separated to access the JKIA area.

NCRS Line 5 runs from Embakasi Village to Nairobi Central station and although it doesn't enter to the Core Area it plays a very important role to Adjoining Areas. The CRMP estimates a train service frequency of 10 trains per hour at peak time on this line.

A route extension from Embakasi Village to Ruai and towards Kangundo was included by CRMP in Phase 2, a longer-term network development. However, the study highlights that "Phase 2 implementation is dependent on a refreshment of the Master Plan once significant progress has been made on the implementation of the core scenario for Commuter Rail, alongside BRT delivery".

Another major railway system that's currently under construction is the SGR Phase 2 A section, a westbound extension to Kampala starting from Nairobi Terminus that crosses through the National Park in a viaduct and deviates from the urbanised area.

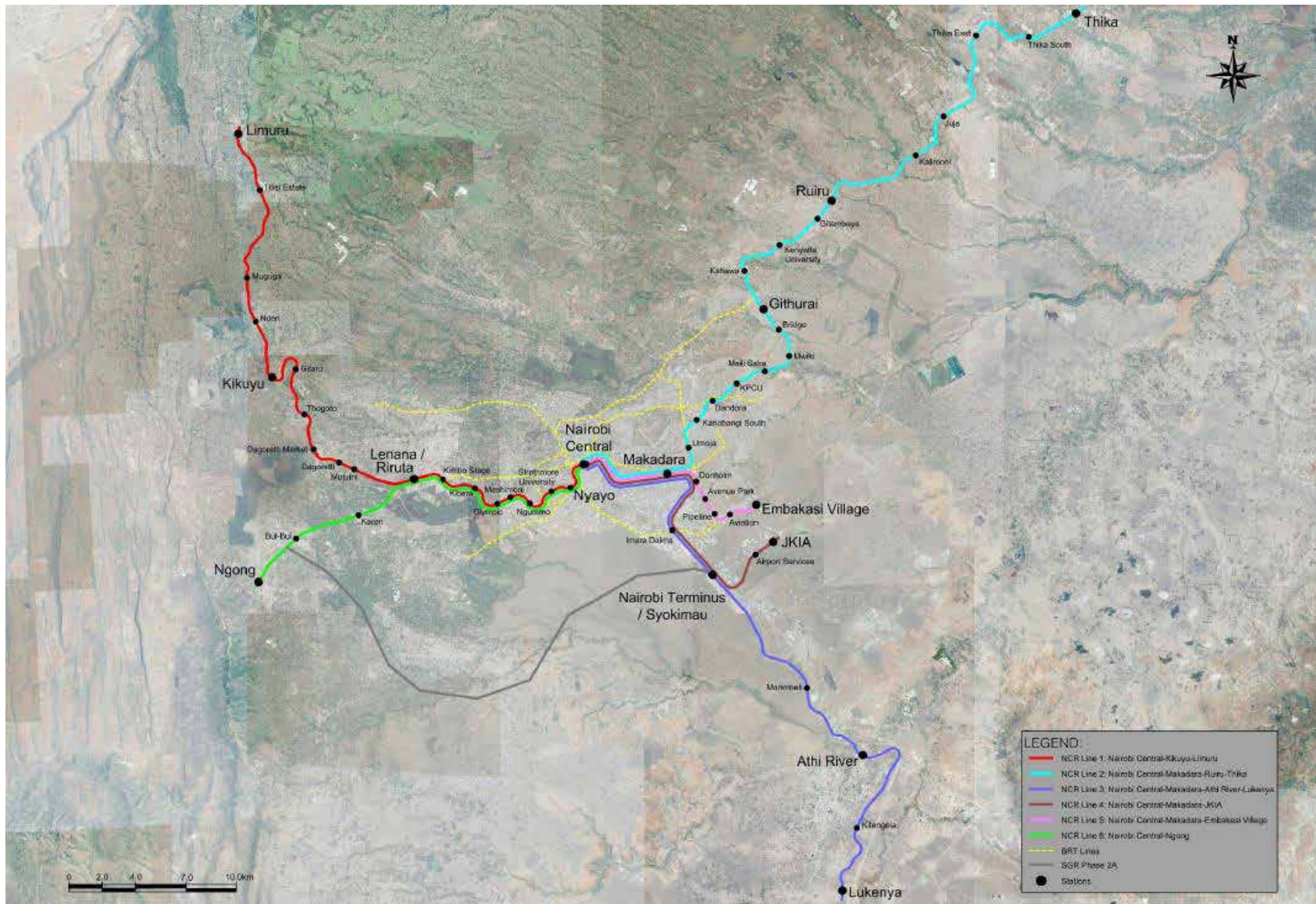


Figure 6.3: Core Commuter Rail Network (Phase 1 - 2030) (Source: Commuter Rail Master Plan for Nairobi Metropolitan Region)

The suggested routes for BRT Lines 1 and 5 in the NIUPLAN have both lines ending in the Imara Daima area, running along the Mombasa Road for Line 1 and along the Airport North Road and the Outer Ring Road for the Line 5.

According to the BRT Line 1 detailed design (Figure 6.4), this line would run from the junction of Mombasa Road with the Southern Bypass Road to a new return specially designed for the BRT near the JKIA access road at the “trumpet” junction.

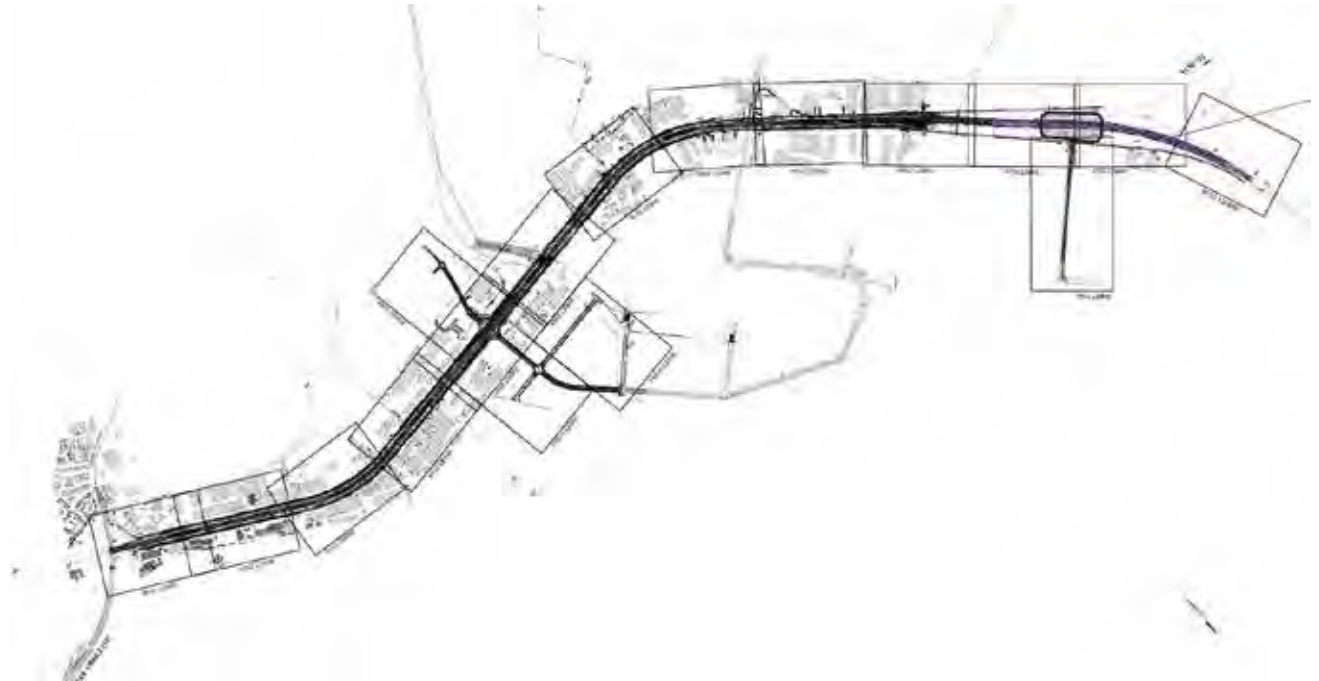


Figure 6.4: BRT Line 1 detailed design (Source: Courtesy of GIBB Africa).

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6.4 NON-MOTORIZED TRANSPORT PROPOSALS

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 is a cycle path and pedestrian path that runs along with the extended BRT Line 1 route on Mombasa Road.
- > At the connection of the SGR Nairobi Terminus Sub-Centre with Syokimau Growth Centre, it is recommended that the proposed flyover also provides (on the same structure) a cycle-only path and separate pedestrian path.
- > 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 transpose the 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 cycle-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 railway is proposed as part of the station structure. If the station design does not allow this possibility, a separate footbridge must be provided elsewhere.

6.5 PUBLIC TRANSPORT PROPOSALS

- > 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 Line 1 is also suggested by extending its original terminus point (Imara Daima as stated in NIUPLAN) to Mlolongo West Growth Centre 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.

NON-MOTORISED TRANSPORT PROPOSALS FOR THE STUDY AREA

LEGEND

- Main Road
- Secondary Road
- Railway (NCR)
- Railway (SGR)
- Water Courses
- Core Area Boundary
- Planning Area Boundary
- Broader Area NMT Main Infrastructures
 - Pedestrian / Cycle paths
 - Cyclists and sidewalks along Mombasa Road
 - Existing Main Roads
 - Footbridges

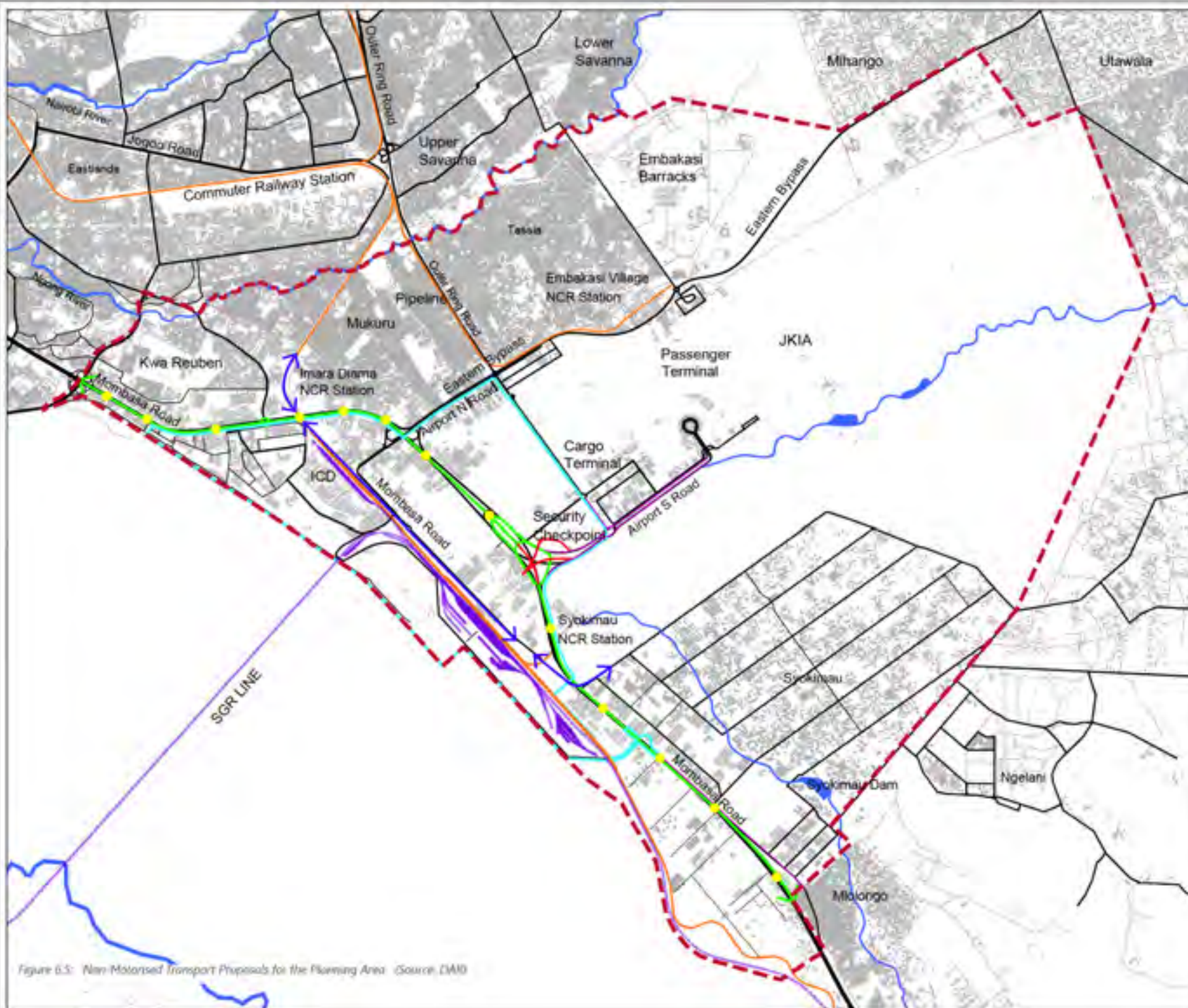


Figure 6.5: Non-Motorised Transport Proposals for the Planning Area (Source: DAR)

PUBLIC TRANSPORT PROPOSALS FOR THE STUDY AREA

LEGEND:

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Core Area Boundary
- Planning Area Boundary
- Nairobi Commuter Rail (Expansion)
- Bus Network (Proposed)
- Demand Vector
- Transportation Connection Nodes
- Commuter Stations

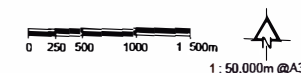


Figure 6.6: Public Transport Proposals for the Planning Area (Source: DAR)

6.5.1 BUS FEEDER LINES

The bus feeder lines network intends to complement the interchanges within the overall transport network being proposed to the Core Area and Adjoining Areas. Additionally, it is recommended to build bus termini for interchanges between the mass transport system and the smaller capacities systems at the end of this lines.

The feeder bus system is different from the service provided by the matatus. The buses have fixed stops and cannot park randomly. The following bus feeder routes are being proposed:

> **Route 1 – internal connection, within Core Area**

Proposed bus Route 1 provides public transport option by bus between the Nairobi Terminus and the southern sector of the Core Area, near the National Park.

> **Route 2 – connection between Airport City and the new bus Syokimau Terminus**

Proposed bus Route 2 provides access between the two areas and also to the Syokimau Terminus. It would be possible for residents of Katani to reach this bus route by walking short distances or from other additional bus service extensions.

> **Route 3 – direct connection between Mlolongo and Syokimau areas and indirect connection between Mlolongo Terminus and Syokimau Terminus**

Proposed bus Route 3 can provide access to the new Syokimau terminus where users can interchange to/from BRT Line 1 extended section. Users coming further from bus route 4 areas can also interchange at the Syokimau terminus in order to reach the Nairobi Terminus and other places within the Core Area.

Additionally, the proposed bus Route 3 can provide access to the Syokimau Terminus where users can interchange to other feeder buses services in order to get to the Syokimau residential areas or even to the Airport City area).

> **Route 4 – interconnection between Syokimau, Core Area and Embakasi Village**

The proposed bus Route 4 interconnects Syokimau with the Core Area and the Embakasi Village area thus serving these three areas.

> **Route 5 – interconnection between Syokimau and Airport City**

Provides a connection between Syokimau and Airport City, serving the western areas of Syokimau.

> **Route 6 – Connection between Mihango and Embakasi Village and the ICD and the Nairobi Terminus**

The proposed bus route 6 Mihango – Nairobi Terminus could also improve connectivity between these two areas).

> **Route 7 – Connection JKIA and Pipeline**

Bus route 7 provides connection to both BRT Line 5 and NCRS at Pipeline Railway Station, reducing travel time between JKIA and Embakasi Village.

> **Route 8 – connection between Airport City and Mlolongo Terminus**

Proposed bus route 8 can provide access between these two areas and also to the Mlolongo terminus. It is possible residents of Katani to reach this bus route by walking a short distance or by potential bus service extensions.

> **Route 9 – Connection between Syokimau and Core Area**

Proposed bus route 9 can provide direct connection from Core Area to Syokimau. Additionally, feeder buses can provide connectivity at the proposed new Syokimau terminus where users can interchange to BRT Line 1 extended section in order to reach the Core Area.

> **Route 10 – Connection between Airport City and Ruai/Mihango**

The new road that goes from Syokimau/Mlolongo up to Eastern Bypass creates a more direct connection between Mihango and the new growth centres. Bus route 10 takes advantage of this new road to provide short link from Ruai/Mihango to Airport City.

The following map provides an overview of the bus feeder routes.

6.6 ROAD NETWORK PROPOSALS

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

- > Improvement of two roads bordering the area of Syokimau Town Growth Centre.
- > Creation of a road which extends from Mombasa Road to Airport City Growth Centre and then heading towards Mihango and onwards towards the Eastern Bypass.
- > Creation of a new bypass south-west of the SGR Nairobi Terminus sub-centre to provide an alternate route between Mombasa Road and west Nairobi.
- > Creation of two new junctions connecting Mombasa Road and the SGR Nairobi Terminus Sub-Centre into Syokimau Growth Centre.
- > Reopening of the road from Airport North to JKIA.
- > A new tunnel north of Imara Daima Station to connect 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 SGR Nairobi Terminus Sub-Centre.
- > Creation of a new segregated roundabout near Imara Daima Sub-Centre allowing a north to south vehicular access point.
- > Grade separated flyover U-turns at strategic locations along Mombasa Road.

COMPREHENSIVE TRANSPORT PLAN

LEGEND

- Existing Nairobi SGR Station
- Planned Transport Interchange Terminus
- Existing Security Check Point
- Broader Area Boundary
- BROADER AREA - ROAD NETWORK**
 - Road Network
 - BRT
 - BRT Access Route to Core Area
 - Flyovers and Viaducts
- BRT Transfer Stations
- Water Courses
- Local Bus Stops (Regular Services)
- Bus Route 1
- Bus Route 2
- Bus Route 3
- Bus Route 4
- Bus Route 5
- Bus Route 6
- Bus Route 7
- Bus Route 8
- Bus Route 9
- Bus Route 10
- RAILWAY NETWORK**
 - Railway (SGR)
 - Railway (MCR)
 - Railway Stations (MCR/RGR) - Proposed

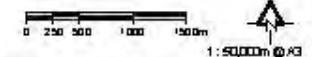
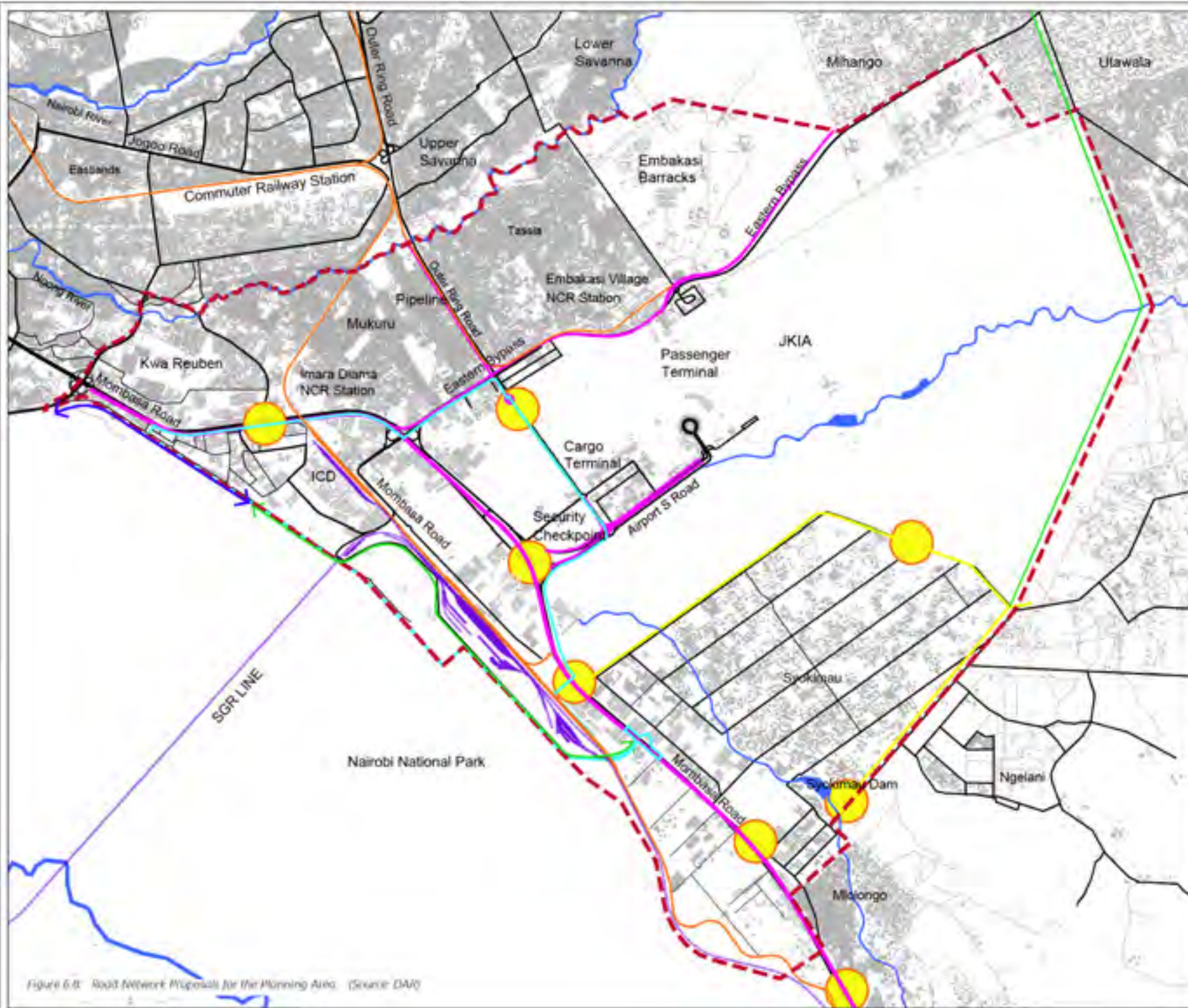


Figure 6.7: Comprehensive Transport Plan (Source: DAR)





Inter-Country Physical and Land Use Development Plan for Nairobi SGR Terminus and Adjoining Areas (2020-2035)

ROAD NETWORK PROPOSALS FOR THE STUDY AREA

LEGEND:

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Com Area Boundary
- Planning Area Boundary

Key Road Inter-Connection:

- Existing Roads Improvement
- Committed Projects
- Proposed Road Connections
- Existing Roads Connections
- Critical Points




1 : 50,000 @ A3

SEPTEMBER 2020 **dar**

Figure 6.8: Road Network Proposals for the Planning Area. (Source: DAV)

6

6.6.1 MOMBASA ROAD

Work undertaken by GIBB Africa redesigns Mombasa Road as indicated in the cross section in Figure 6.9. The Transport Strategy proposes the implementation of new junctions to provide access and exit to and from these areas as shown in Figure 6.10 and set out below:

1. Grade separated flyover U-turns make it possible for drivers to change direction. At the central green spaces, enough room for the BRT buses to turn has been provided, enabling different operational arrangements to take place (e.g. increased bus routing from this point inbound to the CBD).
2. In this section, slip roads are far from the express central lanes, forming a large roundabout with flyover U-turns grade separated that provides access to JKIA and to the SGR Nairobi Terminus Sub-Centre for those travelling in either direction along Mombasa Road. Additionally, a link road provides a direct access between the sub-centre and the airport area, composed of a flyover.
3. The major road along the north side of Syokimau gains a new junction to Mombasa Road, allowing a direct connection between the Core Area and Syokimau and Airport City areas. A grade separated clover leaf connects these two areas to the Mombasa Road at this point, with possible movement inbound to CBD and outbound to Mombasa.
4. The proposed bypass road along the south-west boundary of the SGR marshalling yard, requires a new junction to connect to Mombasa Road. On the south-western side of Mombasa Road the connection will be at grade and a flyover will be required to connect the bypass with the north-eastern side of Mombasa Road.
5. This junction intends to connect Mombasa Road to the major road along the south-east boundary of Syokimau that runs toward Airport City and Mihango. Due to the BRT alignment that is being diverted to a final terminus at Mlolongo West, part of the road will have a special configuration. The express lane and the slip road outbound to Mombasa will split after passing under the flyover. The slip road will cross the existing roads inside the Mlolongo West area. From this section on, the BRT only needs to exist inbound to CBD.
6. At the final section of the BRT, it is envisaged that a grade separated U-turn is provided, taking from the external borders of the central green area. This U-turn allows buses to return to the central BRT lane inbound to the CBD. Stops to the outbound lane are proposed along with the mixed traffic lanes to serve residents in the neighbourhood.
7. Roundabout access from Mombasa Road is proposed to serve the ICD and industrial/warehouse area to the south, and Enterprise Road to the north which contains some similar and commercial land uses.

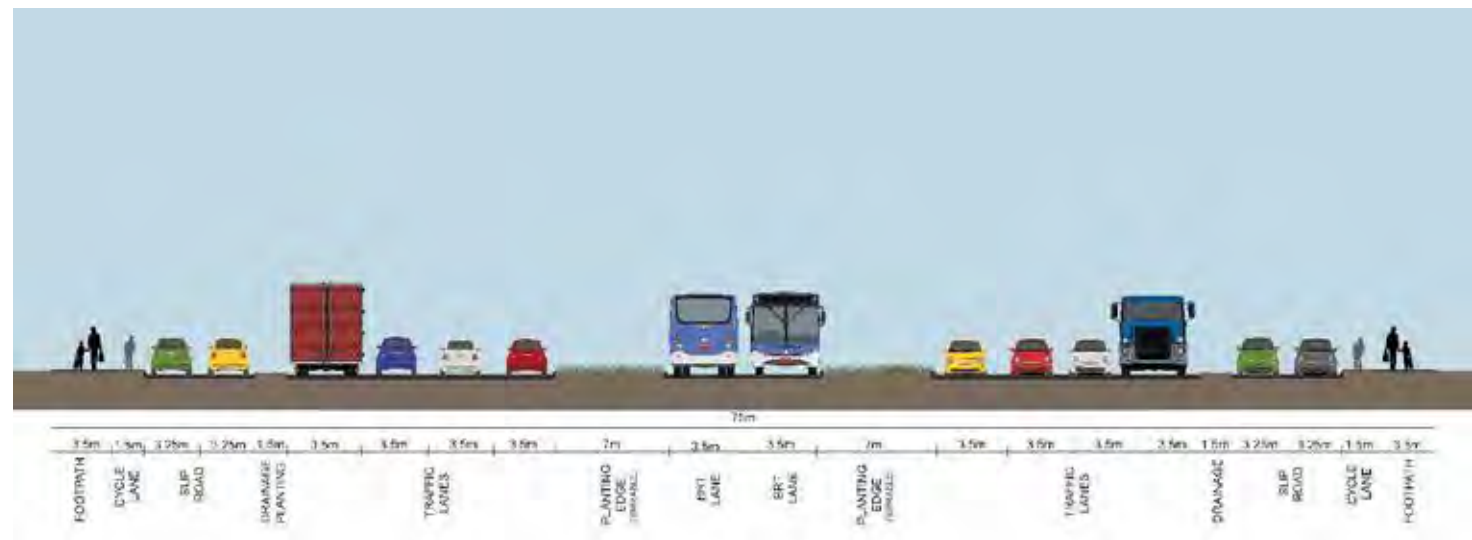


Figure 6.9: : Mombasa Road Proposed Cross Section (Source: DAR)

PROPOSED NEW JUNCTIONS AND
INTERVENTIONS ALONG
MOBASA ROAD

LEGEND

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Core Area Boundary
- Planning Area Boundary
- Mombasa Road
- Junctions / Interventions

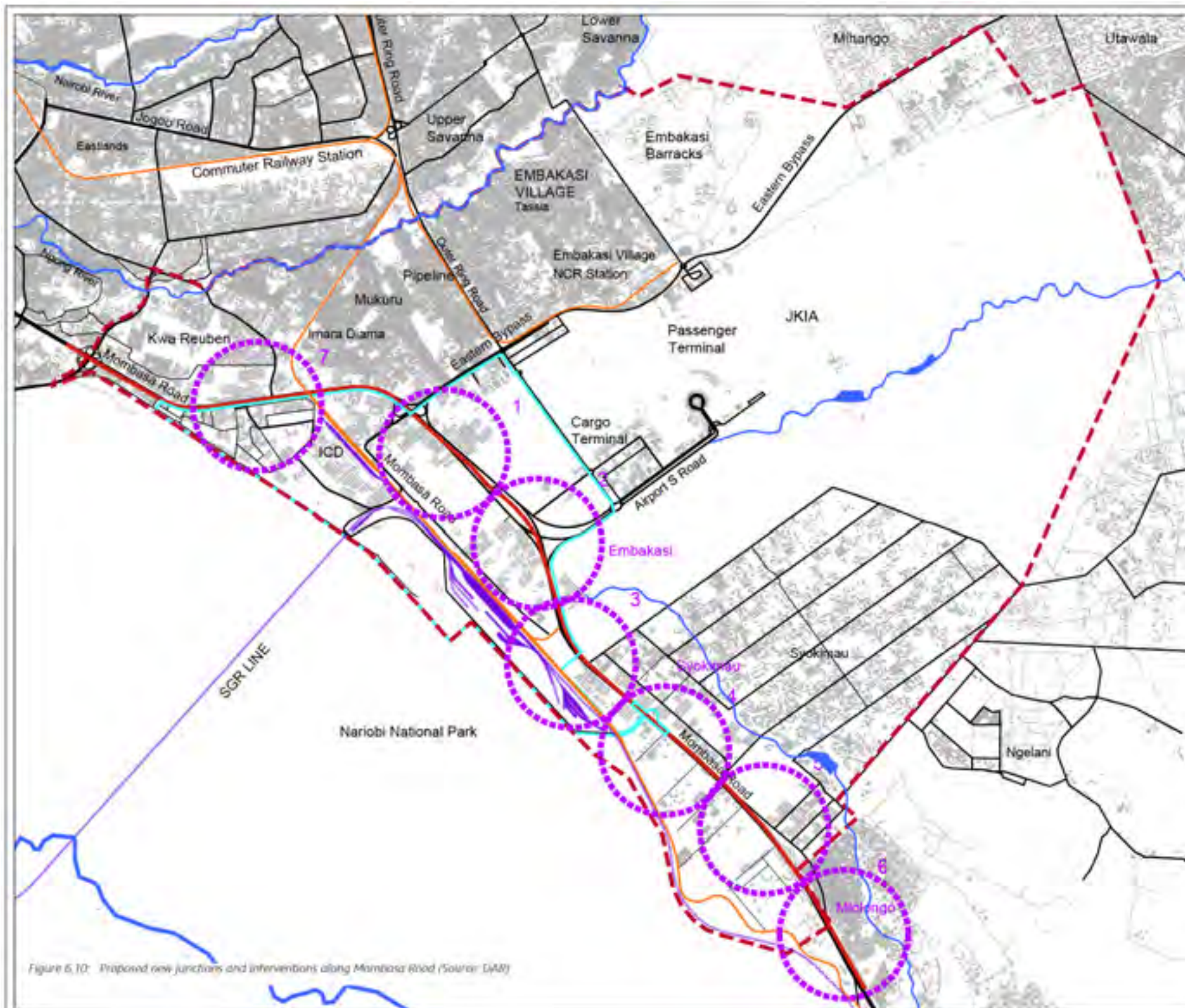


Figure 6.10: Proposed new junctions and interventions along Mombasa Road (Source: DfM)

7. LAND USE STRATEGIES FOR PROPOSED CENTRES

7.1 INTRODUCTION

In the Planning 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:

- > Nairobi SGR 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 West – emerging Mavoko ISUDP Growth Centre;
- > Airport City – additional Growth Centre; and
- > Syokimau Town – additional Growth Centre.

The Nairobi SGR Terminus and Airport North are covered in the Action 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 and are supported by strategic policies with associated policy guidance. The purpose of these is to guide the future planning of these centres.

The chapter concludes with a concept land use plan for the Planning Area, an estimate of development and population capacity, a summary of land use and transport integration, and indicative development timescales.



Figure 7.1: Imara Daima Existing Conditions

7.2 IMARA DAIMA (STRATEGIC POLICY 6)

7.2.1 SUMMARY OF EXISTING CONDITIONS, PLANS AND STUDIES

Imara Daima is situated towards the north-western corner of the Planning Area, just north of Mombasa Road. It comprises some recently-constructed gated residential accommodation and some warehouse industry. 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.

7.2.2 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 (by 2025-2030)

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 post-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 Action Plan for the Nairobi SGR 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 Nairobi SGR 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 bridge, 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 of 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.

Phase 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 7.3 shows how the proposed land use strategy can be achieved spatially.

7.2.3 ESTIMATED DEVELOPMENT AND POPULATION CAPACITY

Table 7.1 contains an estimation of the amount of development that could be achieved along with the population and employment generated

7.2.4 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



Figure 7.2: Imara Daima Mixed-Use Development Concept

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 Physical and Land Use 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;

7

- > 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 Plan. As referred to above, it is envisaged that Phase 2 will be completed post-2030, once improved Commuter Rail services are operational.
- > Because the proposed development will be taking place within an existing developed area, it is important that it does not have adverse impacts on properties and occupiers that will continue to remain in the area. When preparing development and urban design guidelines, it is vitally important to consider the potential impacts of the proposed development on surrounding properties and occupiers to ensure that they are not adversely impacted in respect of matters such as privacy, outlook, daylight/sunlight, air quality, noise and safety/security.

Table 7.1: 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
4 - Public Purpose (within residential and mixed use areas)		0.7	2.0	13,310	9,373						469			351	117	
5 - Commercial (Offices)	5.9	3.7	2.0	73,808	51,977									2,772	693	
11 - Mixed Use (Residential / Recreation / Retail)	16.3	10.2	2.5	254,345	30,450	148,667	1,487			5,947	1,522			609	913	743
13 - Green Spaces (Strategic)	9.4	9.4														
TOTAL	31.6	24.0	N/A	341,462	91,800	148,667	1,487	-	-	5,947	1,991	-	-	3,733	1,724	743

Mukuru



Inter-Country Physical and Land Use
Development Plan for Nairobi SGR Terminus
and Adjoining Areas (2020-2035)

Imara Daima Concept Land Use
Plan : Phase 1

Legend:

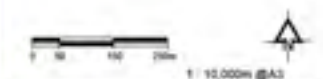
- 800 Radius
- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Core Area Boundary
- Planning Area Boundary
- Key Pedestrian Link to be Developed
- Proposed New Road

Existing Land Uses (Transparent)

- 0 Residential
- 1 Industrial / Warehouses
- 2 Education
- 4 Public Purpose
- 6 Public Utility
- 7 Transportation
- 11 Mixed Use (Residential / Recreation / Retail)
- Existing ICD
- ICD Expansion Area

Proposed Land Uses (Solid)

- 1 Industrial / Warehouses
- 7 Transportation
- 9 Safeguarded Land (Electricity Pylons)
- 11 Mixed Use (Residential / Recreation / Retail)
- 13 Green Space (Strategic)



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dar

Mombasa Road

ICD

Figure 7.3: Imara Daima Concept Land Use Plans: Phase 1 (Source: DAR)

Legend:

- 100 Radius
- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Core Area Boundary
- Planning Area Boundary
- Key Pedestrian Link to be Developed
- Proposed New Road

Existing Land Uses (Transparent)

- 0 Residential
- 1 Industrial / Warehouses
- 2 Education
- 4 Public Purpose
- 6 Public Utility
- 7 Transportation
- 11 Mixed Use (Residential / Recreation / Retail)
- Existing ICD
- ICD Expansion Area

Proposed Land Uses (Solid)

- 1 Industrial / Warehouses
- 5 Commercial (Offices)
- 7 Transportation
- 9 Segregated Land (Electricity Pylons)
- 11 Mixed Use (Residential / Recreation / Retail)
- 13 Green Spaces (Strategic)

Mukuru

ICD

Mombasa Road

Figure 7.4: Imara Daima Concept Land Use Plan: Phase 2 (Source: DVC)

7.3 EMBAKASI VILLAGE (STRATEGIC POLICIES 6 AND 10)

7.3.1 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 7.5: Embakasi Village Existing Conditions (Source: DAR)

7.3.2 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 (by 2030)

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 opportunities 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.

At the Airport North Road roundabout, an existing area of vacant land is proposed to be zoned for office use. This is to facilitate a high intensity employment area close to the station

hub. This commercial land use is strategically placed as 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.

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.

Figure 7.7 shows how the land use strategy can be achieved spatially.



Figure 7.6: Embakasi Village Mixed Use Development Concept

7.3.3 ESTIMATED DEVELOPMENT AND POPULATION CAPACITY

Table 7.2 contains an estimation of the amount of development that could be achieved along with the population and employment generated.

7.3.4 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 Physical and Land Use 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 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.
- > Because the proposed development will be taking place within an existing developed area, it is important that it does not have adverse impacts on properties and occupiers that will continue to remain in the area. When preparing development and urban design guidelines, it is vitally important to consider the potential impacts of the proposed development on surrounding properties and occupiers to ensure that they are not adversely impacted in respect of matters such as privacy, outlook, daylight/sunlight, air quality, noise and safety/security.

Table 7.2: 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
0 - 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
4 - Public Purpose (within residential and mixed use areas)		1.2	2.0	23,856	16,800						840			630	210	
5 - Commercial (Offices)	2.4	1.5	2.0	29,459	20,746									1,106	277	
7 - Transportation	1.1	0.7												17	11	
9 - Safeguarded Land (Commuter Railway Expansion)	2.6	2.6														
11 - Mixed Use (Residential / Recreation / Retail)	21.6	13.5	2.5	337,184	40,367	197,087	1,971			7,883	2,018			807	1,211	985
13 - Green Spaces (Strategic)	2.9	2.9														
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

**EMBAKASI VILLAGE CONCEPT
LAND USE PLAN PHASE 1**

- Legend:**
- 100 Radius
 - Main Road
 - Secondary Road
 - Nairobi Commuter Railway (NCR)
 - Key Pedestrian Link to be Developed
- Existing Land Uses (Transparent)**
- 0 Residential
 - 1 Industrial / Warehouses
 - 4 Public Purpose
 - 6 Public Utility
 - 7 Transportation
 - Remaining JICA
- Proposed Land Uses (2040)**
- 0 Residential
 - 1 Industrial / Warehouses
 - 7 Transportation
 - 8 Saturated Land (Commuter Rail Expansion)
 - 11 Mixed Use (Residential / Recreation / Retail)
 - 13 Green Spaces (Strategic)



Figure 7.7: Embakasi Village Concept Land Use Plans Phase 1 (Source: DAR)

EMBAKASI VILLAGE CONCEPT LAND USE PLAN: Phase 2

Legend:

- 800 Radius
- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Key Pedestrian Link to be Developed

Existing Land Uses (Transparent)

- 0 Residential
- 1 Industrial / Warehouses
- 4 Public Purpose
- 6 Public Utility
- 7 Transportation
- Remaining JGA

Proposed Land Uses (Solid)

- 0 Residential
- 1 Industrial / Warehouses
- 7 Transportation
- 9 Safeguarded Land (Commuter Rail Expansion)
- 11 Mixed Use (Residential / Recreation / Retail)
- 13 Green Spaces (Strategic)



1 : 10,000 @A3

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Figure 7.8: Embakasi Village Concept Land Use Plans: Phase 2 (Source: DAR)

7.4 SYOKIMAU TOWN (STRATEGIC POLICIES 7, 8 AND 9)

7.4.1 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 land amounting to 62 hectares is restricted from development as it appears to be in use for aviation communications.

A dam is located in the southern part of the area, fed by an associated stream which appears to run 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 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 of 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 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.

7.4.2 PROPOSED LAND USE STRATEGY

Syokimau Town is envisioned as a Growth Centre based on its strategic location close to the Nairobi SGR 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 (by 2025).

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 the Development Opportunities identifying this land use as having the highest demand. 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 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 proposed and will create a more fluid integration between Syokimau Town and the proposed Airport City.

Landscaped areas are also 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 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.



Figure 7.9: Syokimau Town - Existing Conditions (Source: DAR)



Figure 7.10: Syokimau Town - Existing Conditions (Source: DAR)



Figure 7.11: Syokimau Town - Existing Conditions (Source: DAR)



Figure 7.12: Syokimau Town Mixed Use Development Concept

Furthermore, it would act as a buffer between the existing residential and industrial areas.

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 Town. 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 Nairobi SGR Terminus Sub-Centre.

Figure 7.13 shows how the land use strategy can be achieved spatially.

7.4.3 ESTIMATED DEVELOPMENT AND POPULATION CAPACITY

Table 7.3 contains an estimation of the amount of development that could be achieved along with the population and employment generated.

7.4.4 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 Physical and Land Use 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 Plan. As referred to above, it is envisaged that development should be provided in the short term (by 2025).
- > Because the proposed development will be taking place within an existing developed area, it is important that it does not have adverse impacts on properties and occupiers that will continue to remain in the area. When preparing development and urban design guidelines, it is vitally important to consider the potential impacts of the proposed development on surrounding properties and occupiers to ensure that they are not adversely impacted in respect of matters such as privacy, outlook, daylight/sunlight, air quality, noise and safety/security.

SYOKIMAU TOWN CONCEPT LAND USE PLAN

Legend:

- Core Area Boundary
- - - Planning Area Boundary
- Main Road
- Secondary Road
- Indicative New Road
- Proposed New Road
- Single Gauge Railway (SGR)
- Nairobi Commuter Railway (NCR)
- Proposed Commuter Rail JICA Extension
- + BRT Station
- + Proposed Commuter Rail Station

- Land Uses**
- Existing (Transparent)**
- 0 Existing Residential (Medium/Low Density)
 - 1 Existing Industrial/Warehouses
 - 3 Existing Recreation/Retail
 - 6 Existing Utility
 - 7 Existing Transportation
 - 11 Existing Mixed Use (Residential/Recreation/Retail)

- Proposed (Solid)**
- 0 Residential (Low/Medium Density)
 - 0 Residential (High Density)
 - 1 Industrial & Warehouses
 - 4 Public Purpose
 - 7 Transportation
 - 9 Safeguarded Land (Commuter Railway Expansion)
 - 11 Mixed Use (Residential/Recreation/Retail)
 - 13 Green Spaces (Strategic)
 - 16 Potential Recreation/Retail/Public Purpose



Figure 7.13: Syokimau Town Concept Land Use Plan (Source: DAR)

Table 7.3: 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
0 - Residential	401.3	258.9														
<i>Maisonettes</i>		56.1	1.0	561,367		395,329	4,678			18,712						4,678
<i>Apartments</i>		202.8	1.5	3,041,824		2,142,129	21,421			85,685						10,711
1 - Industrial / Warehouses	35.8	25.2	0.8	201,669	142,021									303	706	
3 - Recreation / Retail	5.4	3.5	2.0	69,231	48,754						2,438			975	1,463	
4 - Public Purpose (within residential and mixed use areas)		8.6	2.0	171,276	120,617						6,031			4,523	1,508	
7 - Transportation	5.0	3.2												77	51	
11 - Mixed Use (Residential / Recreation / Retail)	71.0	45.8	2.0	916,537	161,362	484,086	4,841			19,363	8,068			3,227	4,841	2,420
13 - Green Spaces (Strategic)	109.2	109.2														
18 - Potential Recreation / 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

7.5 MLOLONGO WEST (STRATEGIC POLICIES 8, 9 AND 10)

7.5.1 SUMMARY OF EXISTING CONDITIONS, PLANS AND STUDIES

Mlolongo is divided into two parts by Mombasa Road. The eastern part is outside the Planning Area. This is a densely developed area including extensive informal development.

The western part is inside the Planning Area. Currently, it is 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, along Mombasa Road, which exacerbates localised traffic conflicts and congestion.

Mlolongo West 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.

The road network in Mlolongo West 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 West and connects to Mombasa Road via slip roads.

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

7.5.2 PROPOSED LAND USE STRATEGY

Mlolongo West 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.

The land use strategy for Mlolongo West 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 the Development Opportunities identifying this land use having the highest demand for growth and expansion. 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 a focus for community activities and seek to encourage walkable communities, whilst also creating an identity and unique feel for the area.

Due to Mlolongo West being partially developed already and there likely to be a continued pressure for further development, the proposed land use strategy should be implemented in the short term (by 2025) 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 West, run in a north-east direction through part of Mlolongo West and Syokimau Town, then along the south-east edge of Syokimau Town (outside the Planning Area). The land use strategy has safeguarded a green corridor within Mlolongo West 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 7.14: Mlolongo West Existing Conditions (Source: DAR)



Figure 7.15: Mlolongo West 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 Planning Area, partly running close to the south-east edge of Syokimau Town.

Figure 7.16 shows how the land use strategy can be achieved spatially.

7.5.3 ESTIMATED DEVELOPMENT AND POPULATION CAPACITY

Table 7.4 contains an estimation of the amount of development that could be achieved along with the population and employment generated.

7.5.4 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 Physical and Land Use 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 Plan. As referred to above, it is envisaged that development should be provided in the short term (by 2025).
- > Because the proposed development will be taking place within an existing developed area, it is important that it does not have adverse impacts on properties and occupiers that will continue to remain in the area. When preparing development and urban design guidelines, it is vitally important to consider the potential impacts of the proposed development on surrounding properties and occupiers to ensure that they are not adversely impacted in respect of matters such as privacy, outlook, daylight/sunlight, air quality, noise and safety/security.

Legend

- Core Area Boundary
- - - Planning Area Boundary
- Main Road
- Secondary Road
- Indicative New Road
- Proposed New Road
- Single Gauge Railway (SGR)
- Nairobi Commuter Rail (NCR)
- Proposed Commuter Rail JICA Extension
- BRT Station
- Proposed Commuter Rail Station

Land Uses

Existing (Transparent)

- 0 Existing Residential (Medium/Low Density)
- 1 Existing Industrial / Warehouses
- 3 Existing Recreational/Open

Proposed (Solid)

- 0 Residential (Medium Density)
- 0 Residential (High Density)
- 7 Transportation
- 9 Safeguarded Land (Commuter Rail Expansion)
- 13 Green Spaces (Strategic)
- 14 Undeveloped Buffer

Nairobi National Park

Syokimau

Syokimau Dam

Mlolongo

Ngeli

Figure 7.16: Mlolongo West Concept Land Use Plan (Source: DAR)

Table 7.4: Mlolongo West Estimated Development and Population Capacity

MLOLONGO WEST																
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
0 - Residential	185.3	119.6														
<i>Maisonettes</i>		25.9	1.0	259,225		182,553	2,160			8,641						2,160
<i>Apartments</i>		93.6	1.5	1,404,640		989,183	9,892			39,567						4,946
1 - Industrial / Warehouses	61.6	43.4	0.8	347,315	244,588									521	1,216	
4 - Public Purpose (within residential and mixed use areas)		4.5	2.0	89,288	62,879						3,144			2,358	786	
9 - Safeguarded Land (Commuter Railway Expansion)	9.1	9.1														
11 - Mixed Use (Residential / Recreation / Retail)	14.9	9.6	2.5	240,574	42,355	127,064	1,271			5,083	2,118			847	1,271	635
13 - Green Spaces (Strategic)	14.2	14.2														
18 - Potential Recreation / Retail / Public Purpose Hub	25.8	16.7	2.0	333,314	234,728						11,736			8,802	2,934	
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

7 7.6 AIRPORT CITY (STRATEGIC POLICIES 10 AND 11)

7.6.1 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 Indicative 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 world class medical facilities and there are opportunities for associated educational, hospitality, retail, leisure and residential development.

7.6.2 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.

It is not clear when KAA envisages that development at Airport City could be commenced. Due to Mlolongo West 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 (by 2030-2035).

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 7.17 shows how the land use strategy can be achieved spatially.

7.6.3 ESTIMATED DEVELOPMENT AND POPULATION CAPACITY

Table 7.5 contains an estimation of the amount of development that could be achieved along with the population and employment generated.

7.6.4 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 Physical and Land Use 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 Plan. As referred to above, it is envisaged that development should be provided in the medium to long term (by 2030-2035).

AIRPORT CITY CONCEPT LAND USE PLAN

Legend:

- Core Area Boundary
- - - Planning Area Boundary
- Main Road
- Secondary Road
- Indicative New Road
- Proposed New Road
- Single Gauge Railway (SGR)
- Nairobi Commuter Rail (NCR)
- Proposed Commuter Rail JICA Extension
- Tunnel
- + BRT Station
- Proposed Commuter Rail Station

Land Uses:

Proposed (Solid)

- 0 ■ Residential High Density
- 0 ■ Residential Medium Density
- 0 ■ Residential Low Density
- 2 ■ Education
- 4 ■ Public Purpose
- 5 ■ Commercial (Offices)
- 9 ■ Land Set-aside for Commuter Railway Expansion
- 11 ■ Mixed Use (Residential/Recreation/Retail)
- 12 ■ Hospitality / MICE
- 13 ■ Green Spaces

Figure 7.11: Airport City Concept Land Use Plan (Source: DAR)

Table 7.5: 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
0 - Residential	251.6	157.2														
<i>Maisonettes</i>		34.1	1.0	340,914		240,080	25,841			11,364						2,841
<i>Apartments</i>		123.2	1.5	1,847,279		1,300,900	13,009			52,036						6,505
2 - Education	50.5	31.6	2.0	631,561	444,761							22,238		623	267	
4 - Public Purpose (Health)	29.2	18.2	2.0	364,533	256,713				3,063			12,836		7,701	5,134	
4 - Public Purpose (within residential and mixed use areas)		13.0	2.0	259,426	182,694						9,135			6,851	2,284	
5 - Commercial (Offices)	4.8	3.0	2.0	59,779	42,098									2,245	561	
9 - Safeguarded Land (Commuter Railway Expansion)	16.4	16.4														
11 - Mixed Use (Residential / Recreation / Retail)	76.6	47.9	2.0	958,003	168,662	505,987	5,060			20,239	8,433			3,373	5,060	2,530
12 - Hospitality / MICE	32.0	24.6	1.0	245,967	121,251	51,965		866			8,083		1,732	1,819	4,244	52
13 - Green Spaces (Strategic)	26.1	26.1														
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

7.7 STRATEGIC POLICIES FOR PROPOSED CENTRES

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.

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.

Strategic Policy 8: Syokimau Town and Mlolongo West – Growth Centres

As shown on the Spatial Development Strategy Diagram, Syokimau Town and Mlolongo West 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 (by 2025).

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 West – Recreation/Retail/Public Purpose Hubs

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

These areas could be developed as a focus for community facilities, retail and recreation 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 recreation, retail and public purpose facilities 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, and in providing a focal point 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).

Strategic Policy 10: Embakasi Village, Mlolongo West and Airport City - Land Safeguarded for Commuter Railway Expansion

As shown on the Concept Land Use Plans, land has been safeguarded in Embakasi Village, Mlolongo West 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 to expand 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 Planning Area, part of the proposed railway passes through the southern part of the Syokimau Town and central part of the Mlolongo West 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 West 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; and 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).

There is no current proposal to expand the commuter railway at Embakasi Village, but as this is the current terminus of the railway, it is logical to safeguard the ability to do this in the future.

The policy objective is to respect the emerging Mavoko ISUDP and allow for the future implementation of the Commuter Railway expansion described above. Whilst it is possible to safeguard the undeveloped land in Embakasi Village, Mlolongo West 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.

7.8 TOTAL ESTIMATED POPULATION AND DEVELOPMENT CAPACITY

Figure 7.18 is a comprehensive plan showing concept land use across the entire Planning Area. Table 7.6 shows the resulting estimated development and population (note that this does not include the Nairobi SGR Terminus and Airport North Sub Centres, which are covered in the Action Plan). Efforts have been made to ensure that these are in general accordance with the Development Opportunities identified.

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 Planning Area this will be a step-change from the existing situation and from the current Nairobi City Development Ordinances and Zones (a similar document for

Machakos County was not available). 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 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 7.6: Estimated Development and Population Capacity for the Planning Area (excluding Nairobi SGR Terminus and Airport North Sub Centres)

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
0 - 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
1 - Industrial / Warehouses	97.4	6.2%	68.6	548,985	386,609									823	1,921	
2 - Education	50.5	3.2%	31.6	631,561	444,761							22,238		623	267	
3 - Recreation / Retail	5.4	0.3%	3.5	69,231	48,754						2,438			975	4,841	
4 - Public Purpose (Health)	29.2	1.8%	18.2	364,533	256,713				3,063			12,836		7,701	5,134	
4 - Public Purpose (within residential and mixed use areas)			27.9	557,155	392,363						19,618			14,714	4,905	
5 - Commercial (Offices)	13.0	0.8%	8.2	163,045	114,820									6,124	1,531	
7 - Transportation	6.1	0.4%	3.9											93	62	
9 - Safeguarded Land (Commuter Railway Expansion)	28.1	1.8%	25.5													
11 - Mixed Use (Residential / Recreation / Retail)	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
12 - Hospitality / MICE	32.0	2.0%	24.6	245,967	121,251	51,965		866			8,083		1,732	1,819	4,244	52
13 - Green Spaces (Strategic)	161.9	10.2%	161.9													
18 - Potential Recreation / Retail / Public Purpose Hub	107.4	6.8%	69.4	1,387,526	977,131						48,857			36,642	12,214	
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

CONCEPT LAND USE PLAN FOR THE STUDY AREA

Legend:

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Proposed Railway (NCR)
- Committed Railway (SGR)
- Water Course
- Core Area Boundary
- Planning Area Boundary

- Submarine 600m Station

Land Uses

Existing (Transparent)

- 0 Existing Residential (High/Medium/Low Density)
- 1 Existing Industrial / Warehouses
- 2 Existing Recreation/Retail
- 3 Existing Public Purpose
- 4 Existing Public Utility
- 5 Existing Transportation
- 11 Existing Mixed Use (Residential/Recreation/Retail)
- KID Existing
- KID Expansion Areas

Proposed (Solid)

- 0 Residential (Low Density)
- 1 Residential (Medium Density)
- 2 Residential (High Density)
- 3 Industrial & Warehouses
- 4 Education
- 5 Recreation/Retail
- 6 Public Purpose
- 7 Commercial (Offices)
- 8 Public Utility
- 9 Transportation
- 9 Safeguarded Land (Commuter Rail Expansion)
- 11 Mixed Use (Residential/Recreation/Retail)
- 12 Hospitality / MICE
- 13 Green Spaces
- 14 Service Apartments
- 15 Flood
- 17 Potential River
- 18 Corridor Rehabilitation
- 19 Potential Retail / Community Hub



Figure 7.16: Concept Land Use Plan for the Planning Area (Source: DAR)

7.9 LAND USE AND TRANSPORT INTEGRATION

The land use strategies are based on the integration of land use and transport planning. The success of the land use strategies is closely related to the provision of improved public transport. Table 7.7 summarises the public transport priorities that will assist in unlocking the development potential of each proposal.

These priorities must be reflected in future detailed planning and supported by other transport proposals in the Transport Strategy. These include feeder buses, non-motorised connections, local pedestrian links, improvements to existing roads/junctions and construction of new roads/junctions.

7.10 INDICATIVE DEVELOPMENT TIMESCALES

The spatial development strategy and land use strategies have set-out indicative timescales for when development could take place and have explained the reasoning for this. This is summarised in Table 7.8.

Table 7.7: Inter-County Planning Proposals and related public transport priorities

PROPOSAL	PUBLIC TRANSPORT PRIORITY	STATUS
Nairobi SGR Terminus Sub-Centre (incorporating Airport North)	Commuter Rail service improvements	Proposed – Nairobi Commuter Rail Master Plan
Imara Daima Sub-Centre	Commuter Rail service improvements	Proposed – Nairobi Commuter Rail Master Plan
Embakasi Village Sub-Centre	Commuter Rail service improvements	Proposed – Nairobi Commuter Rail Master Plan
Syokimau Town Growth Centre	BRT Line 1	At design stage
Mlolongo West Growth Centre	BRT Line 1	At design stage
Airport City Growth Centre	Commuter Rail extension	Proposed – this Inter-County Plan
Integrating Mukuru	New Commuter Rail Station	Proposed – this Inter-County Plan

Table 7.8: Indicative development timescales for Inter-County Planning proposals

PROPOSAL	PHASE	TIMING	NOTES
SGR Nairobi Terminus Sub-Centre (incorporating Airport North)	See Action Plan	See Action Plan	See Action Plan
Imara Daima Sub-Centre	Pre-Development	Immediately	Safeguard/re-zone undeveloped land for TOD
	Phase 1: TOD on Undeveloped Land	Short to Medium Term (by 2025-2030)	In readiness for improved commuter rail services
	Phase 2: Land Use Changes to Facilitate TOD	Post-2030	Once improved commuter rail services are operational
Embakasi Village Sub-Centre	Pre-Development	Immediately	Safeguard some undeveloped land for commuter rail expansion
	Phase 1: Creation of a Station Hub	Medium Term (by 2030)	In readiness for improved commuter rail services
	Phase 2: Land Use Changes to Facilitate TOD	Post-2030	Once improved commuter rail services are operational
Syokimau Town Growth Centre	Development	Short Term (by 2025)	Partially developed already, so there is need to put in place a coordinated approach
Mlolongo West Growth Centre	Pre-Development	Immediately	Safeguard some undeveloped land for commuter rail expansion
	Development	Short Term (by 2025)	Partially developed already, so there is need to put in place a coordinated approach
Airport City Growth Centre	Pre-Development	Short Term (by 2025)	Safeguard some undeveloped land for commuter rail expansion
	Development	Medium to Long Term (by 2030-2035)	Logical for Airport City to follow on from Syokimau Town and Mlolongo West
Ngong River - Linear Park	Pre-Development	Short Term (by 2025)	Relocation of people and properties at high risk of flooding, followed by river rehabilitation
	Development	Medium Term (by 2030)	Creation of Linear Park
Syokimau Town – River Rehabilitation Corridor	Pre-Development	Short Term (by 2025)	Relocation of people and properties at high risk of flooding, followed by river rehabilitation
	Development	Medium Term (by 2030)	Creation of Strategic Green Spaces, where opportunities exist



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ACTION PLAN FOR THE NAIROBI SGR TERMINUS SUB-CENTRE

8. SITE ANALYSIS

8.1 INTRODUCTION

This chapter describes the detailed site analysis undertaken for the Core Area. This was informed by a series of field reconnaissance and surveys conducted with the principal aim of developing an understanding of the physical, topographical and environmental setting of the Site. The following activities were undertaken:

- > Recording the physical characteristics;
- > Visually verifying existing structures and general land use activities, based on publicly available satellite imagery;
- > Identifying areas of opportunities and constraints;
- > Identifying environmentally important features; and
- > Gathering surface evidence of ground conditions.

The following specific locations were visited:

- > Mombasa Highway and its immediate environs;
- > Main access points to the Nairobi SGR Terminus premises;
- > Old Mombasa Road within and its adjacent land uses;
- > Nairobi SGR Terminus facilities (locomotive area, maintenance yard, vehicle depot, freight area) and adjoining industrial/warehousing areas;
- > Nairobi SGR Terminus building and SGR/NCR switch-yard area;
- > 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;
- > Airport runways (existing and proposed) flight clearance zones;
- > Interchange at Mombasa Road and Eastern Bypass Road junction;
- > Existing borrow pits south of Inland Container Depot; and
- > Newly acquired land by Kenya Railways located between the National Park and the Nairobi SGR Terminus premises.

This chapter provides an overview of the findings from the above in relation to land uses, communities and physical conditions. It then identifies the changes and trends taking place. Following this, constraints and opportunities are identified, with a SWOT Analysis providing the conclusion to the chapter.



Existing Nairobi SGR Terminus and Surrounding Site Conditions (Source: DAR)

8.2 SITE 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.



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

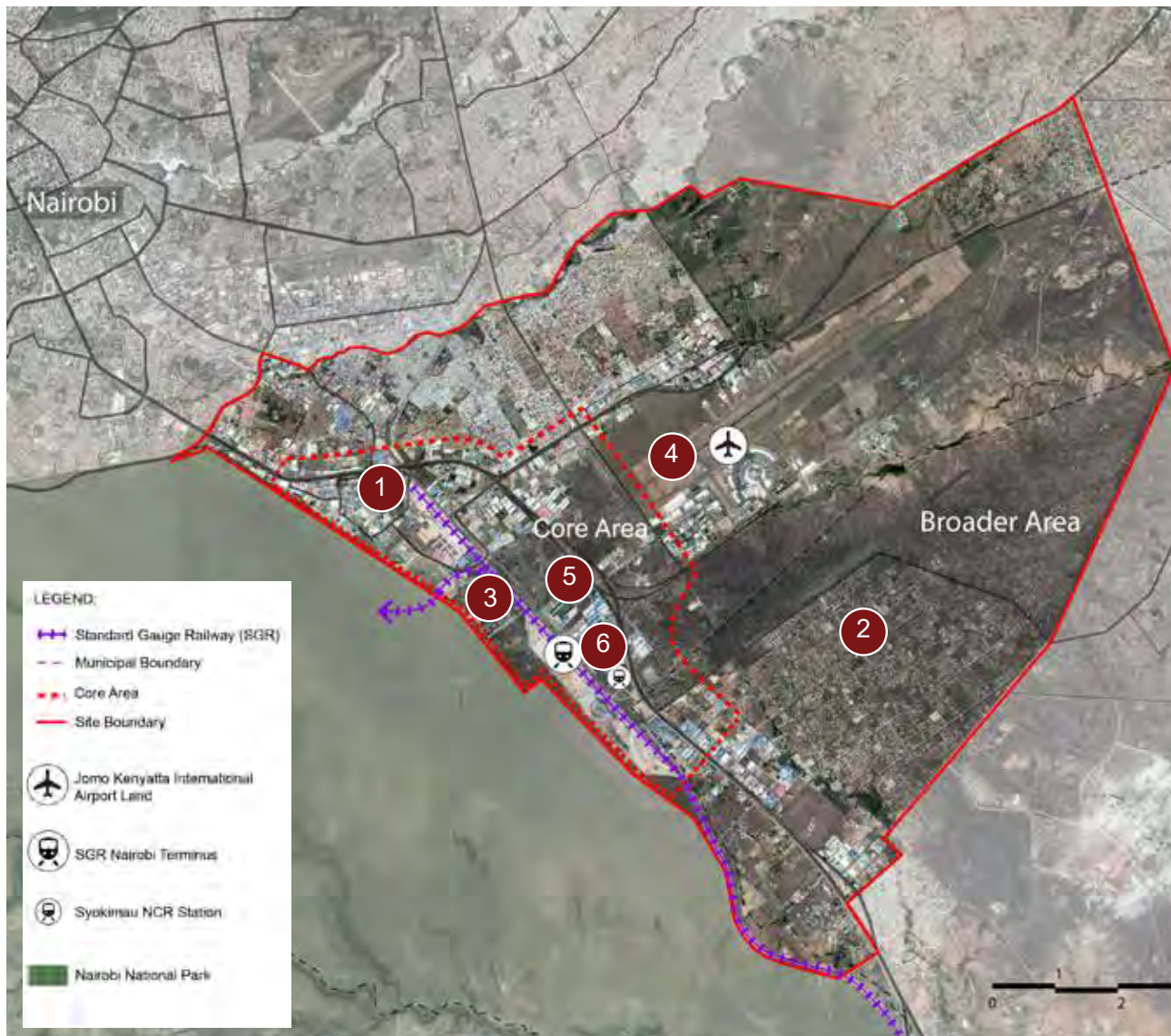


Figure 8.1: Site and Surrounding Areas (Source: DAR)

8.2.1 LAND USES

The Site 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 Site, with a large industrial area surrounding it on all sides. Some vacant land is present within the Site, 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 Site, 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 Site abuts the Nairobi National Park boundary.

LAND USE MAP OF THE CORE AREA

Legend

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Core Area Boundary
- Planning Area Boundary

Existing Land Uses

- 0 Residential (Informal)
- 0 Residential (Formal)
- 1 Industrial / Warehouses
- 4 Public Purpose
- 5 Commercial (Offices)
- 6 Public Utility
- 7 Transportation
- 8 Agriculture
- 11 Mixed Use (Residential/Recreation/Retail)
- Undeveloped Land
- Borrow Pits

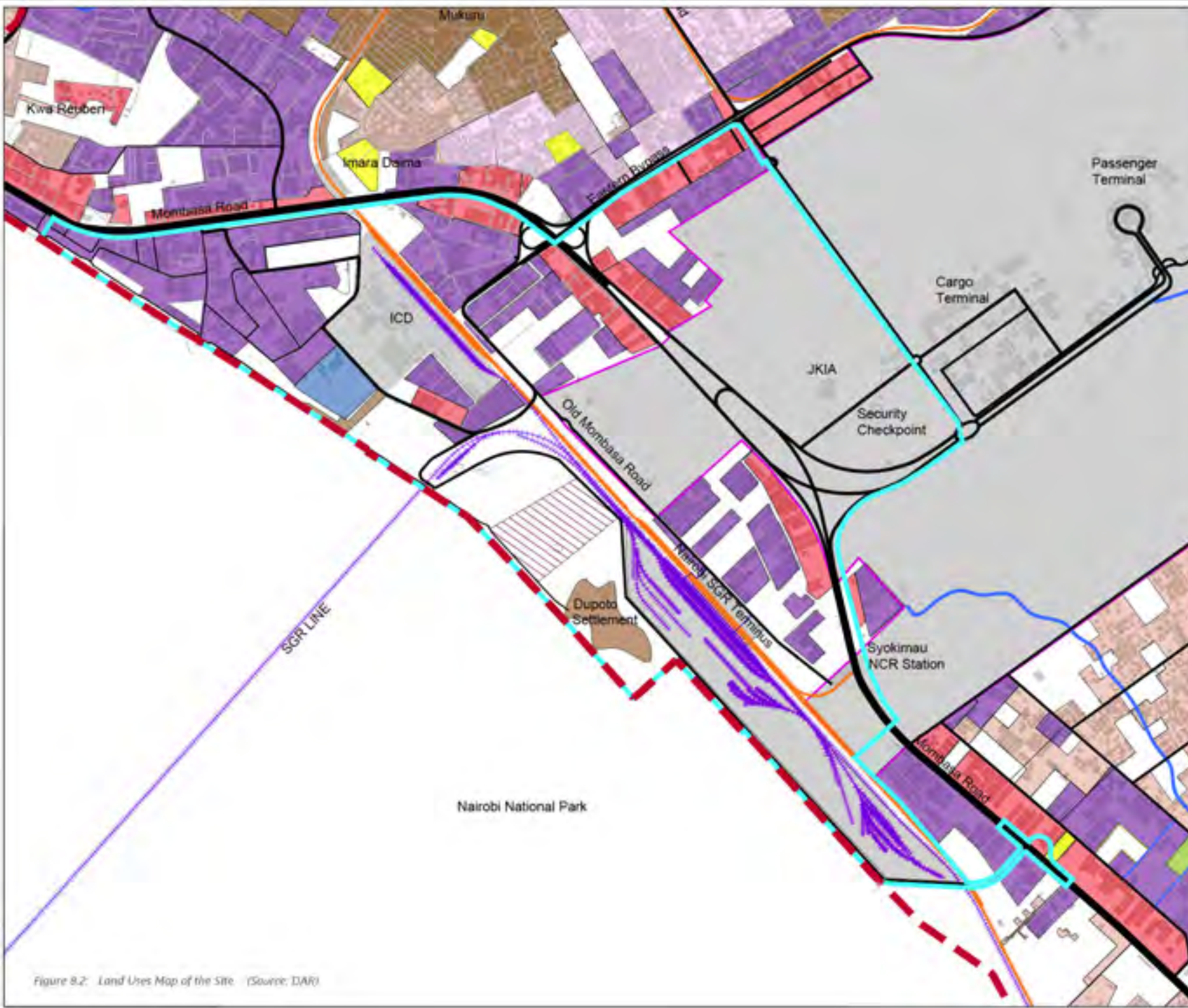


Figure 8.2: Land Uses Map of the Site (Source: DAR)

8.2.2 COMMUNITIES

As seen in the existing land use plan, the project area accommodates only industrial and transport facilities. There are no residential neighbourhoods sites within the site. However, there exists a Dupoto settlement within the site, which is home to around 800 people.

The settlement is somewhat isolated from the neighbouring area as there is no direct access road. The settlement has some community facilities including a school serving 125 pupils (staffed by five teachers). Statistically the settlement was often an outlier to responses, particularly in regards to utilities (access to water, sanitation and waste disposal) and level of education with the settlement having the highest rate of respondents with primary education as the highest level of education of any sub-district.

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 8.4.

8.2.3 PHYSICAL CONDITIONS

The Site site is currently characterised by a sense transience, singular land uses, and a lack of adequate urban infrastructure.

The site's sense of transience is caused by a series of linear road and rail routes that dissect the site. These roads are dominated by industrial traffic, which creates severance, and existing developments flanking them do not contribute to the public realm and create blank frontages on the street. This creates severance between areas and each street reduces place value by hindering pedestrian access in local streets, which are dominated by vehicles.

Most of the uses around the site are industrial. This establishes a lack of variety in visual and physical characteristics of the Site. It also means that there is a lack of diversity for job opportunities. A scarcity of housing on the site means that workers in these sites need to commute, creating more trips



Figure 8.3: Current condition analysis (Source: DAR)

and pressurising the roadways. There is an opportunity to improve the amenities for the local population.

A lack of adequate urban infrastructure exists in the Site. This is encapsulated by the settlements on Kenya Railways land, which represent an unmet housing demand and are disconnected from water supply, sewage, waste disposal, power supply, and telecommunications connectivity. There is also a lack of public realm and public space throughout the area to enable dwelling and pedestrian activity. A number of infrastructure plans have already been prepared but these have not yet been.

These characteristics are summarised in Figure 8.3. A full analysis of existing conditions is provided in Technical Study 1.



Blank frontage caused by Kenya Railways Land Fence

Access Roads with blank frontages and lack of public realm



Kenya Railways road characterised by industrial traffic and lack of public realm

Existing Industrial Development provides no active frontages or public realm



Industrial site opposite SGR station prioritises by vehicular access.

Nairobi SGR Terminus provides public realm



Building Pond fenced, and does not fulfil landscape potential

Settlements on Kenya Railways Land have few urban amenities and infrastructure

RESIDENTIAL NEIGHBOURHOOD IN THE CORE AREA

Legend

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Core Area Boundary
- Planning Area Boundary

Existing Land Uses

- Formal Residential
- Informal Residential



SEPTEMBER 2020

dar

Figure B.4: Residential Neighbourhoods at the Site (Source: IAR)

8.3 A CHANGING CONTEXT

Embakasi is undergoing significant development and change. As Nairobi's population grows, the provision of new urban development, amenities and transport will become increasingly important.

Within the site and Adjoining Areas, there are a number of major development schemes in various stages of planning and construction. These are likely to transform the area and the way that people move through it.

- > Schemes including the upgrading of the commuter rail and the Phase 2A of the SGR, which is currently under construction, are likely to increase the numbers of people arriving by train.
- > A new BRT proposal for the Mombasa Road would provide a high quality fast segregated bus route, and could reconfigure local traffic movements.
- > Major intensification strategies are proposed in the SPR, with Mavoko being earmarked as a growth centre, Embakasi and Mlolingo as Sub-Centres, will introduce new populations to the area including residents employees, students, and visitors.
- > The growing popularity of the Nairobi National Park, also needs to be considered, which is fast increasing the value of this local attraction.

It is important that a vision for the area recognises these changes and allows for their potential impacts.



Figure 8.5: The Changing Context (Source: DAR)

8.4 CONSTRAINTS AND OPPORTUNITIES

Figure 8.6 and Figure 8.7 show the identified constraints and opportunities affecting the Site. These are described further below.

Constraints



Kenya Railways and Airport Land dominate the area. Much of this cannot be used in the design development. There may be contradicting interests between the Airport and Kenya Railways that need to be bridged.



Existing development (mainly industries) put limitations in regards to the amount of available space for development. Relocation of industries might be needed.



Restriction Areas because of the airport's existing and proposed runways limit the uses and building heights around the airport boundary. The airport site creates some noise and air pollution impacts.



Mombasa road is currently extremely congested. There are localised noise and air pollution impacts. Other parts of the road network are in poor condition and need to be improved. Mombasa Road creates a strong barrier that restricts accessibility from one side to the other.



The National Park creates a barrier that needs to be respected.

Opportunities



JKIA is the largest airport in Kenya. It is a major economic driver and provides opportunities for development within the vicinity to capitalise on this. Proposals exist for its expansion.



The existing Nairobi SGR Terminus and nearby Syokimau Commuter Rail Station are strong focal points for activity. This provides opportunities for transit oriented development.



The proximity of SGR and Syokimau stations to the Airport suggests the creation of a strong Transport Hub.



Visitors that will arrive can be separated in 3 categories:

- Locals that require public transport in order to be distributed to other areas of the city.
- Long-term visitors wishing to access Mombasa or other cities by rail.
- Short-term visitors that can stay within the area, something that highlights the need for short-term accommodation (hotels, hostels, etc.).



The proximity to the National Park is an opportunity to create a secondary entrance that will be used especially from short-term visitors. There is also scope to enhance the surrounding environment and provide ecological corridors.

Existence of vacant parcels of land may provide opportunities for development.



Figure 8.6: Constraints Map (Source: DAR)



Figure 8.7: Opportunities Map (Source: DAR)

8

8.5 SWOT ANALYSIS

The adjacent text shows the Strengths, Weaknesses, Opportunities and Threats relevant to the Site from a spatial perspective. These are described further below.

STRENGTHS



The SGR and Commuter Railway provide connectivity to Nairobi City Centre and Mombasa, and intermediate stations



The proximity to the National Park is a significant environmental and touristic resource



JKIA generates national and international visitor traffic and supports business, commercial and industrial uses around the airport



Inland Container Depot has recently been expanded and upgraded. It provides a significant economic benefit to the area

WEAKNESSES



Existing industrial uses occupy prime land close to the railway stations. This is not entirely compatible given the recent investment in high quality station buildings



Proximity to JKIA Airport results in noise and pollution issues which require further analysis to understand its impact on the site



It is possible that vacant Kenya Railways and Airport Land may not be available in the design development. There may be limited land available for development



Significant congestion on Mombasa Road results in air pollution issues. Syokimau residential area currently suffers from poor connectivity

OPPORTUNITIES



Tourism and leisure land uses can be developed within the site, given the amount of visitors arriving to JKIA. Airport expansion will increase this further



There may be scope for expanding the Inland Container Depot. A new road connection would improve connectivity



A better integration with the National Park can provide a green lung for the area and it can also attract visitors



May be scope for expansion of industrial and storage uses associated with the various transport options available



Improved connections between the airport and Railway Stations can create significant benefits and facilitate the creation of a transport Hub



There is extensive scope for Commuter Railway network to be upgraded to provide improved frequency and quality of service

Vacant land

Vacant Land, as well as low density development allow for urban interventions and new buildings.

THREATS



Airport restrictions need to be considered in terms of land uses and building heights



Residential areas situated around the airport and industrial plots need to be protected from noise and air pollution



Kenya Railways and JKIA ownership may limit land for development



Increased congestion on Mombasa Road if a solution to the current problems is not found



National park is a sensitive receptor, so it must be ensured that development does not have an adverse impact on it



Figure 8.8: SWOT Analysis Diagram (Source: DAR)

9. DESIGN PARAMETERS AND OPTIONS

9.1 INTRODUCTION

This Chapter describes the Design Parameters and that have shaped the Sub-Centre proposals. It commences by explaining the stakeholder visioning process that was undertaken and how the vision was developed to identify principles and precedents to inform the design. The key design informants specific to the site are then explained, followed by the design options that were considered for the site.

9.2 THE VISIONING PROCESS

Subsequent to the Data Gathering and Analysis task, the second stage of the study was initiated. This covered the preparation of concept options leading to the development of a final plan.

A Visioning Workshop was held after the Data Gathering and Analysis task had been carried out, but before the detailed planning and decision making process so as to enable key stakeholders to move forward in unison. At this Workshop, the participants developed a vision for the area's development. They discussed what they would like to see as the final outcome of the development of the area.

The Visioning Workshop was set up as a visualising exercise where the stakeholders were given some initial prompts, which will enable them express their expectations for the Development Area.

The Visioning Process comprised of four activities as outlined below, with each activity carried out via group discussions under the guidance of a facilitator. The participants were divided into five discussion groups, with each group comprised of 10 persons.

Activity 1: Expectations

The Workshop Participants listed out their expectations from the Project regarding: Economy, Environmental & Social, Urban Design & Architecture, Transportation.

Activity 2: Values

The Participants were asked to define the key values that they felt were vital to the project. The values were expected to emerge from the expectations in Activity 1.

Activity 3: Visioning Statement

Each Group was then asked to define two Visioning Statements that best encapsulated the Values and the Expectations.

Activity 4: Additional Project Components

The Groups were also asked to contribute their ideas to further developing the project programme to include project components additional to the ones presented in the Project TOR and the Market Analysis.

Table 9.1: Analysis of Values

VALUE	NUMBER OF TIMES MENTIONED
Accessibility/Connectivity	5
Aesthetics/Attractive/Aesthetical	4
Affordability	1
Compact	1
Compatibility/Compatible/Integrated/ Integration	5
Competitive	1
Convenient	1
Cultural/Culture Friendly	2
Diversity	2
Efficiency/Efficient	3
Environmental	1
Flexibility	1
Functionality	1
Iconic	1
Inclusivity/Inclusiveness	5
Mobility	1
Modernity	1
Optimum	1
Orderliness	1
Participatory	1
Prosperity	1
Reliability/Reliable	2
Safety/Security	2
Serenity	1
Sustainability/Sustainable	5
Transforming	1
Vibrant	1

Table 9.2: Key Values within the Vision Statement

KEY VALUES	NUMBER OF TIMES MENTIONED IN THE VISION
Statements (Activity 3)	5
Accessibility/ Connectivity	2
Compatibility/ Compatible/Integrated/ Integration	2
Inclusivity/Inclusiveness	2
Sustainability/ Sustainable	2

Table 9.3: Proposed Area Functions

PROPOSED AREA FUNCTION	NUMBER OF TIMES MENTIONED IN VISIONS
City	1
Gateway	1
Kenyan Hub	1
Hub	1
Transport Hub	3
Urban Hub	2

DESCRIPTIVE WORDS	NUMBER OF TIMES MENTIONED IN VISIONS	COMMENTS
Dream	1	Vision should not be seen as a dream, but an achievable reality
Kenyan	3	Good - makes the vision locally-specific
Preferred	1	Vision should be for the best area rather than preferred area - is a bit weak
World Class	1	Good - makes the vision strive for the best quality

To be...	A world class integrated and sustainable transport hub for Kenya
To be...	A world class sustainable transport hub for Kenya
To be...	An integrated and sustainable transport hub bringing world-class connectivity to Kenya
To be...	Kenya's world-class transport hub - efficient, inclusive and environmentally sound

9.2.1 DEFINING THE PROJECT VISION STATEMENT

The feedback received from the Stakeholders through Activities 1 to 3 has been distilled through the following process to define the Project Vision Statement.

Analysis of Values

The strongest values emerging from the various groups were identified.

Key Values used in the Vision Statement

It was also noted which values had been incorporated into Vision Statements by the Participants.

Area Functions in Vision

The functions expected to be performed by the Project were also listed in some vision statements..

Key Descriptive Words in Vision

Descriptive words used in the Vision Statements were noted.

Project Vision

The following Vision Statements were seen to best represent the outcomes of the Visioning Workshop.

The Project Implementation Team proposed the following Vision for the Project:

"An Integrated and Sustainable World Class Gateway"

9.3 DEVELOPING THE VISION

The Vision outlined in this section was defined at the Project Visioning Workshop, conducted in 2019, within the early stages of the project. This process brought together key stakeholders to examine the current conditions of the site and key future issues to identify an overarching vision statement to define the expectations from the Site.

The vision for the Site outlined by the Project Implementation Team was:

'An Integrated and Sustainable World Class Gateway'

The vision expresses stakeholder aspirations for the site to establish a new Nairobi neighbourhood that symbolises the city's diversity, vitality, and ambition. The site is expected to support Nairobi's ambition to become 'the city of choice to Invest, Work and live In' and Kenya's vision to balance sustainable development with economic growth:

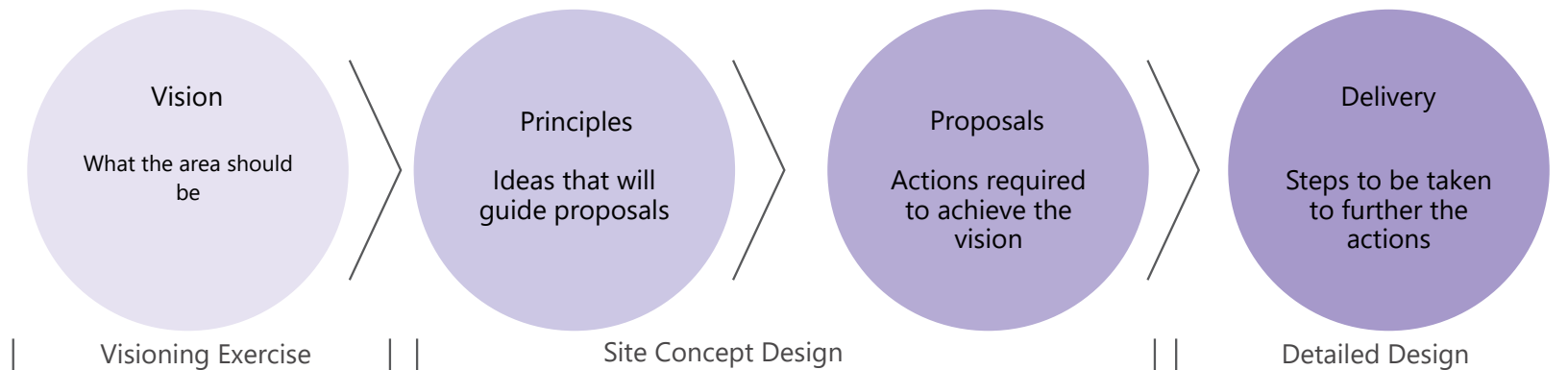
- > The site will leverage its strategic location to unlock its inherent potential.
- > The adjacent Nairobi National Park will permeate the site through the introduction of ecological corridors to

establish green links and spaces that can create moments of calm, reflection, delight and surprise for residents, visitors and workers.

- > Transport infrastructure improvements will enable density and provide alternatives to the car by coordinating transport services at a newly multi-modal node.
- > New buildings and extensive public realm improvements will help create a new gateway site for Nairobi.
- > The advanced infrastructure planned for the near future, means Embakasi has an opportunity to provide much needed office stock, logistics space, and high quality residential developments in a convenient location to meet Nairobi's emerging needs.
- > These will provide a significant number of high value private sector jobs and affordable town centre homes to Nairobi in a highly sustainable location around a new multi-modal passenger terminal.
- > Housing and office space will be accompanied by a strong retail offering and new civic infrastructure comprised of high quality education and cultural facilities, which will embed liveability into the scheme from its inception.

- > As a mixed use neighbourhood of commerce, housing, retail, and culture, the area requires a sensitive movement strategy that respects the different character areas. The site will see an improvement to pedestrian, cyclist and traffic flows through the site with a high quality active travel network accompanied by green amenities.
- > The scheme places a strong emphasis on functional, high quality design, which should be distinctive while respecting and complementing to adjoining uses, such as the National Park.

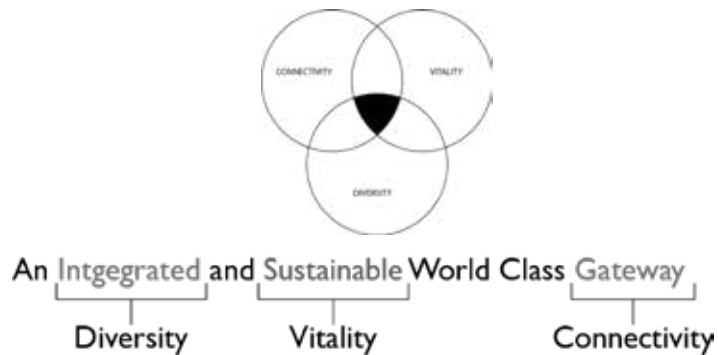
To achieve these aims, the proposals presented in this section of the Plan place people at the heart of the design strategy. They build on the area's assets and is intended to be fully integrated with transport and landscape strategies. The development and implementation of these proposals will rely upon ongoing and future partnership with key stakeholder groups. .



9.3.1 PRINCIPLES

To develop the vision, a series of principles are proposed to guide the proposals. The proposals then represent the specific actions that are proposed to fulfil the vision.

Establishing integration and sustainability as core elements of the vision highlights the need to ensure that social sustainability and positive ecological outcomes are balanced alongside the economic ambition to become a connected place of high quality design. The design strategy reflects these ambitions by promoting diversity, vitality and connectivity.



Diversity is a key consideration for proposals to reflect the different areas around the Embakasi interchange and respond to their own micro-contexts, ensuring a wide range of users, experiences, cultures, activities, and productive uses are safely enabled.

Vitality is imperative to promote both ecology and economy. This acknowledges that places are shaped by the intangible, so proposed uses and activities need to reflect and contribute to the Nairobi's energy.

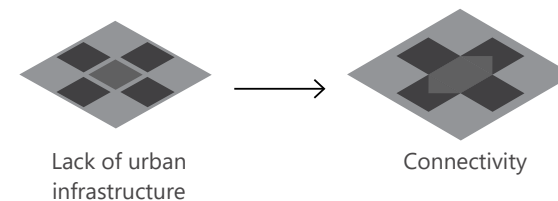
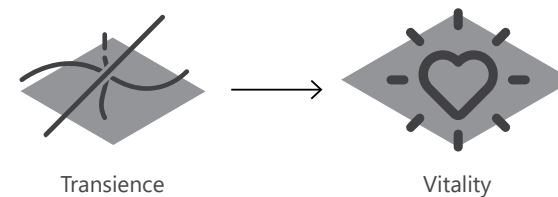
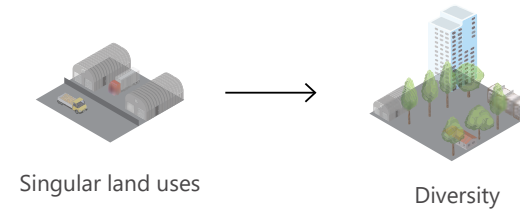
Connectivity is what underpins much of the area's success. Not only improved regional and international links, but crucially those within the site. It is important to ensure that conditions are improved for all road users, and that sustainable travel is the mode choice for moving around.

Identified Challenges

Singular land uses and vacant plots, means that the current area lacks a significant variety of land uses to accommodate the multiple amenities required to cater for to different populations.

The area is currently dominated by industrial roads with little public realm flanked by blank frontages, this creates a sense of transience and leaves a significant potential for place-making.

A lack of urban infrastructure means that Embakasi cannot sustain a growth of population, and existing transport infrastructure creates segregation between different zones and its adjacent neighbourhoods.



Desired outcomes

Built up areas should use urban design to create unique experiences that appropriately reflect local needs through diverse land uses that create visual and physical variety to accommodate a range of economic, civic and cultural activities. Key diversity priorities:

- > Character areas
- > A balanced mix of land uses

Ensuring that residents, workers, visitors, and students feel safe, relaxed and able to do and see things throughout Embakasi. This means activating the urban spaces at different times of day and providing key facilities in the public realm. Key vitality priorities:

- > Meeting different people's needs
- > Healthy places

Ensuring that the default choice for moving around people to walk, cycle and use public transport. This means providing high quality public realm, increase street mobility and coordinate an array of different transport services. Key connectivity priorities:

- > Ease of movement
- > Links to surrounding areas

9.3.2 PRECEDENTS

DIVERSITY

Character areas**Plaza at multi-modal hub as welcome Gateway**

Rotterdam Centraal - Rotterdam, Netherlands

The station development has a large central plaza and boulevard that downgrades car use and prioritises active travel. This is the focal point for the city's commercial district, in the same way as Embakasi Downtown's proposed plaza.

**Daylighting stream to create linear park and public realm for active travel**

Cheonggyecheon Stream - Seoul, South Korea

A regeneration of a canal waterway to create high quality landscaped area alongside it. This highlights the potential of public realm improvements around a waterway to create a world class public space for a city. This frames the surrounding development as proposed at Park Valley.

**Education cluster as an anchor for an urban campus**

Quartier Joliot - Paris, France

A mixed use development proposed for student and family housing, public facilities, commercial activities and public spaces. Density and intensity of use is sought for student housing, while the diversity and plurality of lifestyles guide the design of plots for family housing, a similar objective to West Bridge.

Balanced land uses**Diverse inner city land uses**

Big City Plan - Birmingham, UK

Birmingham's city centre has been split into seven distinctive quarters to enable it to host different land uses. Each quarter has its own character and a development vision to suit, but all are developed with a balance of land uses. This is a unique branding strategy that markets each area as a 'niche' development zone.

**Density following natural features to provide a balance of land uses**

Madinat Irfan - Muscat, Oman

This concept master plan is designed following the contours of natural features of an existing Wadi in Oman. Density creates public space and leverage the potential for an even distribution of land uses around the site.

**Co-location of different uses around public spaces**

Makers District - Abu Dhabi, UAE

Proposed cluster of seven mixed-use towers framing a new public square. All developments are designed to connect to the a central plaza via pedestrian pathways between the blocks.



VITALITY

Meeting different people's needs**Enabling private developers to build their own designs in exchange for contribution to infrastructure delivery**

Oosterwold Master plan - Almere, Netherlands

Developers develop their own plot, but also all the necessary components around it, including infrastructure, energy supply, waste disposal, water storage, and public parks to contribute to the development of the local neighbourhood.

**Public spaces that provide for everyone**

Superkilen - Copenhagen, Denmark

Superkilen is divided into three areas: Red Square, Black Market and Green Park. Residents in the immediate vicinity of Superkilen come from more than 50 countries; the design concept was therefore based on 'extreme participation', i.e. a strategy to engage residents around the park using different materials to provide different entry points for different populations.

**Providing communal services in sustainable residential development**

Marmalade Lane - Cambridge, UK

A car free space is at the centre of this co-housing development that includes shared amenities such as large-scale community kitchen, gym, and laundry. 27 different internal layouts are included for the same shell of the building to promote a sense of individuality.



Healthy Places



Strategic approach to improving activity and health in streets

Healthy Streets - TfL, London

A London wide toolkit and metric to reduce congestion and help make London's communities greener, healthier and more attractive places to live, work, play and do business. New developments are expected to contribute to the Healthy Streets agenda.



Green perimeter walls to avoid blank frontages

O2 Arena - London, UK

Green walls can soften the hardscape of blank frontages, but they require maintenance to ensure that they remain living.



Meanwhile uses activate public space

Kings Cross - London, UK

Kings Cross has deployed meanwhile uses to activate the public spaces at different times with markets, concerts, and outdoor exhibitions. During construction artistic hoardings announcing future development and viewing platforms enabled people to engage with the development while it was being built.

CONNECTIVITY

Ease of movement

Network approach to cycle provision

Cycle Superhighways - Copenhagen, Denmark

A strong network of Cycle Superhighways is to create a competitive transportation alternative to cars and public transportation that can help increase cyclists by 30% on the network. Supported by government funding.



Suitable street furniture to promote active travel

Covered Walkways - Singapore

Singapore has more than 200km of covered walking paths from transport nodes to residences and local amenities such as schools and healthcare facilities. These enable people to make local trips on foot sheltered from the local climate. A large proportion of the network was launched by a programme called Walk2Ride.



Coordinating transport modes to create seamless travel

Multi-modalite Partout - Paris, France

A Master Plan where transport interchange connects last mile travel, such as share bikes and scooters with autonomous vehicles. This could be useful for considering how the digitisation of travel data is creating opportunities for new coordination between modes.



Links to surrounding areas



Private sector engaged in public realm planting

Tree Planting Credit Scheme - Austin, Texas

As part of the city's aim to become carbon neutral by 2020, the city is exploring generating funding for city tree canopies from private companies that wish to offset their carbon emissions by buying credits for tree planting or preservation.



Long term industrial and residential growth centred on airport

Incheon International Airport Master plan - South Korea

A new mixed use master plan split into three phases with aviation related industries, commercial and business services, as well as permanent and temporary housing for employees working at the airport.



Using of public transport to provide additional density in urban periphery

Upzone Seattle - Seattle, USA

Upzone Seattle is a programme to densify suburbs with higher densities than those designed for. This is accompanied by new public transport links to enable these places to become more accessible.

9.4 DESIGN INFORMANTS

9.4.1 URBAN GRID SYSTEM

The area around the station has been laid out as a grid to form a series of urban blocks. This approach to urban design is commonly implemented in major metropolitan areas, and has been employed since the ancient times. The benefits of a grid system can be listed as below:

- > Grids can facilitate pedestrian movement. Two inherent characteristics of the grid plan are frequent junctions to enable choice, and straight lines to provide direct routes to desired destinations, which helps with orientation and way-finding. They are both easily walkable and navigable;
- > They are adaptable and can accommodate a large range of uses as the city grows and expands. Consequently, they are advantageous in terms of economic value as a grid facilitates blocs subdivisions and accesses, which does not restrict certain land uses. By easing movement around and within blocs, they also enhance both tourists and residents access to public facilities and retail uses and, therefore, quality of life and economy;

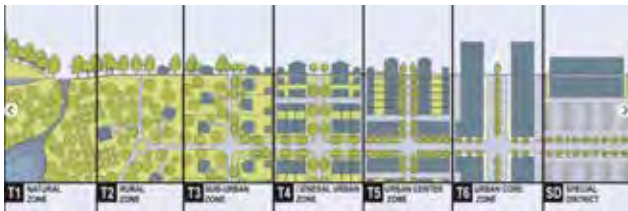


Figure 9.1: The transect principle: from rural to urban (A. Duany)

- > Consequently, they are sustainable as they can “do a lot with the least”. By being adaptable and easy expendable, a grid system helps a city to cope with any growth. Figure 9.1 shows a grid system examples of both rural and urban types.

- > In addition to this, they're proved to facilitate city growth: studies evidence that “Decentralized land demarcation systems have the potential to inhibit development by increasing transaction costs associated with the use, development and exchange of land. The centralized and uniform institutional structure of rectangular grids appears to reduce these frictions to facilitate growth” (O’Grady, 2014);

References.

T. O’Grady (2014), Spatial Institutions in Urban Economies: How City Grids Affect Density and Development, Harvard University (<https://scholar.harvard.edu/files/ogradey/files/citygrids.pdf>)

Grid benchmarking

This section analyses different examples of existing grid road networks in urban areas with close proximity to train stations. These benchmarking examples were selected and analysed as part of the design process.

Euston Station, London

- > Block Size: 140m x 65m approx.
- > Green space in front of the station.
- > Green network connecting with the other side of the primary road passing in front of Euston Station.



Johannesburg Park Station, Johannesburg

- > Block Size: 60m x 70m
- > Parking spaces and green open spaces around the station terminal.



Dallas Train Station, Dallas

- > Parcel Size: 170m x 90m approx.
- > Green space opposite to the station
- > Parking space around the station area



Determining a grid system for Embakasi

Based on the benchmark analysis, a grid system has been introduced around the SGR Terminus in Embakasi Downtown

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where the highest volume of people are expected. This grid is aligned to the station to enable desire lines to be fulfilled, simplify wayfinding, and create intuitive access to rail and bus services for both pedestrians and vehicles.

Each block is around 180m x 210m and could host an average of 300 families. The proposed grid establishes access to community facilities, local services, shops, and green spaces via a ten minute walk in each direction; around five blocks.

The grid is not implemented throughout the site. The grid system away from the station and Embakasi Downtown gives way to radial and contour forming approaches at West Bridge and Park Valley respectively. This breaks from the grid emphasises and reflects these areas as distinct character areas and Sub-Centres in their own right.

Embakasi SGR Terminus, Nairobi

- > Block size: 210m x 180m approx. for commercial uses;
- > The blocks can be subdivided by small access roads;
- > Green spaces in front of the station create a gathering point for different users;
- > Community facilities, local services, shops and open spaces can be integrated in each block;
- > Parking spaces are provided next to the station.



Figure 9.2: Grid system adopted (Source: DAR)

9.4.2 TRANSIT ORIENTED DEVELOPMENT (TOD)

Nairobi's surface transport networks are congested. This is due to a variety of challenges that have accumulated in recent years. Growing populations and development have stressed existing roads' capacity. Congestion is then exacerbated by the number of unsurfaced roads that can flood and become treacherous in times of bad weather, slowing traffic.

Mombasa road is the only arterial route to the South East from the centre of the city. It faces significant congestion, partially due to the increasing number of para-transit modes, such as Matatus, on the road network that provide ad hoc pick ups and drop offs to slow traffic on the outer lanes. Infrequent rail services do not operate provide the reliability to form a sufficiently strong alternative to the congested road network.

The redevelopment of the SGR Station Area presents a unique opportunity for Transit Orientated Development and multi-modal transport facilities to be incorporated within the project site area. This could alleviating many of the transport and traffic issues faced by residents of Embakasi and the local Area.



Figure 9.3: Nairobi Terminus - A potential hub for TOD

Walkability: By Developing Neighbourhoods and creating a grid system, communities can walk between home, work and leisure without the need to vehicle transportation, in turn, reducing congestion and creating a safe and healthy place.

Active Travel: is making journeys by physically active means, like walking or cycling. These are usually short journeys, like walking to the shops, walking the kids to school, cycling to work, or cycling to the station to catch a commuter train.

Bus Rapid Transit (BRT): is a high-quality bus-based transit system that delivers fast, comfortable, and cost-effective services at metro-level capacities. It does this through the provision of dedicated lanes, iconic stations and fast and frequent operations.

Frequent Rail Services: offer a fast, comfortable, and reliable, cost-effective services at metro-level capacities. Usually links to out of town terminus and interchanged with BRT and local active travel networks.

High Speed Rail Services: offer a fast, comfortable, and reliable intercity rail services. Encourage people to travel via public transport as opposed to road vehicles. Similar to the SGR Network in Nairobi or TGV/ICE in France and Germany.

Overview of TOD Principles

Transit Orientated Development considers the functional integration of land use and transit through the creation of compact, walkable, mixed used communities all of which should be within walking distance, usually an 800m radius, of a transit stop. Key principles of TOD are:

- > Multi Modal Hubs;
- > Mixed Use;
- > High Density; area
- > Walkable.

The Core principles of inclusive TOD, extracted from key studies on TOD development are:

- > **Walkability:** Developing neighbourhoods that promote walking;
- > **Cycle-priority:** Prioritising non-motorised transport networks;
- > **Connectivity:** Creating dense networks of streets and paths;
- > **Transit:** Locating development near high-quality public transport;
- > **Land Use Mix:** Planning for mixed uses, income, and demographics;
- > **Densification:** Optimising density and match transit capacity;
- > **Compact:** Creating areas with short transit commutes;

Benefits of TOD

The benefits of TOD have been collated through evidence-based research by the Transit Oriented Development Institute, a leading planning organisation working on promote and accelerate the roll-out of walkable, mixed-use, sustainable communities around rail stations. The potential benefits of TODs are listed below:

- > Reduce dependence on driving;
- > Allow Residents to live, work and play in the same area;
- > Reduce the area's carbon footprint or negative impact on the environment
- > Provided access to better life services;
- > Stimulate the local economy;
- > Provide better access between urban and suburban areas;
- > Provide access to better entertainment or recreation services;
- > Provide access to better jobs;
- > Revitalize urban areas.

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Lessons learnt from other TOD Developments

> Kings Cross St. Pancras, United Kingdom

- > Mixed Use, High Density
- > Multi-Modal Hub
- > Catalyst for Development

> San Francisco, United States of America

- > Sustainable Communities Strategy
- > Increased Ridership
- > Value Creation and Value Capture
- > Affordability

> Denver, TOD Strategic Plan, 2014, has accomplished:

- > Long-range planning for 21 station areas
- > Established or strengthened external partnerships
- > Implemented TOD Typology through new form-based, context-sensitive zoning
- > TOD Fund established to create and preserve affordable housing at station areas
- > Millions of dollars spent on infrastructure in TOD areas
- > Collaborated with Denver Urban Renewal Authority on TIF opportunities at multiple stations
- > Reduced parking requirements in TOD areas
- > Bike sharing stations at multiple stations.



Source: Cass Studio 6

Kings Cross St Pancras TOD development



Source: Design by the bay

San Francisco TOD Strategy



Denver TOD Strategy



Kings Cross St Pancras TOD development



San Francisco TOD Strategy



Denver TOD Strategy

9.4.3 AIRPORT CONSTRAINTS

Jomo Kenyatta International Airport (JKIA)

Airport sensitive design has been key to developing the proposals. Due to the site's proximity to JKIA, there are a number of restrictions in place set by the Kenyan Civil Aviation Authority and the Kenyan Airport Authority. All new spatial development strategies proposed for the SGR Embakasi Railway Station have been developed in line with the regulations. The Land Use Planning and Management Report which accompanied the Airport Systems Plan highlights a series of constraints on development, captured in Technical Study 1, and summarised below.

Initial Assessment of Airport Constraints relevant to the Sub-Centre

The Land Use Planning and Management Report dealt primarily with land use constraints around the airport, and did not – for example – include any information on the proposed Airport City development (also known as JKIA Sky City). It set out the land use compatibility plan.

The JKIA restricts the land use plans for the region - see Table 9.4 and Figure 9.5 - since the Sub-Centre intersects the flight paths in take-off and landing of the current and of the future runways provided in the expansion plans. The intention is that the designated airspace for JKIA shall be protected and remain free of obstacles that jeopardise the safety of air navigation and limit future expansion of the Airport. It is also necessary to restrict some types of developments and land uses in the vicinity of the Airport for public safety, environmental and health reasons.

As a result, the possible implications of the Obstacle Limitations Surfaces (OLS) for the Airport, that were obtained from the Kenya Airports Authority, have been considered. In addition, 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, have been considered.

It should be noted that only an initial assessment has been undertaken at this stage based on the information provided by KAA.

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 guidance has been sought 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:

- > **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 non-residential uses to activities which attract few people
- > **Zone 3: Inner turning zone** — limit residential uses to very low densities / avoid non-residential 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 centres, hospitals, nursing homes

Table 9.4: Surface Heights

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

- > **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 intent of the set of zones depicted for each scenario is that risk levels be relatively uniform across each zone, but distinct from the other zones. 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 that 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, including site specific characteristics of the airport's environs such as Airport Area Topography, Geographic Features and Existing Urban Development.

For social well-being and safety concerns, any new building proposed in Zones 1 to 3 within the Sub-Centre will be those with minimal population use such as community facilities or recreation space where possible. Building heights will also be considered to comply with aviation guidelines.

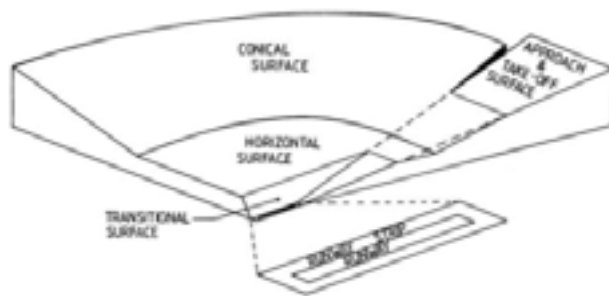


Figure 9.5: Obstacle Limitation Surface

9.4.4 LESSONS LEARNT FROM AIRPORT RESTRICTIONS AND SURROUNDINGS BENCHMARKING

The following lessons can be highlighted from the benchmarking study (Refer to Technical Study 1: Planning Baseline):

Surrounding Land Uses

- > Industries and business centres are usually located at the borders to create a buffer;
- > Event spaces, museums, sport centres, conference centres, hospitals, universities, headquarters and malls are most commonly found around airport hubs;
- > Parks and zoos can also be located near airports;
- > Entertainment land uses are likely to be found next to railway stations rather than airports; and
- > Residential land uses are always separated from the airport by a green buffer.

Place Making

- > Gathering spaces are contained within airports' terminals due to pollution linked with airplanes and safety complications. No measures are taken to invite passengers to enjoy their stay by the airport, their journey to the main city is made easier with tube, train or buses. However, this doesn't necessarily apply to newly built cities, as they see the opportunity to create a new centre around the international hub; and
- > On the contrary, railway stations within the city centre - such as London - include large plazas and facilities.

Airport Hub with or without Railway Station

Differences between an airport and an airport+rail hub are as follow:

- > When a railway station is directly connected to the airport's terminal, there are no entertainment uses by the airport; which means the airport is a separated entity from the rest of the city surroundings; and
- > However, when there is no railway, the airport is integrated to its surroundings with activities and uses.

Hub's Edges

Airport edges can be divided into the following types:

- > Built with industries and business parks at the very proximate boundary;
- > Open spaces, both natural or domesticated (parks, zoos) or natural boundaries such as rivers/canals; and
- > Highways and railways.

Urban Design Special Requirements

- > Train stations are usually located at close proximity of the main terminal along one of the edges of the airport to reduce commuting times. However, it is located outside of the fenced boundary;
- > A main road connects the airport with the city centre;
- > A buffer with industries or natural features circles the hub fence; while the second ring of land uses generally comprises of residential or entertainment activities, and is separated by a main road; and
- > Residential areas shouldn't be placed at each extremity of the runways, but on the length, separated by a buffer, either industrial or natural.

Railway Design Features

- > When connected to an airport, it is located within walking distance to the main terminal. When there are several terminals, a stop is provided for each one;

- > When located further away from the airport, a connection is ensured for quick access to both the airport and the railway in order to facilitate the access to the city centre; and
- > Urban squares with facilities and hotels are located at the entrance of the main railway station, with a quick access to a main road.

Distance from residential areas

- > An average of 1000m between the end of runway and first residential areas is commonly found around the benchmarked airports.

Conclusions for Embakasi

The addition of a railway station located 3km away from the main airport would revitalise the Southern part of Nairobi with the creation of a new centre gathering entertaining and business uses. The road network needs to be carefully revised in order to ensure both the airport and the railway are connected and fluidity is ensured. Buses also need to be included to support a traffic fluidity.

A direct connection with the airport is required to lead to a successful design - either underground or overground for more flexibility with the road network.

Industrial uses must be located at the fences' borders to create a buffer around the highway, with appropriate infrastructure. Entertainment, medical, recreational, business, industrial and educational land uses can be brought around the airport while making sure its borders are properly buffered; this is especially valid for residential areas in order to minimise pollution level. Parks can be spread throughout the uses in order to create wildlife links.

Residential areas must be placed away from runways with a minimum distance of 1000m.

Refer to Technical Study 1: Planning Baseline for more information.

Legend:

- Zone 1: Run-way Protection Zone
- Zone 2: Inner Approach/Departure Zone
- Zone 3: Inner Turning Zone
- Zone 4: Inner Approach/Departure Zone
- Zone 5: Sideline Zone

- Noise Contours
- Conical Surface
- Approach Surface
- Take Off Surface
- Nairobi National Park

Existing Road

- Class A and B - Trunk
- Class C - District
- Class H - Highway
- Class J - Principal Arterial
- Minor Roads
- SGR Nairobi Terminus
- Jomo Kenyatta International Airport Land

Figure 9.6: JKIA: Airport Restrictions (Source: DAR adapted from KAA data)

9.5 DESIGN OPTIONS

Based on the outputs of the Visioning Workshop and subsequent discussions, two options for the redevelopment of the area were investigated. The preparation of the Site Options has been based on the following informants:

- > The Site Opportunities and Constraints - this is set out in Technical Study 1.
- > The feedback received from this presentation has steered the development of the subsequent options: The Project Implementation Team has indicated a strong preference for the 'Do Maximum' alternative.

Various iterations of these options were undertaken over a five month period. These iterations are presented in Technical Study 1: Planning Baseline.

9.5.1 EARLY OPTIONS

In July 2018, two early options were presented as part of the Assessment Report. The Options are presented in more detail in Appendix I of Technical Study 1.

9.5.1.1 Alternative 1: DO MINIMUM

The main strengths and weaknesses of Alternative 1 are outlined below.

Strengths

- > No need for relocation of existing industries;
- > SGR Station connected equally to existing industries commercial centre;
- > Centrally located Transport Hub; and
- > Strengthens the existing industrial land use focus on the Site.

Weaknesses

- > Industrial land uses dominate;
- > Continued presence of industrial uses which may not be compatible with the high quality buildings.

9.5.1.2 Alternative 2 : DO MAXIMUM

The main strengths and weaknesses of Alternative 2 (Figure 5.2) are outlined below.

Strengths

- > Hospitality and Entertainment areas are well-developed and connected with the airport and the SGR station;
- > The spaces around the SGR Station can be used to create a stronger, well-connected business and commercial centre;
- > New roads and road improvements provide better connectivity and reduced traffic congestion; and
- > Broader mix of land uses, including new office/educational hub next to the residential area and the tourist.

Weaknesses

- > Need for relocation of Industries;
- > Need for new road infrastructure and improvement of existing uses - this will necessitate higher upfront investment.

9.5.1.3 Indicative Land Use Diagrams

The adjacent figures present indicative land uses for Alternatives 1 and 2.



Figure 9.7: Indicative Land Uses for Alternative 1 (Source: DAR)



Figure 9.8: Indicative Land Uses for Alternative 2 (Source: DAR)

9.5.2 FINAL OPTIONS

On the 14th of December 2018, the two final concept options were presented:

- > The updated Balanced Strategy,
- > The updated Direct Link Strategy.

9.5.2.1 Balanced Strategy

The land uses are shown in Figure 9.9 and the key features of this Option are:

- > Three entrances are created for the Site: a main commercial central spine is acting as gateway to the main Station; while a Terminus / Syokimau station entrance is retained at the South and a new one is created for residential uses at the north;
- > Residential areas are disconnected from main road network to enhance life quality;
- > Industrial areas are kept existing on the Northern part of the Site and expanded by the airport
- > MICE, Cultural and Education located along old Mombasa road, linked with a pedestrian network;
- > Quiet land uses located along the park (residential, cultural and hospitality).



Figure 9.9: Land Uses - Balanced Strategy (Source: DAR)

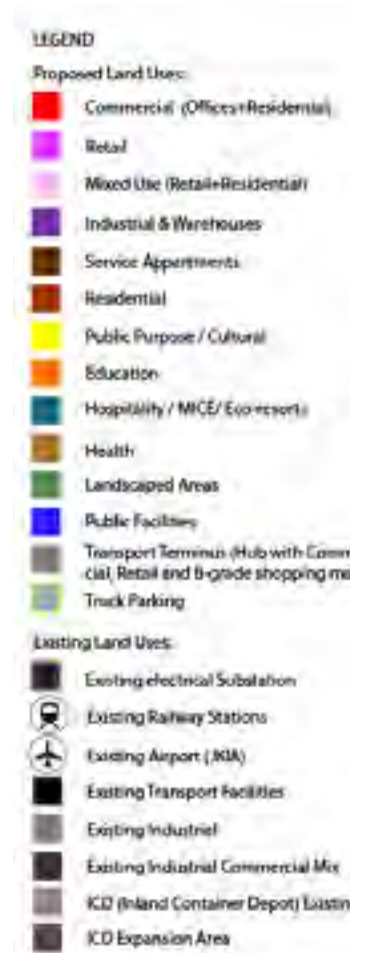
9.5.2.2 Direct Link Strategy

The land uses are shown in Figure 9.10 and the key features of this Option are:

- > A main entrance connects the Site to Mombasa Road and provides a direct link to the airport: the main gateway is located in the Station axis; while four minor entrances link warehouses/offices and quiet uses;
- > Residential areas located to the Northern part of the Site and by the park;
- > Industrial areas are kept existing on the Northern part of the Site and expanded by the airport;
- > All main uses are segregated around the main terminal/station hub;
- > An education hub and cultural node activate the Site and link the different residential areas;
- > Quiet and private land uses located along the park (residential and hospitality).



Figure 9.10: Land Uses - Direct Link Strategy (Source: DAR)



9.5.3 EVALUATION

The Criteria for the Evaluation of the two Strategies is based on the expectations defined by the Stakeholders at the Project Visioning Workshop. The table below states the different criteria (Table 9.5).

Good / Better / Serious Concern

Table 9.5: Main elements and benefits of recommended strategic interventions

Criteria	Balanced Strategy	Direct Link Strategy
1. Relation to Wider Nairobi	The identity of the development is defined by a new commercial/cultural/ hospitality landmark building that is the heart of the development. Both Strategies create a new mixed-use Sub-Centre for Nairobi with all uses for a residential, commercial and business area. They operate as independent neighbourhoods but benefit from high connectivity due to proximity to the SGR, the Commuter Rail and the Airport.	The identity of the development is centred around the transport hub, which forms the heart of the development. It creates a hub connected with the railway stations and the airport.
2. Land Uses Interaction with industrial surroundings	Existing industries are maintained to the North of the Site. New industries are located by the airport side only, separated from the Site by the main road.	
3. Protection of Sensitive Land Uses	Residential areas are buffered from airport, railway, roads and industries by green areas or high-rise commercial streets.	
4. Unique Identity for the Site	The identity of the Site as a Modern District within Nairobi is distinct from the SGR Station, focussing more on cultural aspects and the link with the park.	The identity of the site is centred around the heart of the development at the SGR Station.
5. Create quality urban spaces	Both strategies create quality urban spaces within well-defined urban design strategies.	
6. Strong Link between Airport & Railway	Both strategies connect the Site to the railway stations and the airport, and create a Sub-Centre dependant on these transport modes.	
	A committed railway runs from the SGR Terminus to the Airport. This will provide the Site with a fast access to the Airport.	In addition to the committed railway, a special direct link Flyover traverses across Mombasa road linking the airport to the main SGR Station.
7. Pedestrian friendly connections	A green pedestrian link is provided between the railway Stations and the Cultural/Conference node, running through all the various land uses introduced on Site (except Industrial).	A green pedestrian links are provided along main Boulevards and connecting across key Site Landmarks.
8. Strategic location of Landmark buildings	Both Strategies position Landmark buildings at the core of the Site and create focal points from the main roads. They connect all land uses and help with enhancing navigation within the Site.	
9. Minimise External Traffic onto the site	A busy transport terminus with Matatus and BRT traffic, commuter cars and taxis is located next to the SGR Terminus, resulting in additional pollution and additional Traffic at the SGR Terminus	
10. Link with National Park	Both Strategies create a strong connection with the National park and are sensitive to Environmental considerations.	
11. Strong Internal Road Network and External Accesses	Both Strategies have strong internal and external road accesses.	
12. Provide Adequate Security	Both Strategies will need to provide for similar security	
13. Segregation of Daily Commuters and Long Distance Passengers	A pedestrian green network and shuttle buses link the SGR Station to the BRT and Matatu Transport Terminus which is located at the south-east corner of the site. There will be a BRT stop at the SGR Station and a Matatu Stop at the SGR station – but no terminus	A busy transport terminus with Matatus and BRT traffic, commuter cars and taxis is located next to the SGR Terminus, resulting in additional pollution and additional Traffic at the SGR Terminus. The Daily Commuters will need to access the Centre of the Site to gain access to the BRT and Matatu Terminal.
14. Need for Relocation	Both strategies relocate 68ha of land (industries) closer to the Airport in order to free land to create residential areas and a central commercial and retail node.	
15. Safeguard the Environment	Both strategies address Environmental considerations and minimise industrial uses along the Park.	
16. Inclusive to the Local Population	Both strategies include the Site with its surroundings by providing a liveable city with employment and housing.	
17. Key Infrastructure Costs	No additional key infrastructure costs except bridge over the SGR train lines.	Additional infrastructure costs for the direct Flyover road link between airport and SGR Station. It has been investigated if the flyover can be linked with the commuter rail bridge; however, this was not assessed favourably. Moreover, there is also a cost for the bridge over the SGR train lines.
18. Revenue Generation	Higher returns on extended Residential Development along the Nairobi National park.	Lower returns on reduced extent of residential development.

9.5.4 SELECTION OF A PREFERRED STRATEGY

The two proposed strategies are evaluated following a weighting system that is based on:

- > Red - Serious concern: 0 point
- > Black - Good: 1 point
- > Blue - Better: 2 points

Table 9.6 shows the resulting evaluation matrix.

It was agreed to merge the Balanced Strategy with the Direct Airport Link Strategy by combining the strengths of both strategies. The benefits are described in the following page.

Table 9.6: Options Evaluation Matrix

CRITERIA	BALANCED STRATEGY	DIRECT LINK STRATEGY
1. Relation to Wider Nairobi	1	1
2. Land Uses Interaction with industrial surroundings	1	1
3. Protection of Sensitive Land Uses	1	1
4. Unique Identity for the Site	1	1
5. Create quality urban spaces	1	1
6. Strong Link between Airport & Railway	1	2
7. Pedestrian friendly connections	1	1
8. Strategic location of Landmark buildings	1	1
9. Minimise External Traffic onto the site	1	1
10. Link with National Park	1	1
11. Strong Internal Road Network and External Accesses	1	1
12. Provide Adequate Security	1	1
13. Segregation of Daily Commuters and Long Distance Passengers	1	1
14. Need for Relocation	1	1
15. Safeguard the Environment	1	1
16. Inclusive to the Local Population	1	1
17. Key Infrastructure Costs	2	0
18. Revenue Generation	2	1
TOTAL	20	18

9

9.5.5 BENEFITS OF THE PREFERRED PLAN

- > Direct Link Flyover re-routed to pass via the JKIA security checkpoint (in response to KAA comments)
- > Provision of an green open plaza in front of the SGR Terminus. This is bordered primarily by retail uses
- > Transport Hub relocated to the south-east of the SGR Terminus
- > Cultural Hub relocated next to the main hospitality area (on the south-west of the railway lines)
- > Proposed industrial and warehouse uses on JKIA land amended to match the JKIA Indicative Master Plan
- > An area for public facilities (e.g. a government development) is located at the south-east end of the site (i.e. the area within the safety zones of JKIA's proposed second runway)
- > Some proposed residential uses close to the SGR Terminus have been changed to mixed use

9.5.6 KEY UPDATES TO THE ROAD NETWORK BASED ON FEEDBACK

- > New Bypass from Mombasa Road to Southern Bypass along the National Park border for heavy trucks driving to ICD, firstly to reduce truck traffic flows through Mombasa Road. Secondly to segregate heavy trucks in order to not interfere with the new land use related activities
- > Rectify the Old Mombasa Road connecting to the new road network that contours the ICD and gives access to the Airport North Road
- > Reactivate the current blocked road section from Airport North Road (in accordance with the JKIA Indicative Master plan)
- > Nairobi Terminus assumes Syokimau Station demand and characteristics (park and ride, bus connections)
- > New Syokimau BRT/Bus Terminus reduces potential bus movement at Nairobi Terminus transfer station (see Planning Area Transport Strategy)
- > This is highlighted in Figure 9.11.

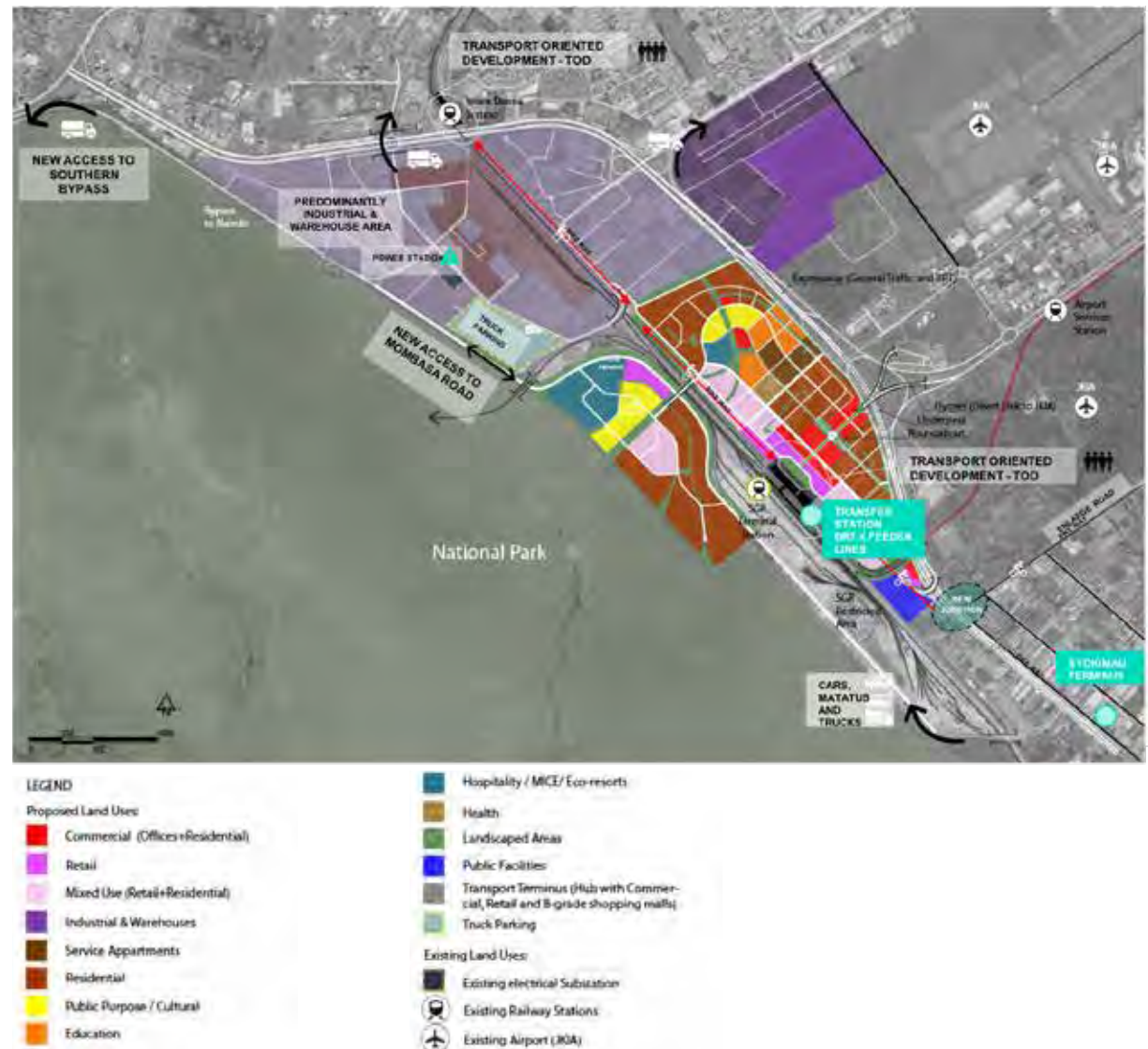


Figure 9.11: Transport Information - Direct Link Strategy (Source: DAR)

10. SUB-CENTRE PROPOSALS

10.1 INTRODUCTION

The proposals for the Nairobi SGR Terminus Sub-Centre are presented within this Chapter, expanding on the design development process. This chapter presents the following sections:

- > **Key Design Elements.**
- > **Land Use** - details the land use distribution and budget, phasing, residential mix, community facilities provision, and proposals for the ICD and Airport North Industrial Areas.
- > **Urban Design Guidelines Overview** - including building heights, security and permeability
- > **Landscape Strategy.**
- > **Transport Strategy** - covering transport integration, transit-oriented development, proposals for active travel and a transport hub, and the road hierarchy.
- > **Utilities Strategy.**
- > **Air Traffic Risk Mitigation Strategy.**
- > **Strategic Planning Assessment of the Sub-Centre Proposals** - appraising the relationship with adjoining areas and consistency with higher-level plans and studies.

10.2 KEY DESIGN ELEMENTS

The design proposals are the actions that will deliver the planning vision. These establish an integrated planning process that will define how design interventions are implemented across the site and complement one another.

As set out in Chapter 5 the Direct Link Option option was chosen by the Project Implementation Team as the preferred one. This was based on the SWOT analysis presented in the previous Chapter. In the development of the pre-concept plans, the following design strategies shaped the Direct Link Option.

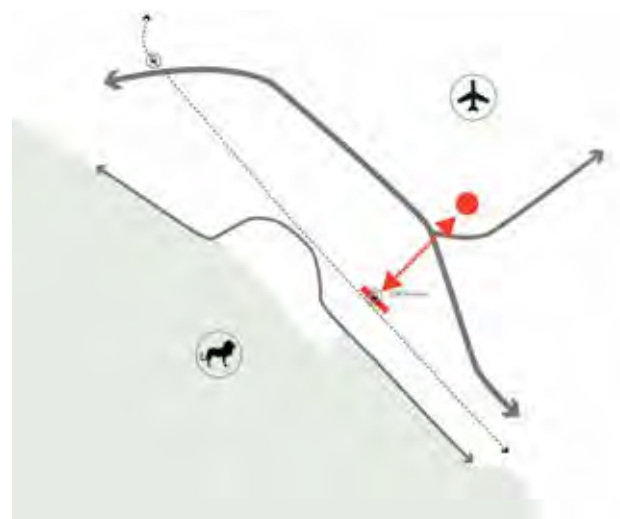
Key features of this option are:

- > Direct Road Bridge Link connects the SGR Terminus with the Airport.
 - > Green network to connect different neighbourhoods
-
- > The main commercial central spine acts as the gateway to the SGR Station.
 - > Residential areas are disconnected from main road network or separated by green buffer zones to enhance life quality.
 - > Green buffer zones as visual and noise barrier between urban areas and main roads / railway lines / industrial areas.
-
- > Quieter land uses are located along the park (residential, cultural and hospitality)
 - > Creation of different commercial and cultural centres, with adequate green spaces, to serve different areas of the site.

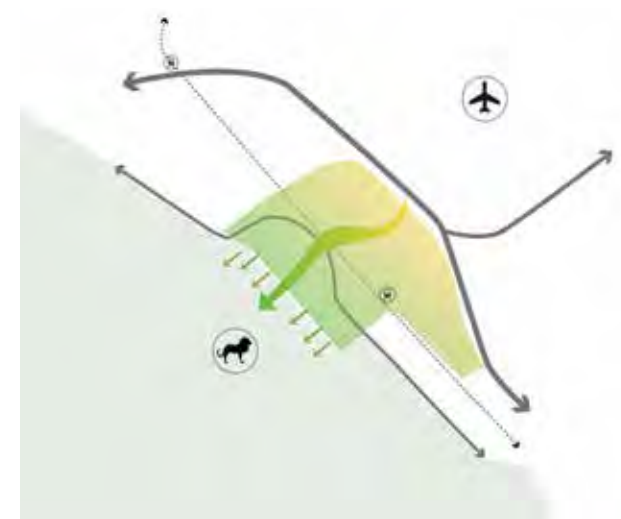
CONNECTIVITY

VITALITY

DIVERSITY



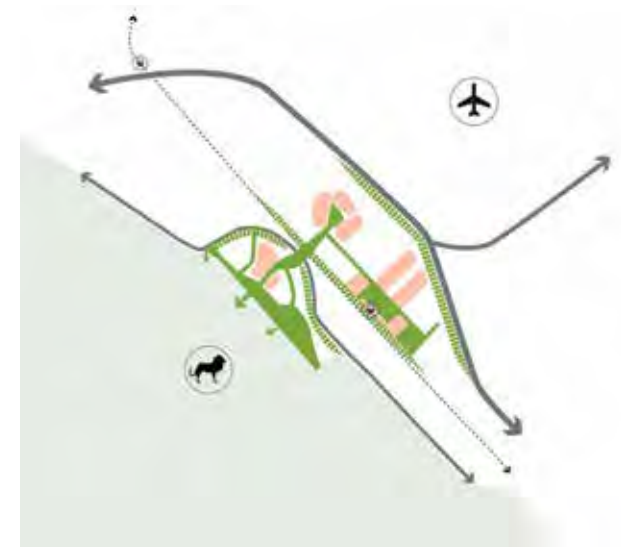
1. Direct link to the airport



2. Denser areas closer to Mombasa Road. Greener areas closer to Nairobi National Park



3. Formalised City Centre around Nairobi Terminus. Additional centres to serve different neighbourhoods.



4. Green network to link urban centres and also link urban areas to the National Park. Green buffers where necessary for visual and noise protection.

Figure 10.1: Concept Design Diagrams (Source: DAR)

10

The adjacent diagram (Figure 10.2) illustrates the concept design strategy for the Sub-Centre. The key takeaways from the strategy are listed below:

- > The identity of the development is centred around the transport hub, which forms the heart of the development. This creates a hub connected with the railway stations and the airport.
- > A new mixed-use Sub-Centre for Nairobi is established with residential, commercial and business areas. They operate as independent neighbourhoods, with commercial and cultural centres (which are analysed in a later section), but they all benefit from high connectivity due to proximity to the SGR, the Metro and the Airport.
- > The development faces inwards, buffered with a green zone from main roads and existing industrial areas.
- > Existing industries are maintained to the North of the Site. New industries are located by the airport side only, separated from the Site by Mombasa Road.
- > Residential areas are buffered from airport, railway, roads and industries by green areas or high-rise commercial streets.
- > In addition to the committed railway, a special direct link Flyover traverses across Mombasa road linking the airport to the main SGR Station.
- > Green network connects the different neighbourhoods, leading to the south of the site where the biggest green spaces, in relation to the National Park, can be found.

As previously mentioned, there were several contributing elements to the Design Strategy. Those of significant influence are listed below and further detailed in section 10:

- > Developing a Grid System;
- > Transit Oriented Design; and
- > Airport Restrictions;



Figure 10.2: Concept Design Strategy Diagram (Source: DAR)

10.3 LAND USE

10.3.1 LAND USE DISTRIBUTION

Land uses have been designated to follow the vision and principles identified in the Design Strategy. Their arrangement provides the basis for built environment within Embakasi by establishing the locations of amenities, cultural facilities, housing, and workspaces. Figure 10.3, the overall Land Use Plan, shows how these are set out. The key features characterising the land use allocations can be summarised as follows:

Commercial and retail

- > The main commercial central spine acts as the gateway to the SGR Station.
- > Commercial uses along the main road connecting the airport to the SGR terminal.
- > Retail - leisure activities around the station to create a diverse.
- > Mixed use close to commercial and retail zones / transition from commercial to residential.

Tourism, culture and civic

- > Quieter land uses are located by green spaces - residential, cultural and hospitality - while denser land uses are placed closer to Mombasa Road and City Centre. These also serve as a visual and noise buffer.
- > Tourism is placed along the National Park to enable easy access, but also to provide a high quality offering with long vistas over the Park.
- > Community Facilities in walkable distances between them (see Community Facilities Section).
- > Culture / commercial uses around parks and central plazas.

Residential

- > Residential areas are disconnected from primary road networks to enhance vitality through efficient and safe local traffic movements.
- > Residential uses are split for different incomes
 - > Affordable Housing form the periphery of residential areas, buffered from main roads.
 - > Medium Income residential - apartment typologies - are found close to commercial / educational / retail centres, creating a sense of town living.
 - > High income areas are located closer to the National park, south of the site, where the plot coverage is lower, to create greener neighbourhood lower density neighbourhoods.

Industrial

- > Industrial warehouses and low gathering public facilities on the eastern corner.

Land Use Planning

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 establishes 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 provide an alternative to car use, while increasing ridership for Commuter Rail. Public street life is promoted in streetscapes through active frontages in mixed-use areas.

b) Industrial Uses: The Plan retains industrial uses where possible without compromising the potential of the SGR Station and the surrounding and offices. As the Sub-Centre will become a major transport hub in Kenya, it is critical that the Area is designed for optimum economic activity that

it capitalises on the strategic nature of the location. Some industrial uses immediately adjacent to the SGR are proposed to be relocated, allowing for commercial and retail uses. This relocation is based on the outputs of the Stakeholder Visioning Workshop, and is aligned with the NIUPLAN strategy for de-centralisation of commercial activity away 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. Landscape design will be an important component and is presented in Chapter 7.

CORE AREA LAND USE PLAN

- Legend**
- Main Road
 - Secondary Road
 - Nairobi Commuter Railway (NCR)
 - Single Gauge Railway (SGR)
 - Water Courses
 - Core Area Boundary
 - Planning Area Boundary
 - Proposed Commuter Rail Alignment
 - Key Road and Rail Bridge
 - Phase I Boundary
- Existing Land Uses**
- Industrial / Warehouse
 - Public Utility
 - Transportation
- Proposed Land Uses**
- Residential (Low Density / High Income)
 - Residential (Medium Density / Medium Income)
 - Residential (High Density / Affordable)
 - Education
 - Recreation / Retail
 - Public Purpose
 - Commercial (Office)
 - Public Utility
 - Transportation
 - Culture
 - Mixed Use (Residential / Recreation / Retail)
 - Hospitality / MICE
 - Green Spaces
 - Service Apartments
 - Transport Corridors
 - Pond

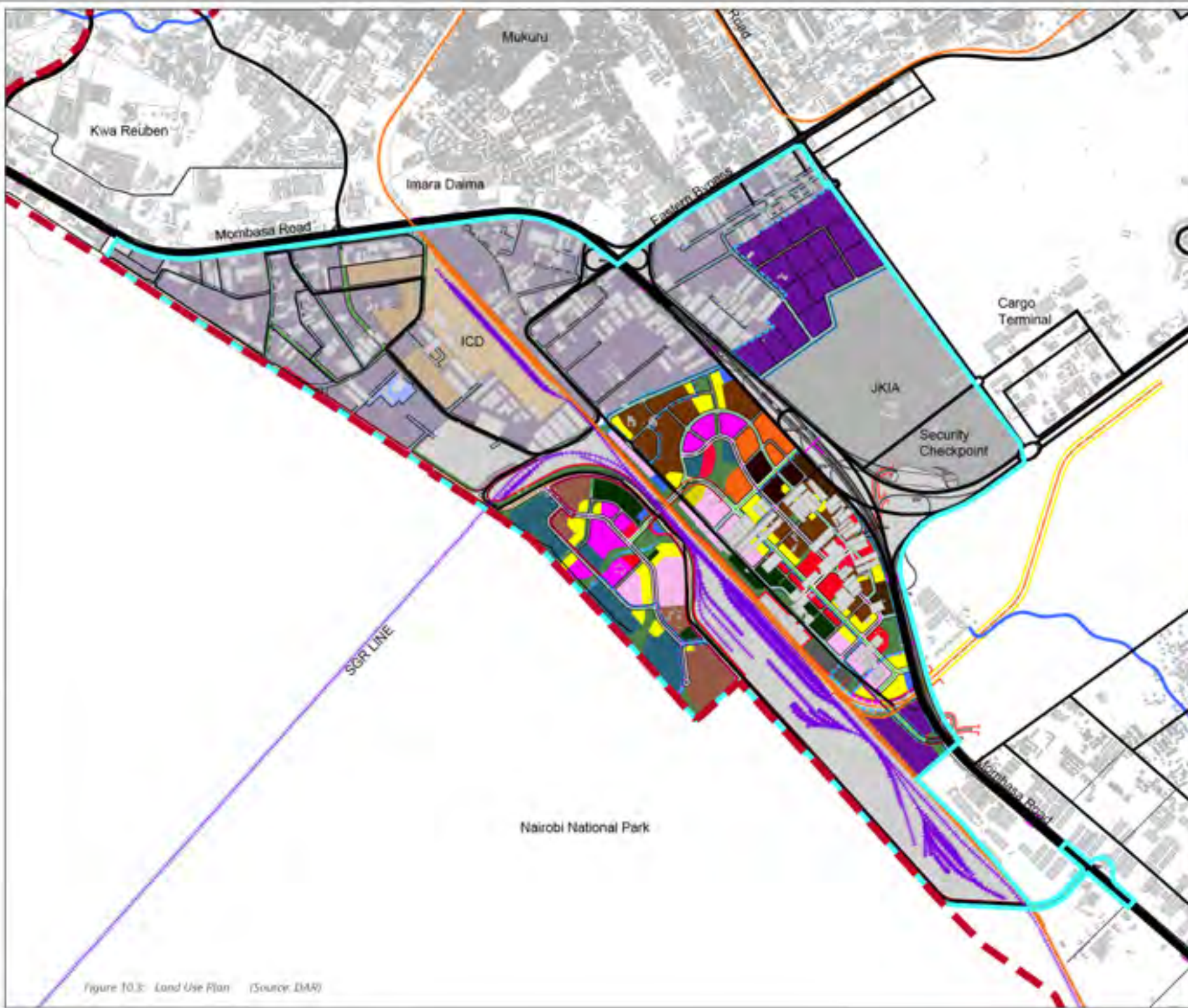


Figure 10.3: Land Use Plan (Source: DAR)

10.3.2 LAND USE BUDGET

The following Figure 10.4 presents the key net development areas, built on the land use budget shown in Table 10.1.

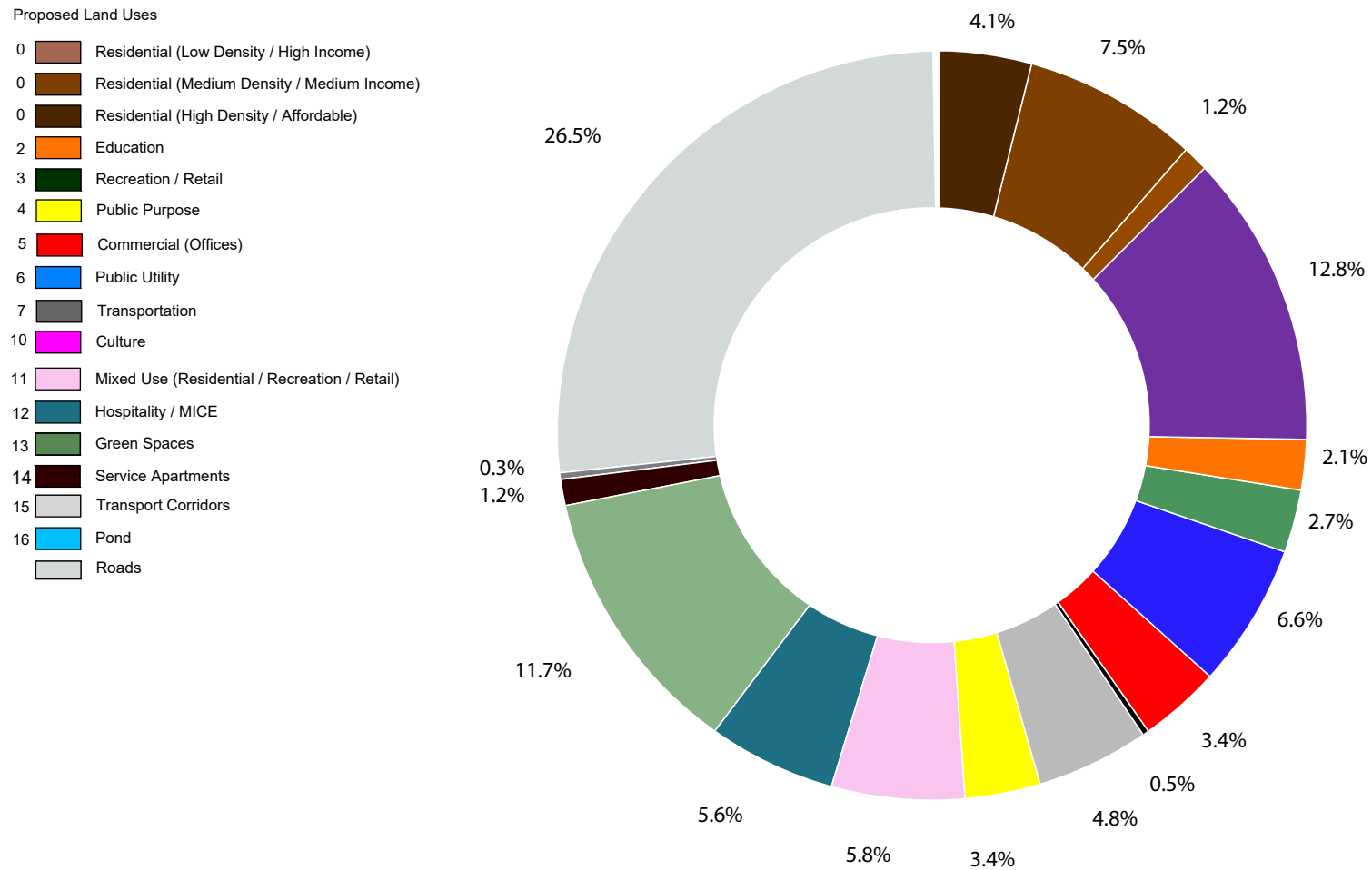


Figure 10.4: Net Development Areas for the new Proposed Land Uses.

Table 10.1: Overall Land Use Budget

Core Area - Overall																
Land Use Zones	Areas			Development Parameters						Population						
Land Use Zones	Gross Land Area (ha)	Net Land Area (ha)	Net Developable Land Percentage	Gross Floor Area GFA (m ²)	BUA (m ²) net floor area non-Resi GLA	BUA (m ²) net floor area Resi GLA	Number of Residential Units	Serviced Apartment / Hospitality Keys (SEE NOTES)	Hospital Beds	Residents	Visitors	Students/ Patients	Hotel guests/ Serviced Apartment Occupants	White collar staff	Blue Collar Staff	Domestic staff
0 - Residential	63.94	63.94	12.7%	1,207,000		784,550	7,846			31,382						7,846
1 - Industrial / Warehouses (towards JKIA)	75.90	64.52	12.8%	516,120	335,478									774	1,806	
2 - Education	10.69	10.69	2.1%	233,725	110,630	41,291				2,065		5,532		155	66	41
3 - Recreation / Retail	13.73	13.73	2.7%	322,325	209,511						10,476			4,190	6,285	
4 - Public Purpose	33.47	33.47	6.6%	596,575	387,774				1,251			1,251		27,957	9,569	
5 - Commercial (Offices)	17.18	17.18	3.4%	631,900	410,735									21,906	5,476	
6 - Public Utility	2.55	2.55	0.5%													
10 - Culture	17.33	17.33	3.4%	395,975	257,384						17,159			7,722	5,148	
11 - Mixed Use (Residential / Recreation / Retail)	29.16	29.16	5.8%	580,600	37,739	339,651	3,397			13,586	1,887			755	1,132	
12 - Hospitality / MICE	28.33	28.33	5.6%	417,425	189,928	81,398		1,357			12,662		2,713	2,849	6,647	81
14 - Serviced Apartments	6.00	6.00	1.2%	75,000		48,750		488					975			49
Roads	122.22	133.61	26.5%													
Other Non Salable (SEE NOTES)	84.50	84.50	16.7%											101	67	
New Development Total	505.00	505.00	100.0%	4,976,645	1,939,179	1,295,640	11,242	1,844	1,251	47,033	42,183	6,783	3,688	66,408	36,198	8,017
Existing Areas Total	915.00	852.86		4790140	3113591	0	0	0	0	0	4095	0	0	7,195	16,536	0
WIDER CORE AREA TOTAL	1420.00	1420.00	44.4%	9,766,785	5,052,770	1,295,640	11,242	1,844	1,251	47,033	46,278	6,783	3,688	73,603	52,734	8,017

NOTES

Other Non Saleable land includes: 7 - Transportation; 13 - Green Spaces; and 16 - Pond.

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



Figure 10.5: Illustrative Plan

Phase 1 (by 2021)

CORE AREA		
GROSS AREAS (ha)		
LAND USE ZONES	PHASE 1	OVERALL
0 - Residential (High Density / Affordable)	0	6
0 - Residential (Medium Density / Medium Income)	14	38
0 - Residential (Low Density / High Income)	0	21
1 - Industrial / Warehouses	0	76
2 - Education	11	11
3 - Recreation / Retail	7	14
4 - Public Purpose	11	34
5 - Commercial (Offices)	5	18
6 - Public Utility	2	3
7 - Transportation	3	24
10 - Culture	8	17
11 - Mixed Use (Residential / Recreation / Retail)	15	30
12 - Hospitality / MICE	11	28
13 - Green Spaces	30	60
14 - Serviced Apartments	2	6
16 - Pond	0	1
Roads	42	122
Existing Areas Total		913
TOTAL	162	1420

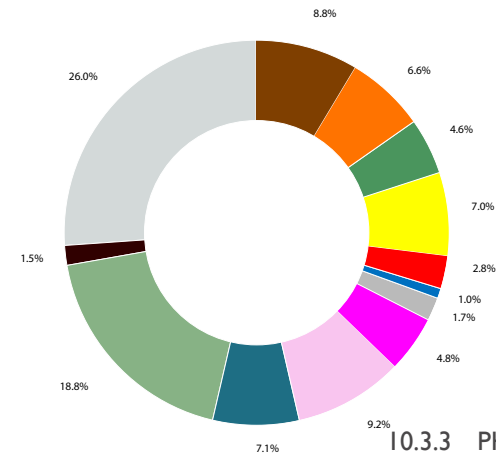


Figure 10.6: Net Development Areas (ha) repartition for Phase 1

10.3.3 PHASING

The proposals are divided into three phases as shown below and further detailed in the next two pages:

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.

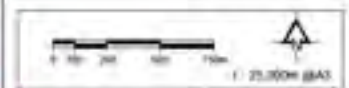
Table 10.2: Land Use Budget - Phase 1



Inter-Country Physical and Land Use
Development Plan for Nairobi SGR Terminus
and Adjoining Areas (2020-2035)

CORE AREA LAND USE PLAN:
PHASE 1

- Legend:**
- Main Road
 - Secondary Road
 - Nairobi Commuter Railway (NCR)
 - Single Gauge Railway (SGR)
 - Water Courses
 - Core Area Boundary
 - Planning Area Boundary
 - Proposed Commuter Rail Alignment
 - Key Road and Rail Bridge
 - Phase 1 Boundary
- Proposed Land Uses:**
- 1 Residential (Low Density / High Income)
 - 2 Residential (Medium Density / Medium Income)
 - 3 Education
 - 4 Recreation / Retail
 - 5 Public Purpose
 - 6 Commercial (Office)
 - 7 Public Utility
 - 8 Transportation
 - 9 Culture
 - 10 Mixed Use (Residential / Recreation / Retail)
 - 11 Hospitality (MICE)
 - 12 Green Space
 - 13 Service Apartment
 - 14 Transport Corridor
 - 15 Park



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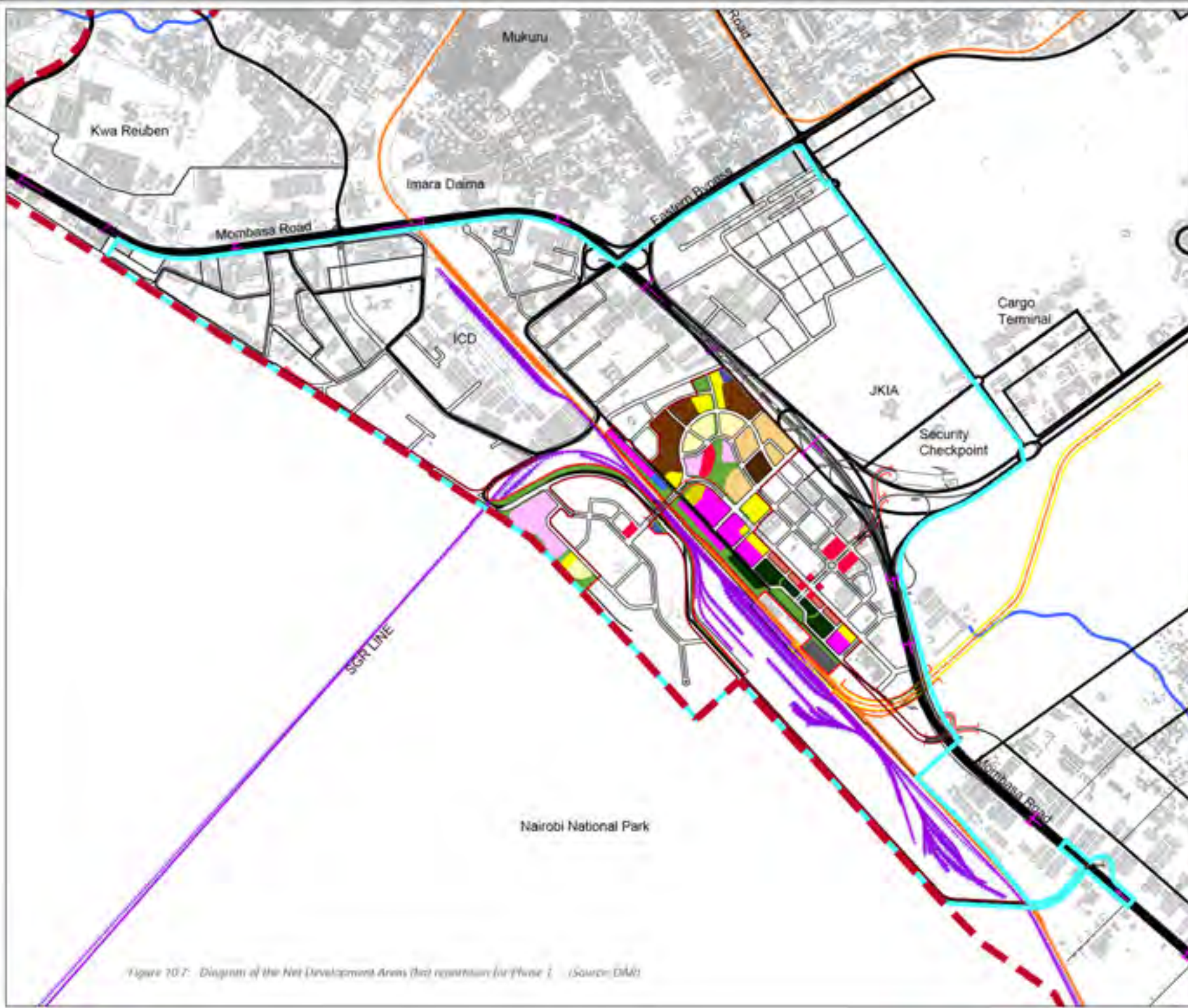


Figure 10.7: Diagram of the Net Development Areas (first reproduction for Phase 1) (Source: DMR)

10 Phase 2 (by 2026)

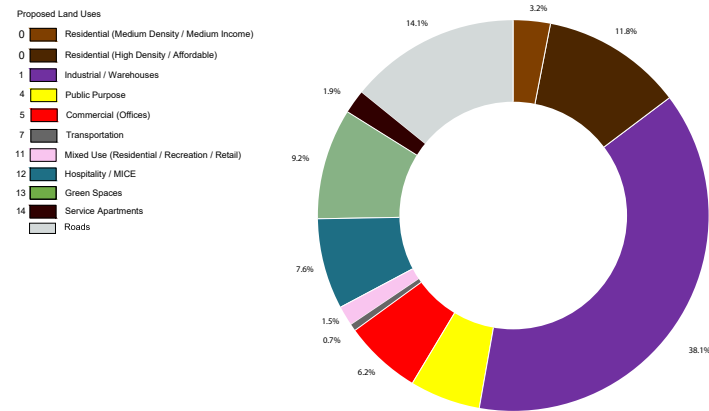


Figure 10.8: Net Development Areas (ha) repartition for Phase 2

CORE AREA		
GROSS AREAS (ha)		
LAND USE ZONES	PHASE 2	OVERALL
0 - Residential (High Density / Affordable)	6	6
0 - Residential (Medium Density / Medium Income)	24	38
0 - Residential (Low Density / High Income)	0	21
1 - Industrial / Warehouses	76	76
2 - Education	0	11
3 - Recreation / Retail	0	14
4 - Public Purpose	12	34
5 - Commercial (Offices)	12	18
6 - Public Utility	0	3
7 - Transportation	1	24
10 - Culture	0	17
11 - Mixed Use (Residential / Recreation / Retail)	3	30
12 - Hospitality / MICE	15	28
13 - Green Spaces	18	60
14 - Serviced Apartments	4	6
16 - Pond	0	1
Roads	28	122
Existing Areas Total		913
TOTAL	199	1420

Table 10.3: Land Use Budget - Phase 2

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.



Inter-County Physical and Land Use
Development Plan for Nairobi SGR Terminus
and Adjoining Areas (2020-2035)

CORE AREA LAND USE PLAN : PHASE 2

Legend

- Main Road
- Secondary Road
- Nairobi Corridor Railway (NCR)
- Single Gauge Railway (SGR)
- Water Channel
- Core Area Boundary
- Planning Area Boundary
- Proposed Corridor Rail Alignment
- Sky Rail and Rail Bridge
- Phase 2 Boundary

Proposed Land Uses

- 0 Residential (Medium Density / Medium Income)
- 0 Residential (High Density / Affordable)
- 1 Industrial / Warehouse
- 4 Public Purpose
- 5 Commercial (Office)
- 7 Transportation
- 11 Mixed Use (Residential / Recreation / Retail)
- 12 Hospitality / MICE
- 13 Green Spaces
- 14 Service Apartments
- 15 Transport Corridor



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Figure 10.9: Diagram of the Net Development Areas (NDA) repatriation for Phase 2 (by 2026) (Source: DAEC)

10 Phase 3 (by 2031)

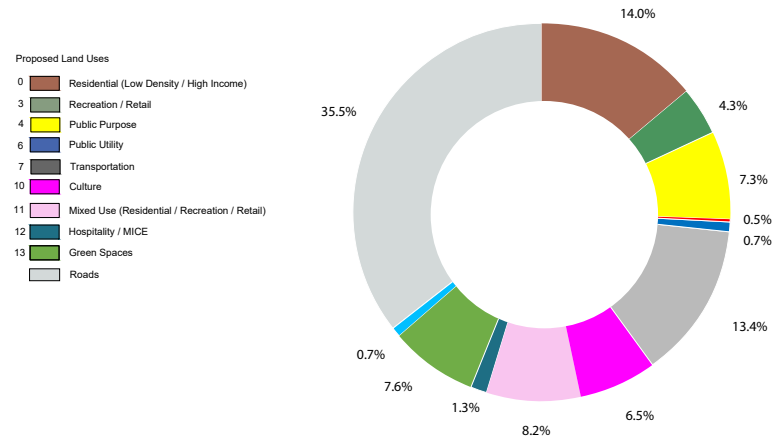


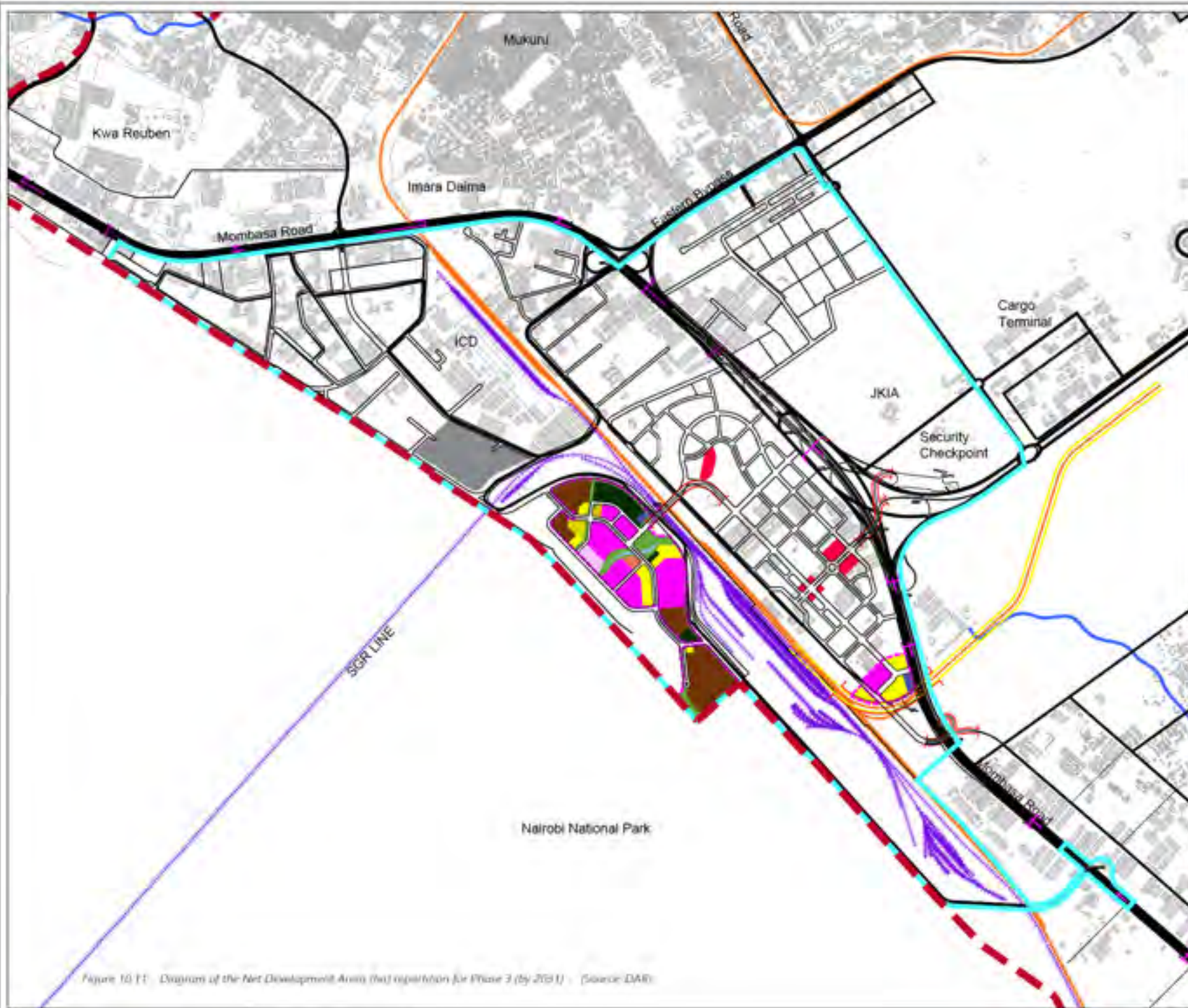
Figure 10.10: Net Development Areas (ha) repartition for Phase 3

CORE AREA		
LAND USE ZONES	GROSS AREAS (ha)	
	PHASE 3	OVERALL
0 - Residential (High Density / Affordable)	0	6
0 - Residential (Medium Density / Medium Income)	0	38
0 - Residential (Low Density / High Income)	21	21
1 - Industrial / Warehouses	0	76
2 - Education	0	11
3 - Recreation / Retail	6	14
4 - Public Purpose	11	34
5 - Commercial (Offices)	1	18
6 - Public Utility	1	3
7 - Transportation	20	24
10 - Culture	10	17
11 - Mixed Use (Residential / Recreation / Retail)	12	30
12 - Hospitality / MICE	2	28
13 - Green Spaces	11	60
14 - Serviced Apartments	0	6
16 - Pond	1	1
Roads	52	122
Existing Areas Total		913
TOTAL	148	1420

Table 10.4: Land Use Budget - Phase 3

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.





Inter-County Physical and Land Use Development Plan for Nairobi SGR Terminus and Adjoining Areas (2020-2035)

CORE AREA LAND USE PLAN: PHASE 3

Legend:

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Core Area Boundary
- Planning Area Boundary
- Proposed Container Rail Alignment
- Key Road and Rail Bridge
- Phase 3 Boundary

Proposed Land Uses:

- Residential (Low Density / High Income)
- Recreation / Retail
- Public Purpose
- Commercial (Office)
- Public Utility
- Transportation
- Culture
- Mixed Use (Residential / Recreation / Retail)
- Hospitality / MICE
- Green Spaces



1 : 25,000 @A3



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Figure 10.11: Diagram of the Net Development Area (the) repurposed for Phase 3 (by 2031) : (Source: DAR)

10 10.3.4 RESIDENTIAL MIX

Residential Uses are placed as follow:

- > Affordable housing is located towards Eastern edge of the Site, buffering from the main road (Mombasa Road):
 - > They will be located in proximity to the SGR - within a 10/15min walk, as needed for the establishment of a successful TOD and public facilities.
 - > They will benefit from an enhanced connectivity with both the rest of the development and Nairobi thanks to an efficient bus network;
- > Medium Income residential (blocs of flats) is located near commercial, educational and retail centres:
 - > They will be protected from railway lines and main road by green buffers;
 - > These secured compounds will have green pedestrian access to main leisure and commercial uses and will also benefit from close proximity to public facilities.
- > High income is situated closer to the National park at the South-West of the site:
 - > They will benefit from a lower plot coverage and height, resulting in greener and less dense neighbourhoods for more privacy (see Design Guidelines section);
 - > They will benefit from green pedestrian access to the National Park, cultural and mixed-use activities, segregated from the busy East part of the project by green buffers protecting from the bypass road and railway line.

Figure 10.12 shows the location of the different housing types.



Figure 10.12: Residential Incomes location within the Site

Affordable housing in Kenya

- > The country and capital is severely lacking affordable housing as there is a very urgent need to provide poor population with decent housing. The project will participate in meeting the deadline of building 500,000 affordable houses by 2022, as set by the National Housing Corporation (NHC);
- > Affordable housing in Kenya comprises mainly both G+1 floors villas and G+3/4 floors blocs of flats (Figure 10.13 and Figure 10.14);
- > Throughout the continent, several competitions aim to further research attractive and innovative but low-cost responses for affordable housing projects such as the Design Indaba 10x10 Low-Cost Housing Project in South Africa (Figure 10.16). These community projects have other benefits such as forging a strong the sense of community while having inhabitants participating in the construction (Figure 10.14).



Figure 10.13: Example of existing affordable housing estate in Kenya



Figure 10.14: Affordable housing cooperatives in Kenya



Figure 10.15: Affordable housing project in Kenya



Figure 10.16: Design Indaba 10x10 Low-Cost Housing Project in South Africa

10 10.3.5 COMMUNITY FACILITIES PROVISION

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 Sub-Centre, aiming to:

- > Ensure that the appropriate facilities are provided;
- > Ensure there is adequate provision to serve local communities;
- > Ensure that facilities are designed within the correct parameters and are appropriately sized; and
- > Ensure community facilities support accessibility for all.

The following process has been followed for identifying community facility provisions:

1. Define the settlement type related to population;
2. Identify which facilities should be provided, based on the settlement type
3. Determine the distribution of facilities based on population and catchment areas.

10.3.5.1 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 and Medical Facilities:** 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 Facilities:** 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.
- > **Cultural and Leisure Facilities:** 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 and Recreation:** 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.
- > **Open Spaces:** Outdoor areas dedicated for public use. Open space types are defined by the combination of certain physical characteristics including their size, their landscaping and the buildings that front onto them.

10.3.5.2 DISTRIBUTION OF FACILITIES

The graphic below illustrates how Physical Planning Handbook identifies settlement types, based on population catchment areas. Different types of facilities are located according to population catchment. For example, full primary schools will be provided for every 5,000 residents. Whereas district hospitals will be provided for every 100,000 residents catchment.

The Sub-Centre can be divided by these settlement types according to population catchment they will serve. Within Phase 1 for example, it is currently indicated that there are 4

local centres, 2-3 market centres and 1 urban centre.

In addition to population catchment areas, transport catchment are vitally important to ensure that people can easily access facilities based on global best practice, 500m walking catchment areas have been used to inform the distribution of community facilities in the Sub-Centre.

Key Informants

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

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

- > Although it is understood 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.

Table 10.5: Proposed Community Facilities Guidelines

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 10.5 contains the guidelines.

Proposed Quantum of Facilities

Informed by the guidelines, the proposed community facilities provision equates to 32.24 hectares.



Community Facilities: Schools

	Number of Facilities Required per Population	Land Area Required per Facility		Number of Facilities Required in the Sub-Centre	Land Area Required in the Sub-Centre (ha)
		Square Metres	Hectares		
CIVIC FACILITIES					
civic centre	1 per major centre	5,000	0.50	1	0.50
Magistrate court	1 per major centre	5,000	0.50	1	0.50
Police Station	1 per 30,000-100,000	5,000	0.50	2	1.00
Fire Station	1 per 50,000-100,000	3,000	0.30	1	0.30
Postal Agency	1 per 10,000-20,000	300	0.04	3	0.12
Chamber of Commerce	1 per major centre	1,000	0.10	1	0.10
Cemetery	1 per 50,000-100,000	Incorporated within Strategic Green Spaces	-	1	-
			Total	9	2.52
HEALTH FACILITIES					
Hospital	more than 70,000 (*includes provision for Adjoining Areas)	-	-	-	2.50
Secondary Care Clinic	1 per 24,000-70,000	6,000	0.60	2	1.20
Primary Care Clinic	1 per 5000-20,000	2,000	0.20	9	1.80
Dentist Practice	1 per 5000-20,000	2,000	0.20	9	1.80
Pharmacy	1 per 8,000-12,000	2,000	0.20	6	1.20
			Total	26	8.50
EDUCATION FACILITIES					
kinder garden / nursery	1 per 2,400-3,500	Incorporated within mixed-use areas (ground floors only) and/or primary schools	-	20	-
pre-education facility	1 per 2,400-3,500	Incorporated within mixed-use areas (ground floors only) and/or primary schools	-	20	-
primary school	1 per 3,500-7,000	2,500	0.25	13	3.25
secondary school	1 per 7,000-12,500	10,000	1.00	7	7.00
			Total	60	10.25
SOCIAL AND CULTURAL FACILITIES					
Community Hall	1 per 10,000-60,000	4,000	0.40	5	2.00
Community Centre	1 per 6,000-10,000	2,000	0.25	8	2.00
Cultural Centre / Art Gallery /Library	1 per 50,000-70,000	Incorporated within public purpose/cultural areas	-	1	-
Youth Centre	1 per 10,000-50,000	2,000	0.20	5	1.00
Worship Centre	1 per 4,000-6,000	4,000	0.40	12	4.80
Local Market	1 per 4,000-7,000	2,000 Partly incorporated within retail and mixed use areas	0.20	12	2.40
			Total	43	12.20
SPORT FACILITIES					
Sport grounds	1 per 2,000-10,000	Incorporated within Strategic Green Spaces	-	8	-
Football fields	1 per 20,000 - 40-000	Incorporated within Strategic Green Spaces	-	2	-
Combi Court	1 per 10,000 - 20,000	Incorporated within Strategic Green Spaces	-	3	-
			Total	13	0.00
			TOTAL	151	33.47

10 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 Sub-Centre 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 10.17.

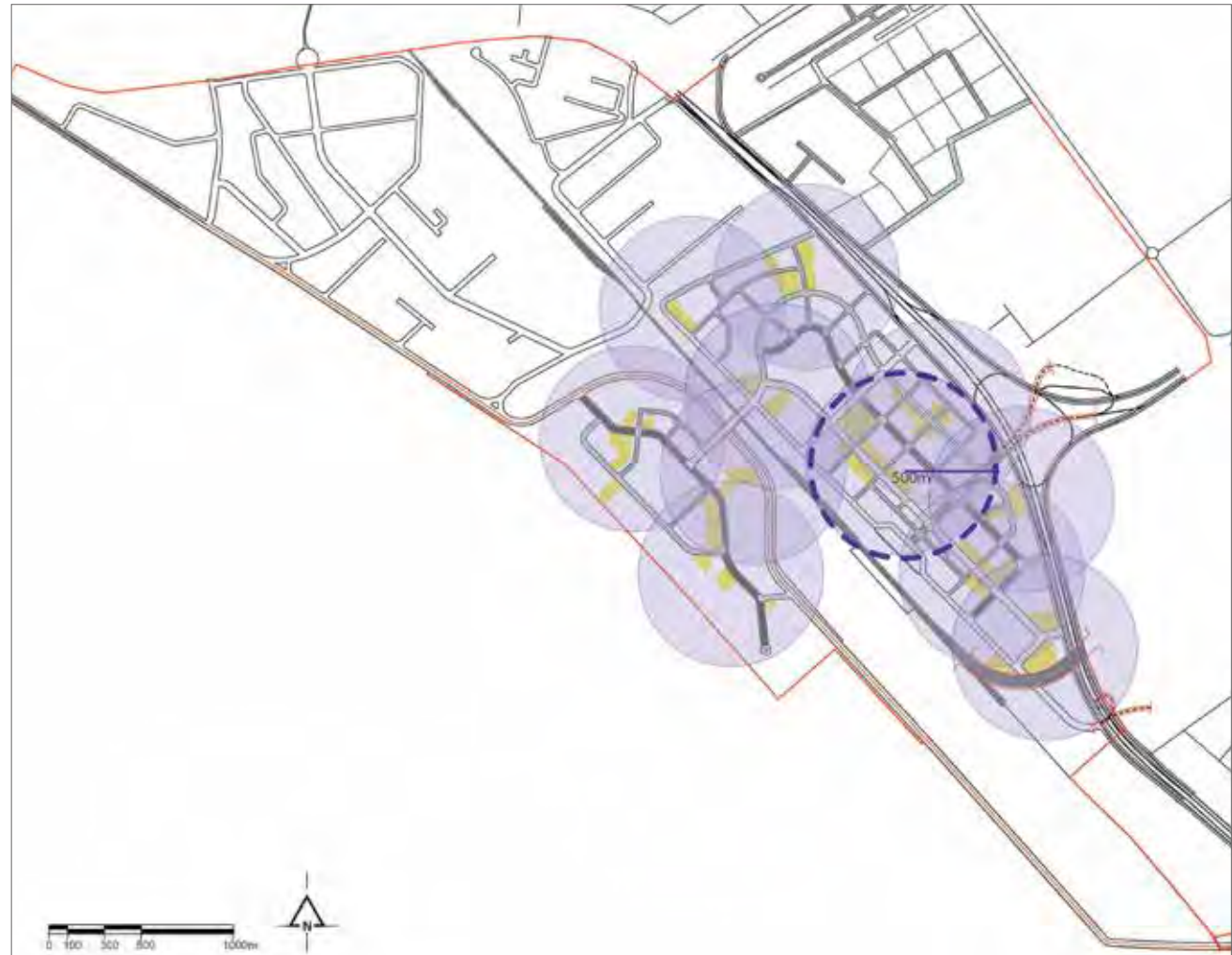


Figure 10.17: Plan showing location of the proposed community facilities and 500m catchments

10.3.6 ICD AND AIRPORT NORTH INDUSTRIAL AREAS

Existing site

The industrial area is currently centred on the Inland Container Depot (ICD) to the north of the Sub-Centre. The ICD sees cargo throughput change between rail and truck. The surrounding land is industrial and hosts a series of interrelated logistics uses. Those closes to the airport in the east are not well connected to the uses in the west.

These are supported by many poor quality roads, that can be problematic for heavy vehicles, especially with inclement weather conditions. The existing road network lacks a coherent road hierarchy that enables a separation of vehicle types

Proposals for the industrial area

The proposals envision an expansion of the ICD, an intensification of industrial uses, and an upgrade of the road network to enable a more reliable flow of goods due the to estimated higher cargo throughput.

The area to the east of the Mombasa Road is proposed to host a new cluster of airport related industries. These will benefit from proximity to both the airport in the east and the ICD in the west. An upgraded link will provide connectivity to the ICD across the Mombasa Road. To unlock this potential a new road hierarchy is established through the site with the provision of new paved roads. See Figure 10.18.

The roads earmarked for upgrading are highlighted in the adjacent figure, they establish new direct paved links to the national network. Through the provision of these direct links to the trunk roads, the Bypass Road and the Mombasa Road, impacts on the mixed use area are expected to be reduced. The new paved roads reduce the need for trucks to interface with the area, providing a separation between industrial and local traffic (Figure 10.19).



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INDUSTRIAL ROAD HIERARCHY PLAN

Legend

- Com Area Boundary
- - - Planning Boundary
- Water Courses
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Primary Road
- Secondary Road
- Local Road

Existing Land Use

- 0 Existing Industrial / Warehouses
- 4 Existing Public Utility
- 7 Existing Transportation
- Existing ICD

Proposed Land Use

- 0 Industrial / Warehouses

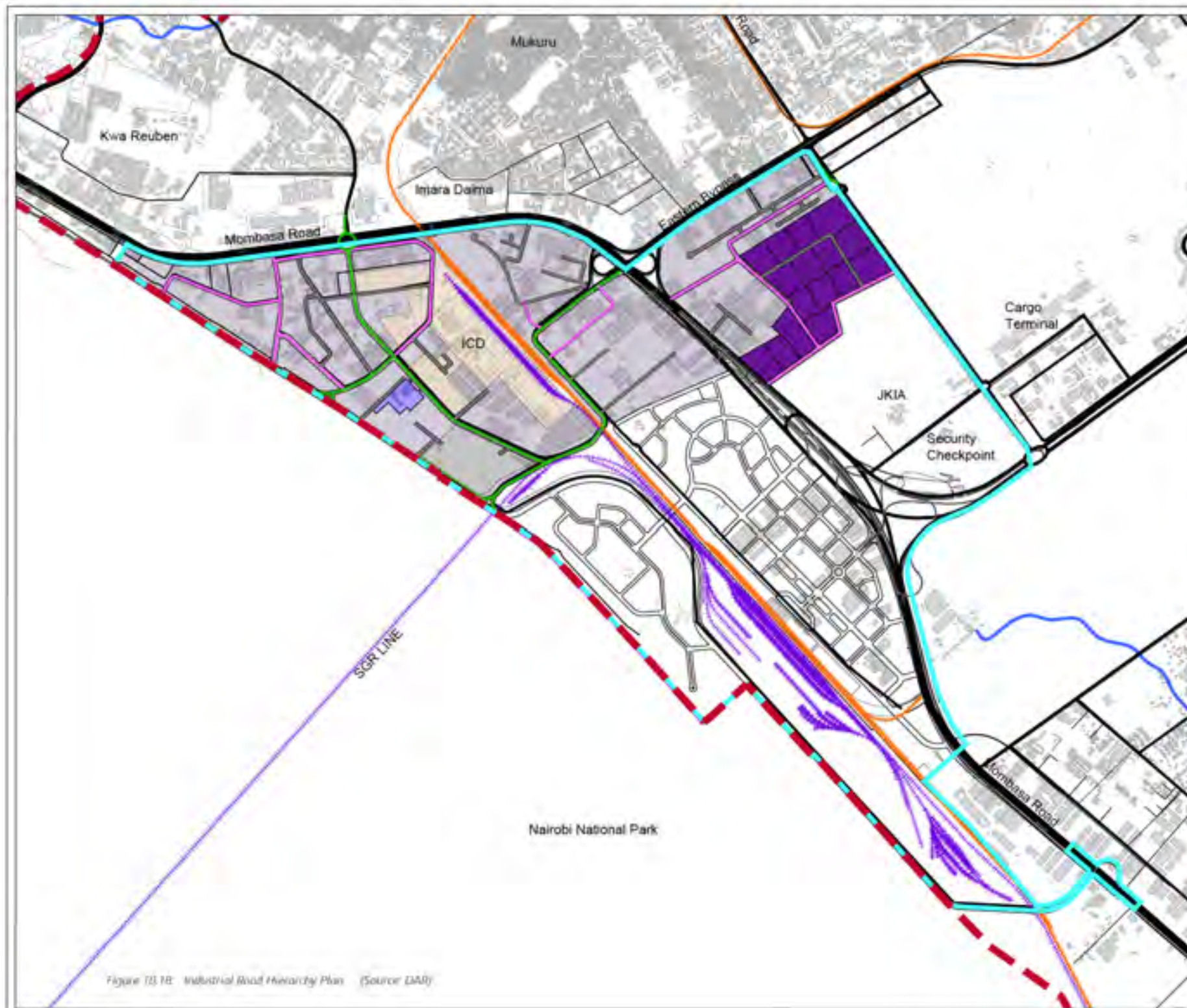


Figure 10.18: Industrial Road Hierarchy Plan (Source: DART)



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INDUSTRIAL AREA ROAD IMPROVEMENT PLAN

Legend

- Core Area Boundary
- - - Planning Boundary
- Water Courses
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Existing Tarmac Road
- Key Road to be Upgraded

Existing Land Use

- Existing Industrial / Warehouses
- Existing Public Utility
- Existing Transportation
- Existing ICD

Proposed Land Use

- Industrial / Warehouses

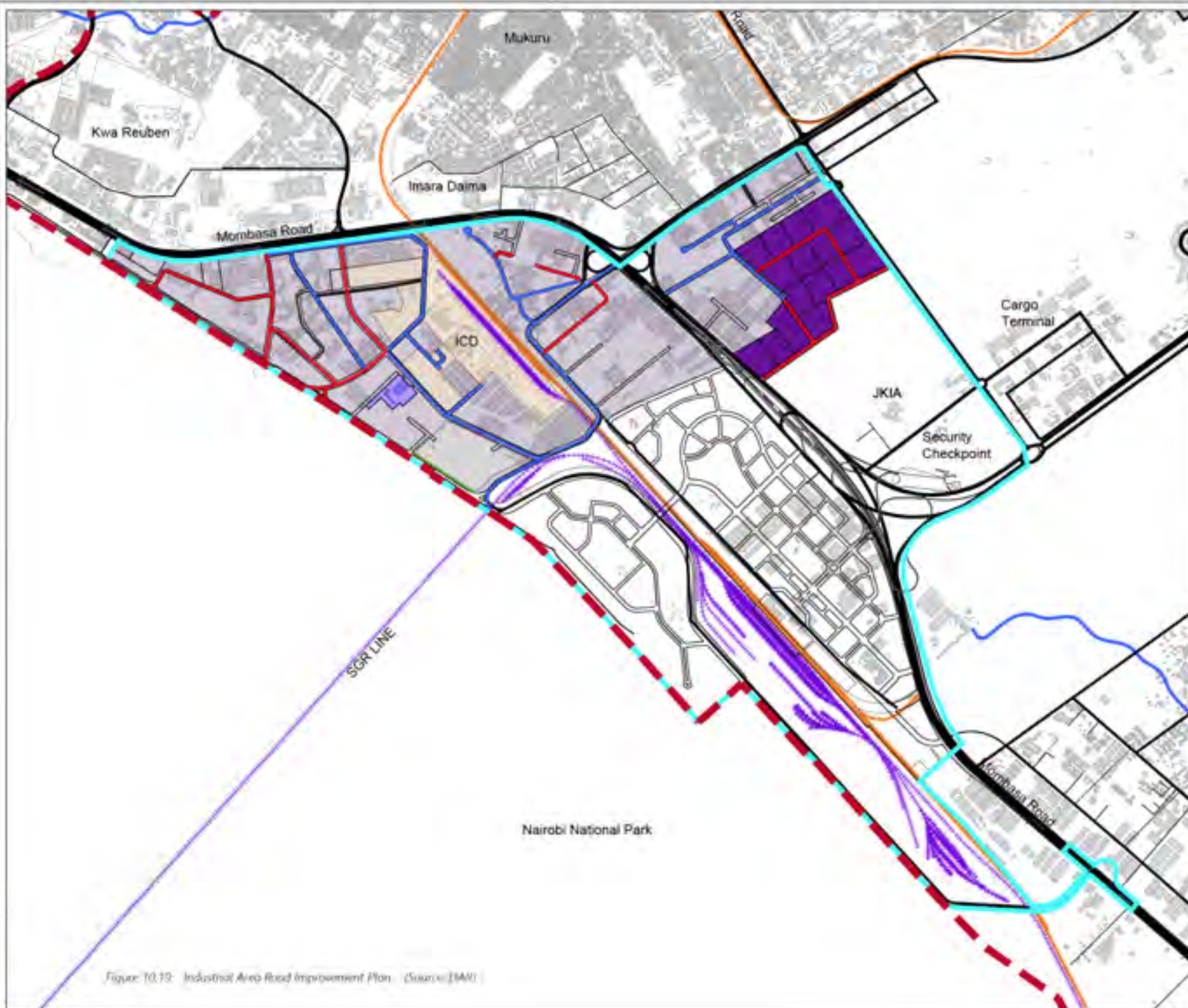


Figure 10.19: Industrial Area Road Improvement Plan. (Source: JMR)

10 10.4 URBAN DESIGN GUIDELINES OVERVIEW

The 'Technical Study 2: Nairobi SGR Terminus Sub-Centre Detailed Design Studies and Urban Design Guidelines' report builds upon the proposals to provide information regarding detailed design.

In consideration of the existing urban and environmental conditions, and in conjunction with the socio-economic and planning baseline, the report provides direction for the detailed design, including the land use plan, the related urban design studies, and the subsequent supporting policies.

The report serves as the basis for design review, providing a framework for plot development and the associated urban design features in order to create a high quality built environment that forms cohesive and holistic whole.

Density analysis is performed at the front-end of the document to better understand the optimal density for the project area based upon best practice examples, in light of the contextual environment.

Analysis of the existing urban conditions is also performed, where issues/weaknesses within the existing urban environment are considered, and future urban design solutions and opportunities are presented. This analysis is performed for a variety of urban assets, from the local road network, to street market areas, to water bodies and open spaces.

Plot development guidelines – which have been developed from the overall urban design strategy submitted during the previous stage of the project – provide clarity on the nature and form of development that should be undertaken in order to deliver the vision and objectives.

The guidelines - presented by land use - have been broken down into development parcels, each of which, has been categorised and studied individually according to a set of design parameters that development should adhere to.

These parameters have been defined based upon an idealised typology which has then been rationalised in consideration of the respective development parcel, its function, size, and location.

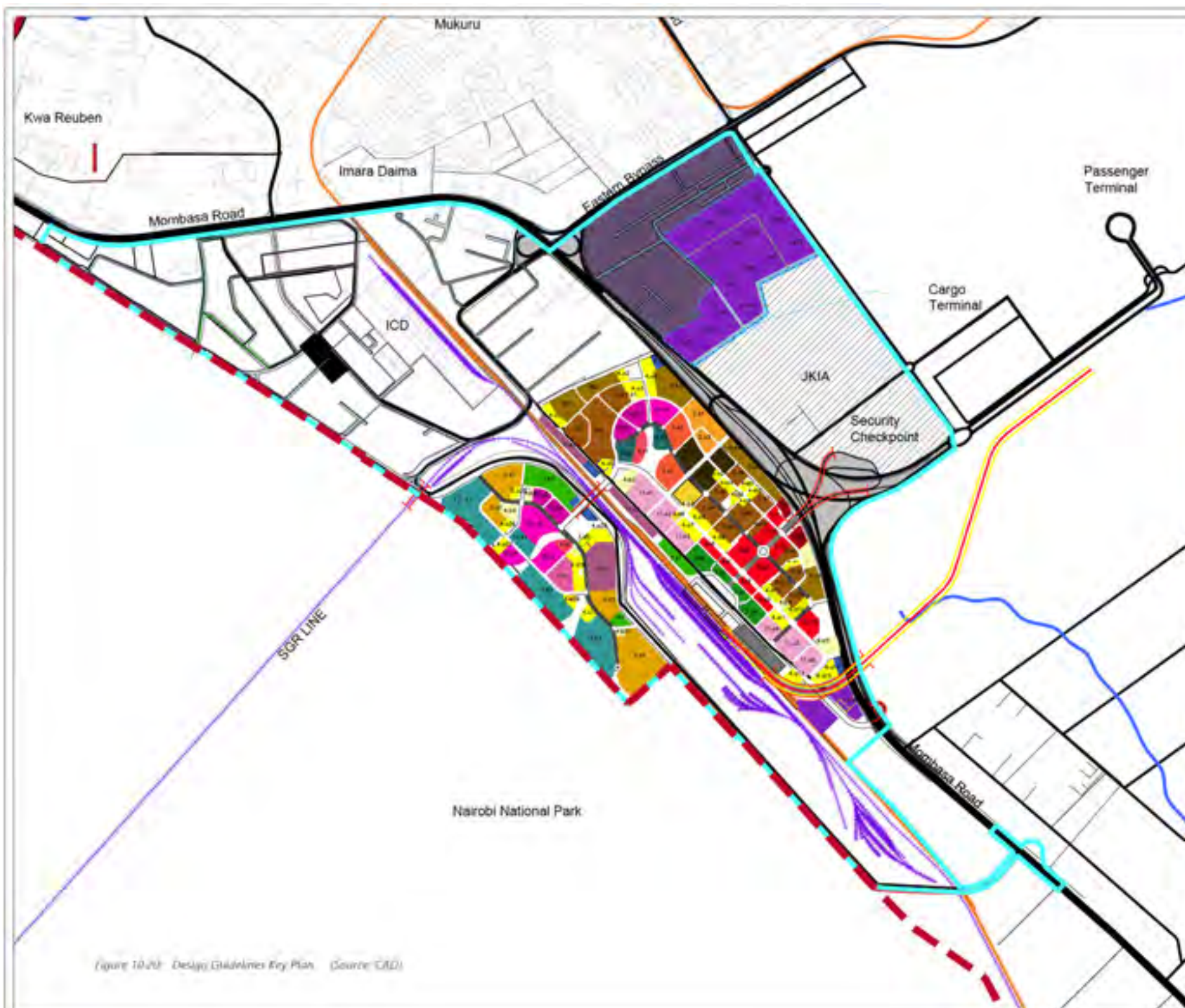
The following design parameters are considered across the major land uses, and are detailed for the respective development parcels:

- > Building Setback
- > Parcel Fencing
- > Building Coverage
- > Floor Area Ratio (FAR), and
- > Building Heights

In the report, the 'Design Guidelines Key Plan' is presented as a reference to allow identification of the respective development parcels and their location. Subsequently, a detailed breakdown of the parameters for the respective parcel is presented within each land use, listing the design specifications for said parcel. In addition to this, an idealised typology is presented through the form of an axonometric image, as well as a number of reference images to aid in visualising the desired output. The idealised typology is a manifestation within the parameters set by the guidelines for that land use.

Table 10.6: Community Facilities design guidelines

URBAN DESIGN					
Phase	PLOT OCCUPATION AND USE				
	Parcel Type	Stated Building Coverage	Target FAR	HEIGHT	Plot Area (Ha)
Community Facilities - (Excluding Schools)					
P2	4-a1	45%	1.75	4	1.15
P2	4-a2	45%	1.75	4	0.46
P1	4-a3	45%	1.75	4	1.18
P1	4-a4	45%	1.75	4	1.69
P1	4-a5	45%	1.75	4	0.96
P1	4-a6	45%	1.75	4	0.34
P1	4-a7	45%	1.75	4	1.24
P2	4-a8	45%	1.75	4	1.03
P2	4-a9	45%	1.75	4	1.03
P2	4-a10	45%	1.75	4	0.84
P1	4-a11	45%	1.75	4	0.98
P2	4-a12	45%	1.75	4	1.24
P3	4-a13	45%	1.75	4	0.84
P3	4-a14	45%	1.75	4	0.72
P3	4-a15	45%	1.75	4	1.18
P2	4-a16	45%	1.75	4	2.20
P2	4-a17	45%	1.75	4	0.75
P2	4-a18		3.25	7	0.46
P2	4-a19	45%	1.75	4	0.34
P2	4-a20	45%	1.75	4	0.40
P2	4-a21	45%	1.25	3	0.47
P2	4-a22	45%	1.25	3	0.46
P2	4-a23	45%	1.75	4	0.57
P2	4-a24	45%	1.75	4	0.29
P3	4-a25	45%	1.75	4	0.44
P3	4-a26	45%	1.25	3	0.42
P1	4-a27	45%	1.25	3	0.77
P3	4-a28	45%	1.75	4	1.78
P1	4-a29	45%	1.75	4	0.59
Community Facilities - (Schools)					
P1	4-b1	45%	1.75	4	0.27
P1	4-b2	45%	1.75	4	1.33
P1	4-b3	45%	1.75	4	0.28
P2	4-b4	45%	1.75	4	0.24
P3	4-b5	45%	1.75	4	0.20
P3	4-b6	45%	1.75	4	1.13
P2	4-b7	45%	1.75	7	1.11
P3	4-b8	45%	1.75	4	0.37
P3	4-b9	45%	1.25	3	1.19
P3	4-b10	45%	1.25	3	0.25
Community Facilities (Health)					
P2	4-c1	45%	1.25	3	2.20
Total Area					32.24



Inter-County Physical and Land Use
Development Plan for Nairobi SGR Terminus
and Adjoining Areas (2020-2035)

LOCATION OF COMMUNITY FACILITIES (PUBLIC FACILITIES) STES

Legend	
Thick Black Line	Main Road
Thin Black Line	Secondary Road
Orange Line	Road for Commuter Railway (HCR)
Blue Line	Single Gauge Railway (SGR)
Blue Line	Water Course
Red Dashed Line	Core Area Boundary
Red Dashed Line	Parking Area Boundary
Grey Hatched Area	Transport Corridor
1. Residential	
2a	2a
2b	2b
2c	2c
2d	2d
3. Industrial / Warehouse	
3a	3a
3b	3b
4. Education	
4a	4a
4b	4b
4c	4c
5. Leisure/Recreation	
5a	5a
5b	5b
5c	5c
6. Public Purpose	
6a	6a
6b	6b
6c	6c
7. Commercial (Office)	
7a	7a
7b	7b
7c	7c
8. Public Office	
8a	8a
8b	8b
8c	8c
9. Public Office	
9a	9a
9b	9b
9c	9c
10. Hospitality	
10a	10a
10b	10b
10c	10c










SEPTEMBER 2020

dar

Figure 10.20: Design Guidelines Key Plan (Source: CAD)

Design Guidelines Table

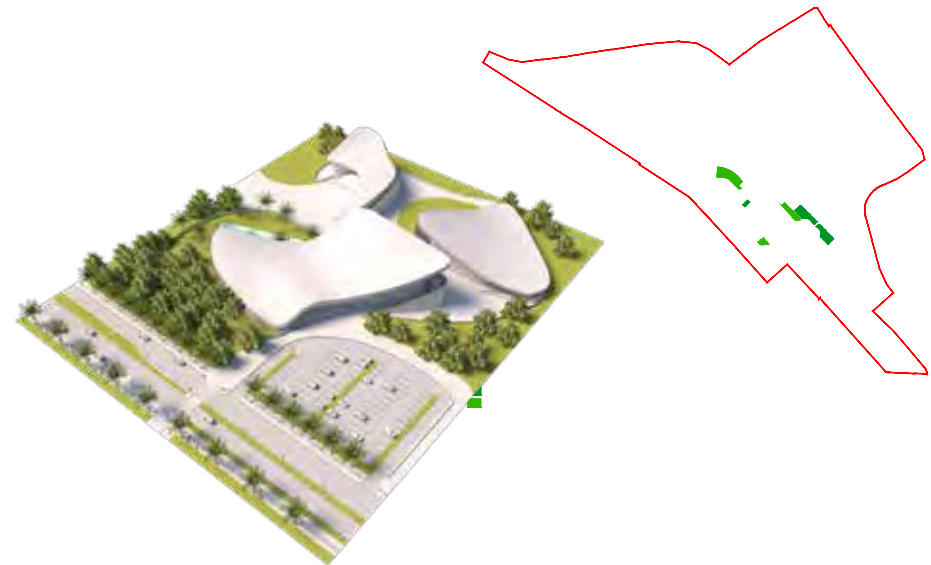
Reference is made to the design guidelines table for 'leisure and entertainment' uses to identify the respective parcel


Plots	name	area (ha)	bH	Far	phase	notes
	3-a1	2.12	6	3.6	P1	higher building heights compared to b-type (see table)
	3-a2	0.74	6	3.6	P1	higher building heights compared to b-type (see table)
	3-a3	0.75	6	3.6	P1	higher building heights compared to b-type (see table)
	3-a4	1.80	6	3.6	P1	higher building heights compared to b-type (see table)
	3-a5	0.39	4	2.0	P3	higher building heights compared to b-type (see table)
	3-b1	2.00	6	3.0	P1	lower building heights compared to a-type (see Table)
	3-b2	5.00	4	1.6	P3	lower building heights compared to a-type (see Table)

Breakdown of Design Parameters

Specific parameters for said parcel are outlined based upon the aforementioned parameters. An idealised typology, a key plan and reference images (in some cases) are presented in conjunction as a visual aid.

In some cases, the notes section may detail an exception or clause that should be taken note of.



PLOTS	NAME	AREA (HA)	BH	FAR	PHASE	NOTES
	3-a1	2.12	6	3.6	P1	higher building heights compared to b-type (see table)

10.4.1 BUILDING HEIGHTS

Buildings Heights across Embakasi are allocated with the following considerations in mind:

- > Airport Height restrictions are applicable to the Site's proximity to the JKIA Runways;
- > The Building heights plan below is aligned with the airport restrictions;
- > The highest building on Site is limited to G+10 storeys to maintain a homogeneous skyline with the existing surroundings;
- > The highest buildings are located around the three main urban nodes (in order to highlight the different centres: transport hub, education and cultural nodes);
- > Medium height buildings are located along the edges to create buffer zones and provide quieter environments to the City;
- > Lower height applies to inner residential areas, as well as the vicinity of the National Park to minimise the impact of the built environment on the fauna.

Figure 10.21 illustrates the permissible building heights.

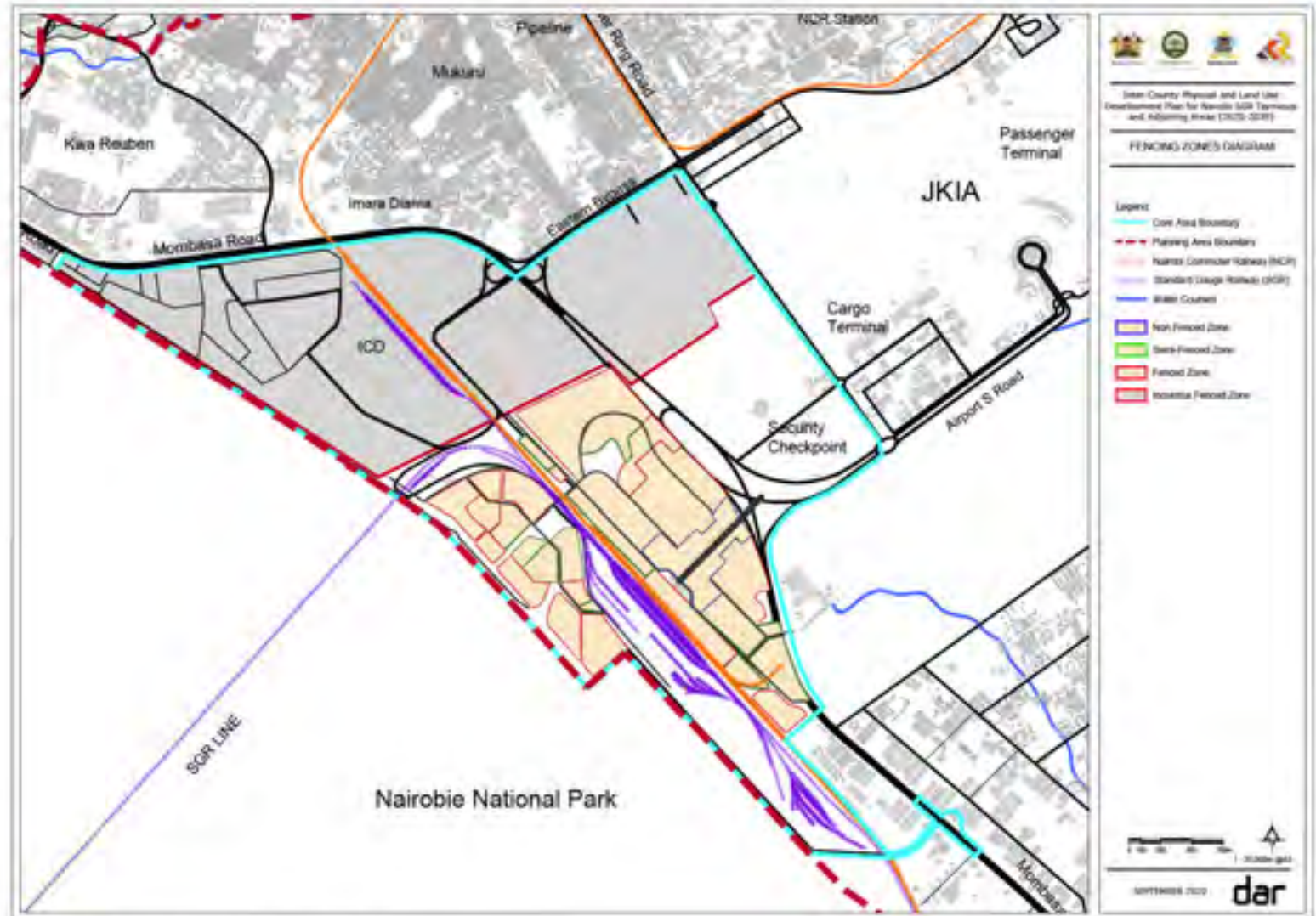


Figure 10.21: Permissible Building Heights (Source: DAR)

10

10.4.2 SECURITY AND PERMEABILITY

Figure 10.22 shows the overall fencing strategy.

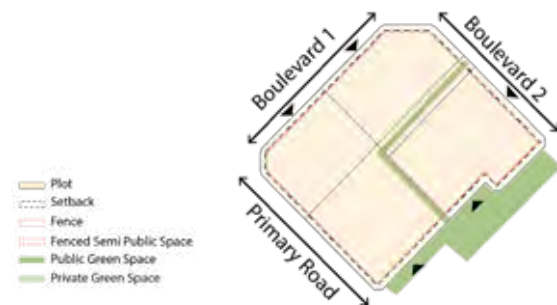


Overall

This section examines the potential for ensuring visual and physical permeability across the non-industrial areas across the site. Permeability needs to be carefully managed in order to address priorities of security for residential areas, while also creating active street frontages in key zones.

Three key zones are established to maximise animated frontages along key focus areas of the site. The focus areas

Non Fenced Zone: Commercial plots



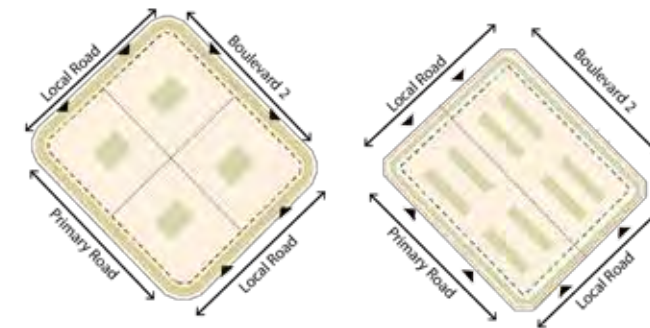
- > Minimum Setback to create active frontages
- > No fence to allow public access and movement
- > No access from primary roads



are set out later in this chapter.

- > The non-fenced Zone : plot frontages will be defined to encourage active frontages with street-side shops and cafés in the vicinity of the SGR Station and areas with retail and cultural uses;
- > The semi-fenced Zones: Allowing partial permeability for certain public administrative buildings, commercial and retail uses;

Fenced Zone: Residential plots



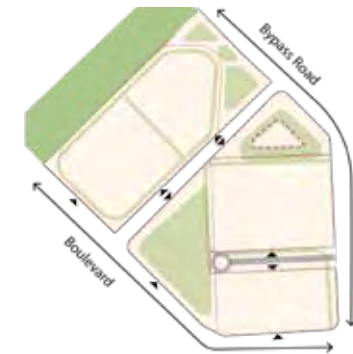
- > Fenced zone for security reasons
- > Setback or 2-5m to allow movement/circulation around the block.
- > Fence is placed on plot boundary.
- > Private green network, accessed only by residents.



- > The Fenced Zone: high-security areas in middle to high-end residential areas; and
- > The Industrial Fenced Zone allows for the future definition of a high security bonded area that is an extension of the ICD area.

The urban block typologies and frontage studies are set out in the following section.

Semi- Fenced Zone: Cultural Uses



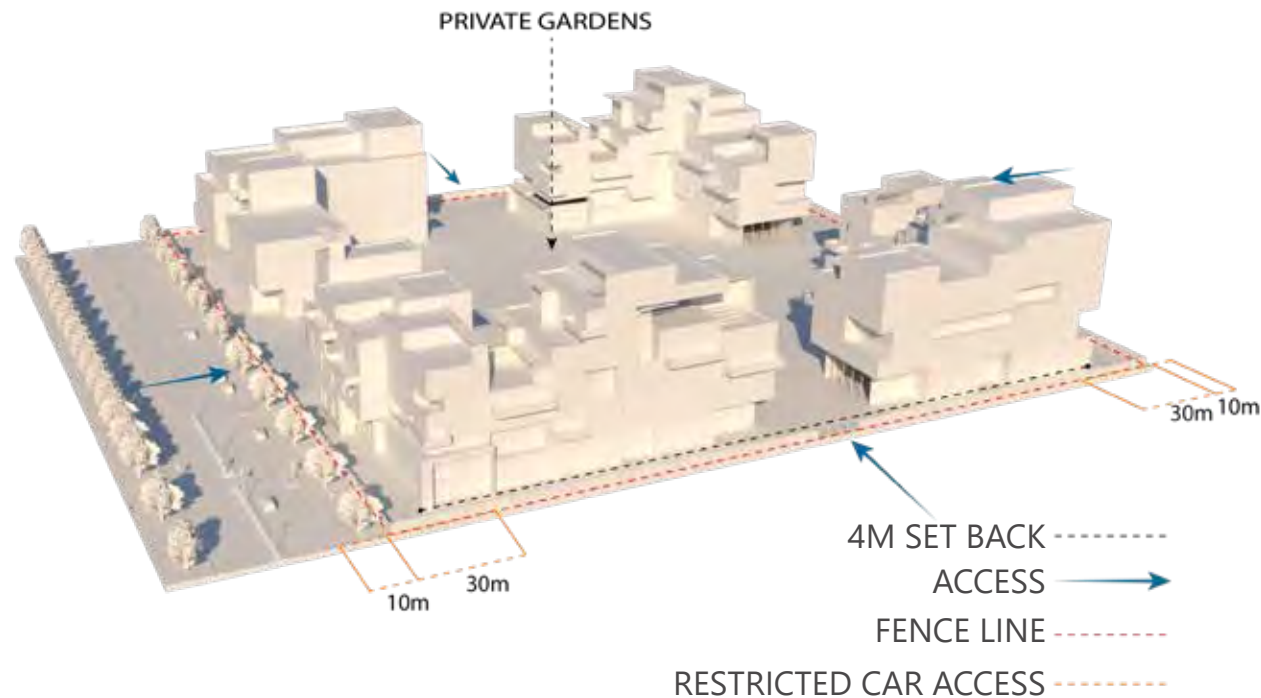
- > Semi fenced zone
- > Large setbacks to create public spaces.
- > Fence is placed on setback boundary
- > Public green network, accessible even when public buildings are not open.



10 URBAN BLOCK TYPOLOGIES

Below, different cases of urban block configuration are presented for each of the three fencing zones. The examples include suggestions for setbacks, vehicle accesses and indicative green network within each plot.

Fenced Plots

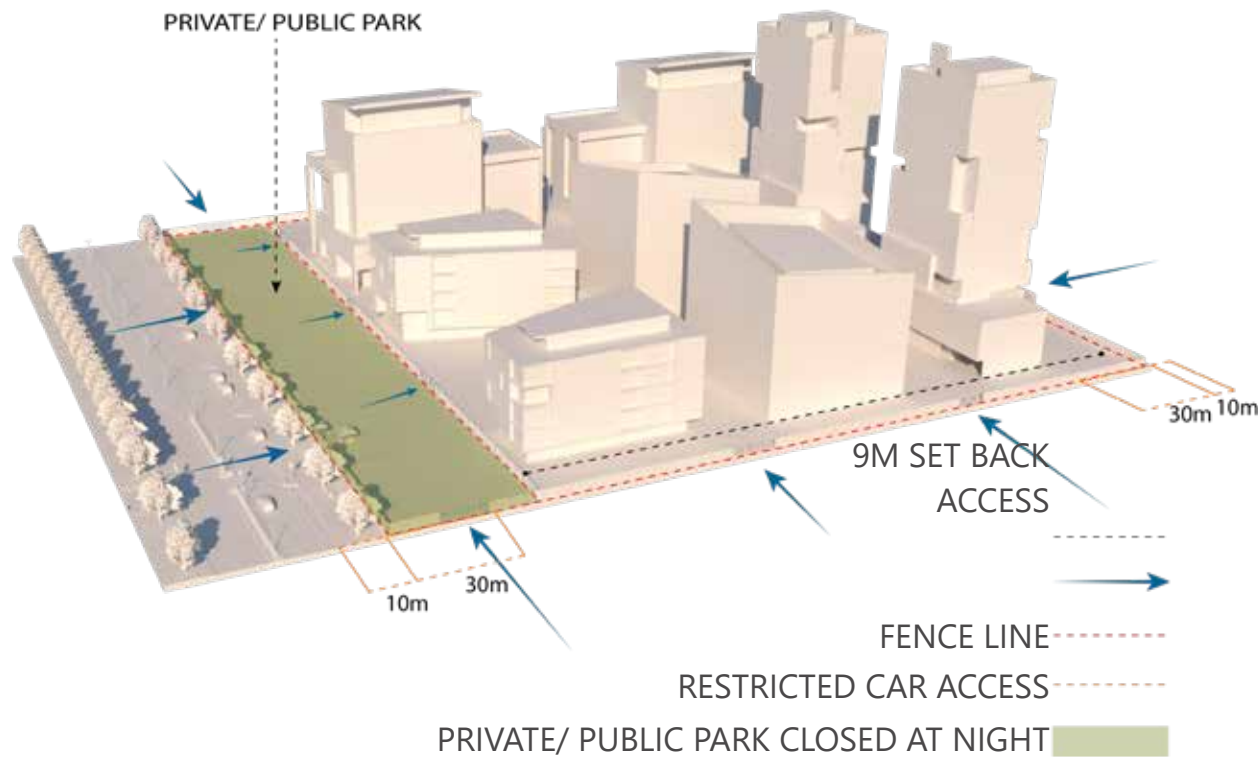


> Fenced Plots

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



> Semi-Fenced Plots

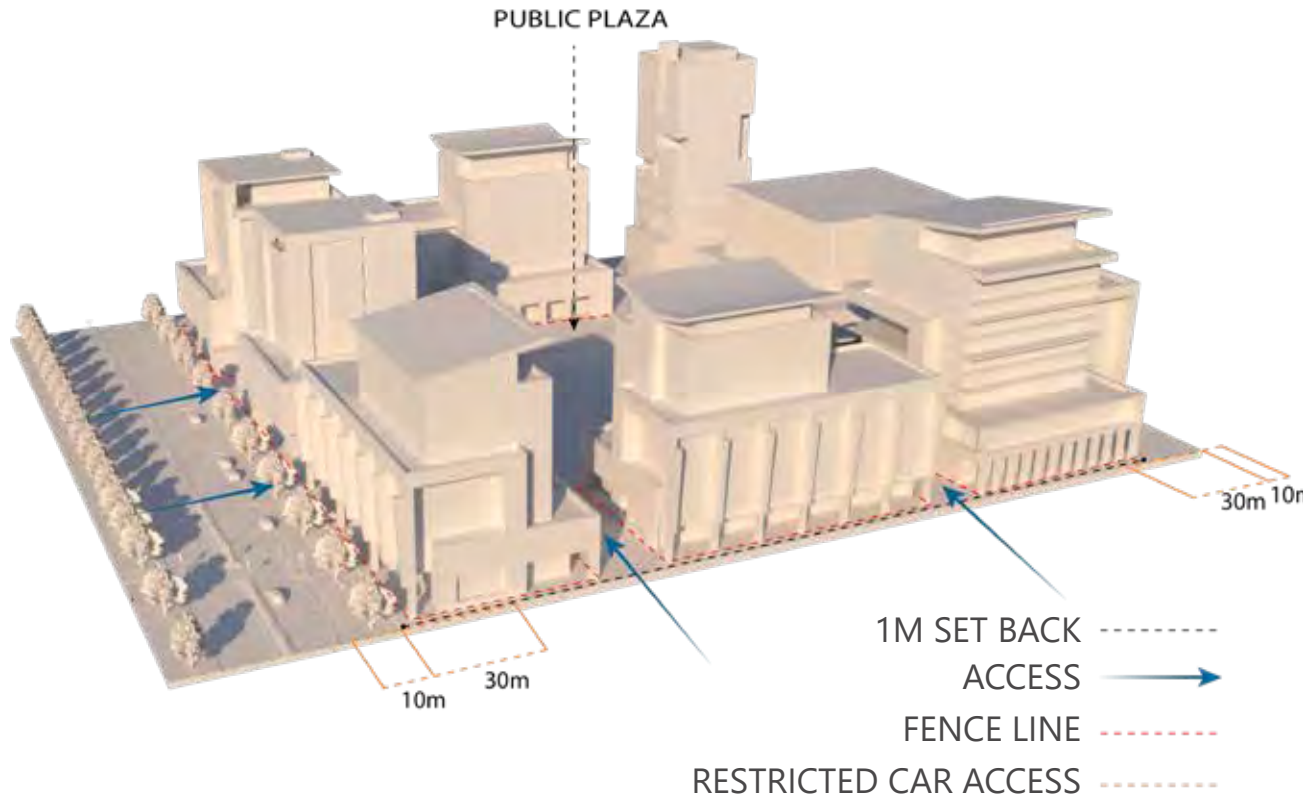
These zones are envisaged to have a flexible fencing approach. In this scenario the plots will remain fenced off for the majority of the time, but for special events the boundaries of the plots can be opened to adjacent areas to create a much larger fenced off zone. The landscape strategy needs to address 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.



10

Non-Fenced Plots



> 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. Security shutters will be applied to building facades and will close at night.



10.5 LANDSCAPE STRATEGY

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 provides 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.

The Landscape Strategy and Proposals are elaborated in Chapter 11. Landscape design guidelines are provided in Technical Study 2.

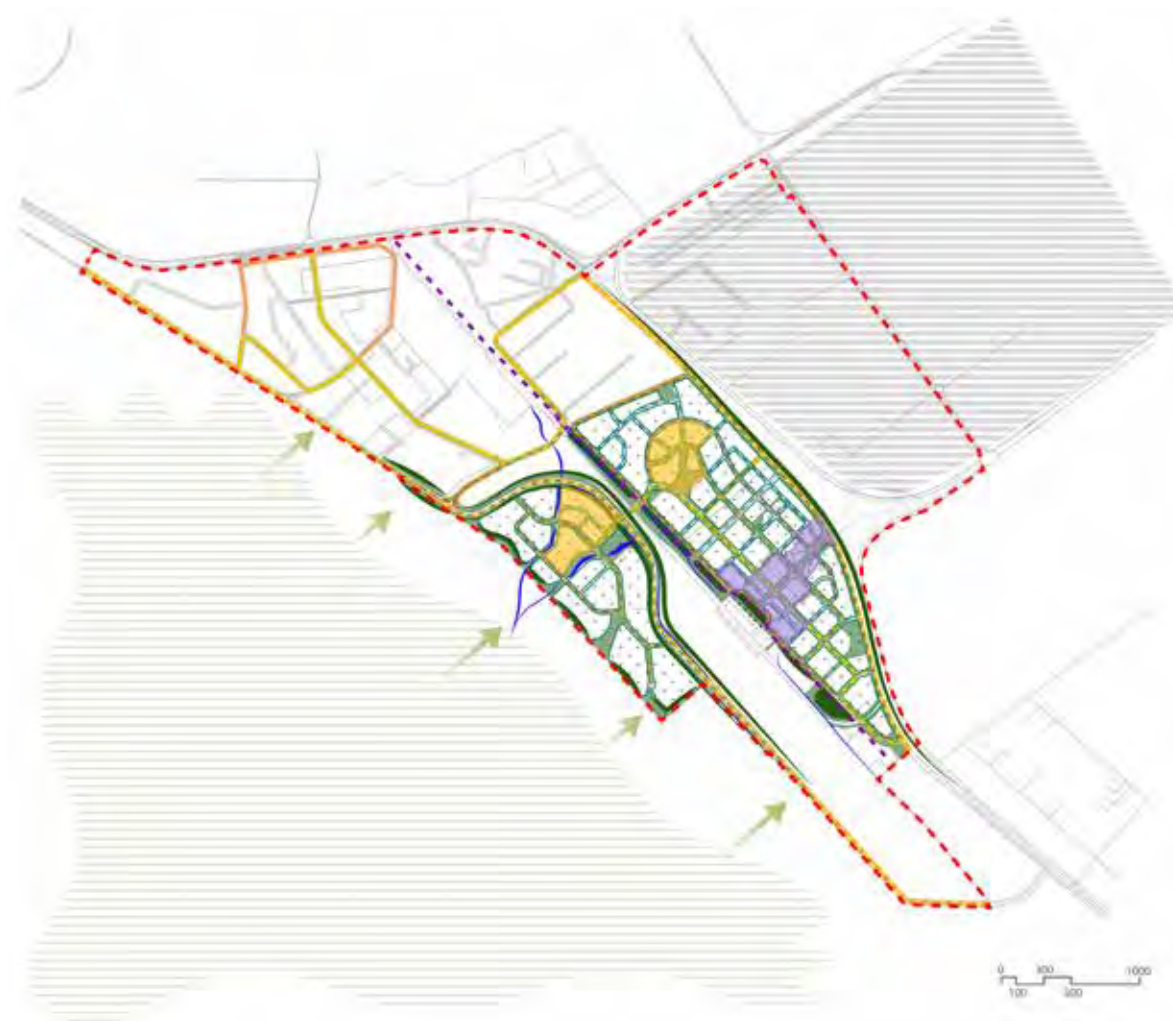


Figure 10.23: Landscape Strategy

10 10.6 TRANSPORT STRATEGY

This section outlines the transport strategy for the Nairobi SGR Terminus Sub-Centre. Further details on transport can be found in Chapter 12 and Technical Study 3.

10.6.1 TRANSPORT INTEGRATION

The transport vision is for the Sub-Centre to become an integrated multimodal transport hub. The vision is further detailed in Chapter 12 Transport Studies

Key transport strategies that provide better integration of the site with the adjacent neighbourhoods and wider Nairobi are:

- > **Removal of Syokimau Station:** The Commuter Railway Master Plan proposes to decommission the existing Syokimau station and replace all functions at Nairobi Terminus. This is due to the station's interface with proposed connections to Mombasa Road and the airport. A new grade-separated connection has been proposed to enable access to the JKIA area from the west.
- > **Nairobi SGR Terminus will absorb all of the travellers currently at Syokimau.** First and last mile travel connections that are achievable at Syokimau will all be provided at Nairobi Terminus, once Syokimau is removed. The Nairobi Terminus station will play the central role in providing seamless integration with other transport modes and replacing Syokimau station. The distance between these two railway facilities is short and was easily transferred with no loss of attractiveness to current or to future users.
- > **Direct Link to JKIA :** A road bridge provides a direct connection between the Sub-Centre and the JKIA Airport. The bridge also provides a pedestrian connection between Syokimau and the Sub-Centre.
- > **Transport Interchange Terminus:** A new transport terminus has been proposed to provide for multi-modal transit for users of the BRT, local buses, taxis, the SGR train station and the Nairobi Commuter railway. The transport terminus is also connected to short-term and long-term parking areas for the SGR terminus.
- > **New Bridge across the railway lines:** A new bridge has been proposed across the railway lines, connecting the two separate development areas. It is proposed that this bridge will be constructed in the latter stages of the Project.

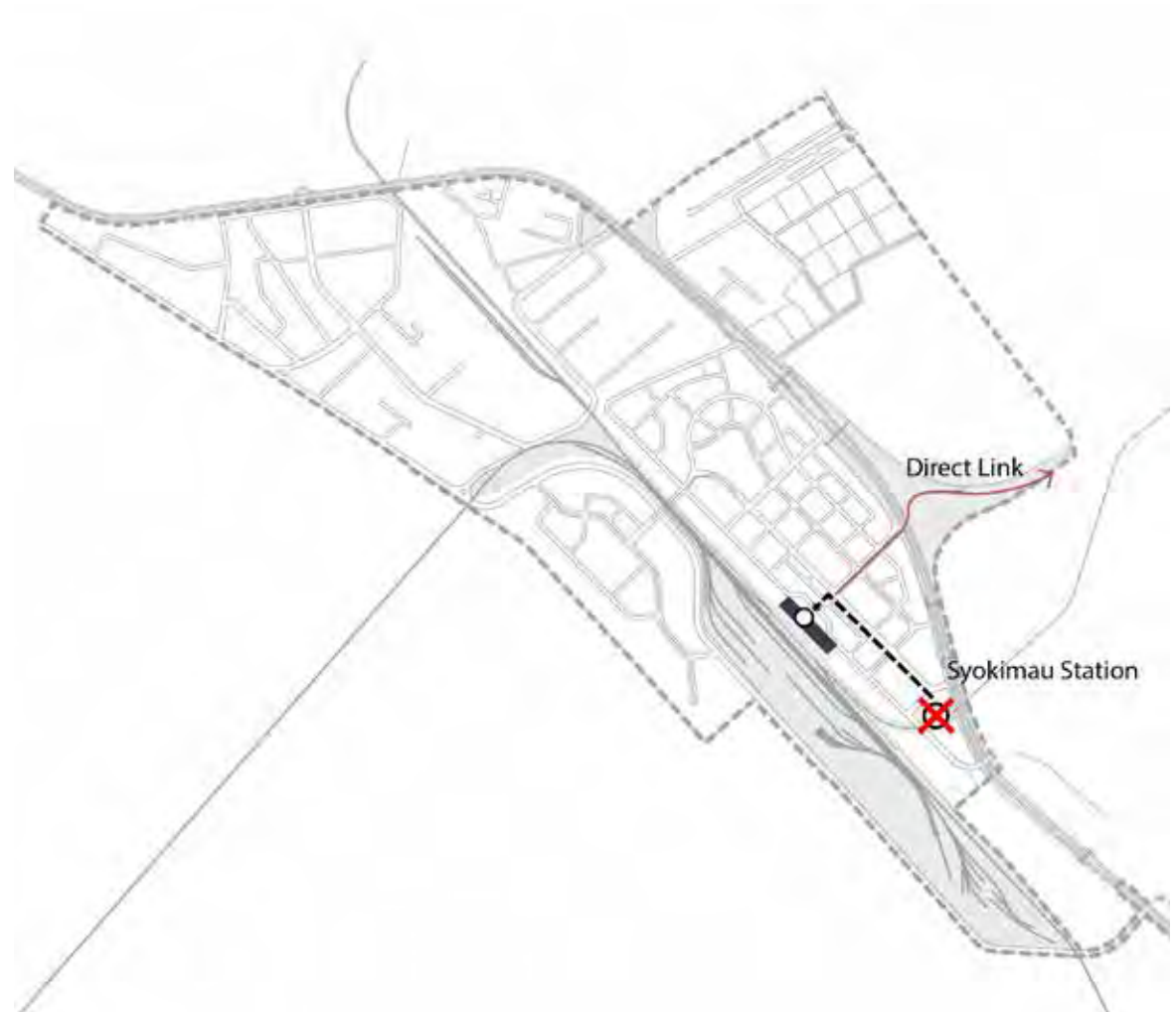


Figure 10.24: Sub-Centre - Integration with adjacent developments.

10.6.2 TOD

Transit-Focused Components of TOD

In order to achieve the benefits of a TOD, a variety of specific components are identified from a variety of sources including the Transit Oriented Development Institute. The components lead on to defining other key areas within a TOD including affordable housing, the station area and the wider community as explained later on. The key components are as follows:

1. Walkable design with pedestrian as the highest priority;
2. Train station as prominent feature of town centre;
3. Public Square fronting Train station;
4. A regional node containing mixture of uses in close proximity;
5. High density, walkable districts within 10 minute walking distance surrounding the railways station (800m);
6. Collector supporting transit systems including trams, light rail and mutatus;
7. Designed to include the easy use bicycle and scooters as daily supporting transport;
8. Large ride in bicycle parking areas within stations;
9. Bike sharing rental system and bikeway network integrated with the station;
10. Reduced and managed parking inside 10 minutes' walk circle of the town centre and train station; and
11. Specialised retail at station serving commuters and locals including cafes and grocery stores.

A special focus is put towards the following elements:

- > Affordable Housing is in most cases, forms a key component of TOD development as they are usually situated in suburban areas to allow commuters to travel into the CBD, which usually lacks affordable housing. It is

thought that mixed-use neighbourhoods near transit stops have considerable benefits including creating walkable communities and promoting a localised economy. A variety of strategies have been developed to for encouraging mixed-income TOD housing.

- > As the focal point of almost any TOD, the station area is at the heart of all development acting as a prominent feature of the town centre. Adopting components such as promoting high density, walkable district within 10 minute walk distance surrounding the railways station (800m) and supporting specialised retail at station serving commuters and locals including cafes and grocery stores, the station area would also create an attractive local place for residents to work, live and play.
- > As a more social aspect, the community are the ones who will work, lives and plays in the development of a TOD. Planning for transit-oriented development that serves families is important for creating truly "complete" communities and how such planning can be achieved in conjunction with local stakeholders such as schools, hospitals are essential. Documents such as the TOD 205 (Families And Transit-Oriented Development – Creating Complete Communities for All) best explains ideal practices of transit-oriented development in relation to communities.

Applicability for Embakasi

Focusing around the SGR Nairobi Terminus, a new TOD would incorporate these elements in a high density, multi-modal transport hub for both locals and those travelling further afield to work, live and play. This would divert the desire for individuals to travel into the CBD and also, with the increased frequency of rail services, allow more commuters to travel via the rail network easing congestion of Nairobi's road network.

In relation to the components of TOD, the proposed concept plan for Embakasi does encourage a walkable design with pedestrian as the highest priority with the train station acting as a prominent feature of town centre with a public square fronting the train station. Embakasi will also act as a regional node containing mixture of uses in close proximity of the station, with specialised commercial such as cafes for both commuters and locals around the station vicinity. It will feature a high density, walkable district within 10 minute walk distance surrounding the railways station (800m) with supporting commuter transit systems including and mutatus hub and increased frequency of the Commuter Rail. This is envisioned to encourage commuters to travel from local surrounding suburban areas such as Athi River, Syokimau and Mlolongo via the mutatus and then onto the CBD through the rail network.

With respect to the TOD criteria, the main activities are located within a 400m radius (5min walk) from the SGR Station, predominantly; while residential neighbourhoods are located within a 800m radius (10min walk). Both the education and cultural hubs can be reached within a 15min walk or will be connected by bus. Pedestrian links are ensured between these neighbourhoods. To demonstrate the advantages and potential similarities of a TOD around the Nairobi Terminus, the following lessons have to be adopted and then carefully implemented within Embakasi.

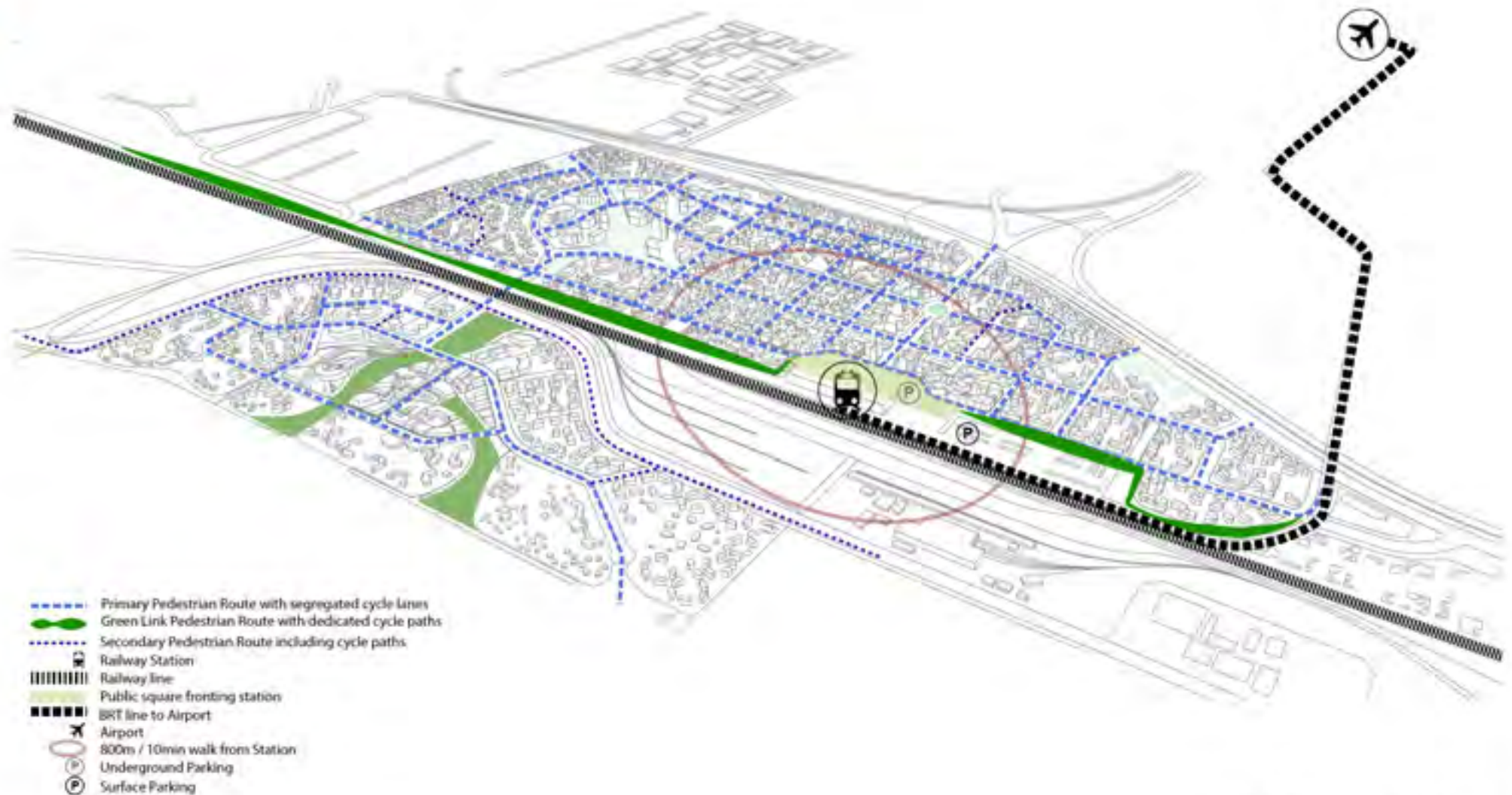
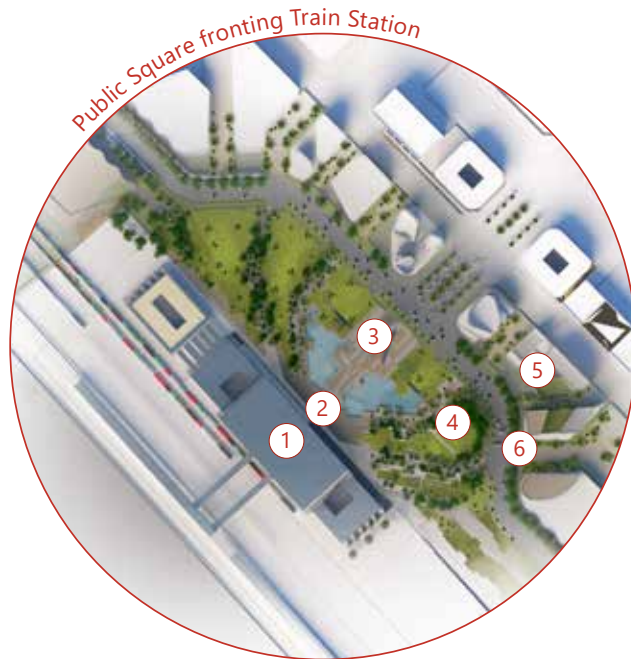


Figure 10.25 TOD elements within Embekland



- ① Nairobi Terminus
- ② Open Space Plaza
- ③ Art Sculpture
- ④ Urban Forest
- ⑤ Direct Views across to Nairobi Terminus
- ⑥ Pedestrian Focused Environment



Figure 10.27: Embakasi's train station area

10 Further to this, affordable housing is located within a 15min walk radius to the Station, along Mombasa Road, with relevant public facilities to create a strong sense of community.

Bus service provide 10 routes in Sub-Centre which interchange close to SGR station, as explained in later in this chapter and further detailed in the Landscape Chapter.

Bikes routes run along the railway line to link the Stations, as well as serving all plots within the Site. Routes are shown in Figure 10.28 and further detailed in the Landscape section.

The successful implementation of the TOD principles within Embakasi will ensure well connected communities and will stimulate the economy within the Site.

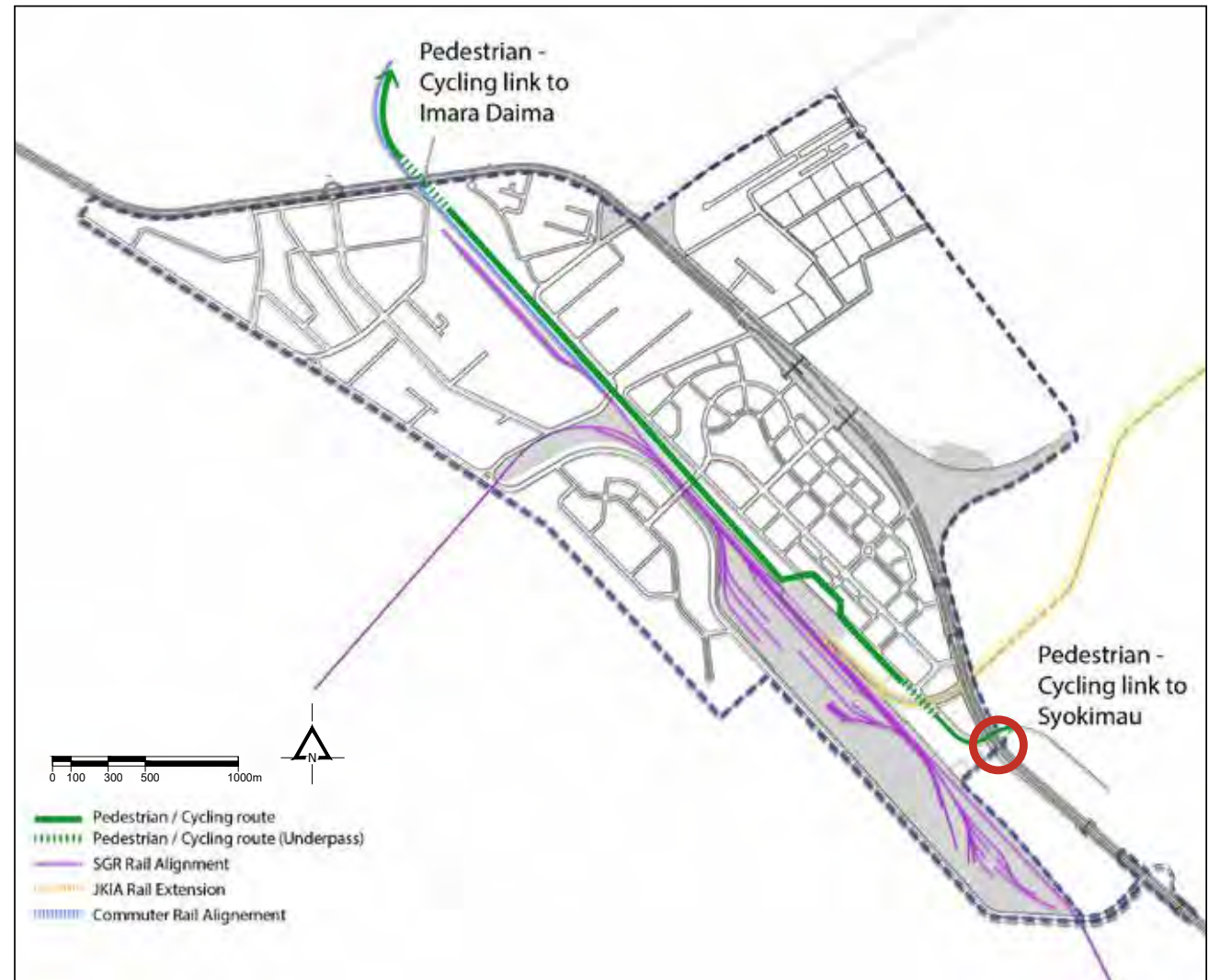


Figure 10.28: Active travel corridor

10.6.3 ACTIVE TRAVEL CORRIDOR

An active travel link between Imara Daima and Syokimau is proposed. This connects Embakasi to neighbouring areas via a continuous segregated pedestrian and cycle shared path. This follows the length of the railway line. The path is proposed to avoid conflict with Mombasa Road and the new railway line via two underpasses as seen in the adjacent figure. This path follows the bridge to connect to Syokimau.

10.6.4 TRANSPORT HUB

The Transport Hub is main element of the TOD strategy as it co-locates a series of different transport uses to provide interchange opportunities. It is located immediately to the south-east of Nairobi SGR Terminus, with an extensive green buffer providing separation from the built development to the north.

The Hub has been located and designed to integrate various public transport modes and enable seamless interchange (Figure 10.29). Areas within the Hub have been provided to allow for convenient pickup and drop-off of passengers by cars and taxis, who can then transfer to public transport for their onward journey, for example by BRT or City Express Buses.

A shaded pedestrian route allows passengers to move between all different zones within the Transport Hub in a safe and pleasant environment. Maximum walking distances are estimated at six to eight minutes, depending on the interchange being made.

A dedicated matatu terminal highlights the importance of para-transit modes.

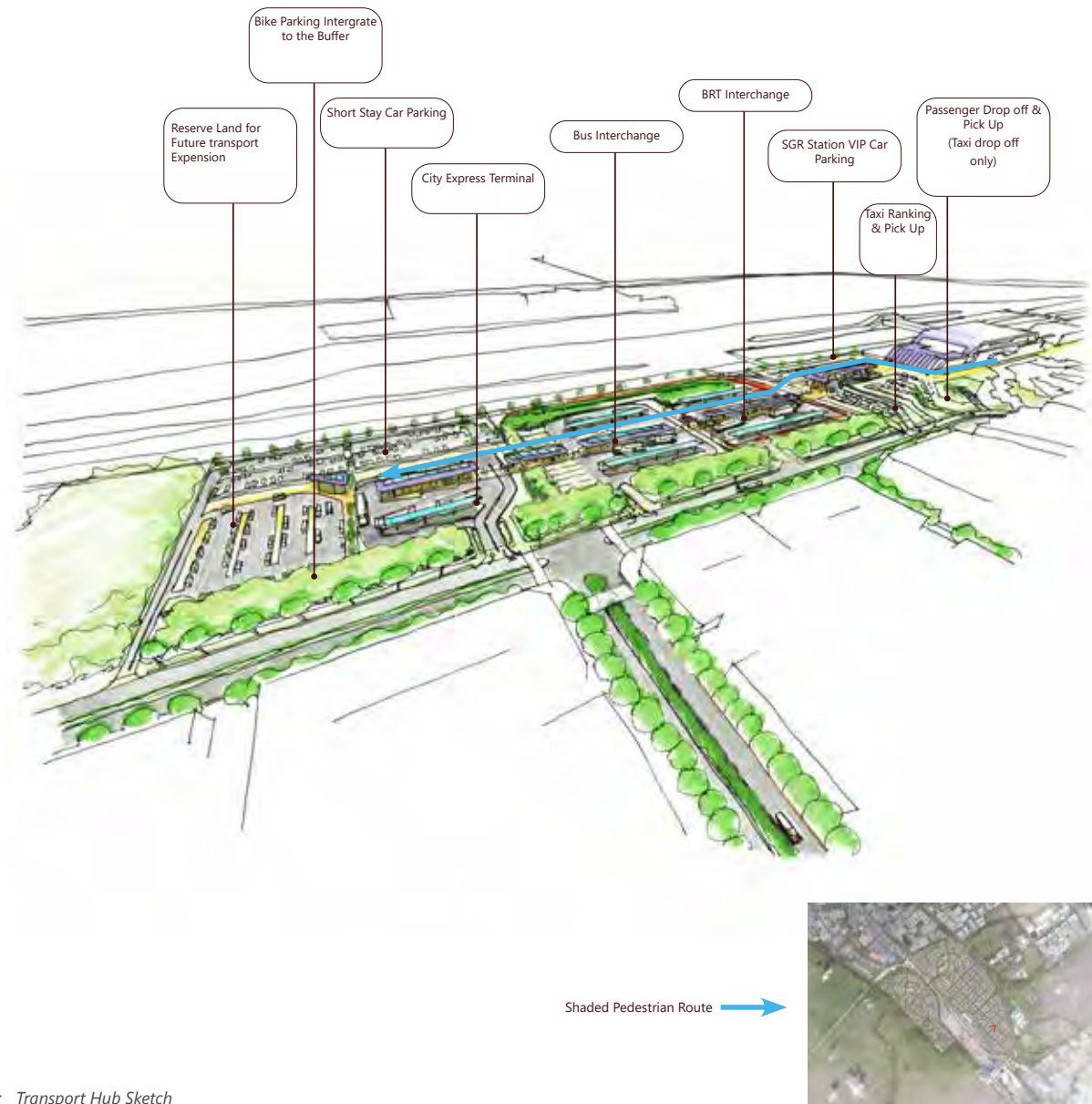


Figure 10.29: Transport Hub Sketch

10 I0.6.5 ROAD HIERARCHY

The road network has been designed to provide high quality access and facilitate efficient traffic circulation through the Sub-Centre while minimising the adverse impacts of traffic on the surrounding areas.

The proposed road hierarchy plan is aligned with the land use development strategy. The road hierarchy is based on a comprehensive analysis of the road capacity and major junctions, the critical points within the network that concentrate the largest number of movements. This analysis has been undertaken using a microsimulation software to evaluate the level of service (LOS) at the peak hours when usually the network is heavily loaded.

Figure 10.30 illustrates the suggested Road Hierarchy with the Transport Strategy presented in Technical Study 4, providing details of the traffic analysis study.

- > The Industrial Area and Non-industrial Area have two distinct road network for 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;
- > Boulevards and collector roads provide links to the bypass and Mombasa Road.

Further detail on road sections can be found in the Landscape within Chapter 7.

ROAD HIERARCHY

Legend

- Core Area Boundary
- Planning Boundary
- Water Courses
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)

Proposed Land Uses

- Bypass Road
- Primary Road
- Boulevard Type 1
- Boulevard Type 2
- Local Road
- Restricted Access Road
- Slip Road
- Collectors Type 1
- Collectors Type 2
- Direct Link

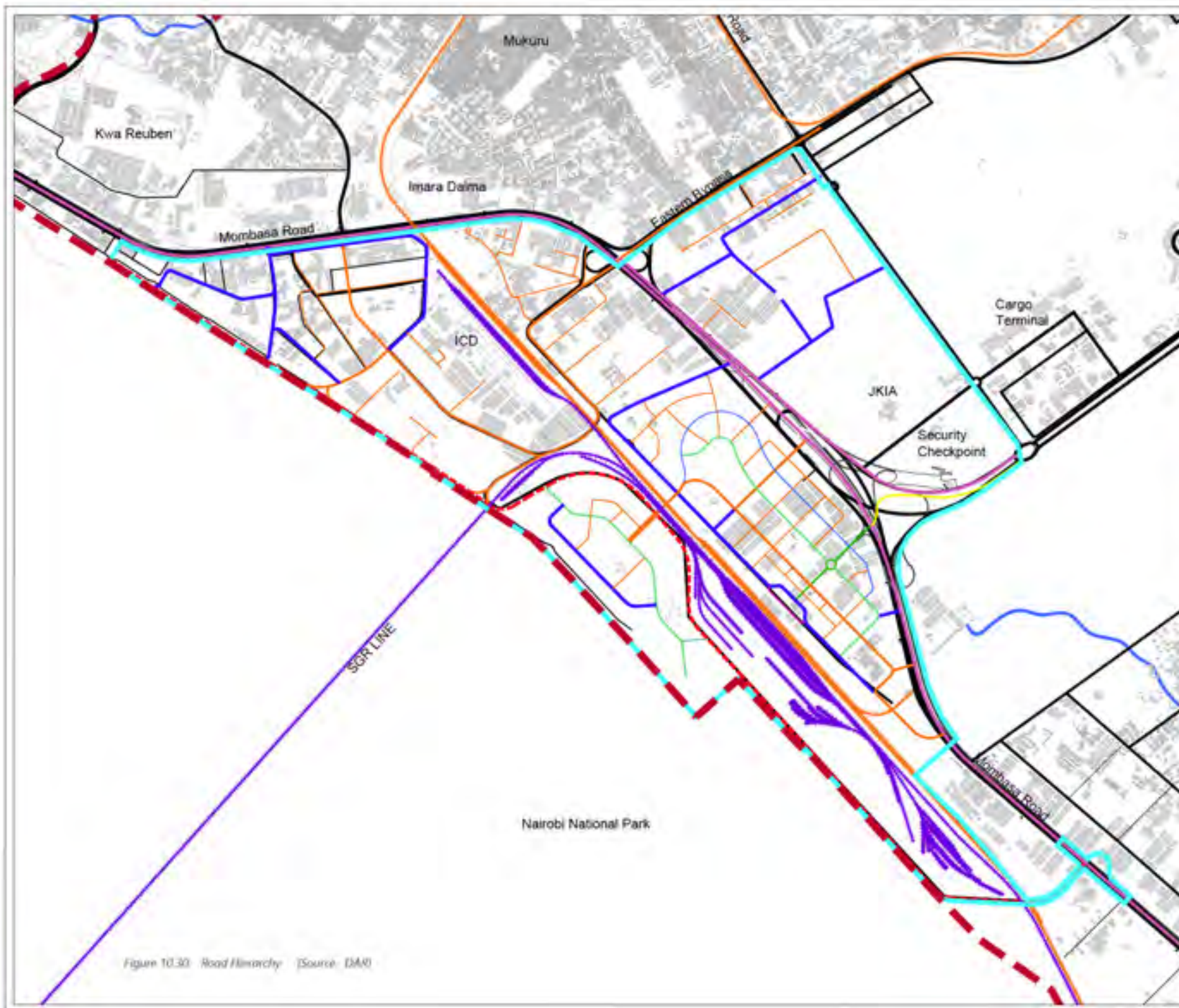


Figure 10.30: Road Hierarchy (Source: DAR)

10 10.7 UTILITIES STRATEGY

The utilities are located as follow:

- > **Power:** Based on the criteria stated above and the estimated loads, three numbers 2x45MVA, 66/11kV substations are proposed to be located as shown in Figure 10.31, in order to cater for maximum demand load of the proposed development.
- > **Water Supply:** The water supply network for Sub-Centre is a combined water supply and fire-fighting network. Ground reservoirs of capacity 12,800 m³ (north zone) and 6,000 m³ (south zone), are proposed to be provided, considering one day storage. As result two pump station shown in Figure 10.31.
- > **Storm Water:** Proposed bypass road alignment has been designed over the existing retention pond, to relocated it, new proposed pond will integrate to the landscape strategy as key water feature. This needs further information about the functions and importance of the existing pond in order to study feasibility of new relocation.
- > **Solid Waste:** The total area require a Transfer Station is around 1.1 Ha. However, Kenyata airport serves turbine aircraft. Therefore the solid waste transfer station a minimum of 3000m from the aircraft operation area is recommended to be clear of any wildlife attracting facility. If protection of the approaches and circling airspace is required, then 8km is recommended.

Further details on utilities is set-out in Chapter 13 and Technical Study 5.

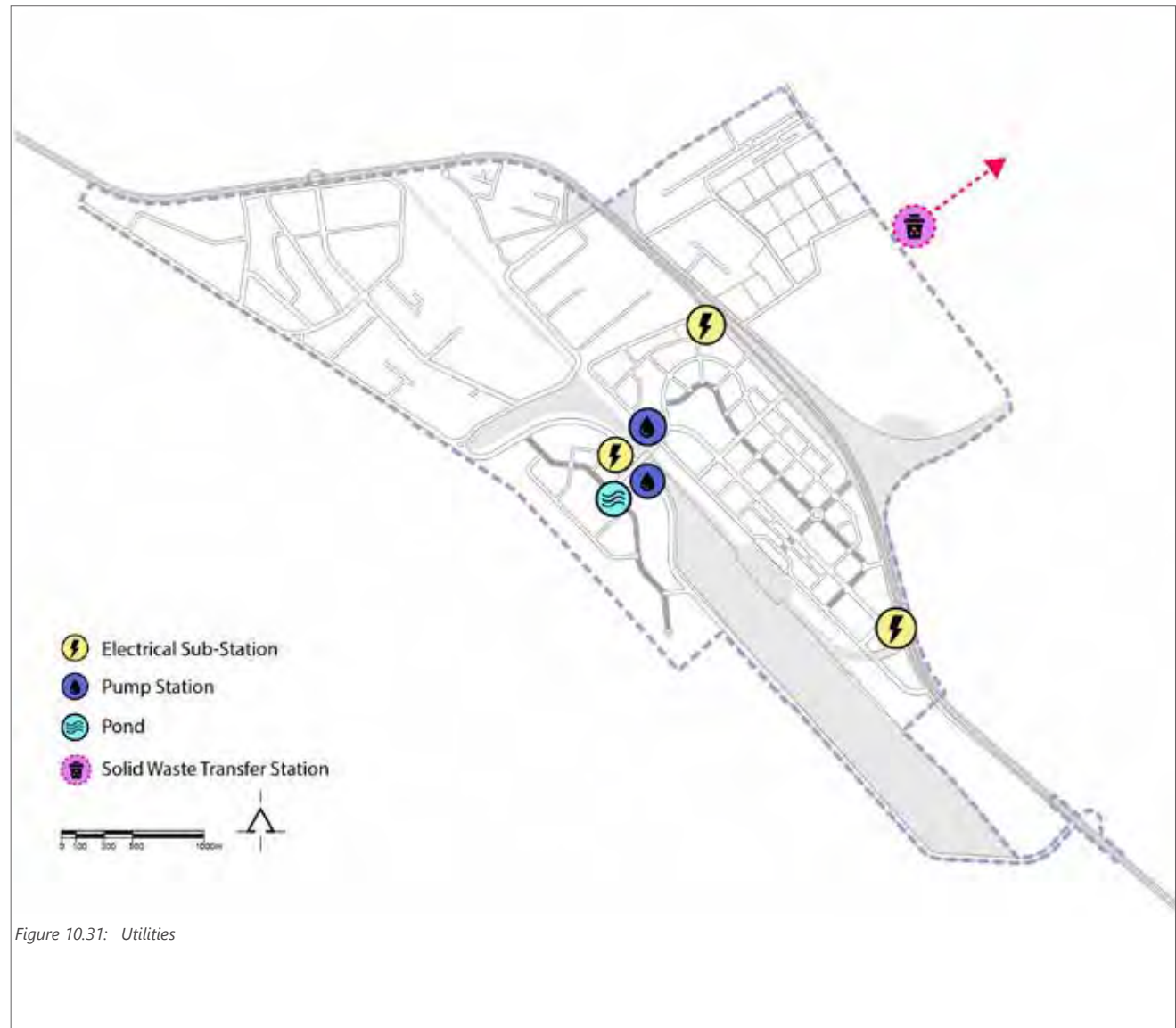


Figure 10.31: Utilities

10.8 AIR TRAFFIC RISK MITIGATION STRATEGY

10.8.1 IMPACTS ON LAND USE

Having reviewed the constraints of JKIA on surrounding land uses, a study was carried out to review the compatibility of the proposed development with the airport in terms of heights and zoning restriction.

Figure 10.32 shows the impacted areas on the Site. A zoom on the areas impacted by the existing and planned runway are shown respectively in Figure 10.33 and Figure 10.34.

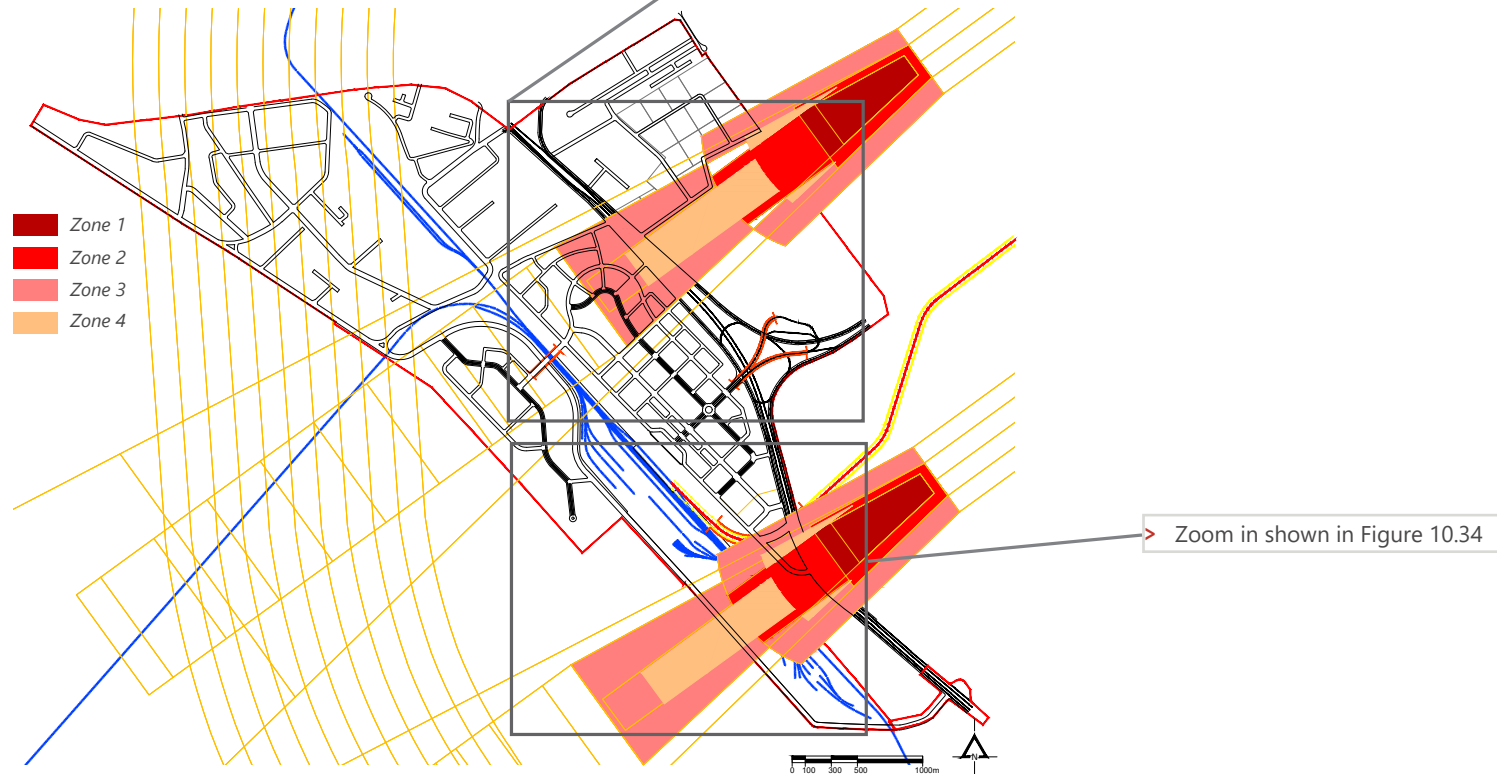


Figure 10.32: JKIA Airport Restrictions

Land Uses are restricted by Zone 3 and 4. Accordingly, land uses are as following:

- > Residential uses to very low densities
- > Children's schools, large day care centres, hospitals, nursing homes are not placed within these zones
- > Low to moderate usage intensities for other uses

Land Uses are restricted by Zone 2, 3 and 4. Accordingly, land uses are as following:

- > Restricted to industrial uses with low usage intensity along with external storages.

USES IMPACTED UNDER THE EXISTING RUNWAY

- Legend**
- Main Road
 - Secondary Road
 - Nairobi Commuter Railway (NCR)
 - Single Gauge Railway (SGR)
 - Water Channel
 - Core Area Boundary
 - Planning Area Boundary
 - Proposed Commuter Rail Alignment
 - Key Road and Rail Bridge
 - Phase 1 Boundary
 - Neat Contours
 - Approach Surface
- Existing Land Uses**
- 1 Industrial / Warehouses
 - 4 Public Utility
 - 7 Transportation
- Proposed Land Uses**
- 0 Residential (Low Density / High Income)
 - 1 Residential (Medium Density / Medium Income)
 - 3 Residential (High Density / Affordable)
 - 2 Education
 - 3 Recreation / Retail
 - 4 Public Purpose
 - 5 Commercial Office
 - 6 Public Utility
 - 7 Transportation
 - 10 Culture
 - 11 Mixed Use (Residential / Recreation / Retail)
 - 12 Hospitality / MICE
 - 13 Green Spaces
 - 14 Service Apartments
 - 15 Transport Corridor
 - 16 Port



Figure 10.33: Uses impacted under the Existing runway (Source: DAR)

USES IMPACTED UNDER THE PLANNED RUNWAY

Legend

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Core Area Boundary
- Planning Area Boundary
- Proposed Commuter Rail Alignment
- Key Road and Rail Bridge
- Phase 1 Boundary
- Noise Contours
- Approach Surface

Existing Land Uses

- 1 Industrial / Warehouse
- 6 Public Utility
- 7 Transportation

Proposed Land Uses

- 8 Residential (Low Density / High Income)
- 9 Residential (Medium Density / Medium Income)
- 10 Residential (High Density / Affordable)
- 2 Education
- 3 Recreation / Retail
- 4 Public Purpose
- 5 Commercial / Office
- 6 Public Utility
- 7 Transportation
- 11 Mixed Use (Residential / Recreation / Retail)
- 12 Hospitality / MICE
- 13 Green Spaces
- 15 Transport Corridor



Figure 10.34: Uses impacted under the Existing runway [Source: DAR]

10

Further to this, different security counter measures that can be applied to mitigate threats of ground to air attacks are explored in the following sections.

10.8.2 “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.



10.8.3 “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 favoured, whereas land uses with higher development and population densities should be placed further away.

In line with this idea; the proposed development strategy placed mainly warehouses in this areas; furthermore, it is recommended 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.

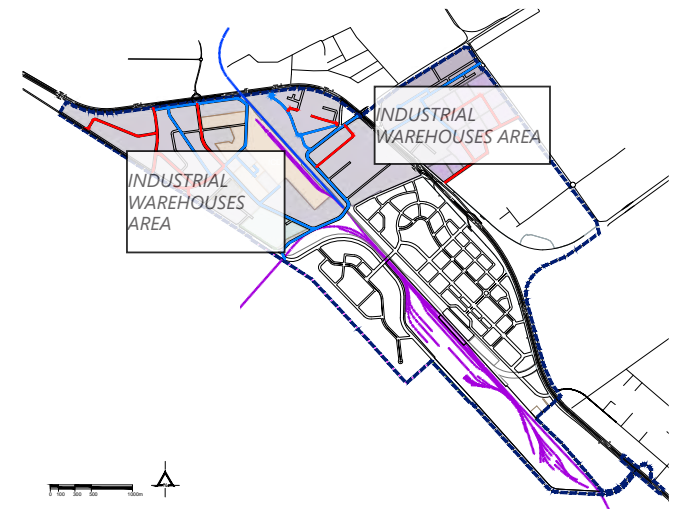


Figure 10.35: Location of main industrial areas

10.9 STRATEGIC PLANNING ASSESSMENT OF THE SUB-CENTRE PROPOSALS

10.9.1 RELATIONSHIP WITH ADJOINING AREAS

Connectivity

Major transport infrastructure creates physical barriers between the Sub-Centre and Adjoining Areas, meaning there will be some self-containment of activities for the communities within the Sub-Centre.

The Sub-Centre will act as a strong focal point for communities in Adjoining Areas due to the presence of extensive and wide-ranging employment, leisure and cultural opportunities. This is particularly so for the western part of the Broader Area and the sub-centres present here (Imara Daima, Embakasi Village and Mukuru). There is also likely to be some movement of people between Mlolongo West, Syokimau and the Sub-Centre, although Airport City will provide a similar focal point and absorb much of the demand from these growth centres.

The transport infrastructure and proposals to achieve the connectivity described above is set-out in Technical Study 4.

Land Use Distribution

Proposed land uses across the Planning Area is shown on Figure 10.35. The Sub-Centre will provide a high number and density of jobs, particularly in the office sector. Three of the other centres in Adjoining Areas include some proposed office development, to achieve some self-containment of activities for their communities. The amount of proposed office development is in general conformity with the development recommendations contained in the Market Analysis report. Therefore, this can be delivered and operated without being in conflict with the office development in the Sub-Centre.

The economic activity in the Sub-Centre includes the health and hospitality sectors, based on the specific opportunities that exist here. These uses are also present at Airport City, based on KAA's vision of the specific opportunities that exist here. It is considered that these uses respond to different needs and users in the two areas, so will not be in conflict with one another. The quantum proposed is in general conformity with the development recommendations contained in the Market Analysis report.

Education land uses in the form of universities are also proposed in both the Sub-Centre and Airport City. Again, these could be developed with specific functions (e.g. a medical focus at Airport City, linked to the health facilities here), or could be separate campuses falling under the same institution, in order that they are not in conflict.

CONCEPT LAND USE PLAN FOR THE STUDY AREA

Legend:

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Proposed Railway (NCR)
- Generalised Railway (SGR)
- Water Course
- Core Area Boundary
- Planning Area Boundary

- Subcenter 800m Radius

Land Uses

Existing (Transparent)

- 0 Existing Residential (High/Medium/Low Density)
- 1 Existing Industrial / Warehouse
- 2 Existing Recreation/Hotel
- 3 Existing Public Purpose
- 4 Existing Public Utility
- 5 Existing Transportation
- 11 Existing Mixed Use (Residential/Recreation/Hotel)
- 12 KOD Existing
- 13 KOD Expansion Areas

Proposed (Solid)

- 0 Residential (Low Density)
- 0 Residential (Medium Density)
- 0 Residential (High Density)
- 1 Industrial & Warehouses
- 2 Education
- 3 Recreation/Hotel
- 4 Public Purpose
- 5 Commercial (Office)
- 6 Public Utility
- 7 Transportation
- 9 Sanguinated Land (concrete Road Expansion)
- 11 Mixed Use (Residential/Recreation/Hotel)
- 12 Hospitality / MICE
- 13 Green Spaces
- 14 Service Apartments
- 15 Field
- 17 Potential River Corridor Rehabilitation
- 18 Potential Retail / Community Hub



10.9.2 CONSISTENCY WITH HIGHER-LEVEL PLANS AND STUDIES

This section explains how the proposals for the Sub-Centre contribute towards achieving the aspirations, objectives and proposals set-out in existing umbrella plans and studies. These are:

1. The National Spatial Plan 2015-2045;
2. Nairobi Metro 2030;
3. The Spatial Planning Concept for Nairobi Metropolitan Region;
4. The NIUPLAN; and
5. JKIA Indicative Master Plan.

The National Spatial Plan 2015 – 2045

Identified as a Key Urban Hub and National Growth Area, Nairobi and surrounding areas have the potential for a significant administrative and transportation hub. The key policies and strategies identified are listed in the table below.

The proposals contribute to the policies and strategies through various means. The project undertakes sound spatial planning principles including connectivity within the Sub-Centre and Adjoining Areas, the optimisation of land uses allowing for balanced growth and densification of built-up areas, and integration of the natural environment, specifically Nairobi National Park via green corridors. The proposals will achieve economic growth, further strengthening Kenya's competitiveness in the global market.

The proposals address the NSP's aim to establish an integrated national transportation network and infrastructure system by integrating JKIA, the SGR Terminus, Commuter Rail, BRT, local mutatu services, and cycle and pedestrian priority routes.

Nairobi metro 2030 - A world class african metropolis

The proposals contribute to the Nairobi Metro 2030 goals through the deployment of world-class infrastructure,

enhancing mobility and connectivity through effective transportation, including the increased utilisation of the SGR Terminus and extensive public transport made up of modern BRT links, frequent local bus services and strategic bikeways.

The proposals will further enhance the quality of life in the wider region. The Sub-Centre will provide a variety of jobs in hospitality, entertainment, commercial, retail and education, creating a vibrant and dynamic economy. This further reinforces the ability to attract a diverse range of people to such centres which offer jobs, shopping, services and entertainment.

Spatial planning concept for nairobi metropolitan region (spc)

The proposals will contribute towards SPC objectives including:

- > The implementation of a modern, frequent public transportation service;
- > The optimisation of a variety of land uses aimed to provided safe, secure areas for residents and visitors to live, work and play; and
- > A unique identity for the Sub-Centre.

The SPC also identified a District Centre at Embakasi, within the Planning Area. The Sub-Centre proposal aligns with this and aims to create a new, unique transportation hub.

Nairobi the project on integrated urban development master plan for the city of nairobi in the republic of kenya, (niuplan)

The optimisation of land use within the Sub-Centre contirbutes to county competitiveness, managing human settlement, and diversified tourism, which are all part of the rationale behind the NIUPLAN strategy.

The Sub-Centre was proposed in the NIUPLAN (referred to as Syokimau) and has now been planned in detail to give it a unique vision and consider how it will sit within the wider

POLICIES	<ul style="list-style-type: none"> • Sustainable urban land use and growth • Balanced growth • Densification of built-up areas • Development of key social and physical infrastructure
Strategies	<ul style="list-style-type: none"> • Development and rehabilitation of key infrastructure in underserved locations • Services to under-served populations • Environmental protection • Conservation of wildlife and forest resources

network of Sub-Centres in Nairobi and nearby centres in Machakos.

JKIA Indicative Master Plan

The Sub-Centre proposals do not restrict the JKIA Indicative Master Plan if it is to go ahead, and has been planned to ensure both centres can function in harmony.

11. PUBLIC REALM STUDIES

11.1 INTRODUCTION

Key public realm proposals are presented within this chapter, building on the Landscape Strategy in Chapter 10. Place-making and urban design best practice have been considered in shaping the final framework for the Sub-Centre to create a unique and distinct area with its own identity. The overall design objectives are explained, followed by three defined focus areas in more detail.

Public Realm Proposals and Urban Design Guidelines are set out within Technical Study 2: Nairobi SGR Terminus Sub-Centre Detailed Design Studies and Urban Design Guidelines.

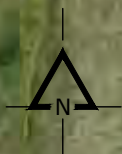
Figure 11.1 presents an illustration of the Final Plan.



Figure 11.1: Illustrative Plan

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

0 100 300 500 1000m



11.2 FOCUS AREA

Three Focus Areas have been identified as key neighbourhoods. These are further detailed in the Urban Design Strategy.



WEST BRIDGE

PARK VALLEY

**EMBAKASI
DOWNTOWN**



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.



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

A. Diversity

A.1. Character areas

The Embakasi area encompasses a substantial region including existing residential settlements, large infrastructure, and industrial uses. The Sub-Centre has therefore been divided into three landmark neighbourhoods to capture distinct existing conditions and become new character areas. These will use built environment elements to each be distinctive, memorable and enjoyable to reflects the identity of each place and its community. They are:

- > Embakasi Downtown – a higher density Transit-Oriented Development centred on the station will form the commercial hub, its plaza and tree lined boulevard will provide a welcoming first impression.
- > West Bridge – a self-contained garden neighbourhood centred on community uses will form the civic hub, located North West of the station area, it will host a student campus.
- > Park Valley – a lower density area connected to the Nairobi National Park via wide green corridors will host a variety of cultural/public purpose and hospitality land uses creating a more touristic and leisure atmosphere.

A.2. A balanced mix of land uses

The proposals aim to provide the basis for a diverse local, civic and circular economy. Proposals aim to provide civic uses, an attractive environment for entrepreneurs and existing companies, and new housing that can address issues of space and affordability. Creative clusters are also supported through education and cultural uses.

- > Mixed use developments to co-locate different activities and functions
- > Inclusion of cultural and leisure as core uses
- > Employment uses throughout the site

- > Range of hospitality uses to provide multiple visitor offerings
- > Community facilities as anchors for each landmark neighbourhood

Strategic Goals from Nairobi Metro 2030 supported within this Local Plan:

- > Build an internationally competitive and inclusive economy for prosperity
- > Deliver a unique image and identity through effective place branding

B. Vitality

B.1. Meeting different people's needs

The Sub-Centre should be a welcoming place for all Nairobi residents, visitors, and workers. It should ensure different people can find different amenities that suit their needs, and enable people to spend time in Embakasi's public spaces and engage in community life.

- > Accessible and good quality public realm to ensure all users can move around in public space seamlessly
- > Quality workspaces ranging from the corporate office to start-up space
- > Publicly accessible leisure facilities for individuals and groups
- > Flexible plot types enable a variety of building massing to align with market demand, ensure that value of the space is maximised
- > Retail offerings within the site should provide for all local retail needs

B.2. Healthy places

The proposals aim to improve and enhance the visual and physical experience of Nairobi in a way that can celebrate public life and promote healthy lifestyles.

- > Active frontages and accessible third places will encourage street life
- > Meanwhile uses, such as the market and exhibitions at Railway Plaza and farmers market in West Bridge will activate places at different times
- > Planting and pocket parks provide access to nature creating a biodiversity network. Planting on fenced plots is encouraged to reduce blank frontages and buffers to key roads provide noise mitigation and visual screening
- > Enclosure used to distinguish between private and public spaces
- > Combination of gridiron, radial ring, and contour forming approaches to urban development creates intrigue throughout the site

Strategic Goals from Nairobi Metro 2030 supported:

- > Enhance the quality of life in the region
- > Ensure a safe and secure region and build world-class governance systems

C. Connectivity

C.1. Ease of movement

The site aims to provide the best conditions for all road users to travel around safely.

- > A new multi-modal hub at Embakasi Station will provide an interchange between bus, BRT, matatus, City Express, rail, and shared cycles
- > Walkable districts – all three landmark neighbourhoods are located within a 15min walk of each other
- > A partial grid based section with two boulevards acting as the backbone for the road network to simplify vehicular movements
- > A green network creates pedestrian permeability throughout the site

- > Segregated cycle paths on key streets to provide continuous safe network
- > Legibility of the site is induced through the positioning of key buildings to form landmarks and vistas, i.e. station at the end of tree-lined boulevard
- > Plazas and private-public parks introduce off-street public spaces within unfenced and semi-fenced blocks to establish permeable blocks

C.2. Links to surrounding areas

Proposals aim to connect Embakasi to surrounding areas to ensure it complements local character, provides sustainable transport options, and reduces through traffic across the site.

- > Nairobi National Park perforates Park Valley with green corridors that provide transition into nature from the built environment
- > Separation of industrial and local traffic enables efficient commercial movements to reduce local traffic impacts
- > A bypass road for Mombasa Road will reduce the strain of traffic
- > A direct link to the Jomo Kenyatta Airport will bring more people to Embakasi Station

Strategic Goals from Nairobi Metro 2030 supported:

- > Deploy world-class infrastructure and utilities for the region
- > Enhance mobility and connectivity through effective transportation



Figure 11.2: Embakasi Downtown Plaza



Figure 11.3: Central Plaza Top View

11.2.1 EMBAKASI DOWNTOWN

This is a denser area with a commercial character. It hosts office buildings around the station that is the principal transportation hub for local people.

Public life is induced with small kiosks in lunch parks, retail spaces that front onto the street, and small hotels that interface host local events.





Raised Roundabout

Figure 11.4 illustrates the raised roundabout in the city centre. An underground public space is created, while vehicles move at ground level uninterrupted.



Figure 11.4: Sketch of Raised Roundabout



11.2.2 PARK VALLEY

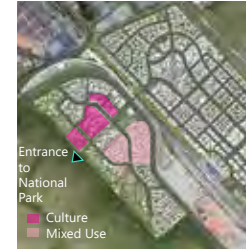
Park Valley is an area designed for cultural activities and tourism, centred on green spaces that perforate the site to provide continuous stretches of biodiversity from the National Park.

11.2.3 MIXED USE AND CULTURE

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 lung for the city of Nairobi.



Figure 11.5: Park Valley - Top View



11.2.4 DISTINCTIVE TOURISM

Along the edge of Nairobi National Park, visitors can choose to stay in beautiful resorts immersed in the nature and offering stunning views over the Safari Park, pathway to the edge and various recreational activities.

The Nairobi National Park front fully absorbs and reflects the qualities and character of the adjacent area. Walking along the activated park edge, visitors can enjoy opportunities for passive and active recreation, as well as a connection to the local nature. An additional entrance to the National Park would add a significant value proposition enabling visitors to access the park directly from Embakasi.

A 50m Buffer zone in front of the National Park is retained. No construction of major buildings is allowed within this zone, but it can be adequately landscaped to provide outdoor seating areas, lightweight construction, and water features.



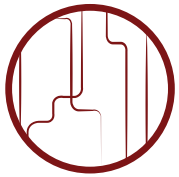
11.2.5 CULTURAL PARK

Figure 11.6 illustrates the Cultural Park, which constitutes the main green space of the Park Valley neighbourhood. Steps by the water create a pleasing environment for citizens.



Figure 11.6: Cultural Park Sketch





11.2.6 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.

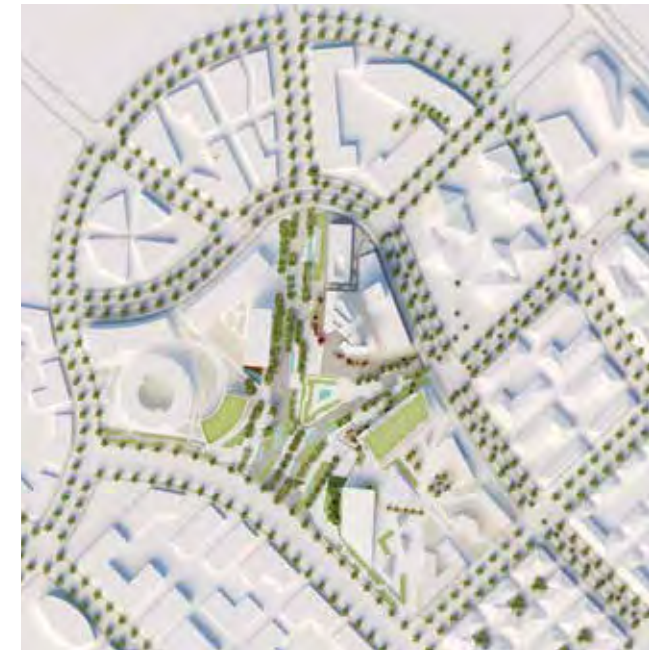


Figure 11.7: West Bridge Top View



Street Markets

Figure 11.8 illustrates a street market taking place in the park. Street markets, either for food or for other goods (clothing etc.) constitute an important aspect of Nairobi's lifestyle, therefore it was considered necessary to include them in the design.



Figure 11.8: Street Market

Neighbourhood Park

Figure 11.9 illustrates a residential courtyard providing local recreational amenities for residents.



Figure 11.9: Residential Courtyard

11 11.3 PUBLIC REALM DESIGN GUIDELINES

Public Realm Design Guidelines have been prepared for the Sub-Centre and are set out within Technical Study 2: Nairobi SGR Terminus Sub-Centre Detailed Design Studies and Urban Design Guidelines.

These 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 provide a comprehensive reference for the purposes of directing and advising development within the development's public and private realms.

The Design Guidelines outline design intentions and promote quality landscape design through the identification of standards for the development of the area. These standards establish mandatory design requirements while at the same time providing 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:

- > 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.
- > Assist in the preparation of planning applications.

DESIGN GUIDELINES OBJECTIVES

The four landscape design directions that have been devised and promoted:

- > Sustainability
- > Place Making
- > Connectivity
- > Circular Economies

Scope of the guidelines:

- > Landscape character concept design for valley park, West Bridge, Embakasi downtown including general guidelines for parks, plazas and urban links.
- > General guidelines for gateways, viewing platform, pocket parks.
- > General landscape guidelines for landscape networks including streetscapes & road layout and hierarchy.
- > Hardscape guidelines including surface materials, site furniture, signage, lighting, water elements, fencing.
- > Softscape including planting strategy, planting pallet.
- > (SUDs) Sustainable urban drainage systems including guidelines, natural water course, surface water retention, road suds, water retention and polishing ponds, sustainable roofs and productive landscapes
- > General guiles for road buffers, railway buffers and also a landscape buffer to the national park.
- > General guidelines for sports areas and playgrounds.

12. TRANSPORT STUDIES

12.1 INTRODUCTION

The Transport Studies for the Sub-Centre cover the proposed road network, including different road types; public transport network, including rail, BRT and bus feeder route proposals; non-motorised transport infrastructure; connectivity between the Sub-Centre and Adjoining Areas; summary of the network analysis undertaken; and priority projects.

Further details of the Transport Studies are set out within Technical Study 4.

12.2 ROAD NETWORK

The road network was designed to provide a high quality of access to existing and planned traffic-generating development areas and to facilitate efficient traffic circulation within, to, from and through the Sub-Centre while minimising adverse impacts on traffic in the surrounding areas.

The road hierarchy plan has been proposed to complement the land use development strategy. The proposed junctions were also proposed to facilitate the flow of traffic and maximise connectivity. Following to this, a comprehensive analysis on the road capacity was addressed at major junctions. These junctions are critical points within the network where the largest number of movements are concentrated. This analysis was made using a microsimulation software to evaluate the level of service (LOS) at the peak hours when usually the network is heavily loaded.

12.2.1 ROAD HIERARCHY

Functional groups define the streets according to their ability to move traffic and to provide access to adjacent properties.

The road network proposed for the Sub-Centre (Figure 12.1) can be classified according to the following hierarchy:

1. Bypass road
2. Primary road
3. Boulevard road type 1
4. Boulevard road type 2
5. Collector road type 1
6. Collector road type 2
7. Local road
8. Restricted road

Each of the eight road classifications presented has a particular road section designed to properly meet the expected traffic demand and the non-motorised transportation characteristics. Typologies are further explained overleaf:

ROAD HIERARCHY WITHIN THE CORE AREA

LEGEND

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Core Area Boundary
- Planning Area Boundary

Road Hierarchy

- Bypass Road
- Primary Road
- Boulevard 1
- Boulevard 2
- Collector 1
- Collector 2
- Restricted
- Direct Link



Figure 12.1: Road hierarchy within the Sub-Centre (Source: DAR/GPO Team)

12 Bypass Road

Projected for high volumes of vehicle traffic, the Bypass Road (Figure 12.2 and Figure 12.3) presents along its 38m wide section, two 3.65m wide traffic lanes on each direction, separated by a 11.8m wide median. There is space (if it is necessary in the future) to accommodate two new traffic lanes. For pedestrian mobility, there are 4.3m wide footpaths on each side of the highway.



Figure 12.2: Bypass Road - Alignment

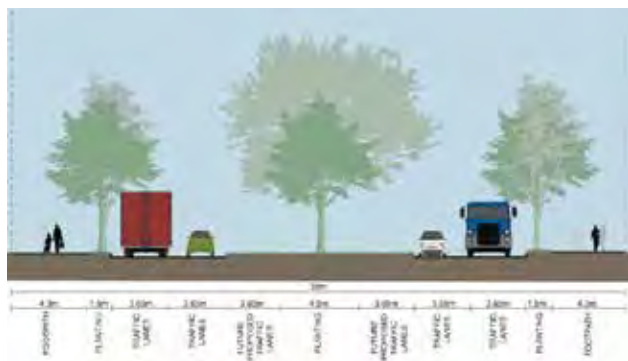


Figure 12.3: Bypass Road – Cross Section

Primary Road

The traffic capacity on primary roads is also high, with three 3.65m traffic lanes on each direction. In addition there are 1.6m cycle lanes and 3.97m footpaths plus a median and space for tree planting within the total width of 38.3m (Figure 12.5).

Primary Roads provide connection from Mombasa Road to the Airport North Road, the buses terminus, the southern Sub-Centre and to the collector road type 1 that approaches Nairobi Terminus (Figure 12.4).



Figure 12.4: Primary Road - Alignment



Figure 12.5: Primary Road - Cross Section

Boulevard Type 1

Similar to the primary roads, the boulevard type 1 road (Figure 12.6 and Figure 12.7) also comprises three 3.65m traffic lanes per direction, but also incorporates 5m wide footpaths on both sides of the street and 1.6m wide cycle lanes.

Boulevard 1 has a 2.50m wide median and is 47.6m total width.



Figure 12.6: Boulevard Type 1 Road - Alignment

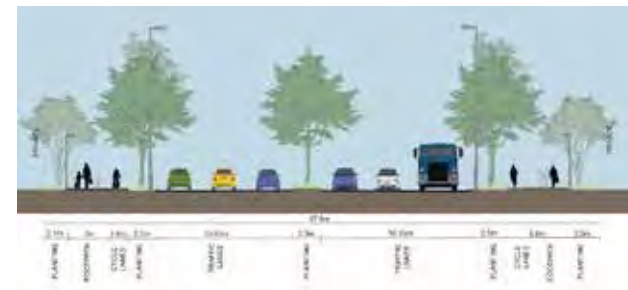


Figure 12.7: Boulevard Type 1 Road – Cross Section

Boulevard type 2

This road class (Figure 12.8 and Figure 12.9) contains all the elements of the Boulevard 1 Road, but in a reduced version. There are two 3.65m traffic lanes in each direction, the footpaths are 4m wide, cycle lanes are 1.3m wide and the medians are 2.2m wide. It has 37.5m of total width.



Figure 12.8: Boulevard type 2 - Alignment

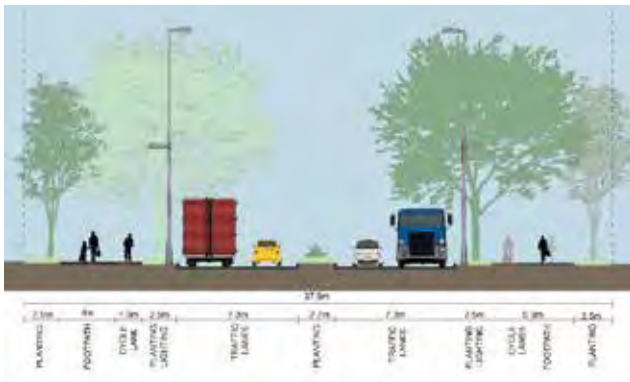


Figure 12.9: Boulevard type 2 – Cross Section

Collector type 1

The Collector 1 Road (Figure 12.10 and Figure 12.11) section presents two 3.65m wide traffic lanes on each direction not segregated by medians. There are 2.65m wide footpaths on both sides and a 1.6 m dedicated cycle lane on one side only. It has 27.1m of total width.



Figure 12.10: Collector type 1 - alignment

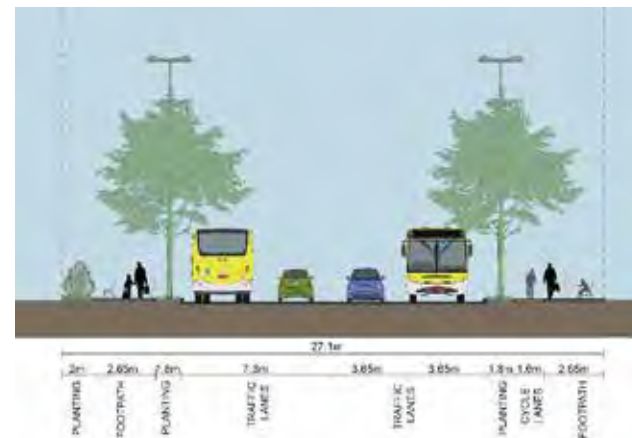


Figure 12.11: Collector type 1 road - cross section

Collector type 2

On Collector 2 Roads (Figure 12.12 and Figure 12.13), there is one 3.65m wide lane, a 3m wide parking lane, a 3.5m wide footpath and a 1.6m wide cycle lane on each side. It has 27.1m of total width.

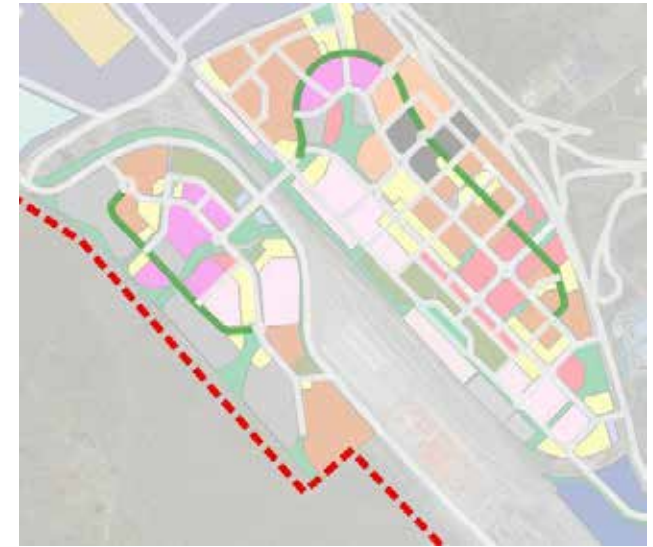


Figure 12.12: Collector type 2 - alignment

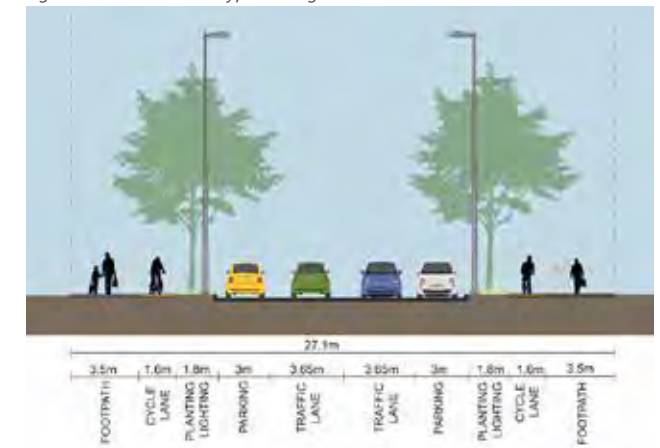


Figure 12.13: Collector type 2 - cross section

12

Local Roads

Local roads (Figure 12.14) have two cross section types. The first has two 3.65m traffic lanes (one on each direction) and a 3m parking lane on just one side. The second type has a 3.65m one traffic lane (one in each direction) and two parking lanes that are 3m and 3.65m wide. Both types present on one side a 3.1m footpath and on the other side a 3m wide footpath.



Figure 12.14: Local Road – Alignment

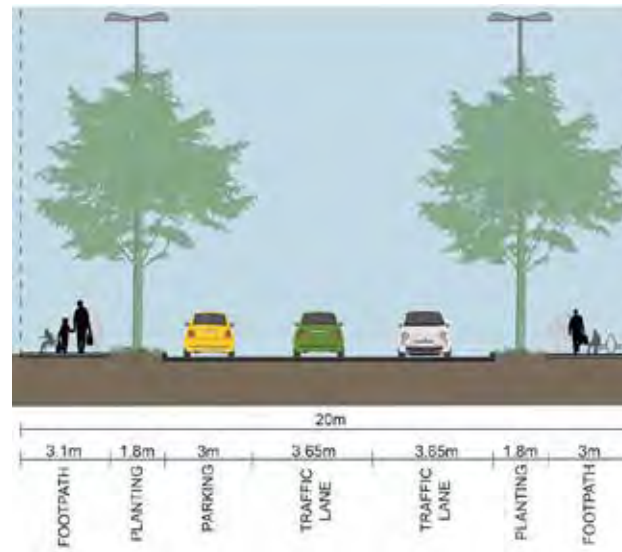


Figure 12.15: Local Road – Cross section (type 1)

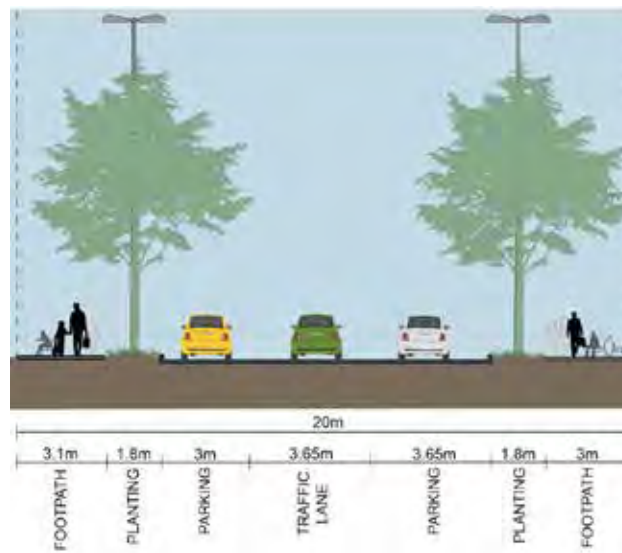


Figure 12.16: Local Road – Cross section (type 2)

Restricted Roads

One restricted road (Figure 12.17 and Figure 12.18) is located in the plaza outside the SGR station and its use is exclusive for loading and emergency services. The section of this street consists only of a one-way shared surface road 3.65m wide and a 6.00m wide footpath between the station and the traffic lane.



Figure 12.17: Restricted Road – Alignment

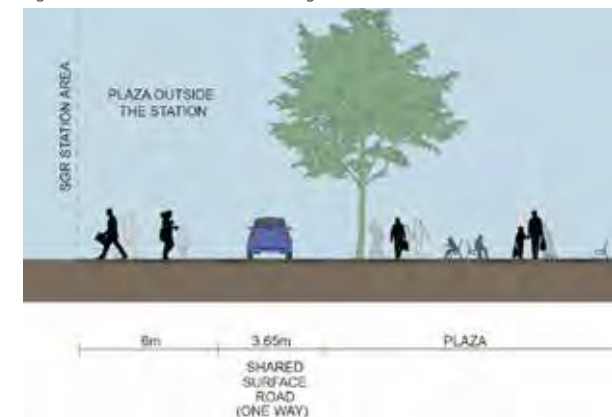


Figure 12.18: Restricted Road – Cross section

12.2.2 BRT LINES

This major proposal has been built up over the existing BRT Line 1 plans:

- > BRT Line 1 that runs along Mombasa Rd bordering the Sub-Centre is proposed to be expanded. This route would serve residents living in housing areas adjacent to Mombasa Road reaching up to Mlolongo where a new BRT terminus is to be located. The terminus would provide space for matatus and feeder bus line services. Additionally, another BRT terminus at Syokimau will play a similar role for this transport integration (Figure 12.19).
- > It is proposed to replace the existing U-turn with a new roundabout that gives access to the Sub-Centre and would also provide access to JKIA for drivers travelling northbound on Mombasa Road.
- > Buses on BRT Line 1 could be diverted from the main BRT axis to access the Sub-Centre through ramps that connect the BRT segregated lane with slip roads off Mombasa Road.
- > After leaving the ramp, these buses would travel through mixed traffic up to a transfer station near Nairobi Terminus providing connections for users of NCRS and SGR services. Alternatively, BRT would be able to interchange at Imara Daima Station where they could reach Nairobi Terminus using NCRS. For those wanting to reach Park Valley area, users would have to switch to feeder bus lines to complement their trips.

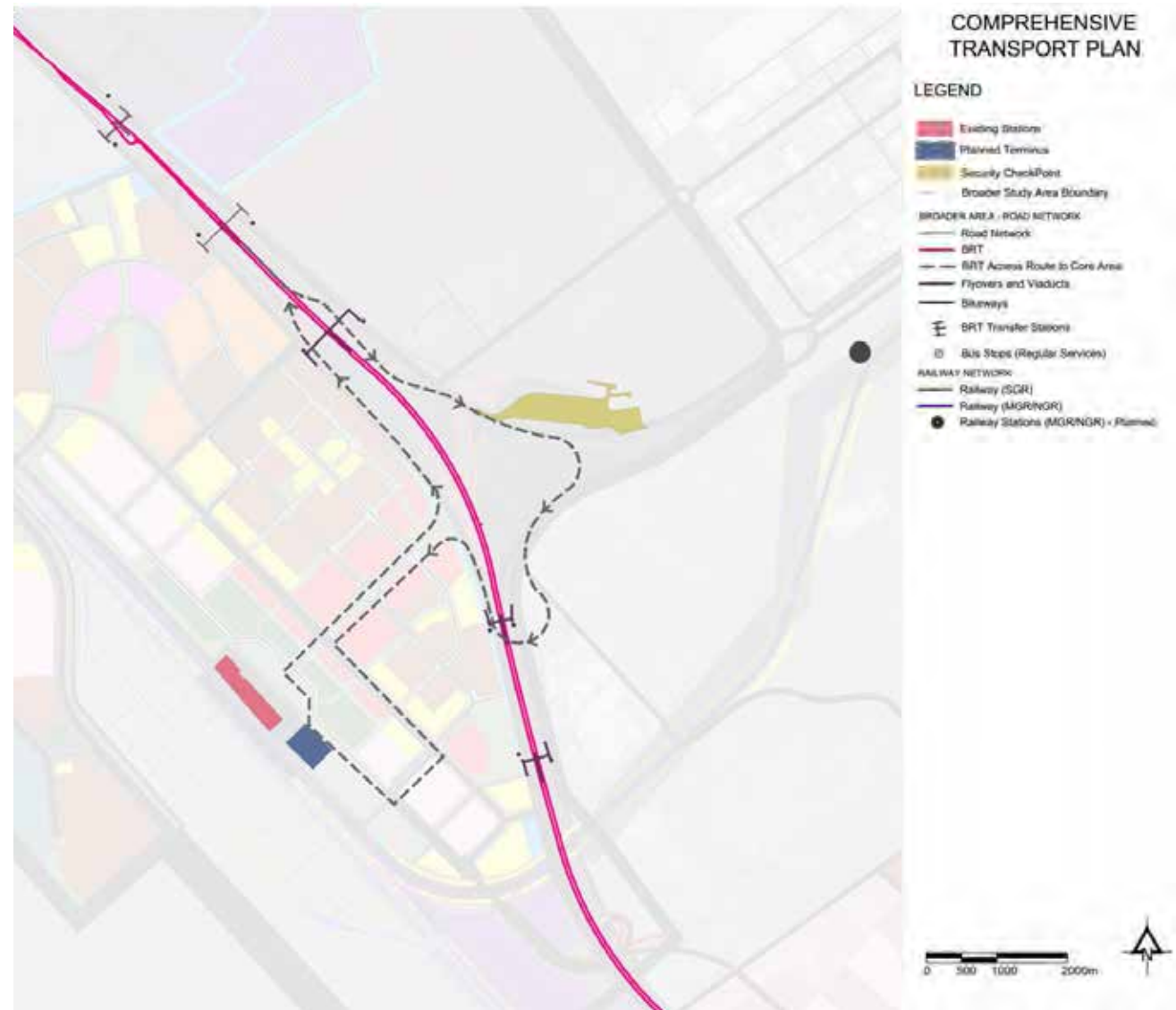


Figure 12.19: The BRT Line 1 Access Route to the Transport Hub within the Sub-Centre

12 12.2.3 BUS FEEDER LINES

The bus feeder lines network intends to complement the interchanges within the overall transport network being proposed to the Planning Area, as identified within the Regional Physical Development Plan (RPDP Document). Additionally, it is recommended to build bus termini for interchanges between the mass transport system and the smaller capacities systems at the end of this lines.

The feeder bus system is different from the service provided by the matatus. The buses have fixed stops and cannot park randomly. The following bus feeder routes are being proposed:

- > Route 1 – internal connection, within Sub-Centre
Proposed bus Route 1 provides public transport option by bus between the Nairobi Terminus and the southern sector of the Sub-Centre, near the National Park.
- > Route 2 – connection between Airport City and the new bus Syokimau Terminus
Proposed bus Route 2 provides access between the two areas and also to the Syokimau Terminus. It is the main public transport option for the K7 (RPDP Document) movement described in the movement diagram analyses. It would be possible for residents of Katani to reach this bus route by walking short distances or from other additional bus service extensions.
- > Route 3 – direct connection between Mlolongo and Syokimau areas and indirect connection between Mlolongo Terminus and Syokimau Terminus
Proposed bus Route 3 can provide access to the new Syokimau terminus where users can interchange to/from BRT Line 1 extended section. Users coming further from bus route 4 areas can also interchange at the Syokimau terminus in order to reach the Nairobi Terminus and other places within the Sub-Centre. Additionally, the proposed bus Route 3 can provide access to the Syokimau Terminus where users can interchange to other feeder buses services

in order to get to the Syokimau residential areas or even to the Airport City area.

- > Route 4 – interconnection between Syokimau, Sub-Centre and Embakasi Village
The proposed bus Route 4 interconnects Syokimau with the Sub-Centre and the Embakasi Village area thus serving these three areas (movement K3 in the RPDP Document), also improves accessibility to the connection movement K7 (RPDP Document).
- > Route 5 – interconnection between Syokimau and Airport City
Provides a connection between Syokimau and Airport City, serving the western areas of Syokimau. It also improves accessibility to the connection movement K7 (RPDP Document).
- > Route 6 – Connection between Mihango and Embakasi Village and the ICD and the Nairobi Terminus
The proposed bus route 6 Mihango – Nairobi Terminus could also improve connectivity between these two areas (movement K1 in the RPDP Document).
- > Route 7 – Connection JKIA and Pipeline
Bus route 7 provides connection to both BRT Line 5 and NCRS at Pipeline Railway Station, reducing travel time between JKIA and Embakasi Village (movement K2 in the RPDP Document).
- > Route 8 – connection between Airport City and Mlolongo Terminus
Proposed bus route 8 can provide access between these two areas and also to the Mlolongo terminus. It is possible residents of Katani to reach this bus route by walking a short distance or by potential bus service extensions.
- > Route 9 – Connection between Syokimau and Sub-Centre
Proposed bus route 9 can provide direct connection from Sub-Centre to Syokimau. Additionally, feeder buses

can provide connectivity at the proposed new Syokimau terminus where users can interchange to BRT Line 1 extended section in order to reach the Sub-Centre (K4, RPDP Document).

- > Route 10 – Connection between Airport City and Ruai/Mihango

The new road that goes from Syokimau/Mlolongo up to Eastern Bypass creates a more direct connection between Mihango and the new growth centres. Bus route 10 takes advantage of this new road to provide short link from Ruai/Mihango to Airport City.

It's important to note that as long as the matatus service is self-regulated, there are no official data about the characteristics of each matatus service. Further studies should work with matatu operators to organise the service to make it compatible and eventually replacing one or another to fit in to transport plans under NAMATA regulatory policies. However, it's critical to keep the recommendation for not allowing to long term parking at central areas. On a daily basis, at the end of the operation, vehicles should go to parking places/garages preferably outside the higher density areas.

Detailed maps for proposed Bus Feeder routes can be found within Technical Study 4.

PROPOSED FEEDER BUS ROUTE 4

LEGEND

- Core Area Boundary
 - Planning Area Boundary
 - Water Courses
 - Existing Stations
 - Planned Terminus
 - Security Checkpoint
 - Broader Study Area Boundary
- BROADER AREA - ROAD NETWORK
- Road Network
 - BRT
 - Flyovers and Viaducts
 - Bikeways
 - BRT Transfer Stations
 - Bus Stops (Regular Services)
 - Route 4
- RAILWAY NETWORK
- Single Gauge Railway (SGR)
 - Railway (MORNGR)
 - Railway (MORNGR) - Tunnel
 - Railway (MORNGR) - Elevated
 - Railway Stations (MORNGR) - Planned



Figure 12.20: Proposed Feeder Bus Route 4



Inter-Country Physical and Land Use
Development Plan for Nairobi SGR Terminus
and Adjoining Areas (2020-2035)

PROPOSED FEEDER BUS ROUTE 6

LEGEND

- Main Road
- Secondary Road
- Core Area Boundary
- - - Planning Area Boundary
- Existing Stations
- Planned Terminus
- Security CheckPost
- BROADER AREA - ROAD NETWORK**
 - Road Network
 - BRT
 - Flyovers and Viaducts
 - Bypasses
 - + BRT Transfer Stations
 - + Bus Stops (Regular Services)
 - Route 6
- RAILWAY NETWORK**
 - Railway (SGR)
 - Railway (MCR)
 - Railway (MCR/NGR) - Tunnel
 - Railway (MCR/NGR) - Elevated
 - Railway Stations (MCR/NGR) - Planned



SEPTEMBER 2020

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Figure 12.21: Proposed Feeder Bus Route 6

12.3 SUB-CENTRE PUBLIC TRANSPORT NETWORK

12.3.1 RAIL

Nairobi Terminus will be the only NCRS station within the Sub-Centre. Therefore, it's also the main hub for connecting from different transport modes. The SGR regional train service and two NCRS lines to Lukenya and to JKIA will stop at this station (Figure 12.22). Considering a 1,000m radius of the station as a catchment area, it is possible to confirm that the station covers 37% of the area in which new land uses are proposed. Additionally, bus route 1, presented in Figure 12.23, was designed to also integrate users from beyond the station catchment area.

12.3.2 BRT

Six stations from the BRT Line 1 are bordering the proposed densely occupied part of the Sub-Centre. Considering a radius of 500m from each BRT station as a catchment area, it is possible to say that they cover 36% of the area in which new land uses are proposed. Additionally, bus Routes 4 and 6 will provide complementary connections between the BRT system and the NCRSI system at the Nairobi Terminus to other zones far from the Sub-Centre (Figure 12.23).

**COMMUTER LINES ENTERING
THE CORE AREA**

LEGEND:

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Core Area Boundary
- Planning Area Boundary
- Line 3 - Lukenya
- Commuter Rail Stations
- Line 4 - JKIA
- Nairobi Terminus 1Km Coverage

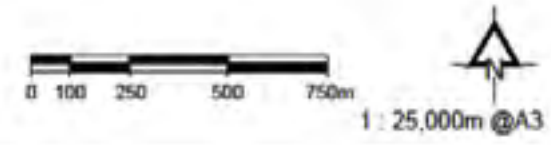
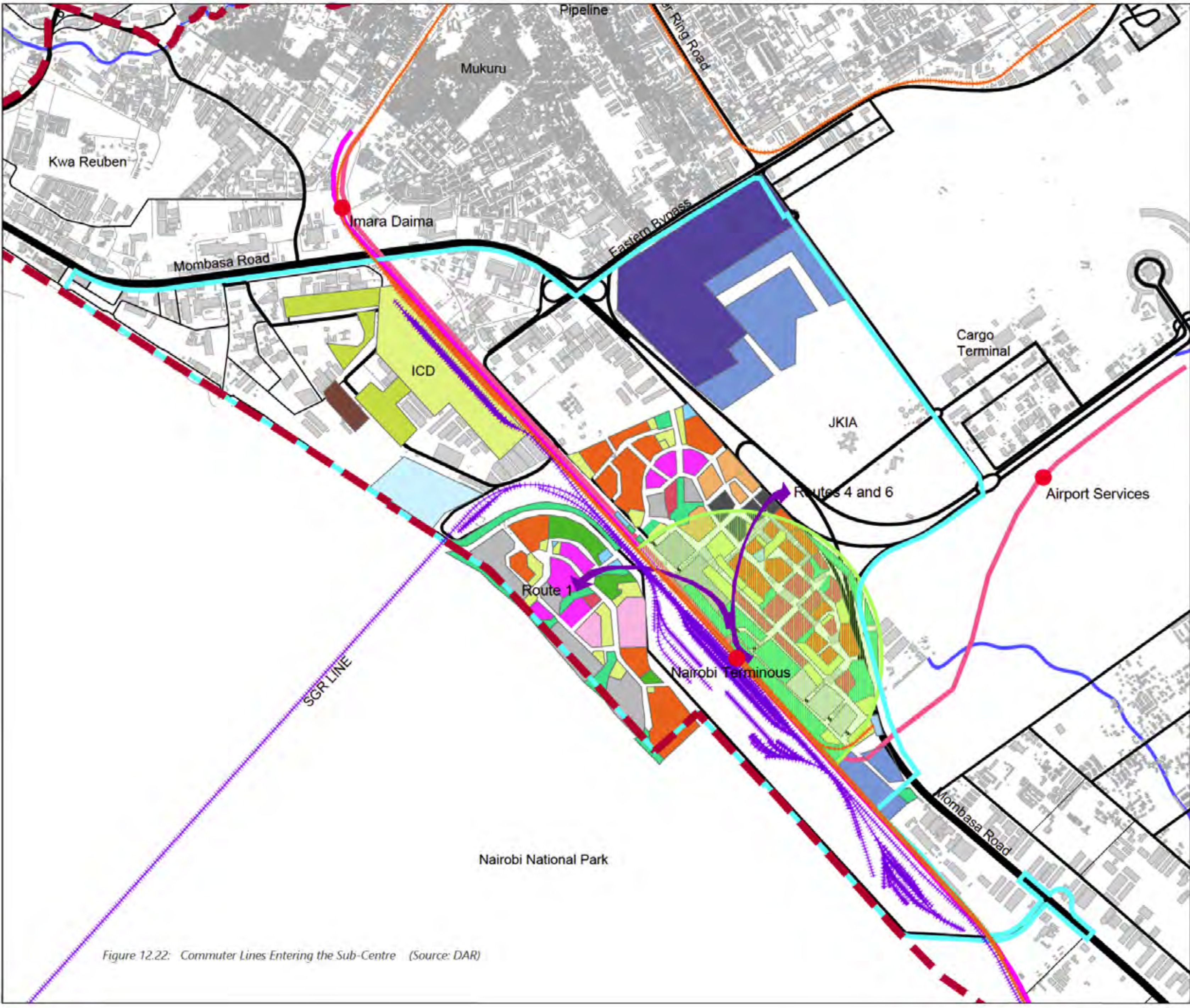


Figure 12.22: Commuter Lines Entering the Sub-Centre (Source: DAR)

BRT LINE 1 STATIONS CATCHMENT AREA WITHIN THE CORE AREA

LEGEND

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Core Area Boundary
- - - Planning Area Boundary
- BRT - Line 1
- BRT - Stops 500m Coverage
- BRT - Stops



Figure 12.23: BRT Line 1 Stations Catchment Area within the Sub-Centre

12 12.3.3 BUS FEEDER ROUTES

Bus stops are proposed within the residential and commercial areas in order to promote territorial coverage that most users can take a walk from any point to a stop at a maximum of 300 metres distance (Figure 12.25).

Within the Sub-Centre, bus feeder lines do not circulate along local roads. Initially, preference was given to pull out bus stops where the vehicle needs to leave the road for loading and unloading.



Figure 12.24: Pull out bus stops within the Sub-Centre

BUS FEEDER STOPS CATCHMENT AREA WITHIN THE CORE AREA

LEGEND

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Course
- Core Area Boundary
- Planning Area Boundary
- Bus Stops

Proposed Bus Lines

- Line 1
- Line 2
- Line 3
- Line 4
- Line 5
- Line 6
- Line 7
- Bus - Stops 300m Coverage

Figure 12.25: Bus feeder stops Catchment Area within the Sub-Centre (Source: DAR)

12 12.3.4 PUBLIC TRANSPORT COVERAGE AREAS

Based on data from the CRMP traffic modelling, the public transport demand forecast estimates 7,300 outbound trips for the morning peak are generated and other 17,900 inbound trips are attracted by the proposed land uses.

According to the catchment area adopted for each transport mode (1,000m for Commuter Rail, 500m for BRT and 300m for conventional bus lines), the coverage level could be estimated. Overlapping the three different coverage areas resulted in four areas typologies, as follows:

1. Potential Commuter Rail trips.
2. Potential BRT trips.
3. Potential Commuter Rail and BRT trips.
4. Potential feeder bus trips.

The number of trips generated and attracted to the Sub-Centre are based on CRMP traffic modelling information and population and employment projected for the Sub-Centre based on land use planning assumptions. The analysis took into consideration different levels of density as part of population and employment distribution along each land use category (according to land uses described in Technical Study 2), and resulted in a distribution of trips for AM peak hour, in Technical Study 4.



Figure 12.26: Public Transport Coverage Areas

12.4 TRUCK PARK

The truck park is a holding area for trucks collecting freight from the ICD. The concept is to create a depot for freight trucks aiming to improve the accessibility to the ICD by providing waiting areas where vehicles can wait in turn to enter the ICD without interfering with the surrounding access roads.

The truck park should segregate and organise all freight vehicles heading to the ICD, monitoring them and releasing them at the right time to load thereby reducing delays and reducing the cost of transport freight. It is also intended that the truck park would provide supporting facilities for truck drivers such as washrooms, changing rooms, food court, gas station and repair and maintenance workshops.



Figure 12.27: Truck Park (Source: Ecorodovias Brazilian Highway Concessionaire)



Figure 12.28: Recommended location for a truck park near to the ICD (Source: DAR/GPO Team)

12 12.5 CONNECTIVITY WITH ADJOINING AREAS

12.5.1 ROAD CONNECTIVITY

Mombasa Road and the truck Bypass Road are the main options for reaching the Sub-Centre, where several points of access are available for each destination within the Sub-Centre. For those coming from the CBD, U-turns and a roundabout near JKIA entrance allows access to the Sub-Centre. The extension of Enterprise Road in the direction of the industrial area provides a new direct access from Imara Daima. Airport North Road remains a key option for those coming from Embakasi Village and areas to the north. Two further direct links to the Sub-Centre are provided: one from/to JKIA and another from/to Syokimau.

All focus areas within the Sub-Centre have different access possibilities. In the focus area called West Bridge, two main accesses by primary and collector road are available, besides local road access. Park Valley has three access options via the truck Bypass Road and one via a primary road that crosses the rail tracks and connects this focus area with Mombasa Road and with West Bridge focus area.

During the preparation of this report, the option of extending the Outer Ring Road through the Airport as an expressway, passing under the 2nd Runway to Syokimau and Mombasa Road was investigated. The suggested extension would have to be three lanes in each direction with a length of approximately 13 km, running from the intersection of the Outer Ring Road and Airport North Road to Mombasa Road passed Mlolongo. It would go about 7.7 km under the airport premises and Syokimau residential area, then continues about 5 km at grade to Mombasa Road. This suggestion was brought to discussions as an alternative route to relief congestion on Mombasa Road. However, the construction cost would be enormous, being a tunnel of around 7.7km and 5.3km at grade. Additional security measures to the airport would be required, such as a new screening point; hence, this alternative would bring

additional operational cost. The proposed Bypass Road bordering the National Park and improvements to Mombasa Road will increase future capacity of this axis. Therefore, both the proposed Bypass Road and Mombasa Road improvements will play the role of improving permeability and linkage through the planning area. It was agreed that the Bypass Road will play the role of alleviating traffic off Mombasa Road instead the Outer Ring Road extension. Besides, the Bypass Road could be implemented much faster at much lesser cost since it does not require any expropriation nor relocation of facilities.

12.5.2 PUBLIC TRANSPORT SERVICES CONNECTIVITY

To summarise the points highlighted in earlier sections of this report:

- > NCRS network improvements and implementation of the BRT routes provide two high frequency alternatives to access the Sub-Centre or to go from the Sub-Centre to other places. Nairobi Terminus can be highlighted as the main hub of the region connecting SGR, commuter and feeder buses, supported by park and ride and bike park infrastructure and high walkability level for pedestrians.
- > The NCRS network improvements will allow users to move easily from the Sub-Centre to Imara Daima and JKIA as well as across the city more generally. Connectivity between JKIA and Wilson Airport is improved, since BRT line 2 intersects BRT line 1 and NCRS lines 3 and 4 close to CBD, thus providing high quality public transport services for those willing to move between the two airports.
- > New stations at Mukuru and Airport City would improve the connectivity of these areas with the Sub-Centre. Syokimau and Mlolongo have their connection with the Sub-Centre improved by the BRT extension and feeder buses complementing internal connections.
- > Feeder buses going to Embakasi Village and Mihango,

routes 4 and 6 respectively, provide direct connection from these sites to the Sub-Centre.

12.5.3 NON-MOTORISED TRANSPORT

To summarise the points highlighted in earlier sections of this report:

- > Cycleways and sidewalks are provided along all Mombasa Road extensions within the Planning Area, thus enhancing non-motorised connectivity between the Sub-Centre and Adjoining Areas. Besides, bikeways to bordering areas, Syokimau and Imara Daima, were also designed to allow better connectivity to the network in the Sub-Centre.
- > Bike parks are provided near Imara Daima Station, Nairobi Terminus Station and Syokimau terminus allowing intermodal connectivity.

COMPREHENSIVE TRANSPORT PLAN

LEGEND

- Existing Nairobi SGR Station
- Planned Transport Interchange Terminus
- Existing Security CheckPoint
- Broader Area Boundary
- BROADER AREA - ROAD NETWORK**
 - Road Network
 - BRT
 - BRT Access Route to Core Area
 - Flyovers and Viaducts
- BRT Transfer Stations
- Water Courses
- Local Bus Stops (Regular Services)
- Bus Route 1
- Bus Route 2
- Bus Route 3
- Bus Route 4
- Bus Route 5
- Bus Route 6
- Bus Route 7
- Bus Route 8
- Bus Route 9
- Bus Route 10
- RAILWAY NETWORK**
 - Railway (SGR)
 - Railway (MCR)
 - Railway Stations (MCR/NGR) - Proposed



Figure 12.29: Comprehensive Transport Plan (Source: DAR/G2D Team)

12 12.6 NON-MOTORISED TRANSPORT INFRASTRUCTURE

12.6.1 POLICIES

The main non-motorised transport facility to serve the Planning Area is a cycle path and a pedestrian pathway that runs along with the extended BRT Line 1 alignment route in Mombasa Road. Other key proposals include:

- > Footbridges at every BRT Line 1 station, at the Syokimau Terminus and at the Mlolongo Terminus can provide better and safe connections between both sides of the road. It is also recommended footbridges connecting both sides of railway lines next to the stations (example Imara Daima and Embakasi Village Stations).
- > The cycleway along the Mombasa Road Enlargement project from GIBB Africa can also provide an alternative way to reach the Sub-Centre.
- > There are several access points from Adjoining Areas to the Sub-Centre. At the connection of the Sub-Centre with Syokimau, it is being recommended that the proposed flyover also includes a bicycle-only path and a footbridge.
- > At the opposite side of the Planning Area, a footbridge is indicated to connect both sides of Imara Daima Station, providing better access between the residential areas and the area of warehousing. Additionally, this connection also supports accessibility for proposed commercial use changes.
- > On the other side of the station, a larger pedestrian link such as a plateau could be provided, to overcome the slope between Mombasa Road and the near plots and at the same time provide safe crossing of the rail line. The connection between Imara Daima and the 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. The cycle path should be extended, bordering

the existing railway tracks that cross the industrial warehouse sector in the Sub-Centre and extending to the proposed land use area, thus naturally forming a linear park. This cycle path along the rail line could also be extended up to Mukuru, improving the accessibility to this area.

- > At Embakasi Village, a footbridge connecting both sides of the station should also provide segregated access for people who are not passengers who need to move between areas on either side of the line. If the station design does not allow this possibility, a separate footbridge must be provided, so pedestrians don't need to walk long distances to reach the opposite side of the station. A new access was also proposed from the new commercial area to JKIA airport commercial area.
- > An elevated structure must be provided where the road and rail line cross, as it assumed that the high service frequency will not allow an at grade crossing.
- > Land must be reserved for a bus/matatu terminal next to each rail station to provide integration between modes. Bike ways were proposed in main roads reaching station surroundings in order to provide better accessibility for those coming from nearby areas.

NON-MOTORISED FACILITIES ALONG THE BROADER AREA

LEGEND

- Main Road
- Secondary Road
- Railway (MCR)
- Railway (SGR)
- Water Courses
- Core Area Boundary
- Planning Area Boundary

Broader Area NMT Main Infrastructures

- Pedestrian / Cycle paths
- Cycleways and sidewalks along Mombasa Road
- Existing Main Roads
- Footbridges

Figure 12.30: Non-motorised facilities (Source: DAI/GPO team)

12

- > Bicycle racks should also be provided at every station of the BRT and NCRS system to facilitate modal integration and easy access.
- > Surrounding these stations, amenities and urban furniture such as street lighting, benches and bins should be provided.
- > Wayfinder signage aimed specifically at pedestrians and cyclists should also be installed to promote public transport usage and to take better advantage of the market potential offered by the mass transport system.
- > Entrances to both sides of rail stations are also highly recommended to provide easier access.
- > Throughout the Sub-Centre it is strongly recommended that public realm improvements are implemented to promote walking and cycling by providing a safe and comfortable environment.
- > Sidewalks should be wide, accessible to people with disabilities and reduced movement capacity, preferably with shaded elements that can promote thermal comfort to people. These improvements can be set out in the detail design stage to provide increased mobility to those users. Road junctions should also provide accessibility and safety for pedestrians to cross.



Figure 12.31: Proposals for Imara Daima Station Surroundings (Source: DAR/GPO Team)



Figure 12.32: Proposals for Embakasi Village Station Surroundings (Source: DAR/GPO Team)



Figure 12.33: Examples of Bicycle Racks at A Bus Stop and a BRT Stop

12.6.2 NON-MOTORISED NETWORK

The proposals provide a wide cycle network (see Figure 12.35). Other proposals include:

- > In addition to the bike lanes along Mombasa Road, there is a cycle lane proposed within the linear park bordering the railway tracks from Imara Daima Station, passing around the Nairobi Terminus and crossing Mombasa Road using the side area along the railway ROW to connect with the cycle lanes at the opposite side to ease access to Syokimau.
- > Traffic calming could be implemented at the local roads to improve road safety to users where cars and bikes will share the same street.
- > Cycle corrals should be installed at the street in front of the Nairobi Terminus. Cycle racks should be installed at every bus stop, at places with higher densities and at every street corner, whenever possible.
- > Pedestrians should have large sidewalks protected from cars and proper signage and road safety improvement.
- > Very high-quality access to the transport hub (flooring, wide roads, universal accessibility, way finding and signage).

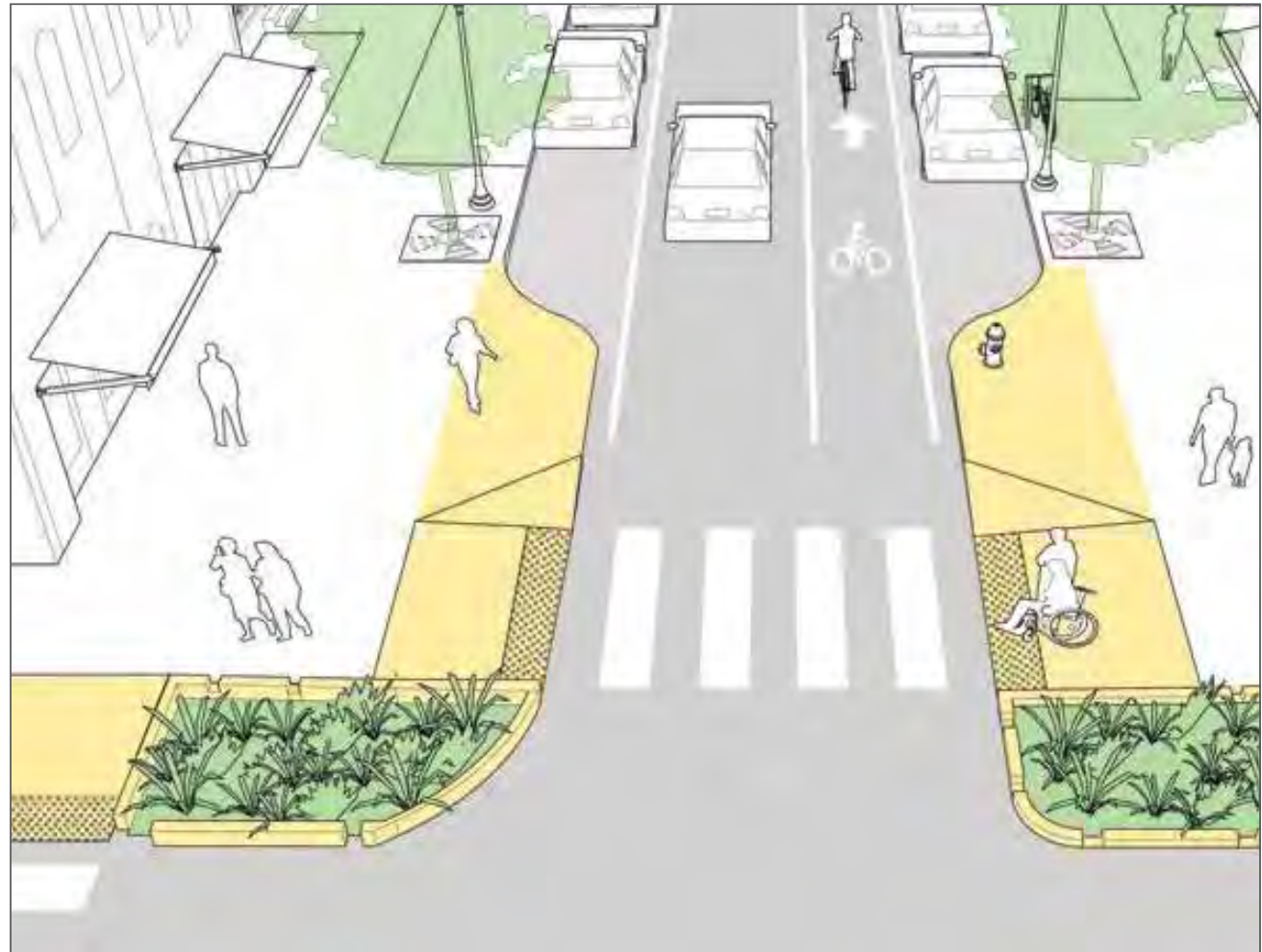


Figure 12.34: Traffic Calming Curbed Sidewalk Extension at Local Roads
(Source: Global Street Design Guide)

CYCLE NETWORK WITHIN THE CORE AREA

LEGEND

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Core Area Boundary
- Planning Area Boundary
- Cycle Lanes

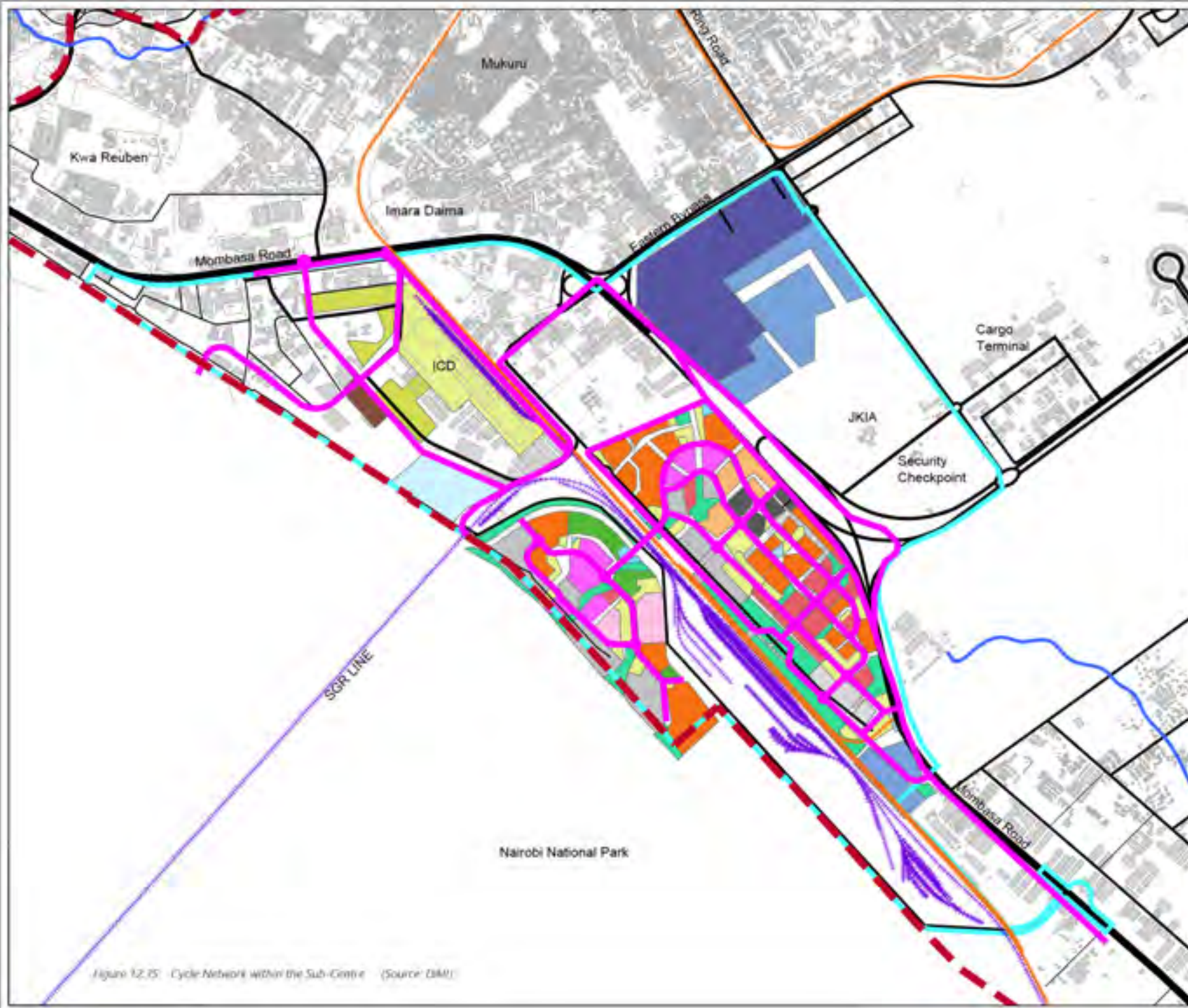


Figure 12.15: Cycle Network within the Sub-Centre (Source: IBAU)

12.7 PRIORITY PROJECTS

The guideline to prioritising road projects should be based on the focal point for mobility within the Sub-Centre, which is to transform the Nairobi Terminus into a transport hub by taking advantage of its proximity to the airport and the connection between the SGR, the NCRS lines and proximity to the BRT.

Thus, it is critical to fully operate the commuter lines and to implement projects along Mombasa Road to provide high-quality access to the Sub-Centre. Particularly note, that the Syokimau clover leaf junction to the Sub-Centre allows ease access to the NCRS at the Nairobi Terminus Station.

Another project of relevance is the implementation of the truck Bypass Road, which diverts trucks from Mombasa Road and consequently alleviates traffic in the accessing points of Sub-Centre.

Having that in mind, the priority investment projects took the following objectives into consideration:

- > To be part of the 1st phase of implementation;
- > To provide direct link to the SGR Terminus building;
- > To provide connectivity between the eastern and western parts of the Sub-Centre;
- > To relieve pressure on Mombasa Road;
- > To provide access to the eco-tourism zone as a section of it will be included in Phase 1;
- > To provide immediate access to the Sub-Centre for the traffic coming from Nairobi.

The five roads, totalling about 10.52km in length, have been selected for detailed designs of priority investment projects and have been agreed with the PIT:

1. Bypass Road (including Link Road) = 7.6 km long. (Seen in yellow) The Bypass Road is considered to have the widest benefits within the existing transport context, as it directly addresses the issue of congestion of Mombasa Road and has therefore been allocated the highest priority of the five

projects. The proposal for a similar bypass road connection has also been presented within the Nairobi Integrated Urban Development Master Plan in 2014 (NIUPLAN);

2. Road 1: Link road to Old Mombasa Road = 0.82 km (Seen in green)
3. Road 2: SGR Terminus connection. Part of Old Mombasa Road (blue) = 1.25 km. Roads 1 and 2 are key to providing a high quality, direct access to the SGR Terminus and to Phase 1 of the development (Seen in blue)
4. Road 3: Link road to proposed eco-tourism zone (off Bypass Rd) = 0.25 km. (Seen in red) Road 3 is the link road that provides access to the hospitality development proposed in the southern area of the site in Phase 1 of the development.
5. Road 4: Small temporary U-turn near Airport Security Checkpoint = 0.6 km (Seen in orange). Road 4 ensures that these roads can be accessed by vehicles on Mombasa Road travelling away from the CBD as well as vehicles travelling towards to the CBD. This temporary road will be replaced by other road connections once Mombasa Road is upgraded.

PRIORITY PROJECTS

LEGEND:

- Main Road
- Secondary Road
- Nairobi Commuter Railway (NCR)
- Single Gauge Railway (SGR)
- Water Courses
- Gate Area Boundary
- Planning Area Boundary
- Priority Project - Section 1
- Priority Project - Section 2
- Priority Project - Section 3
- Priority Project - Section 4
- Priority Project - Section 5



Figure 12-36: Priority Projects (Source: DAR/GPO Team)

12.7.1 RATIONALE FOR THE SELECTION OF THE PRIORITY PROJECTS

The five priority investment projects were selected, in discussion with the Project Implementation Team (PIT) for the SGR Embakasi Railway Station Area Project. All the identified Priority Projects involve the construction of new roads. Roads were considered necessary to unlock development of the Sub-Centre, while also simultaneously alleviating traffic conditions in wider Nairobi.

A detailed account of the objectives on which the rationale for the selection of the Priority Projects is based is presented below:

a. To alleviate the severe present traffic congestion on Mombasa Road, which fronts the eastern boundary of the Sub-Centre and provides the main road access to the Sub-Centre:

The eastern edge of the Sub-Centre is fronted by the A104 section of Mombasa Road and is one of the main roads of the country, crossing Nairobi from northwest to southeast, and connecting Nairobi with Mombasa. There exists heavy congestion on most of the city roads, especially during the morning and evening peak hours, particularly on Mombasa Road. International traffic between Mombasa Port and the neighbouring land locked countries of Uganda, Rwanda, South Sudan and Ethiopia therefore passes along the eastern edge of the site and through the city via Mombasa Road as there are no orbital roads around Nairobi.

The A104 road section is 3 lane dual carriageway and connects Embakasi, Syokimau and Jomo Kenyatta International Airport (JKIA) to Nairobi Central Business District (the CBD). Within the present context, traffic conditions on the A104 are heavily congested during peak times (and sometimes also off peak) and this has affected access to JKIA, the main airport in Kenya, as well as to the Inland Container Depot (ICD), a major logistic hub for the country, with a substantial concentration of industries and warehouses.

Apart from the high regional traffic volumes on the A104,

there are a few further reasons why the A104 is heavily congested. Along the A104, between Syokimau and the Southern Bypass junction, vehicles entering and exiting the A104 from the Airport North Road and from the ICD also contribute to traffic retention. The number of trucks to and from the ICD also contribute to traffic congestion. The disorderly parking of matatus near the footbridges also contributes significantly to the slowing down of traffic.

Not only is the A104 the main strategic highway fronting the site, but it will also provide primary access to the first Phase of development in the Sub-Centre. It is highly unlikely that the proposed Sub-Centre development will be successful unless the present access conditions to the site off the A104 are considerably improved. A Traffic Impact Study has been undertaken to provide the necessary checks for ensuring a high Level of Service (LOS) for traffic to the site. This results of this Study indicate that it is essential to implement the Bypass Road to ensure optimal vehicle access to and from the site.

The Bypass Road will allow for a continuous flow of traffic from Mombasa Road connecting up with the proposed ICD access road (a committed KeNHA road project), which in turn links to the Southern Bypass Road. Implementing both new projects (the KeNHA proposed ICD access road and the Bypass Road) together will hugely benefit the Sub-Centre by enabling the deviation of regional traffic directly to the Southern Bypass Road and thus removing this traffic from the stretch of Mombasa Road that adjoins the Sub-Centre. The Bypass Road will also benefit the local neighbourhoods and wider Nairobi by removing congestion and improving traffic conditions related to accessing JKIA.

b. To Provide the enabling infrastructure for the first phase of implementation of the Nairobi SGR Terminus Sub-Centre which has been planned on basis of transit-oriented development (TOD) principles.

Roads 1, 2, 3 and 4 are essential to providing access to Phase 1 of the Sub-Centre Development. Roads 1 and 2 represent the main streets along which the TOD development proposals are centred and are critical to establishing the foundations for the

future development.

Building on TOD Principles, the Nairobi Station Area is at the heart of the proposed development and a prominent feature of the Project Area. 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 provide an alternative to car use, while increasing ridership for Commuter Rail. Public street life is promoted in streetscapes through active frontages in mixed-use areas. Affordable housing is located towards eastern edge of the Site, in close proximity to the SGR, further reinforcing TOD principles.

Promoting a high-density development within a 10-minute walking distance around the railway station and supporting specialised commercial activities serving both commuters and locals, the Nairobi Station Area will create an attractive local place for residents to work, live and play.

Road 3 provides access to the eco-tourism zone as a section of it will be included in Phase 1.

Further, Priority Project Road 4 ensures that Roads 1 and 2 can be accessed by vehicles on Mombasa Road travelling away from the CBD as well as vehicles travelling towards to the CBD.

c. Transform the Nairobi SGR Terminus into a Transport Hub for Nairobi

Roads 1 and 2 will enable ease of access to the SGR Terminus, with the intention of transforming the Nairobi Terminus into a transport hub by taking advantage of its proximity to the airport and the existing connection to the SGR and the NCRS lines, as well as the future proposed connection to the BRT. There are also proposals for a parking facility, local bus terminus and a taxi stand within the transport terminus proposed adjacent to the existing Nairobi SGR Station.

With its bus and metro links, this Transport Hub will provide ease of accessing the CBD via public transport and with the projected increase in frequency of rail services, allow more commuters to travel via the rail network easing congestion of Nairobi's road network.

12

The Priority Projects detailed have been discussed at various specific meetings and consultations with KeNHA technical staff and more recently at the Nairobi and Machackos Stakeholder Validation Workshops in July 2019.

In order to assist with the early implementation of these projects, detailed road design drawings have been prepared for the five priority investment projects as part of the project deliverables.

12.7.2 PRIORITY PROJECTS - NON-MOTORISED TRANSPORT INTERVENTIONS

It is important that opportunities to implement non-motorised transport proposals are taken forward at the earliest opportunity. One such example is the link from Imara Daima Station to the SGR Nairobi Station. This is set out below. Other examples are listed in Section 12.4 Non-Motorised Transport Infrastructure.

Imara Daima Pedestrian and Cycle link: The connection between Imara Daima and the Sub-Centre can be improved by reconfiguring the space underneath the existing flyover, providing a tunnel for pedestrians and bike-users only. This cycle path along the rail line could also be extended up to Mukuru, improving the accessibility to this area. See Figure 12.38 and Figure 12.37 extracted from Section 12.4.

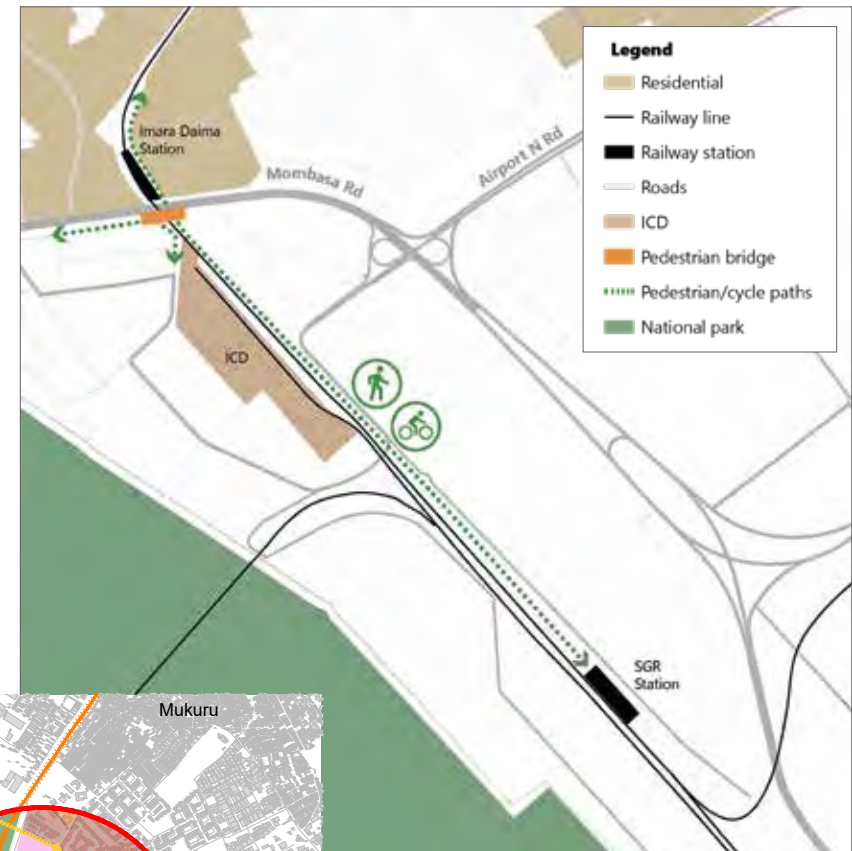


Figure 12.38: Pedestrian Link from Imara Daima to the SGR Nairobi Terminus

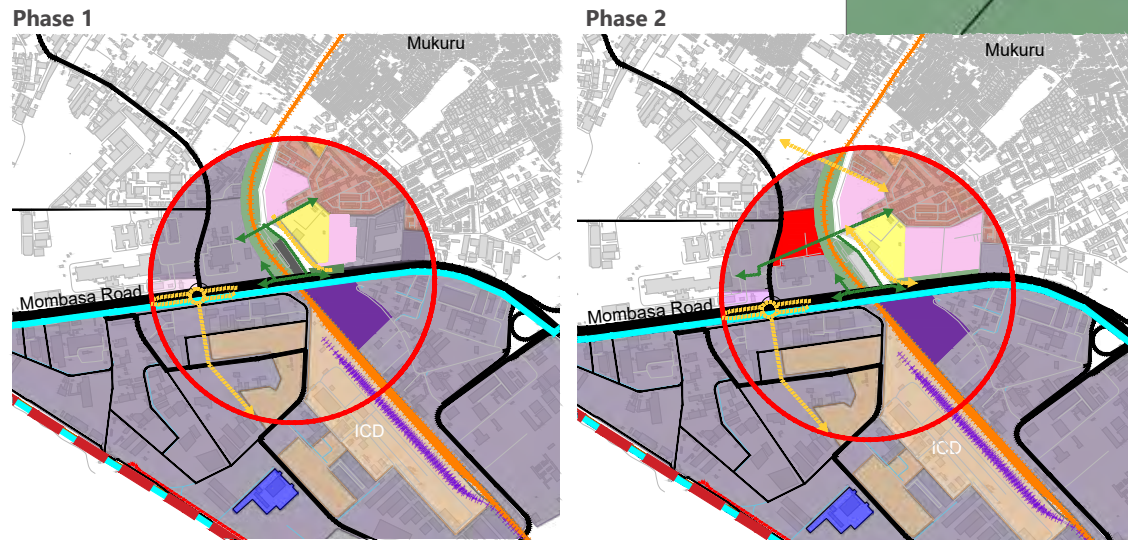


Figure 12.37: Proposals for Imara Daima Station Surroundings (Source: DAR)

12.8 NETWORK ANALYSIS

The analysis of trips produced and attracted at peak time to the Sub-Centre has been carefully evaluated.

Details of the wider Transport Studies and the Traffic Study are set out within Technical Study 4.

12.8.1 OUTPUTS OF MICROSIMULATION

Vissim provides several results for each simulated intersection and for the network as a whole. This makes it possible to perform a complete performance diagnosis and scenario comparison. In this study, the following indicators were analysed for each mode of transport: input volumes at each intersection, average speed and average delays and the level of service (LOS) for each intersection movement.

The speeds are calculated by the average of the 5 simulations of the speed performed by the transport mode simulated time crossing. Thus, through graphical representation generated by Vissim, in each of the simulated crossings it is possible to visualise the total load of vehicles that use each route and intersection to identify where the largest volume of vehicles is likely to be according to the expected demand for the year 2030.

The average delay is calculated by the average of five simulations between the theoretical time the vehicle takes at the desired speed between its origin and route destination, and the actual time it spends in the simulated time. The service level calculation is then undertaken by the node evaluation tool based on these delay times.

For service level A, the average delay during the am peak period is modelled to be less than 10 seconds (intersections signalled or not). For the next service level B, at no traffic light-controlled intersections, the delay time is between 10 and 15 seconds. For level C it is 15 to 25 seconds. For level D, 25 to 35 seconds. For level E, 35 to 50 seconds. At the most critical level of service F, the average delay is modelled to be more than 50 seconds at no traffic light-controlled intersections.

Further, the results are presented and compared for each scenario under analysis: 2030 demand, 1.5 times the 2030 demand and 2 times the 2030 demand

Although directly comparing the average LOS presented at the intersections is a key performance indicator of the simulated network, it does not exclude the possibility that specific movements may cause inconvenience to certain types of vehicles. In order to take account of such movements, a more in-depth analysis of each of the intersections was developed in order to characterise the service levels in specific situations.

This analysis shows the results for all the movements that can be performed, as well as between the different types of



Figure 12.39: Car trips generated in the Sub-Centre (Source: DAR/GPO Team)

vehicles that make use of the road network (motorcycles, buses, trucks and cars).

Crossing Number	Scenario	Average Speed (km/h)	Average Level of Service	Average Delay (s)
1	2030 Demand	41.41	A	0.52
	1.5 x 2030 Demand	41.40	A	0.54
	2 x 2030 Demand	41.26	A	0.59
2	2030 Demand	40.62	A	2.03
	1.5 x 2030 Demand	39.30	A	3.48
	2 x 2030 Demand	34.06	A	7.43
3	2030 Demand	38.73	A	4.98
	1.5 x 2030 Demand	30.00	D	31.05
	2 x 2030 Demand	22.80	B	11.07
4	2030 Demand	37.59	A	2.23
	1.5 x 2030 Demand	35.75	A	3.94
	2 x 2030 Demand	27.24	B	12.51
5	2030 Demand	38.71	A	1.62
	1.5 x 2030 Demand	37.06	A	2.86
	2 x 2030 Demand	26.29	A	5.61
6	2030 Demand	38.10	A	2.55
	1.5 x 2030 Demand	36.45	A	5.53
	2 x 2030 Demand	38.28	D	29.32
7	2030 Demand	39.35	A	3.00
	1.5 x 2030 Demand	39.09	A	4.24
	2 x 2030 Demand	40.49	A	7.19

Table 12.1: Outputs from Microsimulation

13. UTILITIES STUDIES

13.1 INTRODUCTION

The full range of utilities networks required to serve the Sub-Centre are discussed in this chapter. These are water supply, wastewater, stormwater drainage, solid waste, power and telecommunications. For each utility, demand estimates have been calculated and a conceptual design for the necessary infrastructure is described.

Further details on all utilities can be found in Technical Study 5.

13.2 PROPOSED WATER SUPPLY SYSTEM

13.2.1 ESTIMATED WATER DEMAND

The water demand for the Sub-Centre is based upon the "Practice Manual for Water Supply Services in Kenya" (October 2005). The provided estimates are subject to fluctuation and variation depending on the updated land use budget that is expected to be finalised by concerned parties during the detailed design stage of the project. The estimated water demand for the Sub-Centre is presented in Table 13.2. The total estimated population for the Sub-Centre is 181,758 persons.

13.2.2 SYSTEM DESCRIPTION AND COMPONENTS

SOURCE OF WATER

The potable water for the Sub-Centre will be sourced from the existing transmission line of 500mm diameter pipe, running within the Sub-Centre. The Sub-Centre is divided into two zones - a north side and south side - split by the existing railway line. Ground reservoirs of a respective capacity

of 12,800 m³ (north zone) and 6,000 m³ (south zone) are proposed, considering one (1) day storage. Additionally, elevated reservoirs with a staging height of 23.0m and a capacity of 530 m³ (north zone) and 250 m³ (south zone) are proposed, considering one (1) hour storage.

WATER SUPPLY SYSTEM COMPONENTS

The water distribution network proposed for the Sub-Centre is based on a grid network that will ensure a reliable supply with a high flexibility in the phasing of its construction as well as operation and maintenance.

As mentioned, the water supply network within the Sub-Centre will be fed from the existing water transmission line feeding Nairobi city. The main loops within the water supply system are sized to cater for the Sub-Centre water and firefighting

demands. End caps will be provided at all potential future connection points, allowing the network to serve individual plots. This shall be further addressed in the detailed design of the Sub-Centre; however the main connections are shown in Figure 13.1.

The main loops within the Sub-Centre are 315 and 250 mm pipes branching into 160 mm and 110 mm minor loops and 90 mm and 75 mm tertiary lines.

The water supply network for the Sub-Centre is a combined water supply and firefighting network. Fire hydrants will be installed along the water supply system on the major streets to supply the needed fire flow. Noting that the water distribution network is also a firefighting network, the minimum pipe diameter that will be used to place the hydrants is 160mm.

A summary of the water supply system's main components and estimated quantities are provided in Table 13.1

Table 13.1: Water System Components

Component	Unit	Quantity
Ø 315 mm Distribution network	m	2,600
Ø 250 mm Distribution network	m	4,300
Ø 160 mm Distribution network	m	13,400
Ø 110 mm Distribution network	m	4,200
Between Ø 75 mm and Ø 90 mm Distribution network	m	21,500
Ø 250 mm Transmission line	m	400
Plot Connections	Nr.	1,900
Fire Hydrants	Nr.	160
Ground Reservoir 1 (Capacity 10,500m ³)	m ³	1
Pumping Station 1	Item	1
Elevated Reservoir 1 (Capacity 450m ³)	Item	1
Ground Reservoir 2 (Capacity 7000m ³)	Item	1
Pumping Station 2	Item	1
Elevated Reservoir 2 (Capacity 300m ³)	Item	1

Table 13.2: Estimated Water Demand

LAND USE ZONES	GROSS LAND AREA (HA)	POPULATION							AVERAGE DAILY DEMAND (ADD), M3/DAY	MAX. DAILY DEMAND (MDD), M3/DAY
		RESIDENTS	VISITORS	STUDENTS/PATIENTS	HOTEL GUESTS/SERVICED APARTMENT OCCUPANTS	WHITE COLLAR STAFF	BLUE COLLAR STAFF	DOMESTIC STAFF		
0 - Residential	63.94	31,382						7,846	5,100	6,370
1 - Industrial / Warehouses *						774	1,806		1,420	1,770
2 - Education	10.69	2,065		5,532		155	66	41	390	490
3 - Recreation / Retail	13.73		10,476			4,190	6,285		680	850
4 - Public Purpose	33.47			1,251		27,957	9,569		2,400	3,000
5 - Commercial (Offices)	17.18					21,906	5,476		1,370	1,710
6 - Public Utility	2.55									
10 - Culture	17.33		17,159			7,722	5,148		900	1,130
11 - Mixed Use (Residential / Recreation / Retail)	29.16	13,586	1,887			755	1,132		3,520	4,400
12 - Hospitality / MICE	28.33		12,662		2,713	2,849	6,647	81	1,480	1,850
14 - Serviced Apartments	6.00				975			49	290	370
Roads	107.92									
Other Non-Saleable										
a) Transport Terminus	4.20					101	67		8	10
b) Green Spaces	68.00								2,040	2,550
c) Pond	1.00									
d) Truck Parking	25.30									
Total	505								19,598	24,500

* Northern zone of "Industrial / Warehouses" has existing water supply networks nearby, hence, is not considered in the proposed water supply network.

HYDRAULIC ANALYSIS

Preliminary hydraulic analysis of the proposed water supply system has been considered and is summarised in Table 13.3 and Table 13.4. The results indicate that all maximum velocity criteria set in the design criteria section are satisfied for the proposed system to serve the Sub-Centre development.

Pressure within the network is above the minimum set operating pressure and does not exceed the maximum allowable pressure defined in the design criteria.

Table 13.3: Velocities within Water Network

Criteria	Velocity (m/s)
Minimum Velocity	0.2
Maximum Velocity	1.5

Table 13.4: Pressure within Water Network

Criteria	Pressure (Bars)
Minimum Pressure	1.5
Maximum Pressure	2.5

It should be noted that the above Hydraulic analysis is based on the existing site topography. Final site topography may vary based on the final surface grading considered in the detailed design stages.

WATER SUPPLY NETWORK

Legend:

- Main Road
- Secondary Road
- Standard Gauge Railway (SGR)
- Nairobi Commuter Railway (NCR)
- Core Area Boundary
- Planning Area Boundary
- Water Courses
- O75 Water Supply Line
- O90 Water Supply Line
- B110 Water Supply Line
- O180 Water Supply Line
- O250 Water Supply Line
- O315 Water Supply Line
- Existing Line B500
- Transmission Main B250
- Zone 1
- Zone 2
- Reservoir / Pump Station

Notes

All dimensions are in millimetres unless otherwise indicated.

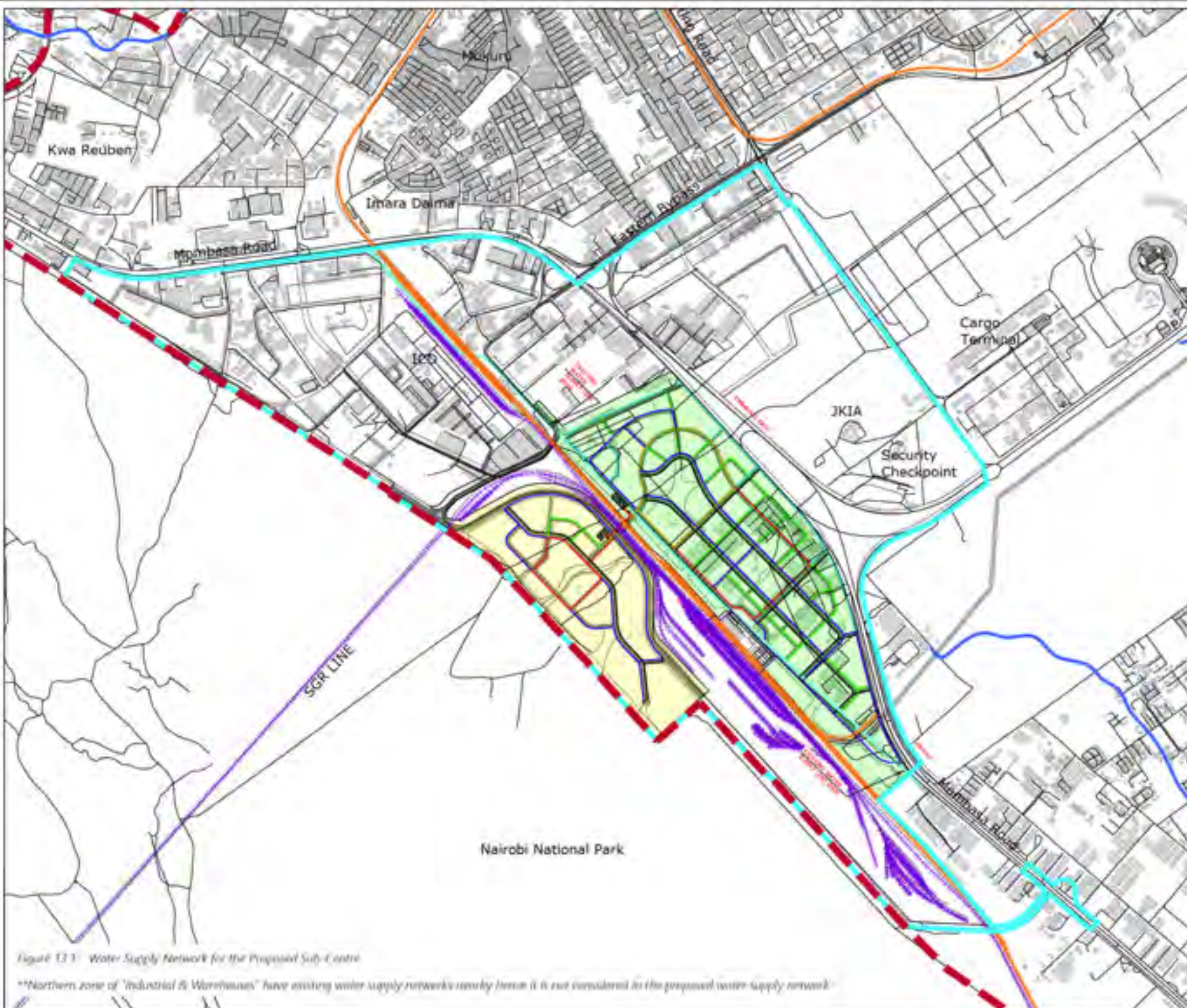


Figure 13.3: Water Supply Network for the Proposed Sub-Centre

**Northern zone of 'Industrial & Warehouses' have existing water supply networks nearby hence it is not considered in the proposed water supply network.

13.3 WASTEWATER COLLECTION SYSTEM

13.3.1 WASTEWATER GENERATION

The generated wastewater flows are estimated based on the water supply unit rates. Due to the fact that part of the water supply accounts for various external uses, no more than 80% of the supplied water is expected to reach the wastewater collection network.

13.3.2 WASTEWATER SYSTEM CONCEPTUAL DESIGN

The design of the wastewater system is presented in the following section.

SYSTEM DESCRIPTION AND COMPONENTS

Wastewater is collected through a piped gravity network. In order to avoid deep networks, a pump station is introduced where the depth of network reaches about 6m and lifts the effluent for discharge into a nearby Manhole. Accordingly, two (2) pump stations and one (1) lift station are provided in the system.

DISCHARGE OF WASTEWATER

The generated wastewater from the Sub-Centre will be collected through a piped gravity network and conveyed to the existing wastewater network of 1200mm diameter pipes.

WASTEWATER GENERATION VOLUME

Wastewater generation volume is based on the updated land use budget that is expected to be finalised by concerned parties during the detailed design stage of the project. Modifications made to land uses and population estimates will hence require these figures to be updated in the detailed design stage.

The estimated wastewater generation for the Sub-Centre is presented in Table 13.6. The total estimated Population for the Sub-Centre is 181,758 persons.

WASTEWATER COLLECTION NETWORK

The wastewater collection network for the Sub-Centre is a combination of a gravity network, manholes and pump stations to discharge the collected effluent from the Sub-Centre land use. The wastewater collection network consists mainly of manholes, pump stations and gravity pipes ranging in diameters from 200 mm to 750 mm. The total length of the wastewater collection network (including force main) is estimated at 43,800m and circa 620 manholes.

As there is no survey data available at this stage (with reference to rough surface grading based on the available SRTM data), the proposed Sub-Centre is divided into different drainage zones such that each zone will be collected through the gravity system. Where gravity flow is not permitted, pump stations are proposed to collect the effluent and discharge into the nearest Manholes.

Effluent from Zone 1 is collected at pump station 1, Zone 2 is collected at pump station 2 and Zone 3 is collected at a lift station. Effluent from these pumps and lift stations is then pumped to nearby and suitable manholes; furthering the collected sewage flows by gravity. Effluent from Zone 4 is collected through networks by gravity. All zone effluents are collectively discharged into existing sewer lines of 1200mm pipe diameter. In the absence of details regarding the existing 1200mm diameter pipe, which depends upon invert levels, an additional lift station may be anticipated upstream of the existing trunk sewer line.

The total estimated number of plot connections is 1,900. A summary of the wastewater network's main components and estimated quantities are provided in Table 13.5 and Table 13.6.

Table 13.5: Main Wastewater System Components

Component	Unit	Quantity
Ø200 mm wastewater pipe	m	30,000
Ø315 mm wastewater pipe	m	4,700
Ø400 mm wastewater pipe	m	1,800
Ø500 mm wastewater pipe	m	400
Ø600 mm wastewater pipe	m	3,300
Ø750 mm wastewater pipe	m	200
Force Main (Ø250 mm)	m	100
Force Main (Ø315 mm)	m	2,300
Force Main (Ø350 mm)	m	1,000
Manholes	Nr	620
Plot Connection	Nr.	1,900
Sewage Pump Stations	Nr	3

Table 13.6: Estimated Waste Water Generation

LAND USE ZONES	GROSS LAND AREA (HA)	POPULATION							AVERAGE DAILY DEMAND (ADD), M3 DAY	MAX. DAILY DEMAND (MDD), M3/DAY
		RESIDENTS	VISITORS	STUDENTS/PATIENTS	HOTEL GUESTS/SERVICED APARTMENT OCCUPANTS	WHITE COLLAR STAFF	BLUE COLLAR STAFF	DOMESTIC STAFF		
0 - Residential	63.94	31,382						7,846	5,100	4,490
1 - Industrial / Warehouses *	75.90					774	1,806		1,420	1,250
2 - Education	10.69	2,065		5,532		155	66	41	390	350
3 - Recreation / Retail	13.73		10,476			4,190	6,285		680	600
4 - Public Purpose	33.47			1,251		27,957	9,569		2,400	2,110
5 - Commercial (Offices)	17.18					21,906	5,476		1,370	1,200
6 - Public Utility	2.55									
10 - Culture	17.33		17,159			7,722	5,148		900	790
11 - Mixed Use (Residential / Recreation / Retail)	29.16	13,586	1,887			755	1,132		3,520	3,100
12 - Hospitality / MICE	28.33		12,662		2,713	2,849	6,647	81	1,480	1,300
14 - Serviced Apartments	6.00				975			49	290	260
Roads	107.92									
Other Non-Saleable										
a) Transport Terminus	4.20					101	67		8	7
b) Green Spaces	68.00								2,040	1,800
c) Pond	1									
d) Truck Parking	25.3									
Total	505								19,598	17,257

* Industrial / Warehouses zone has no contribution to the system, hence, it is not considered in the proposed wastewater network.

HYDRAULIC ANALYSIS

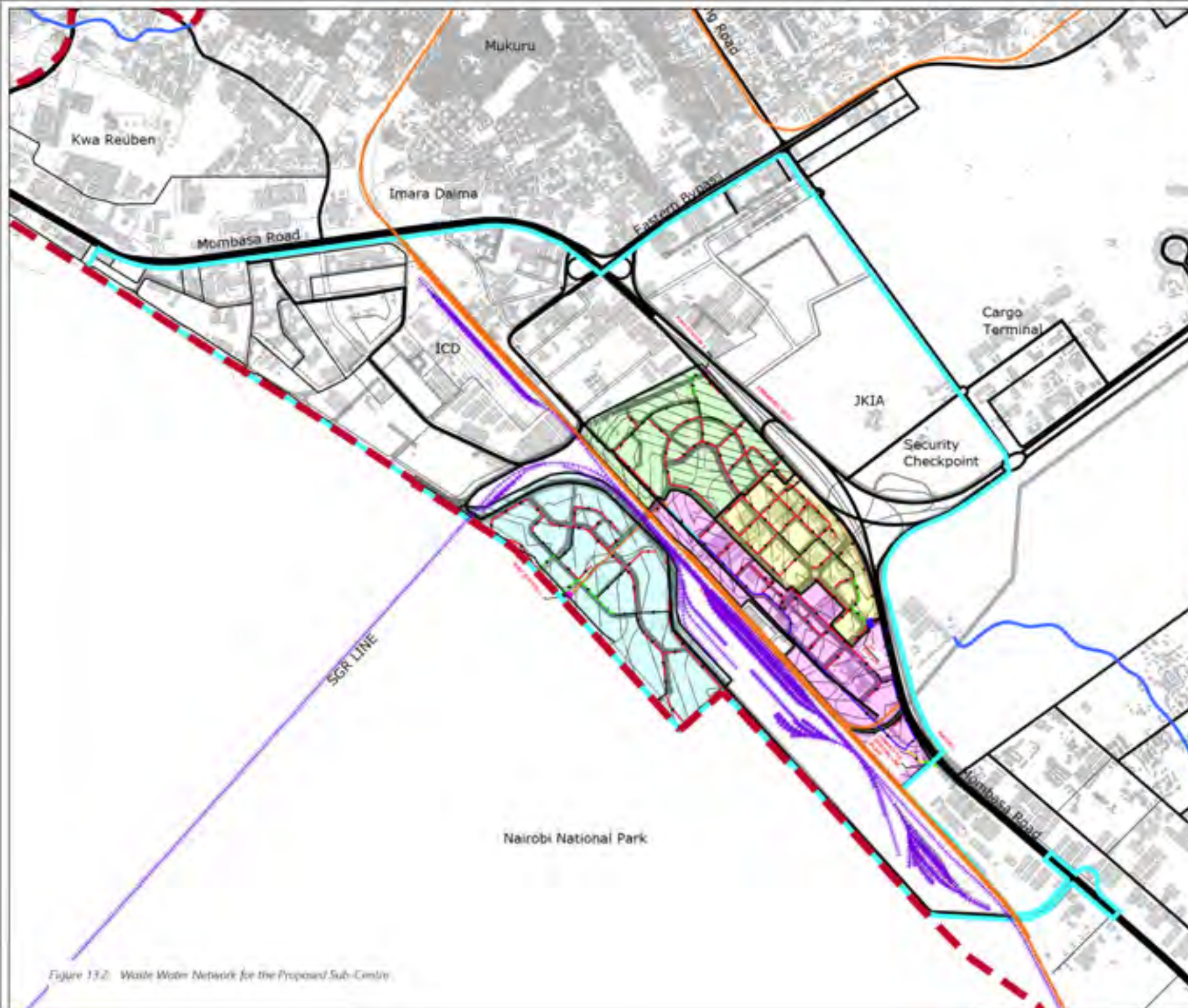
Hydraulic analysis of the wastewater collection network is presented in this section. Maximum velocities and the maximum depth of flow within the network during peak hours are identified as within the acceptable limits as highlighted in Table 13.7.

Low velocities at the start of the network are evident. Assessment will be made as to whether to increase the pipe gradient or accept velocities of 0.45m/s (with flushing required from time to time). This will be addressed during the detailed design stage of the project.

Table 13.7: Hydraulic Results for Sub-Centre at Peak Flows

Criteria	Sub-Centre
Minimum Velocity	0.6*
Maximum Velocity	1.5
Minimum D/Df	7.2
Maximum D/Df	69.8

* Due to flat terrain and various upstream stretches in the network (where low flows are expected), it would be difficult to achieve the minimum self-cleansing velocity, hence these stretches need to be flushed regularly.



Inter-Country Physical and Land Use Development Plan for Nairobi SGR Terminus and Adjoining Areas (2020-2035)

WASTE WATER NETWORK FOR THE PROPOSED CORE AREA

Legend:

- Main Road
- Secondary Road
- Standard Gauge Railway (SGR)
- Nairobi Commuter Railway (NCR)
- Core Area Boundary
- Planning Area Boundary
- Water Course
- Ø200 PVC
- Ø315 PVC
- Ø400 PVC
- Ø500 Concrete
- Ø600 Concrete
- Ø750 Concrete
- FORCE MAIN Ø250
- FORCE MAIN Ø315
- FORCE MAIN Ø350
- EXISTING LINE Ø1200
- FLOW DIRECTION
- PUMP STATION
- LIFT STATION
- ZONE 1
- ZONE 2
- ZONE 3
- ZONE 4

NOTES

- 1- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED.
- 2- INVERT LEVELS OF EXISTING LINE Ø1200 SHALL BE CHECKED AND VERIFIED ON SITE TO CONNECT THE PROPOSED NETWORK.



SEPTEMBER, 2020

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Figure 13.2: Waste Water Network for the Proposed Sub-Corridor

13.4 STORM WATER DRAINAGE SYSTEM

The main objective of this section is to present the conceptual design of the storm water drainage network for the proposed Sub-Centre.

13.4.1 DESIGN CRITERIA/BASIS OF DESIGN

RAINFALL AND RETURN PERIOD

A design storm of 10-year return period will be used for the sizing of the network that will collect runoff that would be generated from the project site.

The 'Intensity-Duration-Frequency' curves that will be adopted are shown in Figure 13.3. Rainfall data is sourced from the 'Research, Analysis of Climate Resilience Options for Nairobi Slums and Informal Settlements', prepared by 'Africa Collaborative Centre for Earth Systems Science (ACCESS) & the Institute for Climate Change and Adaptation (ICCA)', April 2016

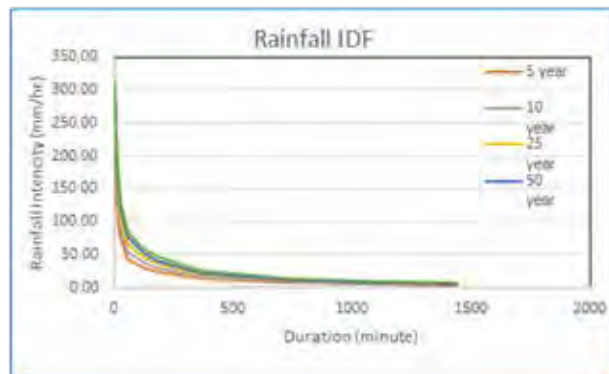


Figure 13.3: IDF Curve

HYDROLOGIC DESIGN

The Rational Method is used for the calculation of the peak runoff, where the time of concentration is for small watersheds (usually smaller than 40 Ha). The peak runoff is given by the following formula:

$$Q = \frac{C * I * A}{360}$$

Where,

Q = Peak runoff flow in m³/s,

C = Runoff Coefficient,

I = Rainfall intensity in mm/hr for a fixed return period

A = Catchment Area in ha.

Run-off Coefficients as shown in Table 13.8 will be adopted in calculating the peak discharge.

Table 13.8: Run-off Coefficient Values

Character of surface	Return Period (years)						
	2	5	10	25	50	100	500
Developed							
Asphaltic	0.73	0.77	0.81	0.86	0.90	0.95	1.00
Concrete/roof	0.75	0.80	0.83	0.88	0.92	0.97	1.00
Grass areas (lawns, parks, etc.)							
Poor condition (grass cover less than 50% of the area)							
Flat, 0-2%	0.32	0.34	0.37	0.40	0.44	0.47	0.58
Average, 2-7%	0.37	0.40	0.43	0.46	0.49	0.53	0.61
Steep, over 7%	0.40	0.43	0.45	0.49	0.52	0.55	0.62
Fair condition (grass cover on 50% to 75% of the area)							
Flat, 0-2%	0.25	0.28	0.30	0.34	0.37	0.41	0.53
Average, 2-7%	0.33	0.36	0.38	0.42	0.45	0.49	0.58
Steep, over 7%	0.37	0.40	0.42	0.46	0.49	0.53	0.60
Good condition (grass cover larger than 75% of the area)							
Flat, 0-2%	0.21	0.23	0.25	0.29	0.32	0.36	0.49
Average, 2-7%	0.29	0.32	0.35	0.39	0.42	0.46	0.56
Steep, over 7%	0.34	0.37	0.40	0.44	0.47	0.51	0.58
Undeveloped							
Cultivated Land							
Flat, 0-2%	0.31	0.34	0.36	0.40	0.43	0.47	0.57
Average, 2-7%	0.35	0.38	0.41	0.44	0.48	0.51	0.60
Steep, over 7%	0.39	0.42	0.44	0.48	0.51	0.54	0.61
Pasture/Range							
Flat, 0-2%	0.25	0.28	0.30	0.34	0.37	0.41	0.53
Average, 2-7%	0.33	0.36	0.38	0.42	0.45	0.49	0.58
Steep, over 7%	0.37	0.40	0.42	0.46	0.49	0.53	0.60
Forest/Woodlands							
Flat, 0-2%	0.22	0.25	0.28	0.31	0.35	0.39	0.48
Average, 2-7%	0.31	0.34	0.36	0.40	0.43	0.47	0.56
Steep, over 7%	0.35	0.39	0.41	0.45	0.48	0.52	0.58

Note: The values in the table are the standards used by the City of Austin, Texas. Used with permission.

(Ref: Chow, Ven Te, et al.1988. Applied Hydrology. New York. McGraw Hill)

The ten (10) year return period runoff coefficient varies as per type of surface cover. As this project comprises predominantly of buildings, roads and public/recreation areas (softscape), the weighted Runoff coefficient will be considered for the calculation of runoff based on the final plan of the project.

TIME OF CONCENTRATION

The time of concentration (T_c) of the watershed is defined as the time needed for a drop of water to travel from the hydraulically most distant point of the watershed to the design point downstream. The time of concentration (T_c) is estimated using the Kirpich method with a minimum time of concentration of 10 minutes. The Kirpich formula is given by:

Where (L) is the length of the main watercourse in m and (S) is the average slope of the catchment in m/m.

The adopted minimum time of concentration is 10 min.

$$T_c = 0.01947 \frac{L^{0.77}}{S^{0.385}}$$

SCS METHOD

For catchment areas greater than 50 Ha, the SCS method will be used. The United States Soil Conservation Service (SCS—now the Natural Resource Conservation Service “NRCS”) method estimates runoff using catchment characteristics such as antecedent soil moisture conditions, types of soil, initial abstraction of rainfall, slope, length of the longest channel, and surface treatment and land cover in addition to rainfall. These characteristics are reflected by a Curve Number (CN) value.

This number typically ranges from 25 (for low runoff

13

depressions) to 98 (for paved impervious areas). An initial abstraction factor (Ia) can be specified. The SCS-CN method typically uses an initial abstraction of 0.2S, where S is a maximum soil storage depth (in inches) and is calculated from the equation below.

$$S = \frac{1000}{CN} - 10$$

Where:

CN = Curve Number

S = Maximum storage depth

The SCS method calculates the volume of runoff given the input rainfall depth and the CN value. The relation is given by:

$$R = \frac{(P - 0.2S)^2}{P - 0.8S}$$

Where:

R = the accumulated depth of runoff (mm);

P = the accumulated depth of storm rainfall (mm); and

S = the value of S is a function of the CN value as given earlier.

13.4.2 HYDRAULIC DESIGN

In general, drainage structures should be of adequate capacity in order to safely convey contributing catchment flows without damage or inconvenience to the road network.

For sizing of the pipe network, the Manning formula will be used:

$$V = \frac{1}{n} * R^{\frac{2}{3}} * S^{\frac{1}{2}}$$

Where,

V = channel velocity, m/s

n = roughness coefficient

R = Hydraulic Radius, m

S = Slope, m/m

CHANNEL SIZE, VELOCITY, GRADIENT AND COVER

The minimum size of a storm water channel will be 500 mm x 500 mm. The minimum design velocity that will be considered in the design of storm water pipes will be 0.75 m/s so as to provide a self-cleansing regime within gravity pipes.

The minimum gradient shall be taken as 0.1%, irrespective of channel sizes, ensuring the self-cleansing velocity is achieved.

Storm water channels laid along sidewalks shall have a minimum cover of 0.2 m - measured from the finished road level.

CONSTRUCTION METHOD

Table 13.9: Spread Criteria for Road Storm drains

Road Classification		Design Frequency	Design Spread (Zd)
Interstate, Principal, Minor Arterial, or Divided	< 45 mph (70 km/hr) ≥ 45 mph (70 km/hr) Sag Pt.	10-year 10-year 50-year	Shoulder+2 ft (0.67 m) ¹ Shoulder Shoulder+2 ft (0.67 m) ¹
Collector and Local Streets	< 45 mph (70 km/hr) ≥ 45 mph (70 km/hr) Sag Pt.	10-year 10-year 50-year	Shoulder+½ Driving Lane ² Shoulder ½ Driving Lane ²

¹The travel way shall have at least 10 ft that is free of water.

²In addition to the design spread requirement, the depth of flow shall not exceed 0.12 ft at the edge of shoulder.

(Ref: Drainage of Highway Pavements. WSDOT Hydraulics Manual, June 2010)

Channel construction will use an open cut/excavation method with depths to invert not exceeding 7m.

13.4.2.1 MATERIAL

Storm water drainage channels will be cast-in-situ concrete. Channel sections vary from 500 mm x 500 mm to 3,000 mm x 2,500 mm.

INLETS AND INLET SPACING

Inlets will be provided at a roads lower edge with the spacing set to limit the spread. Further detail regarding the inlet type that will be adopted and detailed calculations of inlet spacing will be provided in the next design stage of the project.

13.4.3 STORM WATER DRAINAGE SYSTEM DESIGN

DISCHARGE OF STORM WATER

Due to the high/elevated location of the site, the Sub-Centre does not receive storm water from the outside areas. In this regard, storm water drainage comprises of runoff generated from the project site only. The Sub-Centre site has a sloping topography towards the south and north of the Nairobi Railway line; the Railway line will form as a ridge line. A general layout of the site topography, with delineation of the catchment area, is shown in Figure 13.4.

Storm water runoff for the Sub-Centre will be collected in a channel and discharged into nearby outfalls. Bentley Storm-CAD V8 will be used for the hydraulic modelling of the network.

STORM WATER NETWORK AND COMPONENTS

The storm water drainage network within the Sub-Centre will employ a gravity network. Due to the natural topography

of the site - sloping towards the north and south sides of the Nairobi Railway line - lifting/pumping stations are not required. Instead, the natural gravity network will use the natural topography to discharge storm water into the nearby natural streams.

As no survey data is available at this stage, discharge points (natural streams) are identified based on the catchment delineation and available SRTM data.

Accordingly, the Sub-Centre grading has been roughly designed and distributed in to zones such that each zone will drain to its respective discharge point. The design adopted for the storm water system will ensure minimal operation costs based on the fact that a gravity network is proposed. In addition to this, low maintenance costs are ensured since the site grading and pipe gradients are within the acceptable limits to ensure self-cleansing velocities.

The drainage network consists mainly of channels, storm water inlets and outfalls. The channels vary from 500 mm x 500 mm to 3,000 mm x 2,500 mm. The total length of the storm water network is estimated at 71,190 m. Figure 13.5 shows the preliminary layout of the storm water drainage network within the Sub-Centre.

A summary of the storm water network's main components and estimated quantities are provided in Table 13.10.

Table 13.10: Main Storm Water Network Components

Component	Unit	Quantity
Concrete Channel 500 mm x 500 mm	m	25,600
Concrete Channel 750 mm x 500 mm to 750 mm x 750 mm	m	16,500
Concrete Channel 1000 mm x 750 mm to 1000 mm x 1000 mm	m	7,820
Concrete Channel 1250 mm x 1000 mm to 1250 mm x 1250 mm	m	5,580
Concrete Channel 1500 mm x 1250 mm to 1500 mm x 1500 mm	m	3,300
Concrete Channel 1750 mm x 1500 mm to 1750 mm x 1750 mm	m	1,620
Concrete Channel 2000 mm x 1750 mm to 2000 mm x 2000 mm	m	1,680
Concrete Channel 2250 mm x 2000 mm to 2250 mm x 2250 mm	m	320
Concrete Channel 2500 mm x 2250 mm to 2500 mm x 2500 mm	m	890
Concrete Channel 3000 mm x 2500 mm	Nr	880
Outfall Structure 500mm s 500mm to 1750 mm x 1750 mm	Nr	15
Outfall Structure 2000 mm x 1500 mm to 2500 mm x 2000 mm	Nr	2
Outfall Structure 2500 mm x 2500 mm to 3000 mm x 2500 mm	Nr	4
Pipe Culvert (2Nos. of 1200mm dia.)	m	50

13.4.4 EXISTING POND

The proposed express road line passes over an existing pond close to the Nairobi terminus. Therefore, the pond should be relocated to a suitable location which shall be assessed during next stage. A rough cost for the relocation of said pond is considered in the cost estimate of the storm water drainage.

Further information about the function and importance of the existing pond is required in order to study the feasibility of relocation.

SITE TOPOGRAPHY AND CATCHMENT

Legend

- Main Road
- Secondary Road
- Core Area Boundary
- Planning Boundary
- Railway (NCR)
- Railway (SGR)
- Existing Major Road
- Stream
- River
- Catchment Area
- Flow towards Athi River
- Flow towards Nairobi River
- Flow towards Ngong River

0 500 1000 2000 3500m
1:125,000 (B/A3)

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dar

Figure 13.4: Site Topography and Catchment (Source: DAR)

STORM WATER NETWORK FOR THE PROPOSED CORE AREA

- Legend:**
- Main Road
 - Secondary Road
 - Standard Gauge Railway (SGR)
 - Nairobi Commuter Railway (NCR)
 - Core Area Boundary
 - Planning Area Boundary
 - Water Courses
 - 500X500 Channel
 - 750X500 TO 750X750 Channel
 - 1000X750 TO 1000X1000 Channel
 - 1250X1000 TO 1250X1250 Channel
 - 1500X1250 TO 1500X1500 Channel
 - 1750X1500 TO 1750X1750 Channel
 - 2000X1750 TO 2000X2000 Channel
 - 2250X2000 TO 2250X2250 Channel
 - 2500X2250 TO 2500X2500 Channel
 - Outfall
 - Pipe Culvert 2(0)(200)
 - Outfall 1 Zone
 - Outfall 2 Zone
 - Outfall 3 Zone
 - Outfall 4 Zone
 - Outfall 5 Zone
 - Outfall 6 Zone
 - Outfall 7 Zone

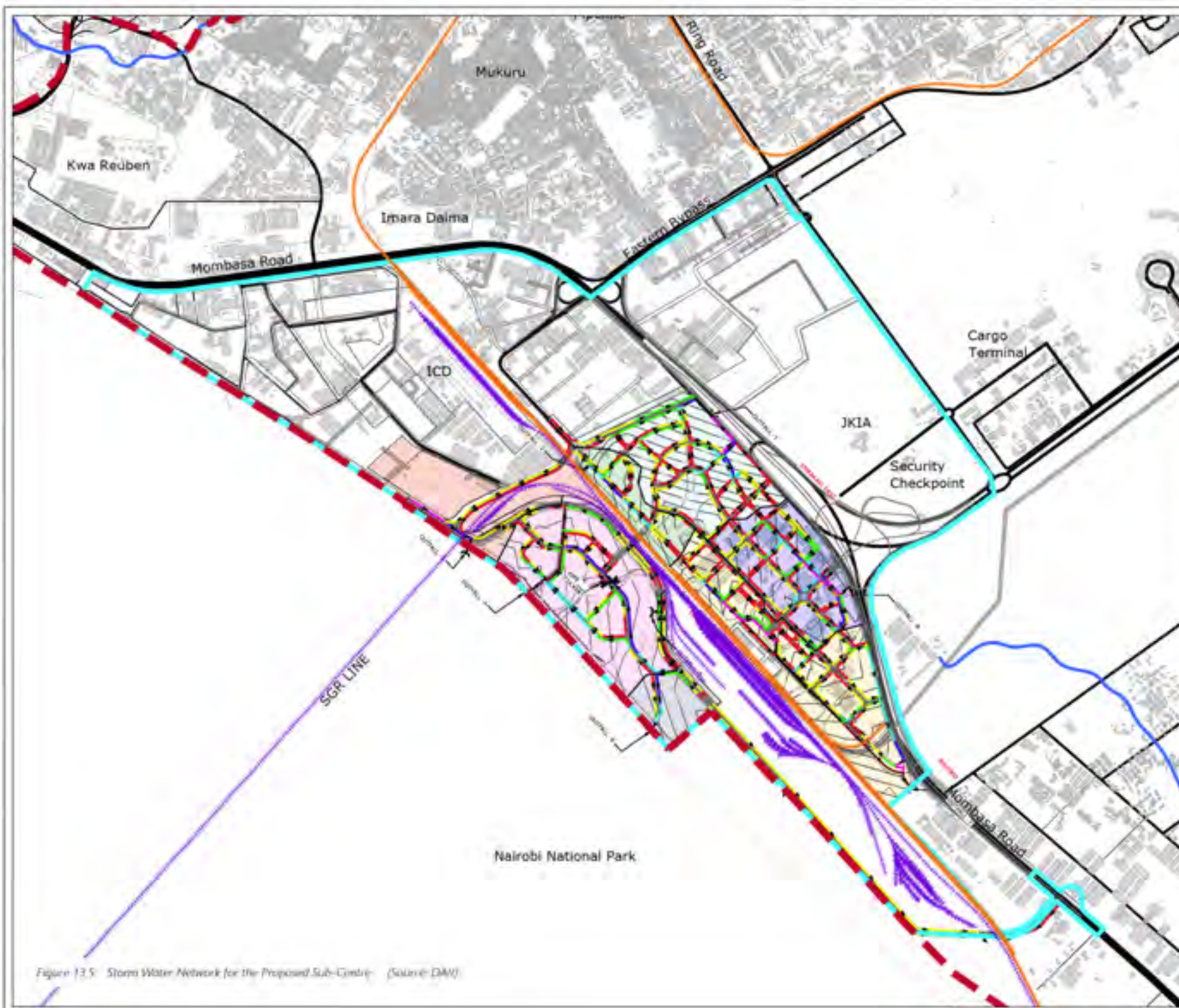


Figure 13.5: Storm Water Network for the Proposed Sub-Centre (Source: DAV)

13.5 SOLID WASTE MANAGEMENT

This section of the report provides an overview of the existing Solid Waste Management (SWM) situation for the SGR Embakasi Railway Station Area – Sub-Centre in accordance with the data made available.

It also provides a strategic approach proposed to improve the SWM scheme. The proposed SWM strategy for handling future generated waste from the various land uses has been prepared in the form of general guidelines that can be reviewed and refined where necessary, brought forward to progressive design stages, and enforced by relevant parties.

13.5.1 SUSTAINABLE ASPIRATIONS

In order to adopt a concept that follows a sustainable approach and allows flexibility to align with any potential future progress / improvements in SWM at a Country-wide level (in terms of plans, policies and regulations), source separation practices, based on 3 streams, is proposed for the Sub-Centre. It is believed that such an approach will result in the establishment of an infrastructure network that will suit and aid future sustainability plans set by relevant authorities.

Based on the above, the proposed streams are as follows:

- > Organic Waste
- > Dry Recyclables (Paper/Cardboard, Plastics, Metals, Glass)
- > General Waste

The introduction of source-separation practices will aid in the provision of flexibility during the handling of waste streams at the downstream end of the entire SWM chain in offsite Municipality facilities (i.e. treatment/disposal schemes). However, although it is good practice to propose sustainable solutions in line with a chronological order of preference (displayed in the Waste Hierarchy presented in Figure 13.6, it is also important to uphold feasible solutions, with regard to both environmental and economic contexts.

13.5.2 SOLID WASTE MINIMISATION



Figure 13.6: Sustainable Waste Hierarchy

This refers to all activities generating waste, whether residential, retail or industrial. Waste generators should adopt all practical and feasible efforts to minimise the amount of material to be discarded as 'waste'. Basic measures to be taken by waste generators, specifically in the industrial and logistics areas, include:

- > Implementing good housekeeping through adopting environmental management systems and standards (EMS) such as ISO 14000 series,
- > Conducting regular environmental audits, particularly for solid waste, involving material flow charts and optimised material balance models as applicable,
- > Utilising efficient and environmentally friendly raw materials and technological processes in their activities,
- > Using recycled material, where applicable,
- > Reusing discarded material prior to storage,

- > Establishing a waste exchange scheme (industrial symbiosis) and reusing material prior to disposal, i.e. taking into consideration that one industry's waste could be another industry's raw or input material.

13.5.3 SOLID WASTE TYPES AND SOURCES

The major types of waste likely to be generated in the project area during its operational stage are as follows:

- > Municipal Solid Waste (MSW): most land uses (residential, commercial areas, etc.) generate solid waste that is typical of the MSW stream. This comprises of general discarded materials from households or office-based locations, e.g. food scrap, paper waste, cardboard, plastics, etc.
- > Non-Municipal Solid Waste (Non-MSW): may include both non-Hazardous (MSW materials) and Potential Hazardous Waste material. In most cases, Non-MSW is generated from hospitals industries, etc. The abovementioned special types of solid waste should be stored at generation points and collected by an approved specialised operator(s).
- > Construction and Demolition (C&D) Waste: generated during the construction stages of a project. These should be managed by the Contractor in full compliance with an approved Environmental Management Plan.
- > Landscape Waste: green waste from landscaped areas is likely to be generated in the project area and should be properly managed by the Landscape Contractor, in terms of collection and treatment.

13 13.5.4 SOLID WASTE GENERATION AND COMPOSITION

Various sources are available for estimated generation rates with respect to various types of land uses. Table 13.11 presents the adopted solid waste generation rates for the land use areas envisaged to generate waste at SGR Embakasi Railway Station Area – Sub-Centre.

Table 13.11: Solid Waste Generation Rates¹

COMPONENT	UNIT	QUANTITY
Offices	0.68	kg/employee/day
Retail	4.63	
Light Industrial*	23	
Warehouses and others	6.28	
Residential	0.65	kg/capita/d
Public Purpose / Cultural	0.15	kg/m ² /d
Education	0.23	kg/student/d
Hospitality / MICE / Eco Resort	0.68	kg/room/d
Health**	4.32	kg/bed/d

Assumptions:

*85% of generated waste is considered to be non-hazardous and is handled as part of generated MSW

**80% of generated waste is considered to be non-hazardous and is handled as part of generated MSW, as compiled from: (i) Congress of the United States - Office of Technology Assessment, "Finding the Rx for Managing Medical Wastes, September 1990; and (ii) World Health Organization (WHO), "Management of Solid Health-Care Waste at Primary Health-Care Centres - A Decision-Making Guide", 2005

The typical MSW composition (by weight; percentage of total) for the predominant land uses is presented in Figure 13.7 below.

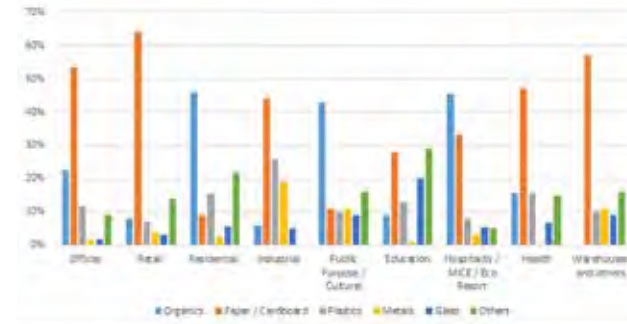


Figure 13.7: Adopted MSW Compositions

To better estimate the solid waste volumes that will require storage, a typical solid waste density for each component of the solid waste make-up was used. The adopted densities of the various waste materials are presented in Table 13.12.

Table 13.12: Solid Waste Density by Main MSW Constituents²

COMPONENT	SOLID WASTE DENSITIES (KG/M ³)		ADOPTED AVERAGE
	FROM	TO	
Food/Organic Waste	130	480	305
Paper/Cardboard	40	180	110
Plastics	40	130	85
Metals	80	520	300
Glass	160	480	320
Others	90	180	150

Based on the adopted waste compositions and densities addressed above, total quantity and volume of MSW constitutes expected to be generated, are estimated as presented in Table 13.13.

13.5.5 SOLID WASTE STORAGE AND COLLECTION

Proper SWM practices require adequate temporary storage solutions for discarded solid waste materials within the development prior to the collection of such quantities for transfer to further treatment/disposal destinations.

There are various typologies available for the temporary storage of solid waste and subsequent collection systems. These typologies vary depending on the preferred level and type of service, the land use distribution, available budgets, the density of the population, compatibility of the storage containers with collection systems, and collection frequency. Other main factors that reflect an implication towards temporary storage requirements include local regulations, climate conditions, aesthetic concerns, building height limitation, etc. The various types of storage include:

- > Street bin storage
- > Dedicated waste rooms inside buildings
- > Enclosures within premises
- > Central storage locations

A solid waste collection system should be compatible with the proposed storage system, in terms of provided containers, accessibility to storage locations and adopting an acceptable frequency of collection in line with common practices.

STORAGE

¹Compiled from: (i) Robert A. Corbitt - "Standard Handbook of Environmental Engineering", 1990 - p8.6; (ii) Cascadia Consulting Group - California EPA, "Targeted Statewide Waste Characterization Study: Waste Disposal and Diversion Findings for Selected Industry Groups" 2006; (iii) Allison Kasozi and Harro von Blottnitz (2010), "Solid Waste Management in Nairobi: A Situation Analysis"; (iv) Ministry of Environment website; <http://www.ciwmb.ca.gov/>; Standard Handbook of Environmental Engineering by Robert Corbitt 1990; (v) Integrated Solid Waste Management by George Tchobanoglous 1993; Mercer County Solid Waste Management District- August 2004 and the previous experience of the Consultant; (vi) The State of California, California Integrated Waste Management Board: "Estimated Solid Waste Generation Rates"

Source-separated MSW generated in the Sub-Centre should be temporarily held at generation locations and then transported for storage at a proposed onsite Transfer Station (TS). Recovered MSW materials (in single streams) will then be further dispatched to the approved offsite destination site(s) such as recycling facilities or dedicated end-users.

All Industrial and Medical Waste (i.e. potential hazardous) generated from all locations throughout the Sub-Centre should be adequately collected from the individual generation points by an authorised/certified waste Contractor/Operator for direct dispatch to an approved offsite treatment/disposal destination site(s) without being doubled-handled at an off-site facility.

Before being transported to the TS, solid waste will be stored in satellite waste rooms/areas available in each land use. The source-separation practice should be maintained throughout storage areas at each generation point. Storage rooms/areas at all generation points will be provided with the adequate provisions to ensure it is suitable to the specific aforementioned waste types, constituents, and categories. Such provisions for specific waste types/categories shall include, but not necessarily limited to, the following:

- > Adequate capacity and durability of containers with respect to their contained waste,
- > Adequate sizing of storage areas and their provision with all requirements to render them operational and safe to both public health and the environment,
- > Adequate accessibility and manoeuvrability of containers to arrive from all storage locations to the collection vehicle standing point,
- > Minimising vehicle compaction efforts for source-separated dry recyclable materials (Plastics, metals, glass) to preserve their end-market value.

SOLID WASTE TRANSFER

Table 13.13: Estimated MSW Quantities and Volumes

Estimates	Organic Waste		Dry Recyclables		General Waste		Total	
	Qty. (t/d)	Vol. (m3/d)	Qty. (t/d)	Vol. (m3/d)	Qty. (t/d)	Vol. (m3/d)	Qty. (t/d)	Vol. (m3/d)
0 - Residential	14	45	10	86	6	43	30	174
1 - Industrial	6	19	91	756	-	-	97	775
1 - Warehouses	-	-	75	704	9	62	84	766
2 - Education	0.1	0.4	1	6	0.4	2	1.5	8.4
3 - Recreation / Retail	5	15	45	393	8	53	58	461
4 - Public Purpose	41	133	39	267	15	101	95	501
4 - Public Purpose (Health)	0.7	2.2	3	27	0.6	4	4.3	33.2
5 - Commercial (Offices)	5	18	16	152	2	14	23	184
12 - Hospitality / MICE	0.4	1	0.5	4	0.05	0.3	0.95	5.3
Total	72	234	279	2,395	41	279	394	2,808

13

MSW consolidation and storage at the Transfer Station (TS) is likely to be cost effective - i.e. by reducing MSW volumes (the major waste type in terms of quantities) - thus reducing direct hauling costs associated with travel distances to further handling offsite or disposal destinations.

At this preliminary project stage, the TS is proposed to comprise a two-level arrangement structure with actual MSW handling operations occurring within an enclosed building to minimise health, safety, and environmental impacts/nuisance. The total area proposed for TS is approximately 1.1 Ha, with an indicative rough cost estimate highlighted in Table 13.14.

The Transfer Station will act as an interface/transition point between off-site SWM operations and downstream/offsite Municipal services for the transfer/transport of the three source-separated streams.

MSW streams will be conducted and monitored by the relevant Municipality body or their Representative from the TS to the approved downstream and offsite destination site(s).

Onsite waste collection vehicles arriving at the TS from various MSW generation locations within the Sub-Centre will be directed to the upper level of the station through a ramp. The vehicles will directly unload waste contents at each dedicated bay through hoppers, eventually leading to designated processing equipment, comprising of either hook-lift containers or compaction units at the lower ground level (typical example shown in Figure 13.8).

The total area require a Transfer Station is around 1.1 Ha. However, Kenyatta airport serves turbine aircraft. Therefore the solid waste transfer station a minimum of 3000m from the aircraft operation area is recommended to be clear of any wildlife attracting facility. If protection of the approaches and circling airspace is required, then 8km is recommended.

Table 13.14: Indicative Rough Cost Estimate

ESTIMATED COST (M\$) FOR TRANSFER STATION AND EQUIPMENT	M\$ 9.0
Main Assumptions	<ul style="list-style-type: none"> *excludes land cost *excludes the cost of transport of waste to offsite treatment/disposal facilities, all of which are considered as part of operational cost *equipment life-span is 5 years – cost of renewal is excluded *quantities increased by 20% to cater for any unforeseen events

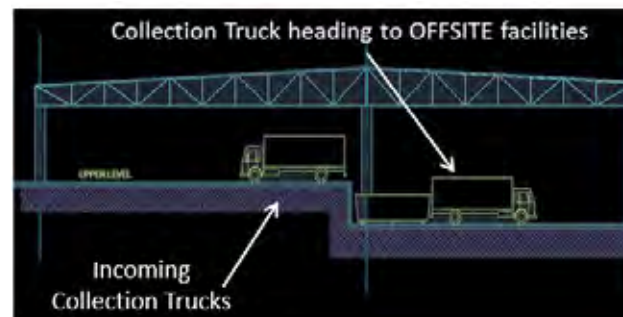


Figure 13.8: Typical Example of Municipal Solid Waste Transfer Station

In addition to MSW generation quantity estimates, space allocations for the MSW TS are generally driven by operational-related aspects. Among other issues, this mainly comprises of:

- > Truck circulation requirements inside the mezzanine floor of the station in accordance with anticipated collection trucks specifications, intended for use by the end-user (onsite Waste Collection Contractor/Operator),
- > Storage duration at the station, and
- > The anticipated frequency of collection of waste from the TS to the approved offsite facilities by end-user(s).

Furthermore, and in order to minimise excessive storage of MSW at the TS and hence avoid its over-sizing, the design may be based on a one-day storage time, prior to further dispatch of the stored MSW to an approved offsite destination site(s), such as recycling facilities or dedicated end-users.

In addition to the waste management operational areas, the TS may accommodate offices and support facilities designed to overlook the station's operations. As such, these will best be located at the upper level of the station.

The main arrangement and design of the TS shall be considered in line with the provision of necessary MEP and other adequate design requirements to ensure it is environmentally sound, hygienic, and safe.

13.5.6 SOLID WASTE COLLECTION

The solid waste collection system should adhere to a separated solid waste collection process. The particular items to be considered in this regard are as follows:

- > Waste collection vehicles should be able to accommodate for the various types and sizes of waste storage containment; these should be specific for collection of all types of generated waste; thus could be of the compacting and non-compacting type.
- > Frequency of collection shall be minimised to at least daily, where food or other organic MSW is anticipated to be generated and could vary for potential hazardous waste, depending on the generated solid waste quantities and adopted storage guidelines.
- > Collection times and truck routes should be coordinated with traffic administration to minimise traffic congestions and nuisance.
- > Collection trucks should be of varied capacities in accordance with the frequency of collection.
- > The transportation of potential hazardous waste should be performed by specialised and licensed service providers in dedicated enclosed vehicles to avoid spillage. The transportation operations should be complemented with consignment notes as part of a manifest system for departure and delivery. This should take into account the types and quantities of material shipped, the transporter and receiver information, and any other measure deemed necessary by concerned public authorities.

13.5.7 SOLID WASTE TREATMENT AND DISPOSAL

As mentioned above, the treatment and disposal of MSW generated from the SGR Embakasi Railway Station Area – Sub-Centre should be adequately integrated with dedicated solid waste treatment/disposal facilities in accordance with Municipality requirements.

13 13.6 POWER

This section of the report is intended to define the scope of the electrical installations required for the proposed SGR Embakasi Railway Station Area project in the city of Nairobi. It will point out the basic design criteria, which will be adopted for the estimation of the demand requirements and proposals for the power supply schemes.

13.6.1 ELECTRICAL LOAD ESTIMATE

In order to determine the capacities required by the main electric supply system, an assessment of the maximum demand is necessary. In order to achieve this, the demand loads, load density and diversity factors need to be defined. These definitions are outlined as:

Table 13.15: Load Density Factors-General

Land Use Type	Load Density Factor (VA per Sq.mtr.)
0 - Residential	82
2 - Education / 14 - Serviced Apartments	100
3 - Recreation/Retail / 10 - Culture / 12 - Hospitality/MICE	117
4 / Public Purpose / 5 - Commercial/Offices	134
13 - Green Spaces (Open Area)	1
Transport Terminus	30
Truck Parking (Open Area)	5

13.6.2 LOAD DENSITY FACTORS

For residential/commercial buildings, community facilities, hotels and utilities, depending on the classification of the purpose, maximum connected load density factors ranging between 1 VA/m² and 134 VA/m² will be used. Similar figures have been used in other projects in Kenya. Table 9.15 provides summary of the load density factors that will be used:

13.6.3 DIVERSITY FACTORS

The load estimate of the development as a whole will be estimated using diversity factors, at different levels of the proposed power system.

The diversity factors that will apply starting from the users upwards, for all land uses except for green spaces, truck parking and street lighting are summarised as follows:

Table 13.16: Load Diversity Factors-General

Land Use Type	Load Density Factor (VA per Sq.mtr.)
At user level	70%
Between users, i.e. at the 11/0.415 kV transformer level	80%
Between 11/0.415 kV transformers, i.e. at the 11 kV loop level	80%
Between 11kV loops, i.e. at primary substation level (11kV switchgear)	95%
Between primary substations i.e. at grid substation level	100%

13.6.4 MAXIMUM DEMAND ESTIMATE

Based on the above analysis, the demand load of the proposed development at 66/11kV substation level is estimated to be approximately 147.5 MVA. Refer to Table 13.17 for detailed load estimation.

Table 13.17: Load Estimation

LAND USE ZONES	BUA (M2) NET FLOOR AREA NON-RESI GLA	BUA (M2) NET FLOOR AREA RESI GLA	GROSS AREA (M2)	CONNECTED LOAD DENSITY FACTOR (VA/M2)	CONNECTED LOAD (KVA)	DEMAND FACTOR AT USER LEVEL	DEMAND LOAD (KVA)	DIVERSITY BETWEEN USERS	DEMAND LOAD AT TRANSFORMER LEVEL (KVA)	DIVERSITY FACTOR BETWEEN TRANSFORMER	DEMAND LOAD AT LOOP LEVEL (KVA)	DIVERSITY FACTOR BETWEEN LOOP	DEMAND LOAD AT 66/11KV SS LEVEL (KVA)	DIVERSITY FACTOR BETWEEN 66/11KV SS	DEMAND LOAD AT 220/66KV SS LEVEL (KVA)
0 - Residential		784,550		82	64,333.10	0.70	45,033.17	0.80	36,026.54	0.80	28,821.23	0.95	27,380.17	1.00	27,380.17
1 - Industrial / Warehouses	335,478			100	33,547.80	0.70	23,483.46	0.80	18,786.77	0.80	15,029.41	0.95	14,277.94	1.00	14,277.94
2 - Education (Residential)		41,291		82	3,385.88	0.70	2,370.12	0.80	1,896.09	0.80	1,516.88	0.95	1,441.03	1.00	1,441.03
2 - Education (Non Residential)	110,630			100	11,063.00	0.70	7,744.10	0.80	6,195.28	0.80	4,956.22	0.95	4,708.41	1.00	4,708.41
3 - Recreation / Retail	209,511			117	24,512.82	0.70	17,158.97	0.80	13,727.18	0.80	10,981.74	0.95	10,432.65	1.00	10,432.65
4 - Public Purpose	387,774			134	51,961.68	0.70	36,373.18	0.80	29,098.54	0.80	23,278.83	0.95	22,114.89	1.00	22,114.89
5 - Commercial (Offices)	410,735			134	55,038.49	0.70	38,526.94	0.80	30,821.55	0.80	24,657.24	0.95	23,424.38	1.00	23,424.38
10 - Culture	257,384			117	30,113.90	0.70	21,079.73	0.80	16,863.78	0.80	13,491.03	0.95	12,816.48	1.00	12,816.48
11 - Mixed Use (Residential)		339,651		82	27,851.38	0.70	19,495.97	0.80	15,596.77	0.80	12,477.42	0.95	11,853.55	1.00	11,853.55
11 - Mixed Use (Recreation / Retail)	37,739			117	4,415.46	0.70	3,090.82	0.80	2,472.66	0.80	1,978.13	0.95	1,879.22	1.00	1,879.22
12 - Hospitality / MICE (Non Residential)	189,928			117	22,221.62	0.70	15,555.13	0.80	12,444.11	0.80	9,955.29	0.95	9,457.52	1.00	9,457.52
12 - Hospitality / MICE (Residential)		81,398		82	6,674.63	0.70	4,672.24	0.80	3,737.79	0.80	2,990.23	0.95	2,840.72	1.00	2,840.72
13 - Green Spaces			680,000	1	680.00	0.90	612.00	0.90	550.80	0.90	495.72	0.95	470.93	1.00	470.93
14 - Serviced Apartments		48,750		100	4,850.63	0.70	3,395.44	0.80	2,716.35	0.80	2,173.08	0.95	2,064.43	1.00	2,064.43
Roads			1,193,050		482.50	0.90	434.25	0.90	390.83	0.90	351.74	0.95	334.16	1.00	334.16
Transport Terminus			42,000	30	1,260.00	0.70	882.00	0.80	705.60	0.80	564.48	0.95	536.26	1.00	536.26
Truck Parking			253,000	5	632.50	0.90	569.25	0.90	512.33	0.90	461.09	0.95	438.04	1.00	438.04
66/11kV Electrical Substation - 1			5,000		300.00	0.70	210.00	0.80	168.00	0.80	134.40	0.95	127.68	1.00	127.68
66/11kV Electrical Substation - 2			5,000		300.00	0.70	210.00	0.80	168.00	0.80	134.40	0.95	127.68	1.00	127.68
66/11kV Electrical Substation - 3			5,000		300.00	0.70	210.00	0.80	168.00	0.80	134.40	0.95	127.68	1.00	127.68
Pump Stations					526.79	0.70	368.75	0.80	295.00	0.80	236.00	0.95	224.20	1.00	224.20
Solid Waste Transfer Station			14,000		1,000.00	0.70	700.00	0.80	560.00	0.80	448.00	0.95	425.60	1.00	425.60
TOTAL	1,939,179	1,295,640	2,197,050		345,452		242,176		193,902		155,267		147,504		147,504

13 13.6.5 PROPOSED NORMAL SUPPLY SCHEME

Based on the criteria stated above and the estimated loads, a total of three (3) 2x45MVA, 66/11kV substations are proposed, as shown in Figure 13.10, in order to cater for the maximum demand load of the proposed development.

As per coordination with KPLC officials, the nearest power supply source to feed the proposed substations is the existing 3x90MVA, 220/66kV substation at Embakasi. The substation is approximately loaded to 250MVA, which translates to 93% of available transformation capacity. Therefore, in order to supply the proposed substations for the development, an increase of the available capacity is required. The available capacity at Embakasi substation can be increased in two ways:

- > Transferring several 66kV feeder loads currently served by Embakasi substation, to other 220/66kV substations such as City Centre or Athi substations, or
- > Increase the transformation capacity of Embakasi to 2 X 200MVA.

The coordination with KPLC officials as mentioned above, was based on 96 MVA demand load and two numbers 2x45MVA, 66/11kV substations (SS-01 and SS-02). However, as per the updated proposals, further coordination with KPLC is required during the upcoming stages of the project to account for an updated demand load of 126MVA, necessitating one (1) additional 2x45MVA, 66/11kV substation (SS-03).

As no consumer has a maximum demand load greater than 10 MVA, power supply at 33kV voltage level does not exist/is not required. Henceforth, an 11kV voltage rating of power supply is proposed for the whole project.

13.6.6 MEDIUM VOLTAGE UNDERGROUND DISTRIBUTION SYSTEM

The new 11kV and 0.415kV systems, which shall be installed, are underground. The ratings of the proposed outdoor package substations, shall be 11kV/0.415kV, 315kVA, 630kVA, 1000kVA etc.

The 11kV circuits will depart from the 66/11kV primary substations in loops. This is proposed as a simple two-legged, underground, directly buried network, placed under sidewalks, with an open tie substation along the network. The 8 MVA power loading of the 11 kV ring loop corresponds to the use of a copper cable with size of 3C, 300mm², directly buried in ground as conveyed in the Distribution Master Plan Study Report-Volume I, prepared for KPLC. The loop system allows for continued service for all consumers, even under failure conditions of one cable in any part of the network, allowing maintenance crews to take their time in repairing the faulted part. Each leg of the 11 kV loop will be designed to carry up to 8 MVA of emergency loading. Under normal conditions, each leg will typically carry 50% of the cable capacity. The cables will be directly buried and encased in duct banks at road crossings only.

The cables will supply the secondary 11/0.415 kV substations as shown in Figure 13.10. These fall under two categories:

- > Outdoor; where they would be located on medians/ green space or sidewalks, in prefabricated enclosures. These substations will serve small residential buildings, maisonettes, public lighting, pumping stations and solid wastewater transfer station loads etc.
- > Indoor; where they would be integrated in the respective private building they serve. In this case, the substation works would be part of the building/plot developer's scope rather than the infrastructure scope.

Refer to Figure 13.10, Figure 13.11 and detailed information from Technical Study 6 for two alternative layouts of MV network typical schematics.

13.6.7 PACKAGE SUBSTATIONS

The medium/low voltage substations will be of a package type, where the MV switchgear, MV/LV transformer and LV switchgear are integrated in a single enclosure. The low voltage distribution network will comprise XLPE insulated cables of different sizes. These will be based on the load of each building, directly buried under the sidewalks and encased in secondary duct banks at road crossings and building entrances.



Figure 13.9: Typical Package Substation

The MV switchgear will include ring main unit switchgear, with one (1) incoming, one (1) outgoing, and one (1) transformer unit. The units will include a switch disconnecter, operable by handles at the front of unit. The switching mechanism is to be a manual, spring-charged, quick-break type. The transformer unit will include a fuse-switch combination.

The transformer shall be oil-type and suitable for indoor installation. Roofs and walls of housing are to be thermally insulated to maintain temperature inside the enclosure within acceptable limits. Lockable, double swing doors are to provide access independently to MV and LV compartments. Access to the transformer is to be through demountable bolted panels. It will be made impossible to reach equipment or live parts from outside the housing.

Proposed Power Supply Scheme

LEGEND

- Main Road
 - Secondary Road
 - Standard Gauge Railway (SGR)
 - Nairobi Commuter Railway (NCR)
 - Core Area Boundary
 - Planning Area Boundary
 - Water Courses
 - Proposed 66kV Network
 - Constituency Boundary
 - Proposed 66/11kV Substation (SS-XX)
 - Proposed 220/66kV Embakasi Substation (SS-XX)
 - Existing Land Use
- XX: SUBSTATION SEQUENCE NO ISL02.03

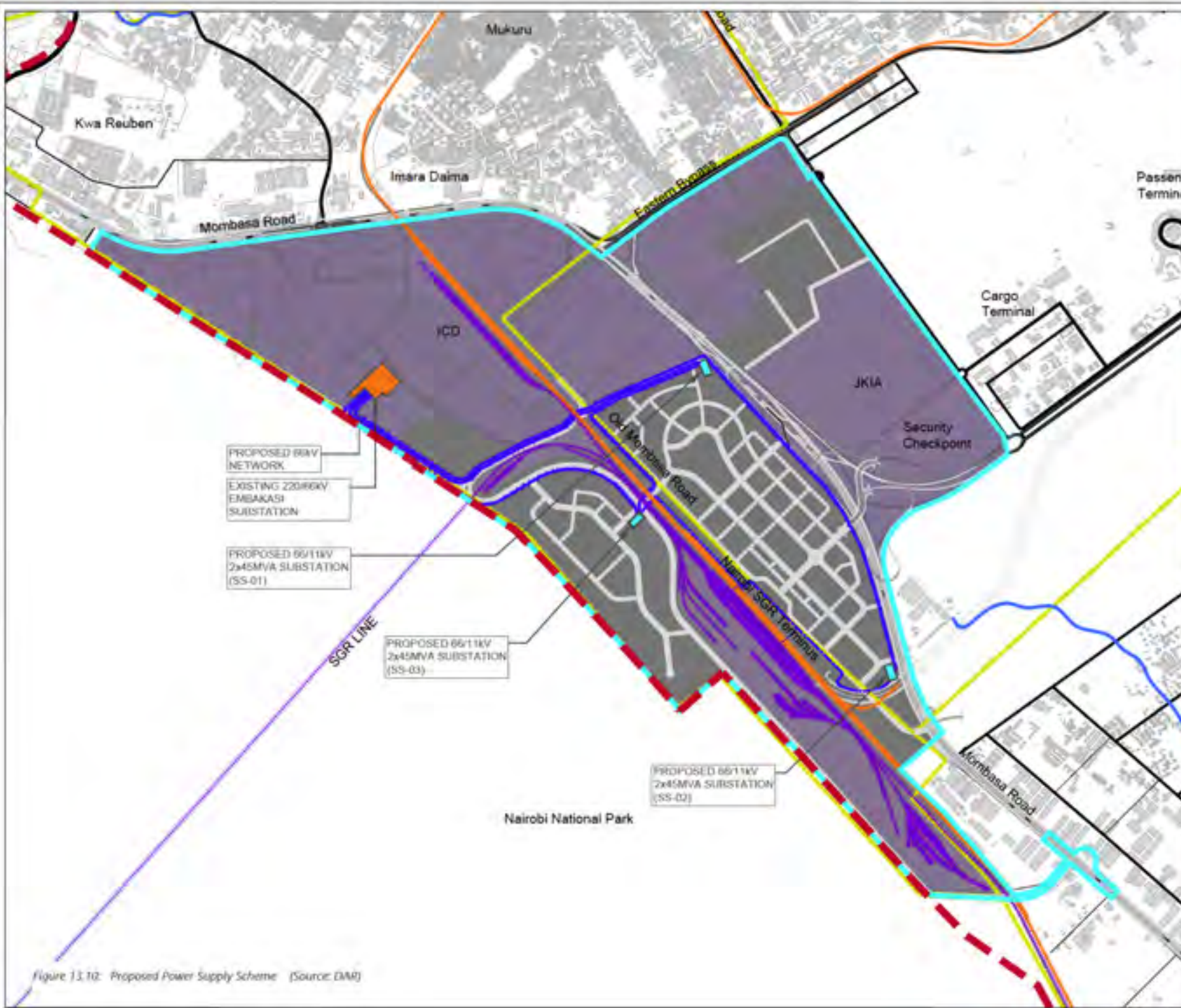


Figure 13.10: Proposed Power Supply Scheme (Source: DMR)

13

13.6.8 LOW VOLTAGE UNDERGROUND DISTRIBUTION SYSTEM

Generally, each 11/0.415 kV package substation will have six outgoing including two (2) spare feeders. Each package substation will feed downstream, low voltage distribution pillars/sub distribution pillars/feeder pillars for the low voltage street lighting, residential loads, community facilities and common utilities etc.

The LV cable shall be 4-core copper conductors, armour, XLPE or PVC insulated and rated 600/1000 V of different sizes based on the demand load of the plots and the utility buildings. Armouring of the cable will be used for earthing connectivity. LV cables shall be directly buried and encased in duct banks at road crossings with adequate spare ducts.

13.6.9 COMMON UTILITY SERVICES

The common utilities shall be supplied with power from the nearest package substation or an independent package substation shall be proposed based on the load requirements.

Table 13.18: Lighting Design Criteria

Luminance Criteria	Bypass Road	All Other Roads
Average Luminance Lav (cd/m ²) (minimum maintained)	1.5	1.0
Overall Uniformity U0 (Lmin/Lav)	0.4	0.4
Longitudinal Uniformity UL (Lmin / Lmax)	0.7	0.6
Threshold Increment (FTI) not exceeding	10	15

13.6.10 PROPOSED STANDBY SUPPLY SCHEME

No centralised emergency backup is considered for the proposed development. Users of the plots will have to cater for their own emergency power supplies, if required.

Generators/standby supply shall be provided, for the common facilities serving the development, such as sewage/ water pumping station as per the requirement. In addition, it is recommended that residential units are provided with adequate outdoor space to accommodate their private generator, should the tenant decide to do so.

13.6.11 STREET LIGHTING

Lighting Design Criteria

The roadways lighting system will be designed to ensure the recommended illumination levels for various classes of roadways are maintained as per International Commission on Illumination CIE-115 (2010) standards. LED luminaires have been selected for their long life, energy savings and high efficiency in addition to their aesthetic appearance. Refer to Table 13.18 for luminance criteria.

Proposed Lighting Installations

The proposed lighting system is as follows:

- > 47.6 m Boulevard-1 Road: 1x108W LED light fixture at 12m height and 1x76W LED Light fixture at 6m on double arm steel column on both sides of the road spaced every 40 meters.
- > 42 m Primary Road: 1x108W LED light fixture at 12m height and 1x76W LED Light fixture at 6m on double arm steel column on both sides of the road spaced every 40 meters.
- > 38 m Bypass Road: 2x250W LED light fixture at 12 m height on steel column installed at the median of the road spaced every 40 meters.

- > 37.5 m Boulevard-2 Road: 1x108W LED light fixture at 12m height and 1x76W LED Light fixture at 6m on double arm steel column on both sides of the road spaced every 40 meters.
- > 27.5m Collector Road: 1x108W LED light fixture at 12m height on double arm steel column on steel column on one side of the road spaced every 40meters.
- > 24 m Local Roads: 1x108W LED light fixture at 12m height on steel column on one side of the road spaced every 40meters.
- > Restricted Access Road: 2x108W LED light fixture at 10 m height on steel column installed at the median of the road spaced every 40 meters.

Power Supply

The power supply for the road lighting and landscape installations is ensured by using street lighting feeder pillars fed from the nearest outdoor package substation located within the area. The feeder pillars will be equipped with an electronic timer and/or photocell, for automatic activation of the lighting system.

Power supply to the lighting poles will be provided in a way to maintain a voltage drop not exceeding 5% between source and the last pole on the circuit. Cables supplying power to the street lighting poles will be 4C 16 mm² CU/XLPE/SWA/PVC directly buried cables.

At road crossings, they will be routed through independent duct crossings.

13.6.12 TRAFFIC SIGNALS

Traffic signal systems will be implemented for road intersections as per the transportation design intent.

The system will include a controller, loop detectors, signal masts lamp heads, red light violation detection, complete with lamps and pedestrian facilities. Cabling and connection to the controller will be ensured via ducting and draw pits.

PROPOSED MV SUBSTATIONS LAYOUT

LEGEND

- Main Road
- Secondary Road
- Standard Gauge Railway (SGR)
- Nairobi Commuter Railway (NCR)
- Core Area Boundary
- Planning Area Boundary
- Water Courses

Symbol	Description
	110KV/220KV Substation
	110KV/33KV Substation
	110KV/10KV Substation
	110KV/6KV Substation
	110KV/3KV Substation
	110KV/0.4KV Substation

Substation ID	Substation Name
SS1	110KV/220KV Substation
SS2	110KV/33KV Substation
SS3	110KV/10KV Substation
SS4	110KV/6KV Substation
SS5	110KV/3KV Substation
SS6	110KV/0.4KV Substation
SS7	110KV/220KV Substation
SS8	110KV/33KV Substation
SS9	110KV/10KV Substation
SS10	110KV/6KV Substation
SS11	110KV/3KV Substation
SS12	110KV/0.4KV Substation
SS13	110KV/220KV Substation
SS14	110KV/33KV Substation
SS15	110KV/10KV Substation
SS16	110KV/6KV Substation
SS17	110KV/3KV Substation
SS18	110KV/0.4KV Substation
SS19	110KV/220KV Substation
SS20	110KV/33KV Substation
SS21	110KV/10KV Substation
SS22	110KV/6KV Substation
SS23	110KV/3KV Substation
SS24	110KV/0.4KV Substation
SS25	110KV/220KV Substation
SS26	110KV/33KV Substation
SS27	110KV/10KV Substation
SS28	110KV/6KV Substation
SS29	110KV/3KV Substation
SS30	110KV/0.4KV Substation

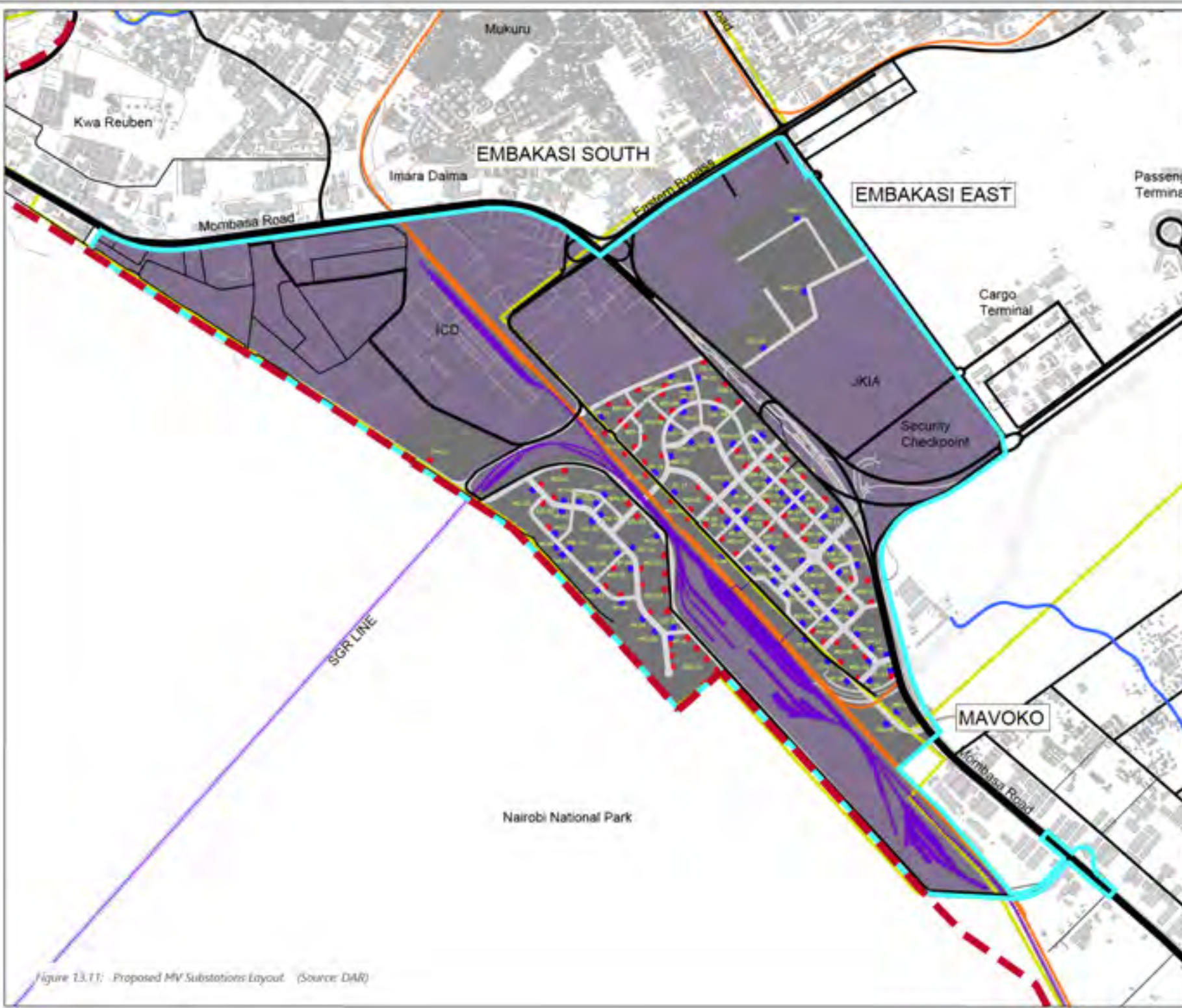


Figure 13.11: Proposed MV Substations Layout (Source: DAR)

13 13.7 TELECOMMUNICATION

13.7.1 INTRODUCTION

This section provides an overview for the telecommunications infrastructure vision for SGR Embakasi Railway Station Area project in the City of Nairobi. The vision is to provide a triple-play converged network framework to connect and serve every residence, commercial office, retail unit, utility and community facility, etc. to narrowband and broadband data services (voice, video, internet connection etc.). The project area will be served by a Fiber-To-The-Home (FTTH) network fanning from nearby telecom exchanges.

Estimation Criteria and Assumption

The project site consists of a variety of land uses and building functions, hence, the work herein involves the provision of telecommunications system services for these uses.

Bandwidth Forecast

I. Voice Lines Calculations

The number of fibre lines required per plot is calculated based on the planning parameters and assumptions presented in Table 13.19.

II. Broadband Bandwidth Consideration

The technology that will be adopted in SGR Embakasi Railway Station Area shall be fiber-to-the-home based on a Passive Optical Network PON. The PON topology is based on the PON distributor or the Optical Line Terminal (OLT) located in the exchange, the downstream splitters located at street cabinets and the Optical Network Units (ONUs) located at each plot premises.

The OLT is the main PON streamer which provides the PON data stream. This data stream - depending on the PON technology - can range from 500Mb/s up to 10Gb/s. The most established streams are the EPON (for 1Gb/s) and GPON (2.5Gb/s). The 2.5 Gb/s GPON stream will be considered in this design.

Table 13.19: Number of Lines Calculation Assumptions

0 - Residential	1 line per residential Units.
1 - Industrial / Warehouses	1 line per each 500 sq.m.
2 - Education	1 line per each 200 sq.m.
3 - Recreation / Retail	1 line per each 100 sq.m.
4 - Public Purpose	1 line per each 200 sq.m.
4 - Public Purpose (Health)	1 line per each 200 sq.m.
5 - Commercial (Offices)	1 line per each 45 sq. m.(for office Space) and 1 line per each 100 sq. m. (for Retail space)
6 - Public Utility	1 line per each 500 sq.m.
10 - Culture	1 line per each 200 sq.m.
11 - Mixed Use (Residential)	1 line per residential unit
11 - Mixed Use (Recreation / Retail)	1 line per each 100 sq.m.
12 - Hospitality/ MICE	1 line per each 200 sq. m for non-residential area and 1 line per each 100 sq. m for residential area.
13 - Green Spaces	-
14 - Serviced Apartments	1 line per each Service apartment / 1 line per each 100 sq. m.
Roads	-
Electrical Substation	1 line per each sub-station
Pump Station	1 line per each station

The splitter equally splits the signal coming from the OLT into each downstream branch (for instance in a 4-way splitter, the stream from the OLT is split into 4 equal streams). The home premises device or ONU (Optical Network Unit) reads the fiber signal coming from the OLT and converts the data into an electrical signal useful for indoor usage (e.g. telephone, data, internet, video, etc.).

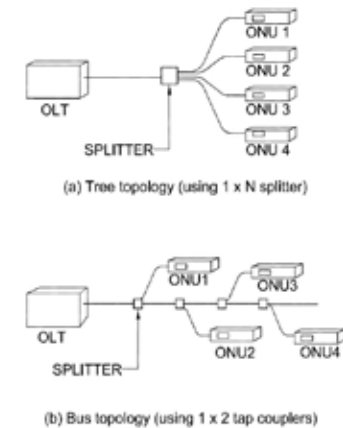


Figure 13.12: Typical PON Distribution

III. PON Assumption and Calculation Criteria

The assumed PON network to be adopted is the GPON, delivering 2.5 Gb/s per each fiber optic strand. This stream can be subdivided into 1, 1/2, 1/4, 1/8, 1/16, 1/32, 1/64 subdivisions or a mixture of those mentioned. As such, any premises can have 2.5 Gb, 1.25 Gb, 625 Mb, 160 Mb, 80 Mb, 40 Mb, 20 Mb, etc. Other subdivisions can be provided upon need.

In the proposed project area, each plot unit is assumed to have a bandwidth of 80 Mb/s (being the subdivision of 2.5 Gb/s over a 32 slot splitter). In the case of commercial spaces, it was assumed that offices constitute 35% of the total area whereas retails constitute 65%. Once the number of units inside each plot is calculated, then one of the following can be defined:

- > The needed number of 2.5 Gb/s FO cores reaching each plot and the number of splitters to be installed inside the building. This is the case when the plot requires numerous 80 Mb/s lines (Commercial plots, Educational Plots, Utility Plots, etc.),

- > The needed number of 2.5 Gb/s FO cores reaching a specific manhole/handhole and the number of splitters to be installed inside it. Each plot will then be served by a specific number of 80 Mb/s lines as needed, from the nearest manhole. This is the case when the plot requires few 80 Mb/s lines (Single Family Housing, Maisonettes etc.)

Table 13.20 describes the total number of 80 Mb/s lines required to serve the project area per building type, based on planning parameters and the assumption stated above. It is estimated that 26,289 x 80 Mb/s lines are required to serve the project area (corresponding to 995 x 2.5 Gb/s lines) considering 20% spare cabling.

The concept for the proposed Telecom infrastructure network layout is shown in Figure 9.13.

IV. PON Network Architecture

> Primary Network

The primary network is the cabling network stretching from the exchanges' location up to each cross connection cabinet of the secondary network. Cabling is assumed to be 144-core cables running from the exchanges through ducts and splitting into three 48 cables, with each cable reaching a cabinet. It is also assumed that each duct will accommodate 3 X 144-core Fiber Optic cables by utilising sub-ducting.

> Secondary Network

Additionally, the FTTH network requires a point of interconnection between the exchange and each plot; this is called a cross connection fiber optic cabinet or a short named cabinet. The cabinet would serve for service connection and maintenance and also available to allocate spare cable cores to new plots in the future or to more cable core requirements for plots. It will have around 20% of extra secondary cabling to cater for any future growth.

The existing cabinets can accommodate up to 48 cores from the exchange and up to 1500 unit connections to the secondary plots. Splitters can be added inside the cabinet where each fiber core can be split into numerous

FO secondary cables and each of those cores would feed one unit. However, and since the majority of the plots have large demand and are composed of several units, most of the cabinets will not include splitters but only use a cross connection panel. Splitters will be located in each buildings main telecom room.

ii. PON Civil Works

The civil works will be dictated by the cable routing. First, the design starts with defining the need of each plot and to convert this need into fiber optic cabling.

Each cable will run in a duct (a HDPE pipe which is pulled in a 110mm of diameter uPVC duct). Each duct can accommodate 3 sub-ducts. This manoeuvre will triple the usage of the duct and will, as a result, reduce the number of ducts.

The civil works infrastructure upon the primary network will engulf all the cabling from the exchange up to each cabinet. As per the above assumption and once the cabinets have been identified, ducting can be sized by considering that each cabinet will be connected to one (1) 48-core cable, and each three (3) 48-core cables leading to three (3) cabinets will be spliced into a larger 144-core cable. The 144-core cable will occupy one sub-duct, and after determining the route to reach each cabinet, the number of ducts needed to feed the cabinets can be reduced. An additional 20% of spare duct for future cabling as well as additional ducts for future networks (GSM, etc.) has also been considered.

The manholes/handholes used are predominantly of large types, mainly of MR4, JRC12 and JRC14. Manholes/handhole assumptions will be based on the below:

- > Major Arterial : MR4
- > Minor Arterial : JRC14, JRC12, JRC4

The utility corridor needed for the primary network will be 1.3m to accommodate the width of the manholes.

In the secondary network (from the cabinet to the plot), ducts will be connecting the cabinets to the plots through adequate

manholes. Each plot will be fed by one (1) or two (2) 110mm duct, and 2 adjacent manholes will be linked through two (2) or more 110mm ducts. The secondary network manholes (i.e. handholes) will be calculated to suit the current and future needs of the SGR Embakasi Railway Station Area. The utility corridor needed for the secondary network will be 1.3m to accommodate the width of the manholes/ handholes.

III. GSM Coverage Within SGR Embakasi Railway Station Area

The civil works will be able to accommodate almost any GSM network which will be introduced in the SGR Embakasi Railway Station Area. The provision of services for GSM will be done by the Telecom operators. However, it is important to highlight that coordination with GSM operator is required to identify the exact requirement of each GSM service provider. This is required as some international operators would negate sharing the infrastructure with other operators which obliges the developer to provide separate civil and cabling infrastructure networks for each GSM operator. For the proposed development, it is assumed that the GSM operators will be sharing the same duct bank infrastructure with all on-board telecom operators.

iv. Cost Estimate

The cost estimate for telecom civil works is based on the following assumptions:

- > The proposed telecom network shall be connected to nearby existing telecom exchange offices.
- > Concrete encased ducts are considered for the telecom network cost estimation (until further coordination for the exact telecom reservation in the roads is distinguished).

The total cost estimate for the provision of the Telecom civil works for the project is 15,179,800 USD.

Table 13.20: Total Number of 80Mb/s and 2.5Gbps Lines

Land Use Zones	Development Parameters				Population		
	Gross Floor Area GFA (m2)	BUA (m2) net floor area non-Resi GLA	BUA (m2) net floor area Resi GLA	Number of Residential Units	Domestic staff	Total number of 80 Mb/s lines	Total No. of 2.5Gbps lines (With 20% Spare)
0 - Residential	1,207,000		784,550	7,846	7,846	7845.50	295.00
1 - Industrial / Warehouses	516,120	335,478				671.00	26.00
2 - Education	233,725	110,630	41,291		41	554.00	21.00
3 - Recreation / Retail	322,325	209,511				2096.00	79.00
4 - Public Purpose	596,575	387,774				1939.00	73.00
5 - Commercial (Offices)	631,900	410,735				5865.00	220.00
10 - Culture	395,975	257,384				1287.00	49.00
11 - Mixed Use (Residential / Recreation / Retail)	580,600	37,739	339,651	3,397		3775.00	142.00
12 - Hospitality / MICE	417,425	189,928	81,398		81	1764.00	67.00
13 - Green Spaces						0.00	0.00
14 - Serviced Apartments	75,000		48,750		49	488.00	19.00
Transport Terminus						0.00	0.00
Electrical Substation 01						1	1
Electrical Substation 02						1	1
Electrical Substation 03						1	1
Pump Station						1	1
Total	4,976,645	1,939,179	1,295,640	11,242	8,017	26,289	995

PROPOSED TELECOM NETWORK LAYOUT

LEGEND:

- Main Road
- Secondary Road
- Standard Gauge Railway (SGR)
- Nairobi Commuter Railway (NCR)
- Core Area Boundary
- Planning Area Boundary
- Water Course

TYPES	DESCRIPTION
	PROPOSED 66KV NETWORK
	CONSTITUENCY BOUNDARY
	CORE AREA BOUNDARY
	PROPOSED 66/11KV SUBSTATION (SS-01)
	EXISTING 220KV EMBAKASI SUBSTATION
	EXISTING LAND USE

XX: SUBSTATION SEQUENCE NO. (01-02-03)

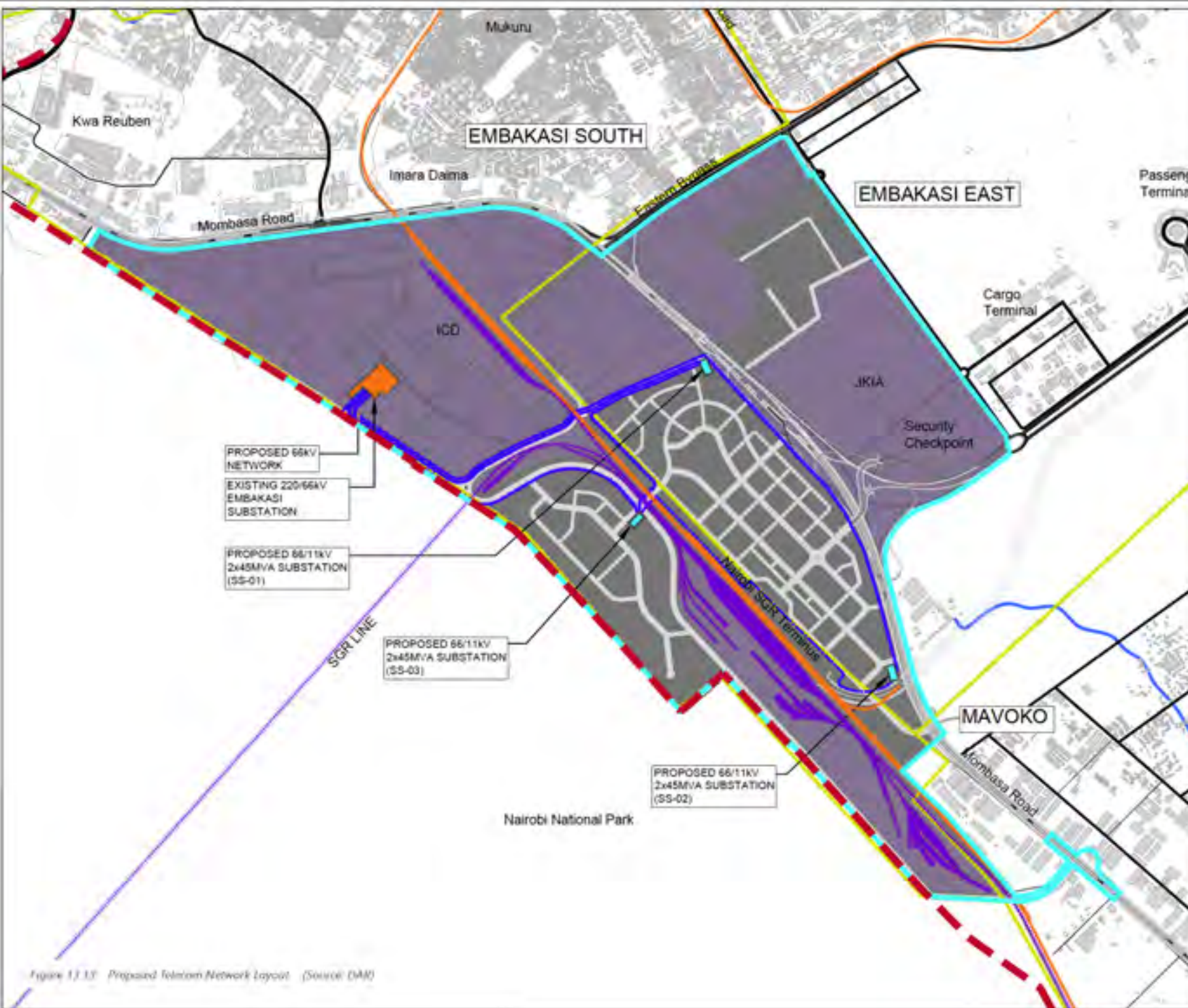


Figure 13.13: Proposed Telecom Network Layout (Source: DAR)

14. LAND ACQUISITION STUDIES

14.1 INTRODUCTION

This chapter analyses the land requirements in order to deliver the development proposed for the Sub-Centre, specifically the ownership characteristics and the quantity of land that may need to be acquired from public organisations and private landowners. The methods used to collect data on existing ownership and the overarching approach to land acquisition are explained. The findings resulting from a comparison between the Proposed Land Use Plan and existing ownership data is then set-out.

14.2 DATA COLLECTED

The data collection process started in earnest in May 2018. Letters of introduction to various government institutions, amongst others, were prepared. Once the data was collected, it was analysed for fitness of purpose. While some were found to fit the project purpose, almost all data collected had no metadata (data about data), so tasks were required to fill the gaps.

Cadastral data and its associated ownership information was acquired from Survey of Kenya (SOK). A significant part of the first lot of datasets did not have parcel identification numbers, which had to be investigated and obtained so searches of ownership could be applied for.

Some cadastral data obtained from Nairobi City County had ownership information as part of their data attributes. The ownership therein was verified with SOK as a legal requirement for ascertaining ownership.

Cadastral data was obtained from other sources, but did not overlay with that of SOK. As such, this data was used as a

guide to obtain original hard copy maps from SOK. These were digitised and datasets adjusted so as to be fit the purpose.

The result of the above tasks is a preliminary understanding of plot boundaries and land ownership, which is shown on Figure 14.1.

14.3 APPROACH

As per the Project Visioning and spatial development scenario development, stakeholders have preferred a strategy that creates a new gateway to Nairobi that is of world class standard. By definition, this necessitates a comprehensive approach to new development and a total change to the character of the area in the immediate vicinity of the Nairobi SGR Terminus. Extensive acquisition of land to facilitate this comprehensive redevelopment is inevitable.

The potential acquisition of plots within private ownership has been limited where possible by working the design around these. The outcome is the definition of one major block of land where nearly all plots may need to be acquired. This is located in the vicinity of the Nairobi SGR Terminus and comprises predominantly of existing industrial and warehouse uses. One other area of land including a number of plot is located within the existing industrial area in the north-west. Based on satellite imagery, all of these plots are currently vacant. Another area of land within the existing industrial area is also earmarked for ICD expansion.

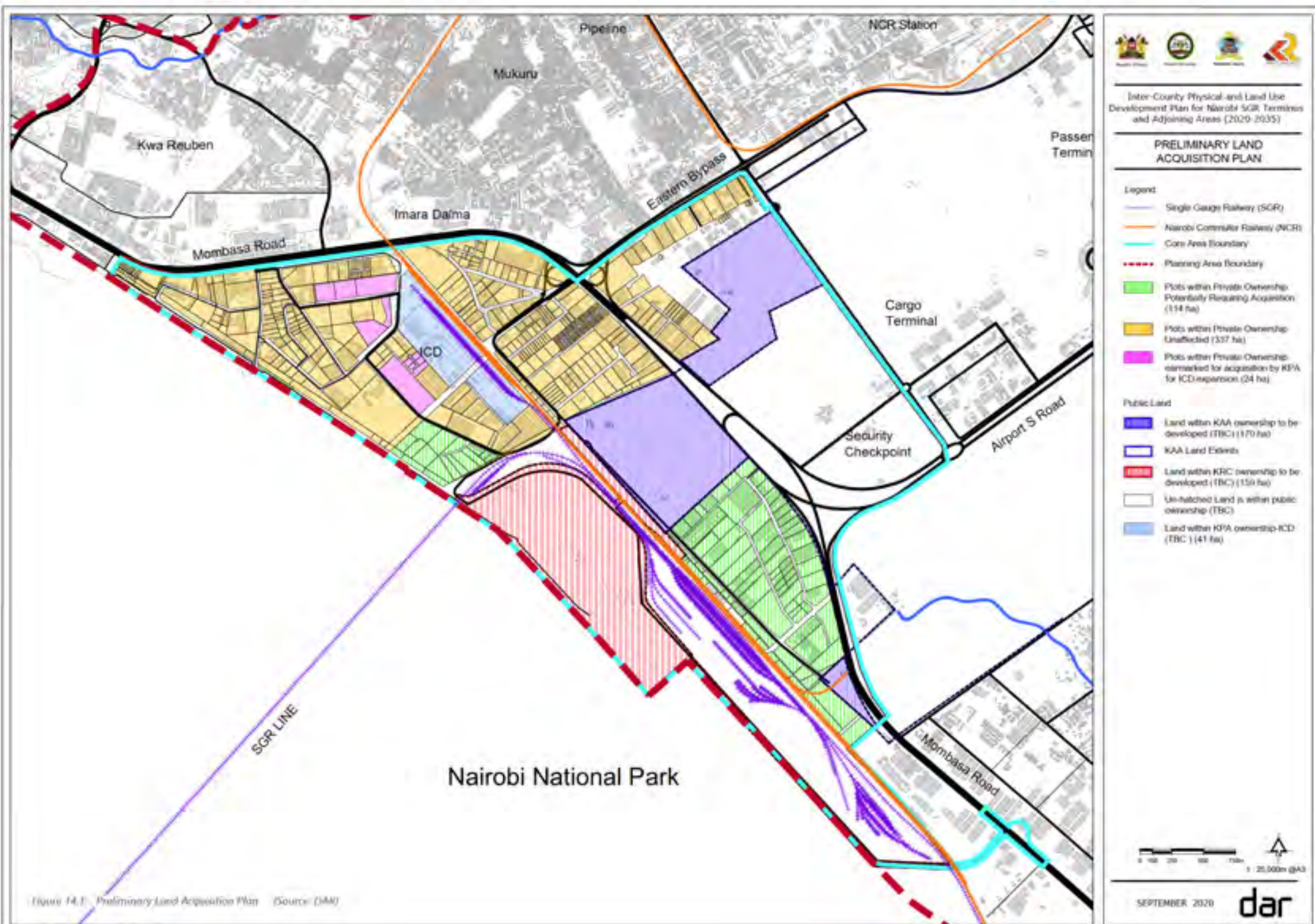
Two other small plots are required for acquisition to facilitate proposed roads. Both of these plots are narrow and awkward shapes, making it difficult to achieve a high quality of development in keeping with the new development taking place in the surroundings. One of these plots is within the north-west end of the proposed bypass road. This part is within a committed road project proposed by other public organisations.

14.4 PRELIMINARY FINDINGS

Having compared the existing plot boundaries with the Proposed Land Use Plan, the following key findings have emerged:

- > Area of land within KAA ownership to be developed (to be confirmed) = 170 hectares
- > Area of land within Kenya Railways ownership to be developed (to be confirmed) = 159 hectares
- > Area of plots within private ownership earmarked for acquisition by the ICD = 24 hectares
- > Area of plots within private ownership potentially requiring acquisition = 144 hectares
- > Area of plots within private ownership unaffected = 337 hectares

Figure 14.1 and Figure 14.2 shows the location of these areas.



PRELIMINARY LAND ACQUISITION PLAN- ZOOMED IN AREAS

Legend:

- Single Gauge Railway (SGR)
- Nairobi Commuter Railway (NCR)
- Core Area Boundary
- Planning Area Boundary
- Plots within Private Ownership
Potentially Requiring Acquisition
(114 ha)
- Plots within Private Ownership
Unaffected (337 ha)
- Plots within Private Ownership
earmarked for acquisition by KPA
for ICD expansion (24 ha)

Public Land

- Land within KAA ownership to be
developed (TBC) (170 ha)
- KAA Land Extents
- Land within KRC ownership to be
developed (TBC) (159 ha)
- Un-hatched Land is within public
ownership (TBC)
- Land within KPA ownership-ICD
(TBC) (41 ha)

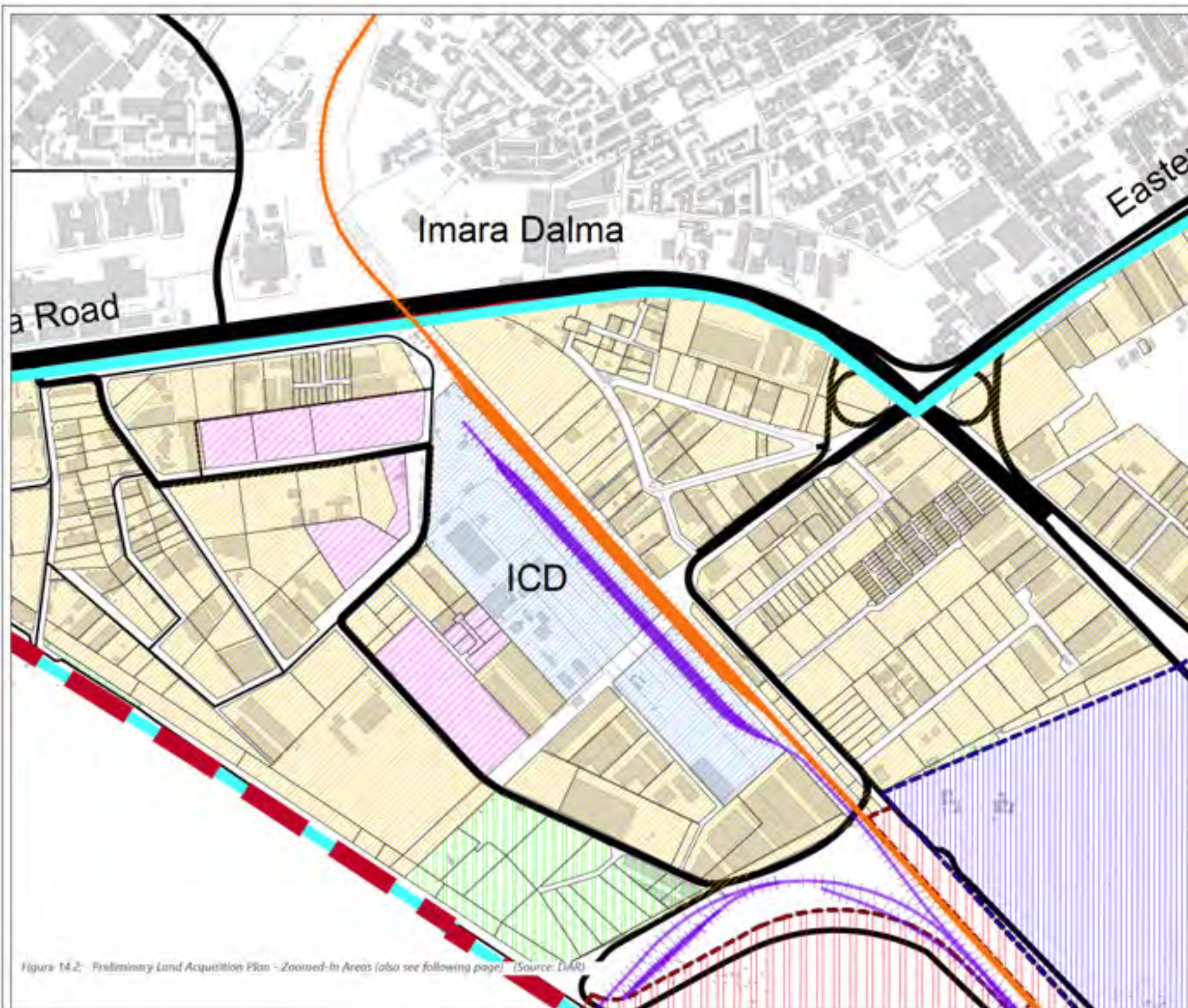


Figure 14.2: Preliminary Land Acquisition Plan - Zoomed-In Areas (also see following page) (Source: DARR)



Inter-Country Physical and Land Use
Development Plan for Nairobi SGR Terminus
and Adjoining Areas (2020-2035)

PRELIMINARY LAND ACQUISITION PLAN- ZOOMED IN AREAS

Legend:

- Single Gauge Railway (SGR)
- Nairobi Commuter Railway (NCR)
- Core Area Boundary
- Planning Area Boundary
- Plots within Private Ownership
Potentially Requiring Acquisition
(114 ha)
- Plots within Private Ownership
Unaffected (337 ha)
- Plots within Private Ownership
earmarked for acquisition by KPA
for ICD expansion (24 ha)

Public Land

- Land within KAA ownership to be
developed (TBC) (170 ha)
- KAA Land Extents
- Land within KDC ownership to be
developed (TBC) (150 ha)
- Un-hatched Land is within public
ownership (TBC)
- Land within KPA ownership-ICD
(TBC) (41 ha)

Security
Checkpoint

Nairobi National Park



SEPTEMBER 2020

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15. FINANCIAL FEASIBILITY STUDIES

15.1 INTRODUCTION AND SUMMARY

This section presents the financial pre-feasibility of the Nairobi SGR Terminus Sub-Centre proposals and provides an assessment of its financial performance. The results and observations in this section are the focus of the financial model that employs the necessary methodologies to ensure financial rigour.

The analysis covers a project period of 31 years, inclusive of all three phases from start of Site Development to the end of Operations. The Project is assumed to begin in 2020 (Site Development start) and end in 2051. Site development works enabling Infrastructure (Roads etc.) are expected to last for one year in phase 1. Each phase, lasting 22 years, comprises a Construction period of 2 years when the real assets are created and an Operations period of 20 years when the revenue generation starts post-Construction.

Utilising the full suite of benchmarked assumptions, the project generates USD 21.56 bn on a nominal basis, with a Pre-Tax IRR (internal rate of return) of 14.26% on the basis of a Pre-Tax WACC (weighted cost of capital) of 12.83%. Specific sensitivities have been run to test the robustness of the Project.

Further details are contained in Technical Study 4.

15.2 PROJECT DELIVERY APPROACH

The analysis uses a classic approach that considers the Master Development Company ("MasterDevCo") approach as the legal entity that has exclusive rights to (but not ownership of) the land allocated, and which is responsible for total

project delivery. However, as discussed in the Implementation Strategy, the final delivery body is likely to take the form of a Development Authority (similar in structure to one currently operating for the Konza project) which is highly likely to include an actual or quasi- land bank.

The structure of a developing institution must have a blend of the 'Authority' with potentially aspects of a MasterDevCo's structure, preferably imparted by Presidential Executive Order.

The funding required is based on the planning parameters defined and projected market rates of site development and construction assumed valid for Kenya.

15.3 KEY OPERATIONAL CONSIDERATIONS

15.3.1 ASSET CATEGORIES

All the Project components have been grouped into 13 asset categories:

- > Commercial Office,
- > Hospitality,
- > MICE (Meetings, Incentives, Conference and Exhibitions),
- > Residential,
- > Retail,
- > Warehousing/Industrial ,
- > Landscaped Areas,
- > Educational,
- > Cultural Uses,
- > Community Facilities,
- > Transport Terminus, and

- > Truck Park.

These assets have been regrouped into 4 macro-asset groups: Real Estate, Hospitality, Education and Supporting Infrastructure.

In order to assess the overall profitability and financial viability of the project, each proposed asset is allocated the appropriate revenues, site development and construction costs.

15.3.2 BUILD AND LEASE BUSINESS MODEL FOR THE REAL ESTATE MACRO-ASSET GROUP

In the context of the implementation of this Project, the Development Authority [/ MasterDevCo] is in charge of the investment in:

- > Capital Expenditure ("Capex") notably including Site Development Capex, Construction Capex of the Supporting Assets and related Lifecycle Capex; and
- > Related Operating Expense ("Opex").

Following the completion of construction, the Assets (warehouses, commercial offices, factories, hotels, etc.) are directly leased by the Development Authority/ MasterDevCo to third parties. The assets are assumed to be constructed and then leased at a lease per square metre of planned built up area and benchmarked to local market rates. The lease rate is based on current market rates and market absorption levels.

Exclusions:

- > Roads that are deemed to have a strategic benefit for the country are excluded from the analysis, in particular the Bypass and the airport 'U-Turn'.

The tenants pay the Development Authority/ MasterDevCo:

- > Land Lease Rent for the serviced assets



Figure 15.1: Typical Build and Lease Business Model (Source: The Consultant)

- > Service Charge for lifecycle asset maintenance of common areas
- > Utility Tariffs for Utility consumption (Electricity, water supply, etc.).

The typical Build and Lease Business Model is illustrated by the following figure:

From a Development Authority/ MasterDevCo standpoint, the main benefits are:

- > Greater control over the Land Use Budget and tenant type
- > Land ownership retention
- > Potential higher return in case of good performance of the Project

The drawbacks are:

- > Initial high capital investment required
- > Construction risk
- > Revenue risk
- > Longer payback period

15.3.3 OTHER MACRO-ASSET GROUPS: EDUCATIONAL, HOSPITALITY AND SUPPORTING

- > **Hospitality** is a revenue generating macro-asset group with primary revenue through rental income per paid occupied room in a given time period and Service charge.
- > **Educational** is a revenue generating macro-asset group with primary revenue through tuition fees
- > **Supporting** is a non-revenue generating macro-asset group needed to have a functional and mix-used urban centre. The Supporting Assets include Roads, Utilities, Green Spaces, Truck Parking, Transport Terminus and a Pond.

15.4 FINANCIAL MODEL

In order to assess the financial feasibility of the Sub-Centre proposals, a financial model has been built to assess the potential return of the Project using a number of business-specific, macro- and micro-economic assumptions.

The financial model assumes commencement of groundworks in 2020 and continuing through site development, construction and operations over three phases until 2051 for a period of 31 years.

It includes capital expenditure, soft costs, contingency and lifecycle expenditure throughout, together with calculations for tax, depreciation, interest charges and debt facilities.

During operations, four sources of revenues contribute: commercial and residential leases or rental income; hospitality (leased hotels and serviced apartments); community facilities (e.g. leased medical facilities); and revenues, such as tuition fees from educational establishments.

Revenues are subject to a reduction for 'bad debts' and conservative occupancy levels have been assumed at the commencement of each phase.

In the final year of operations for each phase, Terminal Values for all revenue generating assets have been included, giving more accurate perspective in relation to the profitability of the project.

Price inflation, affecting both costs and revenues, is based on CPI forecasts from internationally accepted sources.

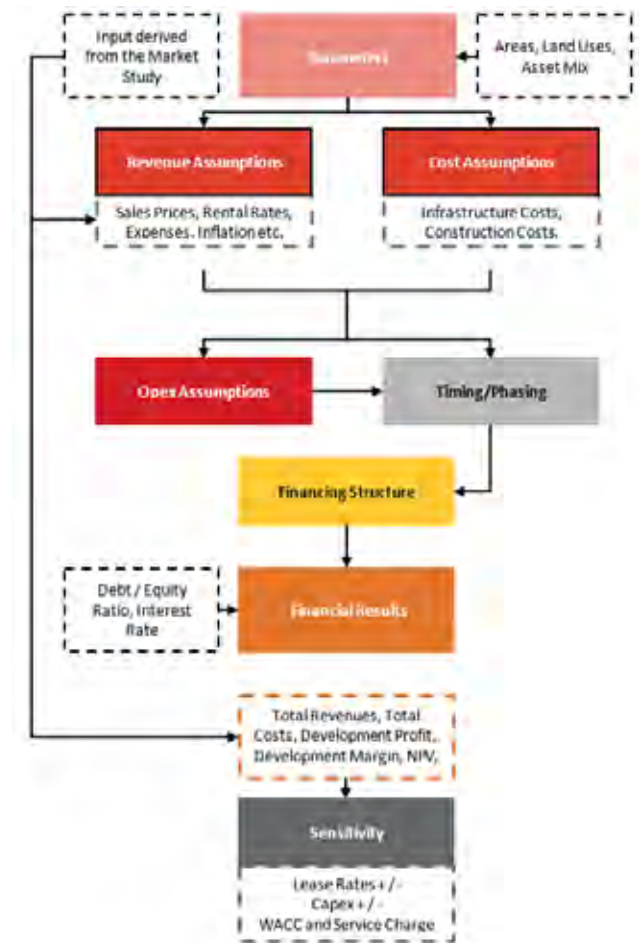


Figure 15.2: Financial Model Overview (Source: The Consultant)

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The Financial Model employs a Discounted Cash Flow ("DCF") methodology, which is based on the principle that the value of a Project is inherently based on its ability to generate cash flows for the providers of capital. It relies more on the fundamental expectations of the business than on public market factors or historical precedents.

The model is structured as follows:

Revenues, initial investment costs (Capex) of each component (site development and asset construction) and Opex of the Project have been estimated and discounted to the present using the appropriate discount rate.

All potential revenue streams of the project will generate (asset operations, land leases) have been identified and phased on an annual basis. Additionally, operating costs during operations are accounted for and incurred annually.

Project Cash Flows are calculated on the basis of assumptions of development and construction capital expenditures, available market returns and operation costs. Market returns represent the assets marketability through market rates and absorption levels as well as the expected occupancy of the proposed assets. A Perpetuity Growth Model has been used to calculate the Terminal Value.

15.5 KEY ASSUMPTIONS

Only a selected set of assumptions is provided in the Executive Summary but further assumptions and details are provided in the core Report.

15.5.1 PROJECT PHASING

The Land Use Budget described in a separate section is at the heart of the Financial Model and is developed as follows:

PROJECT SCHEDULE	PHASE 1	PHASE 2	PHASE 3
Site Development	2020	-	-
Construction	2020 - 2021	2025 -2026	2030 - 2031
Operations	2021 - 2041	2026 -2041	2031 -2051

Table 15.1: Project Phasing

15.5.2 PRE-OPERATING CAPEX - SITE DEVELOPMENT

Pre-operating Capex refers to the Capex investment during the development period i.e. before the Operating Period. Site Development Capex is the cost of transforming raw land to serviced land.

Table 15.2: Site Development Capex by Work

CATEGORY	TOTAL COST(USD)	DESCRIPTION
Transportation (Roads)	119,660,598	Truck Parking Area (32%), Collector Road (25%), Local Road (17%), Primary Road (13%), Boulevard Road (11%), Others (2%)
Landscape	111,679,550	Green Spaces (Hardscape 69%, Softscape 20%), Streetscape (Softscao 9%, Site Furniture 2%)
Electrical Network	93,426,819	Low Voltage Systems (38%), Medium Voltage Systems (44%), High Voltage Systems (6%), Street and High Mast Lighting System (8%), Landscape Lighting System (4%), Traffic Signals (1%)
Stormwater Network	32,033,700	Gravity Concrete Channels (96%), Othes (4%)
Site Grading	30,000,000	Cut (30%), Fill (70%)
Telecom Network	13,625,200	Duct banks and in concrete encasement (85%), Telecom Manholes (15%)
Environment	10,078,000	Distribution network (36%), Ground & Elevated Reservoirs (28%), Plot connection (12%), Others (24%)
Solid Waste	9,000,000	Estimated Cost inclusive of transfer station and Equipment
Sewage Network	7,724,000	Gravity pipes (41%), Sewage Pump Stations (21%), Manholes (19%), Plot Connection (16%), Others (4%)
TOTAL	427,919,696	

(Consultant's Estimate)

15.5.3 PRE-OPERATING CAPEX - CONSTRUCTION

Table 15.3: Construction Costs in USD per square metre

CATEGORY	ASSET	USD / SQ M
Warehousing / Industrial	Warehousing	500
Residential	Maisonette	561
Residential	Apartments	663
Commercial / Offices	Grade B	663
Retail	Mall	663
Retail	Mixed / Residential	561
Hospitality	3* Hotels	989
Hospitality	Serviced Apartments	1,350
Educational	University	510
Educational	Campus grounds	510
Educational	Lecture halls	510
Educational	Laboratories	510
Educational	Student Accommodation	510
Educational	Learning Resource Centre/ library	510
Cultural Uses	CU1	510
Community Facilities	Hospitals	1,229
Community Facilities	Other Community Facilities	337

(Consultant's Estimate)

15.5.4 LIFECYCLE CAPEX

Lifecycle Capex refers to the capital expense required to replace and refurbish assets during the operating period. One percent of Site Development and Construction Capex, are applied annually for the duration of the Project.

15.5.5 LEASE RATES AND SERVICE CHARGE

Details of per square metre Lease Rates are given in the table below.

Table 15.4: : Base Case Revenue Rates by Asset

CATEGORY	ASSET	REVENUE BASIS	USD
Warehousing / Industrial	Warehousing	USD/sq m per annum	45.00
	Industrial	USD/sq m per annum	45.00
Residential	Bungalow	USD/sq m per annum	34.39
	Maisonette	USD/sq m per annum	35.09
	Apartments	USD/sq m per annum	46.82
Commercial / Offices	Grade A	USD/sq m per annum	128.44
	Grade B	USD/sq m per annum	118.44
	Grade C	USD/sq m per annum	104.75

(Consultant's Calculations)

Retail	Mall	USD/sq m per annum	168.00
	Mixed / Residential	USD/sq m per annum	92.38
	CF-1	USD/sq m per annum	117.21
	Health Clinics	USD/sq m per annum	117.21
	Hospitals	USD/sq m per annum	117.21
	Churches	USD/sq m per annum	0
Community Facilities	CF-5	USD/sq m per annum	117.21
Hospitality	3* Hotels	ADR - USD per Day	65.00
	Service Apartments	ADR - USD per Day	75.00
Educational	University	Tuition Fee USD per annum	1839.00

For all asset categories other than Educational, Service Charges (including utilities) are added to the gross revenue at a rate of 30% (Education Service Charge = 0%). Revenues are then reduced by a 'Bad Revenue' penalty of 1%.

Lease rates for all asset types are included in the results section, along with the sensitivity tables. Lease rates range from US\$ 34 per square metre for Residential assets, up to US\$ 168 per square metre for prime Retail assets e.g. shopping malls. Regarding Service Charge, 30% are charged on gross lease revenues to offset Lifecycle Capex and Utility costs.

15 15.5.6 DEBT FINANCING TERMS

The main assumptions are as follows:

Table 15.5: Debt Financing Terms

DEBT TERMS	
Repayment profile	Equal annuity
Loan Tenor	15
Grace Period	1
Interest type	Fixed rate
Fixed rate / Spread	4.20%
Front-end fee	1.50%
Commitment fee	n. a.

(Source: The Consultant)

15.5.7 WACC

The Weighted Average Cost of Capital (WACC) is a combination of the Cost of Equity and the Cost of Debt associated with the project as well as the project funding structure i.e. Capital Structure through the Capital Asset Pricing Model (CAPM). Both the cost of equity and debt result from the national economy's profile particularly inflation expectations and ease of access to capital for infrastructure projects. The Post-tax WACC Method has been used for discounting purposes.

15.5.8 TERMINAL VALUE (TV)

The TV is calculated using the Terminal Multiple Method. The TV as equal to the Final Year Net Revenues (Rn) multiplied by the predicted revenue inflation rate (i), then divided by the Capitalisation rate (the 'Cap rate' C). Cap Rates vary by asset type, ranging from 5.8% for Warehouses, up to 10% for less commercial assets.

Table 15.6: Cost of Capital Derivation

COST OF CAPITAL DERIVATION	%
Pre-Tax Cost of Capital	12.83 %
Country specific risk premium	7.64%
Market risk premium	5.96%
Weight of Debt	37.92%
Weight of Equity	62.08%
Before-tax Cost of Debt	4.23%
Corporate Tax Rate	30.00%
After-tax Cost of Debt	2.96%
Cost of Equity	18.08%
Pre-tax Nominal WACC (USD)	12.83%
Post-tax Nominal WACC (USD)	12.35%

(Source: The Consultant)

Table 15.7: Terminal Values

ASSET TYPE	CAP RATE
Warehousing / Industrial	5.80%
Residential	6.50%
Commercial / Offices	9.20%
Retail (Mall)	9.60%
Retail (Mixed with Residential)	7.67%
Hospitality	9.00%
Educational	10.00%
Community Facilities	10.00%

(Source: The Consultant)

15.6 BASE CASE/CENTRAL SCENARIO RESULTS

15.6.1 PRE-OPERATING CAPEX AND LIFECYCLE CAPEX

Pre-operating Capex, amounting to 4,746 US\$ Mn, refers to the Capex investment during the Development Period and comprises:

- > Site Development Capex: Capex of transforming the undeveloped land to serviced land – Site Development: US\$ 535 mn Nominal
- > Construction Capex: Capex of constructing the superstructures.
- > Soft Costs: 5% of Development Capex.
- > Contingency: 10% of Development Capex.

15.6.2 SOURCES AND APPLICATION OF FUNDS

Table 15.8: Sources and Application of funds

UNDISCOUNTED TERMS - SOURCES	%	UNDISCOUNTED TERMS - APPLICATIONS	%
Revenues	80.1%	Cash Balance BEG	46.9%
Equity	12.4%	Capital Expenditure	19.6%
Debt	7.5%	Corporation Tax	16.5%
		Debt Service	10.2%
		Lifecycle Capex	6.5%
		Interests during construction	0.2%
		Front-end fee	0.1%
Total Sources - US\$ 26.9 mn Nominal	100%	Total Applications - US\$ 26.9 mn Nominal	100%

Consultant's Calculations

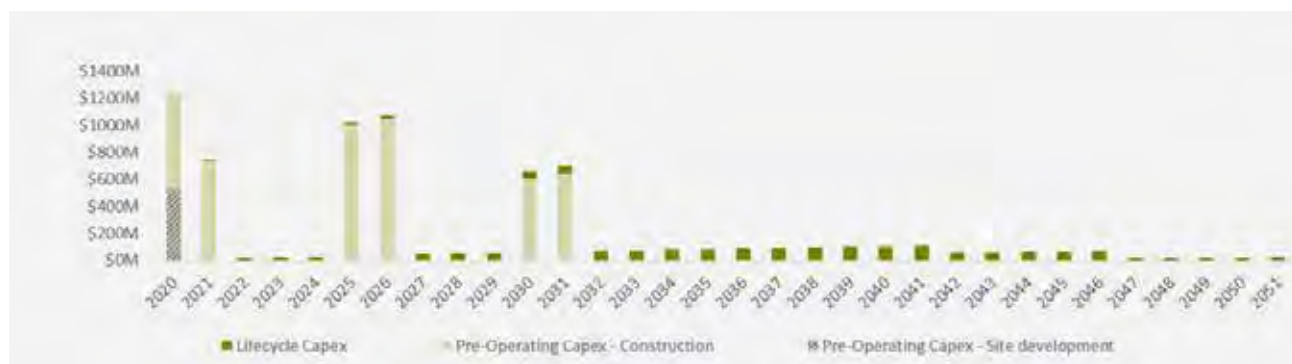


Figure 15.3: Total Capex Expenditure profile – Consultant's Calculations

15.6.3 STUDY SUMMARY

Table 15.9: Study Summary

	UNIT	TOTAL	PHASE 1	PHASE 2	PHASE 3	% PHASE 1	% PHASE 2	% PHASE 3
Land Use Budget								
Land Area	Sqm	5.05	2.91	1.49	0.65	58%	29%	13%
GFA	Mn	4.98	1.85	2.08	1.05	37%	42%	21%
BUA	Sqm	3.23	1.20	1.35	0.68	37%	42%	21%
Assumptions								
Site Development	year	1	1	-	-	100%	-	-
Construction	year	6	2	2	2	33%	33%	33%
Operation	year	60	20	20	20	33%	33%	33%
Revenues	US\$ mn	21,561	6,573	8,951	6,037	30%	42%	28%
Pre-operating Capex – Site Development	US\$ mn	535	535	-	-	100%	-	-
Pre-operating Capex – Construction	US\$ mn	4,746	1,452	2,049	1,246	31%	43%	26%
Lifecycle Capex – Site Development	US\$ mn	201	201	-	-	100%	-	-
Lifecycle Capex – Construction	US\$ mn	1,551	516	729	306	33%	47%	20%
Results								
IRR before taxes	%	14.26%	63,700					
NPV before taxes	US\$ mn	529.2						
Payback*	#	15.2 yrs						

15.6.4 PROJECT CASH FLOW

Table 15.10: Project Cash Flow's Key Figures

UN-DISCOUNTED NOMINAL TERMS IN US\$	US\$
Nominal Maximum Financing requirement	US\$ 1,243 mn in 2020
Maximum Nominal Peak Cash Flow	US\$ 971 mn in 2041
Project Pay Back period	16 Years, in 2036

Consultant's Calculations

Note: Nominal Pre-Tax cash flows do not include Terminal Values Break Even

Achieved in 2036, year 16 of the project. Based on Post-Tax Nominal cash flows

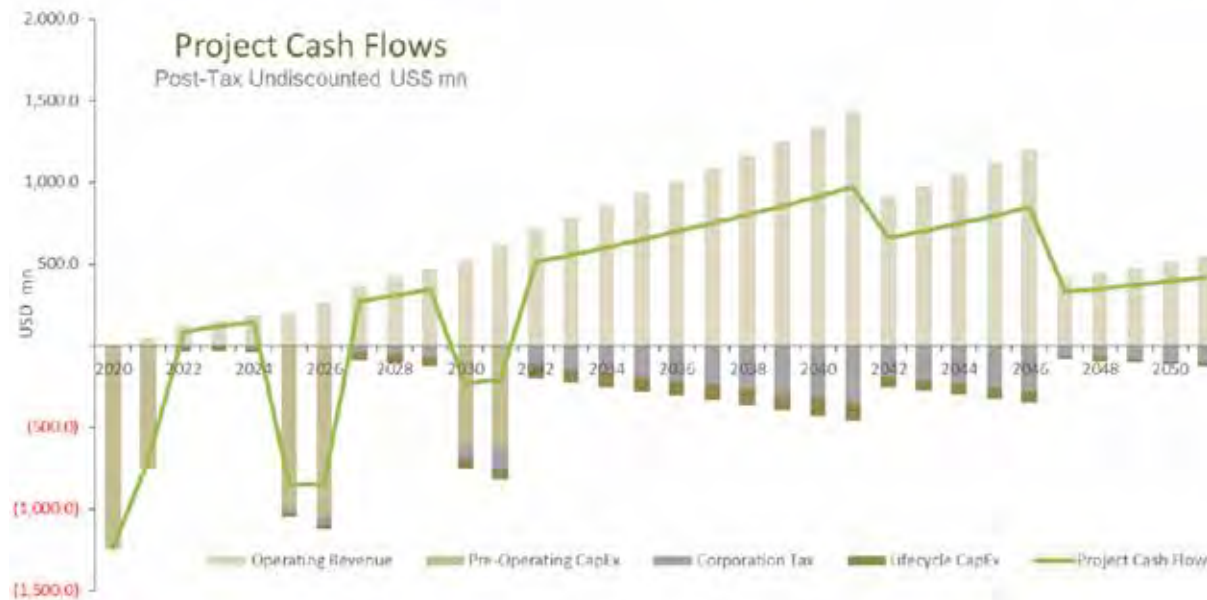


Figure 15.4: Project Cash Flows – Post-Tax Undiscounted – Consultant's Calculations

(Source: The Consultant)

15.7 SENSITIVITIES

Additionally, in order to test the strength of the project's return, some sensitivities have been undertaken using a scenario approach by determining appropriate sensitivities to changes in costs of development and returns rates.

> Lease Rate sensitivity

The data table above demonstrates the impact of varying the base case Lease Rates, in steps of 10%, upwards to 30% and downwards to -30%.

Table 15.11: Data Table giving IRR and Project Pre-Tax NPV including Terminal Values

INITIAL LEASE RATES	-30%	-20%	-10%	0%	2021	2022	2023
IRR	11.15	12.27	13.30	14.26	15.17	16.04	16.87
NPV US\$ Mn	(554.6)	(193.4)	167.9	529.2	890.5	1,251.8	1,613.1

Consultant's Calculations

> Scenario of two variables: WACC and Construction costs

- > Any two variables could be compared in this way.
- > From the resulting table below, we note that should WACC reduce to 11.83%, for example, then a 30% increase in construction could still be absorbed without negative Project NPV
- > Similarly, if construction costs were reduced by 10%, then an increase in WACC (e.g. caused by increasing market or country risk premiums) to 14.83% could be absorbed without negative Project NPV.

Table 15.12: Two-way data table demonstrating effects of bi variable variation

		CAPEX Sensitivity						
Cost of Capital sensitivity	529.2	30%	20%	10%	0%	-10%	-20%	-30%
	15.8%	(1,117.0)	(881.8)	(646.6)	(411.4)	(176.2)	59.0	294.2
	14.8%	(901.9)	(656.4)	(410.9)	(165.3)	80.2	325.7	571.3
	13.8%	(627.5)	(370.7)	(114.0)	142.8	399.6	656.4	913.1
	12.8%	(277.9)	(8.8)	260.2	529.2	798.3	1,067.3	1,336.3
	11.8%	167.2	449.7	732.1	1,014.6	1,297.0	1,579.5	1,861.9
	10.8%	734.0	1,031.2	1,328.4	1,625.5	1,922.7	2,219.9	2,517.1
	9.8%	1,456.3	1,769.8	2,083.2	2,396.6	2,710.0	3,023.4	3,336.8

Consultant's Calculations

16. IMPLEMENTATION PLANNING

16.1 INTRODUCTION

This section presents the recommended implementation planning requirements for both the priority projects and other land uses. The purpose is to convey the key details discussed in the Implementation Strategy for Priority Projects Report (see Technical Study 4) in a form that, as closely as possible, follows the Project Implementation Team's preferred structure of an implementation plan. This is within the context that an 'implementation plan' requires considerable certainty of the likely outcome of 'go/ no go' decision. In light of this provision, this discussion is designed to provide guidance on the initial processes required to implement the project.

Figure 16.1 depicts a high-level roadmap that portrays the stages requiring attention for implementation of the plan.



Figure 16.1: Implementation Planning Process Map Source: Consultants

16.2 IMPLEMENTATION MATRICES

The implementation matrices are a tool to capture the main aspects that require assessing for each sub-project.

The most important series of sub-projects are the roads which are contained in Table 16.1. These sub-projects are perceived to the main enablers for the Project.

Table 16.1: Priority Project's Implementation Matrix

PROGRAMME	ACTIVITY	LOCATION	ACTORS	TIMELINES	OUTCOME	
					EXPECTED	INDICATORS
By-pass Road plus link road	Construct by-pass 7.6 km	South- Northwest from Mombasa Road to Langata Road	Kenya National Highway Authority (KeNHA)	Phase 1 (Implementation stage)	Relieve pressure on Mombasa Road and enable peripheral roads in the Sub-Centre. Provide access to proposed hospitality are adjacent to Nairobi national park	Reliability. Traffic flow. Journey times. Traffic congestion.
SGR Terminus connection	Build road 1.25 km	North -South to the west of the SGR Terminus	KeNHA Kenya Urban Road Authority (KURA)	Phase 1	Improved access to the SGR Terminus	Ease of access to Terminus – no back up congestion
Mombasa Road Connection	Build road 0.82 km	East-West connecting SGR Terminus parallel to Mombasa road	KeNHA KURA	Phase 1	Improved access to the SGR Terminus	Access to Terminus. Traffic flow.
U-Turn on Mombasa Road	Build U-turn 0.30 km	Connect north airport entry road to the south airport exit road to facilitate access to the project area	KeNHA KURA	Phase 1	Improved access to the SGR Terminus and Project area	Use of the U-turn

The next leg in the implementation process is the adoption of the phasing plan of the land use. This forms a critical component of the Plan approval process, and is provided below.

The delivery of the planned and phased land-use will require the provision of new (or expanded) infrastructure (typically utilities and services). This then becomes a critical component of implementing the project and is portrayed in the Infrastructure Implementation Matrix (Table 16.2).

Table 16.2: Infrastructure Implementation Matrix Source: Consultants

NO.	SECTOR	STRATEGIES/ PROPOSALS	PROJECT/ACTIVITIES	LOCATION	PHASING	EXPECTED OUTCOMES	ACTORS
1	Water & Sewerage	Ensure policies, standards and regulations guiding water and sewerage are adhered to. Protection of the water towers and water sources through community initiatives and projects by the water authorities. Regulation of service agencies in charge of provision of water to communities within the Sub-Centre and adjoining areas.	<ul style="list-style-type: none"> > Design infrastructure requirements > Construct appropriate networks (inc. piping and pump stations) 	Nairobi SGR Terminus Sub-Centre	Site Development Phase 1	Installation of appropriate water and sewerage infrastructure	<ul style="list-style-type: none"> > Nairobi City Water and Sewerage Company (NCWSC) > Mavoko Water and Sewerage Company (MAVWASCO)
2	SGR and Commuter Rail	Development and management.	<ul style="list-style-type: none"> > New commuter rail lines > station upgrades > ticketing upgrades 	Nairobi SGR Terminus Sub-Centre	Phase 1, 2, 3	Development of commuter rail	<ul style="list-style-type: none"> > Kenya Railways > Nairobi City County
3	Energy/Electricity	Ensure policies, standards and regulations of the energy and petroleum sector are adhered to. Ensure distribution of power within the area. Responsible for energy infrastructure e.g. power sub-stations, pipelines etc.	<ul style="list-style-type: none"> > Design infrastructure requirements > Construct appropriate networks (inc. over/ under ground cabling) 	Nairobi SGR Terminus Sub-Centre	Site Development Phase 1	Cabling (over ground/ underground) Piping of fuel as appropriate. Supply of fuel tanks as appropriate	<ul style="list-style-type: none"> > Kenya Power and Lighting Company (KPLC) > Energy Regulatory Commission

4	Telecommunications	Ensure policies, laws and regulations on information and communication are adhered to. Provide infrastructure for communication e.g. telephone mast, fibre optic cables etc.	<ul style="list-style-type: none"> > Design infrastructure requirements > Construct appropriate networks (inc. towers & cabling) 	Nairobi SGR Terminus Sub-Centre	Site Development Phase 1	Provision of cabling and GSM towers.	<ul style="list-style-type: none"> > Postal Corporation of Kenya > Communication Commission of Kenya > Private Companies e.g. Safaricom and Telkom
5	Flight Path Management	Flight path management.	Ensure that construction and development adheres to flight path safety requirements	Nairobi SGR Terminus Sub-Centre	Continuous	Appropriate development along flightpath	<ul style="list-style-type: none"> > Directorate of Civil Aviation > Kenya Airports Authority (KAA)
6	Residential / Housing	Preparation of detailed action area plans	Preparation of detailed action area plans	Areas selected for TOD developments; <ul style="list-style-type: none"> > Imara Daima > Embakasi Village > Syokimau > Airport City 	Short term (1-5 years)	<ul style="list-style-type: none"> > Detailed physical & land use plan to guide implementation > Enhanced urban environments > Compactification of developments 	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG > Department of Metropolitan Development
		Provision of densified residential developments through redevelopment of the proposed areas	<ul style="list-style-type: none"> > Construction of maisonettes & apartments > Land acquisition / change of use of the existing use > Relocation of a section of industrial uses 	<ul style="list-style-type: none"> > Nairobi SGR Terminus Sub-Centre > Land acquisition & Change of users where applicable 	Between medium term to long term (5-20 years)	<ul style="list-style-type: none"> > Increased housing stock > Provision of affordable housing > urban renewal & Regeneration & compaction of developments 	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG > Private Sector/ Investors
7	Mixed used Developments Residential	Preparation of detailed action area plans	Preparation of detailed action area plans	Areas selected for TOD developments; <ul style="list-style-type: none"> > Imara Daima > Embakasi Village > Syokimau > Airport City 	Short term (1-5 years)	<ul style="list-style-type: none"> > Detailed physical & land use plan to guide implementation > Enhanced urban environments > Compactification of developments 	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG > Department of Metropolitan Development

8	Social and community facilities	<ul style="list-style-type: none"> > Integration of social and community facilities within residential neighbourhoods and in mixed use areas > Ensuring that there is appropriate and adequate provision to serve the local communities 	Construction of a cultural hub next to the area proposed for hospitality	Nairobi SGR Terminus Sub-Centre	Medium Term (5-10 years)	Integration/& ease of access between the cultural hub and hospitality section	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG > Private Sector/ Investors
			Provision for & government facilities		Medium Term (5-10 years)	Access to government services	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG
			Provision for Civic halls, medical clinics & hospitals, police stations, fire stations		Medium Term (5-10 years)	Ease of access to social services by the local communities	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG > Private Sector/ Investors
			Provision for market facilities		Medium Term (5-10 years)	-	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG

9	Environmental	Protection & Regeneration of the River Corridors, as well as minimize the impacts of flooding on abutting properties	Construction of Ngong River Linear park (recreational Park)	Along the river stretch	Short term 5 (1-5 years)	> Cleaner and safer river > Protection of the River Corridor	> SGR Embakasi Development Authority > Investors > NEMA > NCCG > Respective Local Communities
			Designation of Syokimau River as a wetland Corridor	Along the river stretch	Short term 5 (1-5 years)	> Provision for recreational activities	
			Relocation of housing structures located along the river bank	Along the river stretch	Short term 5 (1-5 years)	Protection of the River Reserve to allow for proposed uses	
			Provision of safe and attractive pedestrian and cyclists routes	Along the river stretch	Short term 5 (1-5 years)	Promotion of NMT use and a green environment	
		Provision of green buffers	Designate the areas as a green buffers, as well as increment of coverage of greenery	> Undeveloped section between Embakasi Barracks and AP Police Camp > Along main roads & railway lines > Between industrial uses > Along Nairobi national park	Short Term – Medium terms (1-10 years)	> Acts as an imaginary boundary, preventing further urban sprawl > Acts as a barrier to noise & air pollution and as visual buffers > Provides for physical separations between uses	> SGR Embakasi Development Authority > Kenya Army > Kenya Police > NCCG
		Provision of green networks to connect different neighbourhoods and other green spaces	Designate and establish green networks	Along the road reserves, & railway reserves	Short Term – Medium terms (1-10 years)	> Act as pedestrian links between activity sites > NMT is environmental friendly and a zero carbon mode	> SGR Embakasi Development Authority > NCCG
		Provision for sustainable Urban Drainage Systems	Development of a smart blue and green network	Along Road reserves	Short – Medium terms (1-10 years)	> Direct runoff away from the new developments and into the natural drainage > Flood mitigation and protection	> SGR Embakasi Development Authority > NCCG

10	Recreational	Provision of strategic recreational and green spaces	Provision of green open plazas & Pocket parks	<ul style="list-style-type: none"> > in front of the SGR terminus > Within residential and commercial areas > Integrate with the market 	Short to medium terms (1-10 years)	Protection of the Park from encroachments	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG
			Protection and Conservation of existing Parks	Nairobi national Parks		Protection of the Park from encroachments	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG > KWS > NEMA
		Provision of cultural facilities	Establishment of museums, theatres and galleries	Western quarter of Nairobi SGR Terminus Sub-Centre	-	-	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG > Private Sector/ Investors

11	Transportation	Creating connectivity and Integration with Surrounding environment / Activity points	Linking the project area to Mukuru Special Planning Area	Between Mukuru slums and the project area	Medium term (5-10 years)	Provision of connectivity between the project area and the populous settlement	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG > KURA > Kenya Railways > Respective Local Communities
			Provision of Public transport options & NMT facilities (through further detailed planning)	-			
			Provision of a direct Road/ bridge link between the SGR and the airport	Between SGR terminus and the JKIA airport	Medium term (5-10 years)	Easing connection between the airport and the Sub-Centre, the Railway station and beyond	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG > KENHA
			Provision of a new bypass from Mombasa road to Southern Bypass	Along the Nairobi National park boarder	Short term (1-5 years)	Reducing congestion on Mombasa Road - Redirection of heavy trucks from Mombasa road	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG > KENHA > KWS
			Provision of an intermodal transport Hub	South Eastern Area of the SGR terminus		Provision of a seamless interchange between various transport modes including BRT, coaches & matatus Provision of terminal facilities for all modes of transport	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG > KURA
		Provision of NMT facilities	Construction of pedestrian and cyclist lanes, street benches	Along the; road reserves, railway line, boulevards, and connecting major activity sites, landmarks, land uses, etc	-	<ul style="list-style-type: none"> > Enhance walkability > Ensure safety of the NMT users > Reduce congestion on carriage ways 	-
		Preservation of Land for future expansion of the Commuter railway	Preservation of Land for future expansion of the Commuter railway	<ul style="list-style-type: none"> > Mlolongo > Airport City 	Short term (1-2 years)	Availability of land for expansion	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > Kenya Railways > NCCG
		Provision for a truck parking	Allocate land for truck parking	Adjacent to the industrial hub	Short term (1-2 years)	Will allow for expansion of the ICD zone	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > Kenya Railways > KENHA / KURA > NCCG

12	Industrial	Retaining the industries at current locations	Retaining the industries at current locations	Industrial Zone	Short to medium terms (1-10 years)	To allow for detailed planning of the industrial zone	> SGR Embakasi Development Authority
			Preparation of a detailed action area plan	Industrial Zone	Short to medium terms (1-10 years)	Detailed action area plan to guide implementation	> Nairobi Metropolitan Development
		Relocation of some of the industries	Relocation of the industries to allow for development of the proposed commercial retail	Industries adjacent to the SGR terminus	Medium term (5-10 years)	<ul style="list-style-type: none"> > Enhance compatibility of uses > Creation of a new sub Centre adjacent to the SGR terminus, as per the NIUPLAN proposals 	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG > Private Sector/ Investors
		New Industrial Warehousing	Development of the proposed new light industries	Adjacent to the Airport	Medium to long term	<ul style="list-style-type: none"> > Provision of additional warehouse facilities in support of airport activities 	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG > KCAA
		Upgrading of existing industries	-	Industries that are adjacent to the ICD	Short to medium term (1-10 years)	Enhance compatibility with the new developments at the Nairobi SGR Terminus Sub-Centre	<ul style="list-style-type: none"> > SGR Embakasi Development Authority > NCCG > Private sector/ investors
13	Commercial	Provision for commercial establishments	Establishment of office and retail businesses	<ul style="list-style-type: none"> > Around the SGR terminus > Along the boulevards 	Short to medium term (1-10 years)	Enhancement of office and retail businesses	<ul style="list-style-type: none"> > SGR Embakasi Development Authority
		Provision for tourism and hospitality establishments	Establishment of tourism and hospitality businesses	Along Nairobi National Park	Short to medium term (1-10 years)	<ul style="list-style-type: none"> > Attraction of both national and international tourists > Accessibility to JKIA and the SGR transportation hub 	<ul style="list-style-type: none"> > NCCG > Private sector/ investors
14	Education	Integrate education facilities with other compatible functions	Provision for schools as per population demands	Within residential developments within the Nairobi SGR Terminus Sub-Centre	Short to medium term (1-10 years)	Accessibility to education facilities to the populace	<ul style="list-style-type: none"> > SGR Embakasi Development Authority
		Provision for an educational Hub	Establishment of a research hub, high quality exhibition and convention centres	Norther quarter of the Nairobi SGR Terminus Sub-Centre (West Bridge)			<ul style="list-style-type: none"> > NCCG > Private sector/ investors

16 16.3 INSTITUTIONAL FRAMEWORK

The implementation of the project will require an identification of existing institutions that should be involved in the delivery of the development. This has two aspects:

1. Identifying and empowering existing institutions; and
2. The creation of a vehicle focused specifically on delivering the Project.

16.4 KEY EXISTING INSTITUTIONS REQUIRED FOR THE DEVELOPMENT OF THE PRIVATE SECTOR ASSETS

There will be a substantial private sector component to the delivery of the development and the key players that will be needed for delivery are captured in Table 16.3.

16.5 PLAN APPROVAL

It is only after formal approval of the Plan that various implementation factors can be considered and finalised. In particular these include:

3. The final shape of the vehicle that will ensure delivery;
4. The likely frameworks needed to facilitate community engagement (communication, participation and capacity building);
5. Identifying critical success factors;
6. The projected capital required for investment (both public and private sector assets);
7. Identifying the types and sources of capital; and
8. The preferred and expected operating models.

Table 16.3: Institutional 'Actors' and 'Roles' for a Private Sector Development

LAND USES	ACTORS	ROLES
Residential	National Government County Government (Nairobi & Machakos)	<ul style="list-style-type: none"> Provision of policy and regulations Housing Development
	Private sector (i.e. developers)	<ul style="list-style-type: none"> Finance mobilization Housing Development
Commercial	Private Sector (i.e. real estate developers)	<ul style="list-style-type: none"> Finance mobilization Development of commercial facilities
Industrial	National Government County Government (Nairobi & Machakos)	<ul style="list-style-type: none"> Policy and regulations Development of industrial parks Establishment of SMEs
Institutional	Private Sector (i.e. industrial sector developers)	<ul style="list-style-type: none"> Finance mobilization Industrial development
	National Government County Government (Nairobi & Machakos)	<ul style="list-style-type: none"> Policy and Regulations Development Facilities
Recreational	Private Sector (i.e. developers of schools, hospitals, etc.)	<ul style="list-style-type: none"> Finance mobilization Development of facilities
	National Government County Government (Nairobi & Machakos)	<ul style="list-style-type: none"> Policy and Regulations Development Facilities
Public Spaces	Private Sector (i.e. parks developers)	<ul style="list-style-type: none"> Mobilization of funds Development of facilities
	National Government County Government (Nairobi & Machakos)	<ul style="list-style-type: none"> Policy and regulations Development of facilities

Source: Consultants

16.5.1 ADDITIONAL FRAMEWORKS

As noted above, a number of considerations come into play once a plan has been formally approved.

A communication strategy, including appropriate participation from local residents' associations, was developed at the outset of the Project, but it was very much focused on communication during the planning process, as opposed to the implementation and delivery. This will need to be revisited once formal approval has been achieved.

Additionally, during the next steps of delivering the Project a Capacity Building Framework will need to be devised and implemented.

16.6 ENTITIES FRAMEWORK FOR IMPLEMENTATION

The Plan proposes the creation of an implementation and coordination vehicle to oversee and ensure implementation. A solution that is appropriate for the design of the vehicle is the creation of two entities:

1. A strategic management and control entity, the Control Board; and
2. An entity tasked with the delivery and implementation of the Project, the Development Authority.

The functions of the combined Control Board and Development Authority are expected to include:

1. Ensuring planning, development, operation and management of the component sectors of the plan like transport, physical infrastructure and social infrastructure.
2. Ensuring proper and systematic programming by the participating counties in regard to determination of priorities and in accordance with the Policies and Spatial Development Plan.
3. Agreeing the critical success factors appropriate for project delivery.

4. Facilitating the participation of private sector and flow of private resources in the Planning, Development, Operation and Management of the plan.
5. Assembling, holding, managing and allocating land for development purpose in the project area
6. Coordinating the implementation of the plan policies and programmes by various sector functional agencies.
7. Procuring a master development company or development companies to deliver superstructure assets in accordance with the planning regulations, Policies and Spatial Development Plan.
8. Levying fees and charges in respect of facilities and services.
9. Stipulating norms and standards of development and operation of various facilities.
10. Performing such other functions and duties as may be entrusted to the Board and the Authority by the central and local governmental authorities.

The Control Board and Development Authority are discussed below.

16.6.1 CONTROL BOARD

The Control Board will guide, monitor and safeguard the delivery of the project. The Control Board may be formed with stakeholders from private, public and third sectors. It will comprise the key stakeholders of the project, including the KRA, KPA, KAA, the public utility companies, the County governments, financiers, National Government and others that may be considered necessary for successful project support.

The example depicted below considers the likely structure of stakeholders and stakeholder groups with the Board. Tasks the Board will have to undertake include consolidation of the legal provisions for the planning, construction, operation, maintenance and management of the project and specific

provisions to facilitate entry of private sector. It is unlikely that the Control Board will have the mandate to make decisions on implementation, as its role is advisory providing oversight, guidance and support. This will be important when processes have a degree of political procedures.

It is expected to have the following structure (Figure 16.2):



Figure 16.2: Suggested Control (Advisory) Board Structure Source: Consultants

16.6.2 THE DEVELOPMENT AUTHORITY

The challenge is to inaugurate a model Authority that will support the development of the project in a comprehensive and integrated manner. It may benefit from a Presidential Executive Order, nonetheless, it should have the autonomy to act as a master development company, or employ a master development company depending on where the Board and the Authority believe the best interests of the project lie and what matches their expertise. This approach is similar to one use for Konza [Konza Technopolis Development Authority (KoTDA)] and is perceived to be generally acceptable to all sectors.

Implementing the project will require (in the absence of a Presidential Order) the requisite legal backing that will establish the Authority comprehensively and empower it through due legal process. This will enable the Authority to ensure delivery schedules are met and the proposals are delivered to plan. These legal empowerments will largely be a result of the Control Board's consolidation of all the necessary legal provisions.

16 The model proposed has the following high-level structure as shown in Figure 16.3.

It should be noted that formation of special purpose vehicles in the form of an Authority has featured in various Government documents, e.g. Nairobi Metropolitan Development Strategy of 1973, Spatial Planning Concept for Nairobi Metropolitan Region 2012, the NIUPAN 2014 and Urban Areas and Cities Act 2011.

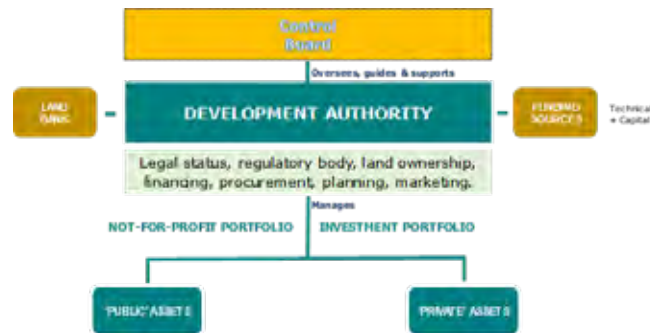


Figure 16.3: Example Development Authority

16.7 CAPITAL INVESTMENT

It is beyond this paper's scope to provide a detailed capital invest programme for the project.

However, initial costings for the enabling Priority Projects and the site development infrastructure have been estimated. They are provided in the Table 16.4 and Table 16.5 below.

Table 16.4: Example Development Authority

PRIORITY INVESTMENT PROJECTS COST ESTIMATE						
PRIORITY ROADS	USD ('000S)					
	STREET LIGHTING	STORMWATER NETWORK	ROADS/ PAVEMENT	BRIDGES	LANDSCAPE	TOTAL
By Pass Road	2,282	5,129	7,083	2,025	16,871	33,390
Connection Road 1	40	171	151		142	503
Connection Road 2	19	115	83		87	304
Connection Road 3	22	63	97		1,384	1,566
Link Road	113	169	195		497	974
Road 1	360	1,494	1,114		1,451	4,418
Road 2	510	376	1,313		1,084	3,282
U-Turn Road	119	17	284		164	583
TOTAL	3,465	7,532	10,318	2,025	21,679	45,019

Table 16.5: Consultants Analysis (Summarised in Table 8.1 from Report KE17123-0100D-RPT-PM-13-V7/8-REV 1)

CATEGORY	SUB CATEGORY	ITEM DETAIL	TOTAL COST (USD '000S)
Site Grading	Cut		9,000
Site Grading	Fill		21,000
Transportation (Roads)	Primary Road (42 m)		14,989
Transportation (Roads)	Boulevard Road (47.6 m)		2,728
Transportation (Roads)	Collector Road (27.5 m)		30,046
Transportation (Roads)	Boulevard Road (37.5 m)		13,102
Transportation (Roads)	Local Road (24 m)		20,335
Transportation (Roads)	Restricted Access Road		419
Transportation (Roads)	Truck Parking Area		38,041
Landscape	Green Spaces	Softscape	22,140
Landscape	Green Spaces	Hardscape	77,490
Landscape	Streetscape	Softscape	10,008
Landscape	Streetscape	Site Furniture	2,042
Telecom Network	Telecom Manholes		2,050
Telecom Network	2way 100mm duct bank; in concrete encasement		775
Telecom Network	4way 100mm duct bank; in concrete encasement		5,025
Telecom Network	6way 100mm duct bank; in concrete encasement		5,775
Electrical Network	High Voltage System (HV)	66/11 kV Substation with firm capacity of 45MVA including 2 transformers rated 45MVA and 11kV switchgear	6,000

CATEGORY	SUB CATEGORY	ITEM DETAIL	TOTAL COST (USD '000S)
Electrical Network	High Voltage System (HV)	Duct Banks for High Voltage Cables in concrete encasement; including all excavation works, back filling, warning tape, spacers accessories, etc...	50
Electrical Network	Medium Voltage System (MV)	11/0.415kV Outdoor Package Pad Mounted Substation (1x1000 KVA) including Ring Main Unit, 1000kVA transformer and Low Voltage main distribution board	11,067
Electrical Network	Medium Voltage System (MV)	11/0.415kV Outdoor Package Pad Mounted Substation (1x 315KVA) including Ring Main Unit, 315kVA transformer and Low Voltage main distribution board	135
Electrical Network	Medium Voltage System (MV)	MV cables, 3C, 300mm ² Cu XLPE/Armoured/ PVC including trenches, excavation and backfilling with warning tape	29,138
Electrical Network	Medium Voltage System (MV)	Duct banks for MV cables in concrete encasement; including all excavation works, back filling, warning tape, spacers accessories, etc...	294
Electrical Network	Medium Voltage System (MV)	Earthing System for Outdoor Package Pad Mounted Substations including all necessary accessories	560

CATEGORY	SUB CATEGORY	ITEM DETAIL	TOTAL COST (USD '000S)
Electrical Network	Low Voltage System (LV)	Low Voltage Distribution Pillars (DPs) including protective breakers and control devices with foundation	1,493
Electrical Network	Low Voltage System (LV)	Low Voltage Sub Distribution Pillars (SDPs) including protective breakers and control devices with foundation	574
Electrical Network	Low Voltage System (LV)	Low Voltage Cables including trenches, excavation and backfilling with warning tape	1,548
Electrical Network	Low Voltage System (LV)	Low Voltage Cables including trenches, excavation and backfilling with warning tape	352
Electrical Network	Low Voltage System (LV)	Low Voltage Cables including trenches, excavation and backfilling with warning tape	784
Electrical Network	Low Voltage System (LV)	Low Voltage Cables including trenches, excavation and backfilling with warning tape	12,692
Electrical Network	Low Voltage System (LV)	Low Voltage Cables including trenches, excavation and backfilling with warning tape	17,616
Electrical Network	Low Voltage System (LV)	Duct banks for low voltage in concrete encasement; including all excavation works, back filling, warning tape, spacers accessories, etc...	152

CATEGORY	SUB CATEGORY	ITEM DETAIL	TOTAL COST (USD '000S)
Electrical Network	Low Voltage System (LV)	Earthing System for Distribution and Sub Distribution pillars including all necessary accessories	219
Electrical Network	Street and High Mast Lighting System	Street lighting column, height 12m, equipped with 2x340W LED including cabling, excavation, backfilling and foundation	771
Electrical Network	Street and High Mast Lighting System	Street lighting pole, height 12m, equipped with 1x340W LED at 12m height and 1x110W LED at 8m height including cabling, excavation, backfilling and foundation	677
Electrical Network	Street and High Mast Lighting System	Street lighting pole, height 12m, equipped with 1x180W LED at 12m height and 1x110W LED at 8m height including cabling, excavation, backfilling and foundation	92
Electrical Network	Low Voltage System (LV)	Low Voltage Cables including trenches, excavation and backfilling with warning tape	352
Electrical Network	Low Voltage System (LV)	Low Voltage Cables including trenches, excavation and backfilling with warning tape	784
Electrical Network	Low Voltage System (LV)	Low Voltage Cables including trenches, excavation and backfilling with warning tape	12,692

CATEGORY	SUB CATEGORY	ITEM DETAIL	TOTAL COST (USD '000S)
Electrical Network	Low Voltage System (LV)	Low Voltage Cables including trenches, excavation and backfilling with warning tape	17,616
Electrical Network	Low Voltage System (LV)	Duct banks for low voltage in concrete encasement; including all excavation works, back filling, warning tape, spacers accessories, etc...	152
Electrical Network	Low Voltage System (LV)	Earthing System for Distribution and Sub Distribution pillars including all necessary accessories	219
Electrical Network	Street and High Mast Lighting System	Street lighting column, height 12m, equipped with 2x340W LED including cabling, excavation, backfilling and foundation	771
Electrical Network	Street and High Mast Lighting System	Street lighting pole, height 12m, equipped with 1x340W LED at 12m height and 1x110W LED at 8m height including cabling, excavation, backfilling and foundation	677
Electrical Network	Street and High Mast Lighting System	Street lighting pole, height 12m, equipped with 1x180W LED at 12m height and 1x110W LED at 8m height including cabling, excavation, backfilling and foundation	92

CATEGORY	SUB CATEGORY	ITEM DETAIL	TOTAL COST (USD '000S)
Environment	Water Supply System	Distribution network-uPVC (Outer 315mm)	55
Environment	Water Supply System	Distribution network-uPVC (Outer 250mm)	1,000
Environment	Water Supply System	Distribution network-uPVC (Outer 160mm)	927
Environment	Water Supply System	Distribution network-uPVC (Outer 110mm)	400
Environment	Water Supply System	Distribution network-uPVC (Outer 90mm)	448
Environment	Water Supply System	Distribution network-uPVC (Outer 75mm)	840
Environment	Water Supply System	Transmission line – uPVC (Outer 250mm)	40
Environment	Water Supply System	Valves (25% of Distribution network cost)	928
Environment	Water Supply System	Plot Connection	1,200
Environment	Water Supply System	Fire Hydrant inclusive of chamber and isolation valve	160
Environment	Water Supply System	Ground Reservoir 1 (Capacity 10,500 m3)	1,450
Environment	Water Supply System	Pumping Station 1	710
Environment	Water Supply System	Elevated Reservoir 1 (Capacity 450 m3)	230
Environment	Water Supply System	Ground Reservoir 2 (Capacity 6,800 m3)	950
Environment	Water Supply System	Pumping Station 2	550
Environment	Water Supply System	Elevated Reservoir 2 (Capacity 300 m3)	190
Sewage Network	Gravity pipes - PVC 200 mm		1,950

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CATEGORY	SUB CATEGORY	ITEM DETAIL	TOTAL COST (USD '000S)
Sewage Network	Gravity pipes - PVC 315 mm		376
Sewage Network	Gravity pipes - PVC 400 mm		180
Sewage Network	Gravity pipes - Concrete Pipe 500 mm		150
Sewage Network	Gravity pipes - Concrete Pipe 600 mm		504
Sewage Network	Force Main -PVC (Outer 250mm)		7
Sewage Network	Force Main -PVC (Outer 315mm)		184
Sewage Network	Force Main -PVC (Outer 350mm)		81
Sewage Network	Manholes		1,488
Sewage Network	Plot Connection		1,200
Sewage Network	Sewage Pump Stations (3Nos.)		1,604
Stormwater Network	Gravity - Concrete Channel 500 mm x 500 mm		6,984
Stormwater Network	Gravity - Concrete Channel 750 mm x 500 mm to 750 mm x 750 mm		5,280
Stormwater Network	Gravity - Concrete Channel 1000 mm x 750 mm to 1000 mm x 1000 mm		4,457
Stormwater Network	Gravity - Concrete Channel 1250 mm x 1000 mm to 1250 mm x 1250 mm		3,906
Stormwater Network	Gravity - Concrete Channel 1500 mm x 1250 mm to 1500 mm x 1500 mm		2,739

CATEGORY	SUB CATEGORY	ITEM DETAIL	TOTAL COST (USD '000S)
Stormwater Network	Gravity - Concrete Channel 1750 mm x 1500 mm to 1750 mm x 1750 mm		1,539
Stormwater Network	Gravity - Concrete Channel 2000 mm x 1750 mm to 2000 mm x 2000 mm		2,318
Stormwater Network	Gravity - Concrete Channel 2250 mm x 2000 mm to 2250 mm x 2250 mm		493
Stormwater Network	Gravity - Concrete Channel 2500 mm x 2250 mm to 2500 mm x 2500 mm		1,504
Stormwater Network	Gravity - Concrete Channel 3000 mm x 2500 mm		1,672
Stormwater Network	Outfall Structure 1500 mm x 1500 mm		3
Stormwater Network	Outfall Structure 2000 mm x 1500 mm to 2500 mm x 2000 mm		9
Stormwater Network	Outfall Structure 2500 mm x 2500 mm to 3000 mm x 2500 mm		20
Stormwater Network	Curb Inlets		504
Stormwater Network	Relocation of Pond		590
Stormwater Network	Riprap D50 = 0.3 m and 0.5 mm		15
Solid Waste	Estimated Cost inclusive of transfer station and Equipment		9,000
TOTAL			427,920

16.7.1 POTENTIAL FUNDING SOURCES (HIGH LEVEL OPTIONEERING)

Funding typically comes from a number of sources (listed in increasing order of cost to the Authority):

1. Grants: these are monies not paid back and generally provided by donor countries or IFIs (Governments or Multi-Government). Such funding normally provided to the neediest of countries to projects that are aimed to deliver non-cash benefits such as: reducing deprivation; gender equality; health benefits; and environmental improvement.
2. Soft Loans: money paid back at low rates provided by IFIs typically offered in parallel or instead of Grants
3. Guarantees: offered by Governments (with adequate credit rating or IFIs such as the World Bank). Such guarantees offer protection to commercial lenders where a borrower has a low credit rating or poor history of making payments timeously).
4. Hard Loans: offered by the commercial arms of International IFIs (e.g. AIDB, IFC, EIB etc.) or the domestic banking sector to projects that generally have clear revenue streams and provide above average returns to investors (who in turn can repay the lenders).

16.7.2 FINANCING DEVELOPMENT DELIVERY STRUCTURES

There are a range of development options that can be used to procure and deliver the Phases of the Project. The contract models discussed below allow for the contractual risks to be allocated in different ways.

For instance, under a 'traditional model', the client appoints advisers to prepare a detailed design for the works, procures a contractor to construct the works in accordance with the client's design for a fee based on a schedule of rates, finances the work and pays at intervals for the work completed, and then operates the works. If the works are completed late

or not in accordance with the design and specification, the additional costs are borne by the contractor. However, if the design cannot be built (due to unforeseen ground conditions), the contract scope proves to have been underestimated or does not achieve the outputs it was meant to, then the consequences are borne by the client. Other contract models alter this allocation of risk. Generally, however, the contractor is more risk averse than the client and tends to add a larger contingency in the tendered Contract Sum for taking on more risk than a client. In addition, the client generally has access to cheaper sources of money than a contractor so if the contractor takes responsibility for financing the Contract Sum increases.

A second construction model seeks to transfer design risk to the contractor. This form is typically known as a Design and Build Contract. Under this form of contract, the client sets out what he wants the assets to deliver – the Employer's Requirements. The burden is therefore on the client to be extremely clear about the specifications. The contractor designs the works to meet that output, and contracts to build the works in a fixed time for a fixed fee albeit this fee may be paid in instalments based on the contractor achieving programme milestones such as foundations and sub-structure, super-structure and roof, first fix, etc. This means that the contractor can design the works to suit his preferred construction methodology and maximise return on his supply chain. The client gets more programme and cost certainty but has to recognise that the details of the design and therefore the utility may be sub-optimal even though the Employer's Requirements are met.

A further variation of design and build is design, build and finance. Under this model, the client does not make any stage payments and pays for the works when they are complete.

Public sector bodies have also sought to enter into Public Private Partnerships (PPP Contracts). These contracts tend to be for a longer term than a straight construction contract.

16.7.3 MOTIVATION FOR ENGAGING IN PPPS

The three main needs that motivate governments to enter into PPPs for infrastructure are:

- to attract private capital investment (often to either supplement public resources or release them for other public needs);
- > to increase efficiency and use available resources more effectively; and
- > to reform sectors through a reallocation of roles, incentives, and accountability.

However, it must be realised that the opportunity must be financially attractive before the private sector engages.

In theory, it allows the client to focus on undertaking its core activities. The client may decide to transfer responsibility for the provision and maintenance of the building for a set period of time and pay an annual fee to the contractor. When the asset is not specialised, this model is known as a development lease if a new asset is developed, or a 'lease' if an existing asset is used. The lease can assign responsibility for maintaining the asset (a 'repairing lease'). The lease approach can be a useful model when a client does not have specialised needs and is not sure what his long-term needs are. It provides the developer the opportunity to lease it to a second user at some time in the future.

Taking the risk transfer further, under a Build Operate and Transfer model, the contractor designs, builds, finances, operates and maintains the asset, provides services (cleaning, security, etc.) for the client over a fixed term for annual fee and then hands the asset over to the client at the end of the term. This form of contract has been used for the provision of public sector facilities such as schools, hospitals, prisons and transport infrastructure. The public sector is fairly certain that it will need to asset for the foreseeable future and hence requires the asset to be handed-over at the end of the term when it can continue to deliver services to the public from the asset. If the public sector does not believe that it will need to

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asset at the end of the term, the ownership of the asset can be retained by the contractor at the end of the term. This model is typically known as a Build Own and Operate.

Other forms of PPP can be in the form of a concession where the contractor may design, build, finance, operate and maintain a network for a fixed term but crucially collects the amounts due under the tariff sent by the Government. Such concessions typically transfer the risk of non-collection to the private sector to a greater or lesser extent.

The most extreme form of a PPP is 'privatisation' where a service is sold to the private sector, tariffs, service standards and returns on investment are controlled by a 'Regulator' and all revenues and efficiency improvements are retained by the concessionaire.

An indication of the range of contract models that can be viewed under the heading of public private partnerships (as described above) is shown in the following table:

Table 16.6: : Classification of PPP Models (source: UNESCO).

BROAD CATEGORY	MAIN VARIANTS	OWNERSHIP OF CAPITAL ASSETS	RESPONSIBILITY OF INVESTMENT	ASSUMPTION OF RISK	TYPICAL DURATION (YEARS)
Supply and management contracts	Outsourcing	Public	Public	Public	1-3
	Maintenance Management	Public	Public/Private	Private/Public	3-5
	Operational Management	Public	Public	Public	3-5
Turnkey		Public	Public	Private/Public	1-3
Affermage/Lease	Affermage	Public	Public	Private/Public	5-20
	Lease1	Public	Public	Private/Public	5-20
Concessions	Franchise	Public/Private	Private/Public	Private/Public	3-10
	BOT2	Public/Private	Private/Public	Private/Public	15-20
Private ownership of assets and PFI types	BOO/DBFO	Private	Private	Private	Indefinite
	PFI3	Private/Public	Private	Private/Public	10-20
	Divestiture	Private	Private	Private	Indefinite

Notes:

1 – Build-Lease-Transfer (BLT) is a variant.

2 - Build-Operate-Transfer (BOT) has many other variants such as Build Transfer-Operate (BTO), Build-Own-Operate-Transfer (BOOT) and Build-Rehabilitate-Operate-Transfer (BROT).

3 - The Private Finance Initiative (PFI) model has many other names. In some cases, asset ownership may be transferred to, or retained by the public sector.

The risk sharing versus control is captured in Figure 16.4 below.

The private sector will require sufficient certainty of financial returns relative to its acceptable risk threshold. Thus, from the project point of view, the infrastructure is a cost to the entire project. Therefore, infrastructure and utility development are considered outside of the investor envelope (including the larger requirements of infrastructure development of the road and bridges). These non-investor development requirements may also include social infrastructure such as medical clinic, government schools, churches, fire and police stations.



Notes: BOT - Build Operate & Transfer; BOOT - Build, Own, Operate & Transfer; BLO - Build, Lease & Own; BOO - Build, Own & Operate.

Figure 16.4: : Classification of PPP Models (source: UNESCO).

16.7.4 LAND ACQUISITION

This section is a discussion of what needs to be assessed in terms of having land available for the development of the Sub-Centre.

For the three phases of delivering the Sub-Centre, the critical premise for the project analysis is that the Authority either:

- acquires all the land prior to project commencement to establish a land bank; or
- has development control for land not in its land bank.

The land bank will be used for both the internal infrastructure and real estate development. The underlying approach is that the main infrastructure requirement (e.g. roads, bridges or utilities) will be achieved by the relevant delivery bodies purchasing the land; and thus, the costs of these purchases are outside of the land bank set aside for the real estate development.

The land allocated to real estate assets is around 300 hectares; this is the area that would come under a special purpose vehicle (SPV) or master developer (MasterDevCo.), whether the Authority itself or under contract to the Authority. In summary, this land allocation is expected to include commercial assets: Commercial (Offices), Retail with Leisure, Mixed Use, Serviced Apartments, Residential, Public Purpose/Cultural, Education, Hospitality/MICE, Health and Community Facilities. The ownership analysis of the land allocated to the real estate development indicates that only 144 hectares would need either purchasing on the 'open market' or being subject to a development control envelope, as the balance is owned by Government Agencies (particularly KAA and KRA). There are a number of approaches to amassing an actual or quasi- land bank, including:

- > Purchasing land at market prices (this is complicated as it will need to be achieved in a fashion to avoid the developer paying speculative premiums – one approach is capping the land value by Executive Order);

- > Incorporating specific planning regulations that prescribe the land uses, asset development and land valuation;
- > Compulsory Purchase (typically only applicable for land to be used for public assets, the law may need to be adjusted for this specific area); and
- > Land swap (in theory the land swap should be achieved at 'shadow' prevailing market values such that the cost is equivalent to alternative i. above).

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A.1. TECHNICAL APPROACH AND METHODOLOGY

This section outlines the methodology and approach to delivery of services, as set-out at the start of the project. The project was in three stages, as follows:

- > Stage 1: Data Collection, Review of Existing and ongoing Developments Plans
- > Stage 2: Broader and Core Areas Development Framework (Conceptual Level)
- > Stage 3: Detailed Master Plan and Urban Design for the Core Area

A.1.1. STAGE 1: DATA COLLECTION, REVIEW OF EXISTING AND ONGOING DEVELOPMENT PLANS

A.1.1.1. TASK 1: PROJECT INCEPTION MEETING

Following mobilization, the Consultants team will meet with Client's team for the kick off meeting. This meeting will establish the procedures and protocols for the project as follows:

1. Introduce the members of each team.
2. Re-clarify the goals and objectives.
3. Review the methodology in the light of any developments since the original submission of the proposal.
4. Re-affirm the key stages, the expected deliverables at each stage, and the workshops/charrettes at the end of each stage including participants and length of time for approvals.
5. Obtain letters of introduction in order to facilitate data collection.
6. Identify the key individuals for reporting channels and for day to day contact.

7. Review the stakeholders and obtain a deeper understanding of their particular interests in the project.
8. Identify any particular issues, potential difficulties that the Consultants should be aware of as early as possible.
9. Identify any particular procedures that the Consultants will need to undertake in order to execute the project and seek the Client's assistance in this regard.

A.1.1.2. TASK 2: STAKEHOLDER ENGAGEMENT

Stakeholder Database Preparation

The Consultants will prepare a stakeholder database based on the information received at the project inception. The database will include; contact details for the main points of contact, the key office holders, decision-making structure and procedures, goals and objectives and key concerns of the stakeholders in relation to the project. It will be most important that every workshop is attended by representatives of the statutory approval body in order that, by the time the Detailed Master Plan for the Core Area is submitted to this body, any issues that they might have raised, have been dealt with on the way through the process. In this way, it is hoped that the final statutory approval will be a formality.

Stakeholder Engagement Programme Outline

The purpose of this task is to integrate the agreed work programme with the stakeholder engagement programme.

Ideally, the stakeholder engagement will be through joint meetings rather than individual one to one engagement with individual stakeholders. The value of joint meetings/ workshops/charrettes is that the views of all the key parties are heard at the same venue and this will expose possible conflicts and help to resolve them through discussion. All parties can hear the views of the others and react to them. The Client will also gain a good understanding of all views and this may influence Client approval at each Stage.

It may be however that not all stakeholders will be willing to engage in this way and, in these cases, one to one contact may be the only option.

Of course, stakeholders are more than just the main ministries and governmental bodies. They include local residents and transport users such as car drivers, commuters and the passengers of trains and buses. They also included all the commercial enterprises that exist in the area or who may be attracted to the Core Area because of its transport hub status. Stakeholders will also include other users of the area such as schools, shops, or organizations dedicated to protecting wildlife.

For this outreach to the wider community, a Communications Strategy will be devised which will include discussion meetings and workshops, advertisement materials, project brochures, media campaign and other public relation activities.

Initial Stakeholder Meeting (Stakeholder Workshop 1)

This meeting will be an opportunity to introduce the Consultants team to the stakeholder representatives and for them to outline their individual interests in the project. It is also an opportunity to clarify the protocols for future charrettes and other engagement opportunities.

A.1.1.3. TASK 3: CAPACITY BUILDING PROGRAMME

Establish Capacity Building Objectives

This will be important to establish right at the start of the project and it will depend on the existing qualifications and experience of the secondees. Ideally the aim should be for the secondees to take over the project after the Consultants have left but the task at this stage will be to assess the realism of this goal. At a minimum however, the Consultants anticipate that all secondees will make rapid progress provided that they are all extremely committed to the project and are willing to put in the necessary effort. The Consultants will expect this from the Client and the secondees that the Client recommends.

Capacity Building and Training Programme Schedule

The essence of the capacity building programme will be to combine theoretical training for the secondees with a parallel track of being engaged in contributing to the programme. So the process will be similar to an academic course in which theoretical training is followed by the practical application of the theory in actual projects. The timing of the theoretical training will mirror the programme.

The proposed training programme will form a fundamental pillar of the project approach. It will provide the necessary capacity building for the secondees to engage positively in the project and ultimately to take over the long term implementation of the project after the Consultants have gone. The training programme will seek a desirable balance between theory-based lectures and tutorials as well as local site visits and the overseas visit and exposure to daily project operations, technical meetings, charrettes and stakeholder consultations.

The Training will be undertaken during the project's 12-month duration. It is assumed that the programme will be limited to 30 secondees from a cross-section of the Client and the stakeholders.

- > The Client will recommend the Trainees to attend the training course
- > The training venue will be the Client's office.
- > Trainers and Lecturers will be sourced from the Consultants Team's own highly experienced international staff with strong academic and professional connections.
- > The Project Manager will also be the Training Coordinator and will manage the training logistics and the team of trainers. The trainers will be the staff who are engaged on the project.
- > Training sessions will be structured around prepared presentations and will be interactive, inviting engagement and the sharing of ideas around structured presentations and homework, reading and research assignments. They

will be structured as a series of modules.

- > There will be Individual and Group Assignments and Assessments at the end of each module.

Profile of Trainees

The trainees to be determined by the Client should ideally be drawn from a wide variety of representatives from the key Stakeholder Agencies who will be at the forefront of implementing the project:

- a) Kenya Railways
- b) Directorate of Urban and Metropolitan Development
- c) Ministry of Transport and Infrastructure
- d) Nairobi City County Government
- e) Kenya Ports Authority
- f) Kenya Civil Aviation Authority
- g) Kenya National Highways Authority
- h) Security services
- i) County Government of Machakos

The benefit of drawing trainees from different departments and organizations is that it will help to in still the concept of "joined up thinking" which will be essential for the long term implementation of the Master Plans.

As the TOR requires, the Consultants will also arrange all the logistics and organizational matters for the study tours to countries of similar successful urban planning models. It is estimated that the study tours will cover four cities for 3 days each, and this assumption has been reflected in the Financial Proposal.

A.1.1.4. TASK 4: DATA COLLECTION

Obtaining all readily available data as early as possible is critical to meeting the agreed project delivery timeframes. The Consultants will acquire digital and/or paper copies of all

baseline documentation for the study area.

The Consultants will lead the baseline data collection, but will require Client support to obtain information from the various stakeholders and ministries.

Collection and review of statistics and existing reports and models

The priority will be to gather all of the relevant desktop information and then to identify any gaps relative to goals and objectives. These gaps can be filled by surveys if necessary or by other means such as interviews with key personnel.

The Consultants have assumed that desktop information is adequate for the purposes of the project and only limited surveys will be required to supplement any missing desktop information.

Data collection at this stage will include; all existing plans and policy/ strategy documents, as built plans, surveys - topographical and geotechnical, existing committed transportation and other projects, existing, utilities networks and their capacities, unplanned development trends, existing land acquisition commitments, land ownership, GIS mapping, environmental assessments and social impact assessments.

Additionally, data related to the economic performance and socio-economic indicators will be collected. This is expected to include:

- > GDP growth rates and trends (national level and per capita);
- > GDP by sector and trends;
- > Investment inflows and national competitiveness indices;
- > Population and demographic information (including Government projections); and
- > Employment indicators – including a sector breakdown, unemployment rates.
- > Real estate market indicators – including historic and current stock, performance metrics (lease/sale rates).

The Consultants will draw on a number of sources including national sources (regional and urban plans including the Integrated Urban Development Masterplan for Nairobi, national strategic plans and the most recent national census(2009)), international sources (the World Bank, UN and other relevant sources), as well as other publicly available information from 3rd parties including previous studies and reports.

Interviews

Structured interviews of key personnel will be carried out following the gap analysis on the existing desktop information. Interviews may be “hard” i.e. to obtain hard information that is not available on paper or electronic records or “soft” e.g. gathering opinions.

Satellite Imagery

GIS mapping is an important tool for characterising the existing environment. In this instance, satellite imagery will be used to determine land use, describe the characteristics of the study area, present important geographical information (e.g. designated areas) and provide constraints mapping.

Satellite imagery will be used to:

- > Prepare a geographical reference base to underpin the study;
- > Update existing thematic maps at the local and regional scales for features such as geology, transportation, land cover;
- > Prepare maps for field surveys; and
- > Prepare general and detailed land use mapping.

Urban Planning

It will be important to identify the context of existing approved plans that cover the Broader Study Area and to understand their status. Some plans may be approved but were prepared some years before and the data that formed the basis of them is outdated and key variables have changed. Conversely, some

plans may be up to date but have not yet gone through the full process of political approval and may yet change.

All of these matters will need to be taken into account in establishing a robust planning context for Master Plans for the Broader Study Area and the Core Area.

The Consultants will establish which policies and proposal are still robust and which may now be invalidated or made uncertain because of new trends and/or political changes.

A.1.1.5. TASK 5: FIELD RECONNAISSANCE AND SURVEYS

A series of field reconnaissance and surveys will be conducted to supplement the data collection task. Once complete, data will be digitised into a GIS database used to provide a mapping base for all future outputs.

Site Reconnaissance

The Consultants will carry out a site reconnaissance exercise for the project area with the aim of developing an understanding of the physical, topographical and environmental settings. Specifically, this task will involve the following activities:

- > Recording the physical characteristics of the project area;
- > Visually verifying the available mapping and images;
- > Identifying environmentally important features within the project area;
- > Surface evidence of ground conditions;
- > Visual inspection of major geotechnical and geological features.

Topographic Survey

The Consultants will prepare the concept and detailed master plans for both the broader and core areas based on the available topographic maps for the region. However, it is assumed that these available plans are not sufficiently detailed to develop the preliminary and detailed designs

for the priority investment projects. Therefore, and only for these specific projects, the Consultants will carry out the topographic survey and produce the necessary mapping suitable for the preparation of final designs. The survey will include the following;

- > Establishment of a control network of intervisible reference markers. Each marker will be precisely surveyed and levelled and will be tied to the National Grid and datum. Each marker will be monumented, protected and referenced.
- > Capture of survey data in 3-D digital format including surface details, existing physical features, structures, walls, fences, gates, existing roads adjoining the road and existing depressions and waterways.
- > Constructing a three-dimensional (3-D) digital terrain model, suitable for engineering designs, cross-sections, and automatic computation of earthworks quantities and generation of layout drawings.
- > Generating topographic maps of the Project area to an appropriate scale to be used as base maps for the engineering design.

General Land Use, Building and Plot Survey

Given that the focus of the project is the Core Area with the Broader Study Area providing a planning context, the land use survey for the Broader Study Area will be restricted to satellite imagery and observations from survey vehicles, but the Core Area will require a more intensive treatment with a pedestrian inspection survey of each plot to identify the number of floors, use of each floor, division of the building into different uses including separate households, condition, vacant plots. This will help to identify, for example, poor condition areas that may be appropriate for redevelopment.

Inventories of Transport Networks and Services

The Consultants will assemble a full inventory of the existing transportation system within the Core Area and Broader Study Area, from aerial photography and site inspections. This will

include the following information:

- > Road network – status, road condition, link cross-sections, junction layouts and controls, traffic management, on-street parking regulations
- > Public transport network – modes, services, terminals and stops
- > Pedestrian infrastructure – locations and standards of footways, crossings, pedestrian bridges/underpasses
- > Off-street parking facilities – type of facility, number of spaces.

Transport Surveys

Following the review of existing data, transport surveys will be undertaken, if required to provide sufficient data on the existing use of the transport system. These surveys may include: classified traffic counts on links and at major junctions, pedestrian counts, public transport vehicle and occupancy counts, parking intensity observations.

Historic, Cultural and Townscape Inventory

As part of the visual inspection of the Broader Study Area and the detailed survey of the Core Area, important aesthetic features will be identified such as key views, character areas, iconic buildings and architectural landmarks, parks and green areas, sites or buildings of historical or cultural importance.

A.1.1.6. TASK 6: SETUP OF THE GIS SYSTEM AND PROTOCOLS FOR THE PROJECT

A geographic information system is needed to support the Project in data retrieval, analysis and mapping. It will ultimately be a tool for managing and sharing the databank of information and allowing for a smoothly functioning work flow process that integrates information for demand forecasting, engineering, operations support, and maintaining the data inventory of the study. Once the study is completed, it will enable the planners and engineers as well as other related stakeholders to browse, search, query and investigate the

current and proposed urban structure.

Therefore, the main objectives of implementing GIS are:

- > Act as a storage pool for digital spatial data
- > Provide an easy access to spatial data
- > Be used as an analytical tool in planning
- > Perform modelling and simulation
- > Aid in conducting statistical analysis
- > Support the decision making process
- > Produce cartographic maps

Satellite Imagery

As described in Task 4, satellite imagery will be collected for the project. This will be used to underpin the project geographically.

Topography

The Consultants will collect the available topographic maps of scale 1:50,000 and 1:25,000 (if available) to allow mapping of the digital elevation contour lines.

Base Maps

The preparation of base maps will include the following steps:

- > Definition of the land parcels; land cover classes and landmarks;
- > Procurement of available topographic maps scale 1:50,000 (and 1:25,000 if available);
- > Digitizing the baseline land parcels, land cover and landmark features;
- > Acquisition of existing land use / land cover maps;
- > Updating the available information using available satellite imagery; and
- > Organising field checking (or ground truth) campaigns

using hand held GPS devices to record physical locations where necessary.

Land Use Database Design

Due to the interrelation of field collected data with digitised Land parcels in GIS, it will be necessary for the GIS team to design and build a database to support the land use surveys as described in Section 2.1.5.2. Creating and utilizing a database to capture the information collected allows validated and consistent data that can be queried and analysed quickly and effectively. Also, correctly linking the tabular data to the GIS allows effective mapping to provide quantification of land uses, property conditions and other project insights.

Use of GIS Analytical Functionality

The GIS analytical power will be used to assess the existing conditions pertaining to the study area by analysing the data that will be collected.

The following examples can be given:

- > Point data related to groundwater level, water quality and rainfall can be analysed using appropriate data interpolation/extrapolation models;
- > Administrative socio-economic statistics can be compiled and aggregated at an appropriate scale of analysis;
- > Statistics based on land use, coverage can be generated;
- > Terrain analysis using satellite images and topographic maps GIS overlay functions allow for the over-laying of data and the performance of multi-criteria analysis during the baseline analysis and the preliminary potential sites identification.

Mapping

One of the major outputs of utilizing GIS is clear and consistent map production. Various thematic and composite maps of different sizes and scales will be produced using the GIS cartographic power.

A.1.1.7. TASK 7: ASSESSMENT AND INTERPRETATION OF EXISTING CONDITIONS AND DATA

The Consultants will analyse and interpret the collected data, which will be supported by relevant mapping and charts. The Consultants will identify gaps in the material collected and if necessary agree with the Client on a plan to undertake further searches or primary research as appropriate and discuss the impact on time and fees.

Baseline Macroeconomic and Socioeconomic Assessment

Based on the data collected in Task 4, the overarching macroeconomic and socioeconomic context will be assessed to understand current and projected trends at both a national and metropolitan scale.

This will include:

Macroeconomic Assessment

The Consultants will undertake an assessment of economic trends and characteristics with a view to understanding the direction and pace of economic development in the country. The assessment will be used to inform projections in the next stage, and to guide on development recommendations for the broader/ core area. The analysis will consider the following factors:

- > Economic activity by sector and degree of diversification;
- > Competitiveness/ ease of doing business, and the business/ regulatory environment (including the capacity of infrastructure and human capital to support business growth);
- > Investment inflows by source and sector;
- > Composition and direction of trade (including key source/ destination markets);

Socioeconomic Assessment

Available data will be analysed to build a comprehensive baseline of the existing population at the urban/ sub-urban level; to the extent possible this will seek to characterise

the project area specifically. This will be vital to projecting population growth and identifying future development opportunities/ requirements in the next stage of work. As such, of particular importance will be the analysis of:

1. Current population size and historic growth rates;
2. Current population structure (breakdown of the population by gender, age cohorts, income levels.);
3. Any migration flows (both in and out of the area) and their drivers;
4. Employment levels and employment by sector;
5. Average household incomes and expenditures;
6. Average household sizes and trends; and
7. Housing types and tenure

Transport Networks Capacity Analysis

The objective for this task will be to identify transport-related current and future constraints and opportunities to be taken into account in the development of transport network and circulation plans to support the land use master plans.

Based on the inventories described in Task 4 and the demand and operational data from existing sources and if needed from surveys discussed in Task 5, the Consultants will analyse the existing transport networks with regards to their: capacity, utilisation, accessibility, and operational characteristics (efficiency and safety for all users). Problems evident in the existing situation, and the contributory factors to those problems, will be identified for further study in the course of the development of master plan transport network and service options.

The Consultants will then undertake an initial assessment of the potential impact of currently planned transport network and service improvements and land use developments. This will draw upon available information from existing reports and studies. In particular it is expected to draw upon demand forecasting undertaken for the MRTS Harmonisation Study

(which in turn utilised more strategic forecasting undertaken in NIULAN), the Interdisciplinary Land and Transport Metropolitan Analysis study and the Commuter Rail Master Plan, together with any forecasting undertaken in connection with specific schemes such as the Standard Gauge Railway and road improvements.

Network data will be updated to reflect planned network changes. Future year demand will be developed from the observed base year demand taking into account general growth and generated demand due to specific transport and land use developments. The future year situation will then be assessed to identify:

- > The impact of network changes and demand growth on existing problems
- > Additional problems that may be expected to arise in the future
- > Opportunities presented, such as with regard to new 'spare' transport capacity created, enhanced accessibility etc.

Problems to be addressed in the development of options for the master plan transport networks may relate to such matters as: overloaded highway links, inadequate public transport capacity or accessibility; and inadequate provision for pedestrian access and movement (in terms of capacity, quality, convenience and safety). Preliminary concepts for how the more significant problems may be addressed will be considered in order to assess to what extent they may impose constraints on development options in the short or longer terms.

Opportunities and Constraints

The data collected will be analysed to carry out a broad SWOT analysis of the Broader Study Area and a detailed one for the Core Area. This will include important development constraints such as flight paths and ground access for aircraft emergencies. This process may also reveal the best locations for commercial development where land values can be maximized and where the most can be made of ground

features. Given that Embakasi will become a major transport interchange, there are obvious opportunities for Transport Orientated Development but potential noise might be a limiting factor for residential development close to the station.

An important aspect to establish at this point is the definition of the Broader Study Area. In the RFP this Area is not precisely defined in relation to features on the ground. It just shows a perception of the “area of influence” of the Core. Part of this task will be to identify the factors in the geographical context of the Core that will impact on its Master Plan and thus define precisely the boundary of the study area. This will be one of the issues to discuss at the first workshop.

A.1.1.8. TASK 8: STAKEHOLDER ENGAGEMENT- PRESENTATION OF FINDINGS/ LOCAL COMMUNITY

By this stage, the Consultants will have a good understanding of what should be the goals and objectives of the project and of the strengths, weaknesses, opportunities and threats present in the local environment that could impact on the design of the Master Plans.

This launch workshop will be attended by the Client, the Consultants, the main stakeholders and stakeholders identified through the Communications strategy. The main purpose of the workshop will be to:

1. Develop a consensus on the vision for the area and crystallise this vision into clearly articulated goals. As part of this, the goals and objectives from the existing plans in the area will be factored into the process.

2. Carry out a “brain storming” session on initial ideas that will flow from the knowledge of the opportunities and constraints from which the future proposals will flow.

3. At the end of the workshop, a brief for the Broader and Core Area Concept Master Plans will be agreed with the Client.

The Consultants anticipate that the workshop will be approximately 1 week including a final session just with the Client.

A.1.1.9. TASK 9: INCEPTION REPORT

Before the start of the Stage 2 “Broader and Core Areas Development Framework (Conceptual Level)”, an Inception Report will be submitted containing the results of the data collection task, as well as a work plan detailing the design program, the team organization and the Quality Assurance Plan (QAP). Specifically, the report will include the following:

- > List of the data collected and reviewed.
- > Description and findings of the site reconnaissance.
- > List and names of Authorities Contacted and the meetings protocols.
- > Detailed work program comprising all tasks.
- > Team structure with task allocations.
- > Details of the planned quality control procedures.
- > Identification of gaps in available data.
- > Risks and challenges anticipated.

A.1.2. STAGE 2: BROADER AND CORE AREAS DEVELOPMENT FRAMEWORK (CONCEPTUAL LEVEL)

A.1.2.1. TASK 10: MARKET ANALYSIS AND DEVELOPMENT RECOMMENDATIONS

Employment and Population Projections

Building on the macroeconomic and socioeconomic assessment undertaken in Stage 1, the Consultants will forecast employment and population to 2030. Importantly, within the context of the current project, these projections will be key drivers of:

- > Demand for real estate (including residential, commercial, retail); and
- > Demand for infrastructure – both in terms of utilities and transport.

As such, the projections will provide the foundation upon which recommendations for the concept masterplan are developed.

The population projections will begin at the level of the Nairobi Metropolitan Area given pressures on urban sprawl stem from broader growth. However, the Consultants will consider a number of scenarios with relation to the potential implications on such growth on East Nairobi, and on the Embakasi district specifically. These projections will be cross-referenced against government projections and strategic plans to ensure alignment between the Consultants' projections and the strategic priorities of the Government.

The employment projections will draw on (i) economic growth projections (ii) labour productivity trends; and (iii) trends in sector growth to forecast employment by sector to 2030. As above, these projections will be undertaken at the Nairobi Metropolitan scale – reflecting the level at which data tends to be available. However, any specific characteristics or trends at the district level identified in the baseline assessment will be

utilised to draw specific conclusions with relation to Embakasi and the broader project area.

Real Estate Analysis

A real estate analysis will be undertaken to determine the optimal mix of asset classes which could be hosted in the core project area, in line with market demand and projections.

The Consultants will look at current and projected demand, as well as current and planned supply of real estate products by asset class. In line with the uses identified in the RFP, the Consultants will consider:

- > Residential;
- > Commercial (including short term leases/ flexible office spaces and other supporting facilities including meeting facilities);
- > Retail and hospitality to serve the residential and commercial assets (considered to be a secondary driver);
- > Industrial/ warehousing demand to complement the existing ICD and other logistical services provided within the area; and
- > All other supporting community and social facilities/ infrastructure (including healthcare, education, culture/ leisure, public offices).

On the basis of the demand/ supply analysis, a gap assessment will be undertaken to determine the demand/ supply net balances and potential gaps in the market. Further, by studying the various segments, the Consultants can determine which sub-markets (with relation to the varying grades and typology of each asset class) present more opportunity, and, therefore, how the Client can differentiate their product and serve gaps in the market.

For each of the asset classes, the Consultants will assess the following within the context of the Nairobi Metropolitan Area – and specifically East Nairobi/ Embakasi area. Development Recommendations



As indicated above, a key outcome of the Real Estate Market Analysis will be a series of recommendations relating to the scale, mix and phasing of uses which could be developed on the site.

These will provide a basis for the concept masterplan and will be refined in light of spatial and financial considerations in later stages resulting in an integrated Real Estate Development Programme by the end of the Stage.

A.1.2.2. TASK 11: SPATIAL DEVELOPMENT STRATEGY

This task is the first step in the design of the Concept Master Plan for the Broader Study Area. It will identify in broad terms; key directions for growth, key areas for redevelopment, major vacant sites which could be locations for major landmark development and constrained areas which are not appropriate for built development but should be retained as wild areas or parks. The main purpose will be to set a preliminary framework for the main components of the Master Plan.

This stage is also the opportunity to draw the major constraints on the map to help set the context for the strategy. For example, the existing and committed transport projects and important constraints such as flight paths and the

National Park will be shown on the map so that the room for maneuver on the Master Plan becomes clear.

A.1.2.3. TASK 12: STRATEGIC ENVIRONMENTAL ASSESSMENT

The objective of a Strategic Environmental Assessment (SEA) for the proposed concept masterplans is to provide a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of the detailed masterplan and urban design for the core area with a view to promoting sustainable development. In view of the fact that the Project will be funded by the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA), part of the World Bank, the SEA will be performed in accordance with the requirements stipulated by the following authorities.

- > Kenyan National Environmental Management Authority (NEMA): National Guidelines for Strategic Environmental Assessment in Kenya;
- > International Finance Corporation ((IFC), member of the World Bank) - Sustainability Framework including its Environmental and Social Performance Standards; and
- > World Bank – World Bank Environment, Health and Safety (EHS) Guidelines.

The SEA will be performed in seven stages:

Stage No.	Stage Name	Key Tasks
1	SEA Scoping	<p>The key issues to be established in the SEA scoping:</p> <ul style="list-style-type: none"> • Project description; • Objectives of the Masterplan; • Objectives of the SEA (including decision criteria and suitable indicators of desired outcomes); • Alternatives to be considered; • Criteria for assessment; • Significant issues to be considered; • Stakeholders to be consulted; and • Methods of data collection and analysis. <p>Deliverable: Terms of Reference for SEA (submitted to the Client and NEMA for approval)</p>
2	Baseline Environmental Information Collection and Review	<p>Via literature review, site-walk over, field survey (if needed), and stakeholder consultation to collect the following environmental baseline data to reflect the objectives of the SEA and to analyses the situation:</p> <ul style="list-style-type: none"> • Physical environment (e.g. climate, air, soil and water quality, noise and vibration); • Biological environment (e.g. habitats, flora and fauna, protected ecosystems, biodiversity); • Socio-economic environment (e.g. archaeological and cultural heritage landscape, transport, infrastructure, safety, security, human health); and • Adaptation to climate change. <p>Deliverable: Nil (the baseline information will be incorporated in the SEA Report).</p>

Stage No.	Stage Name	Key Tasks
3	Alternative Masterplan Identification and Evaluation	<ul style="list-style-type: none"> • Identification of the impacts of masterplan alternatives (direct or secondary effects, cumulative impacts, duration and extend of impacts, risks to social and ecological systems); and • Testing the masterplans and its objectives against SEA objectives / policy and legislation framework. <p>Deliverable: Nil (the findings will be incorporated in the SEA Report).</p>
4	Identification and Prediction of Impacts, Determination of the Significance of Impacts, Identification of Mitigation Measures & Establishment of an Environmental Management, Monitoring and Evaluation Plan	<p>Based on the activities at/near the project site and baseline status:</p> <ul style="list-style-type: none"> • to identify and evaluate the impacts (positive and adverse, duration, reversibility and scale) during the construction and operational phases of the proposed masterplan; and • to determine the significance of the impacts via a matrix analysis (based on GIS analysis, stakeholder and expert opinions, findings of field surveys and other relevant information). <p>Identify measures to enhance opportunities and mitigate significant adverse impacts.</p> <p>Establishing an Environmental Management, Monitoring and Evaluation Plan for the implementation of the proposed master plan to ensure the proposed mitigation measures are implemented and effective.</p> <p>Deliverable: Nil (the findings will be incorporated in the SEA Report).</p>

Stage No.	Stage Name	Key Tasks
5	Preparation of the Draft SEA Report	<p>The key topics of the SEA Report will include:</p> <ul style="list-style-type: none"> • Introduction; • Project description; • Policy and legal framework; • Assessment methodology; • Baseline status <ul style="list-style-type: none"> > Physical Environment (e.g. Meteorology and Climate, Air, Geology, Topology and Soil, Surface and Groundwater, Noise and Vibration, Existing Emission, Discharge and Contamination Sources); > Biological Environment (e.g. Habitats, Flora and Fauna, Ecologically Sensitive
6	Consultation of the Draft SEA Report	Submit the Draft SEA Report to the Client and NEMA for comment (the latter will dispatch the Draft Report to stakeholders (may include the public) for comments).
7	Preparation of the Final SEA Report	Update the SEA Report by addressing the comments issued by the Client, NEMA and stakeholders.

A.1.2.4. TASK 13: SOCIAL IMPACT ASSESSMENT

The objective of a Social Impact Assessment (SIA) is to identify the significant potential social impacts and associated mitigation measures to minimise the adverse impacts at manageable levels for the proposed masterplan. In view of the fact that the Project will be funded by the IBRD and the IDA, part of the World Bank, the SIA will be performed in accordance with the requirements / stipulated by the following authorities / Law:

- > Kenyan National Environmental Management Authority (NEMA): the socio-economic elements specified in NEMA's Environmental Impact Assessment Guidelines and Administrative Procedures;
- > The Constitution of Kenya, Environmental Management & Coordination Act (1999);
- > Country Government Act of Kenya;
- > The Land Act;
- > Kenya Vision 2030 and Nairobi Integrated Urban Development Masterplan;
- > International Finance Corporation ((IFC), member of the World Bank) - Sustainability Framework including its Environmental and Social Performance Standards; and
- > World Bank – World Bank Environment, Health and Safety (EHS) Guidelines.

The SIA will be performed in seven stages:

Stage No.	Stage Name	Key Tasks
1	SEA Scoping	<p>The key issues to be established in the SEA scoping:</p> <ul style="list-style-type: none"> • Project description; • Objectives of the Masterplan; • Objectives of the SEA (including decision criteria and suitable indicators of desired outcomes); • Alternatives to be considered; • Criteria for assessment; • Significant issues to be considered; • Stakeholders to be consulted; and • Methods of data collection and analysis. <p>Deliverable: Terms of Reference for SEA (submitted to the Client and NEMA for approval)</p>
2	Baseline Socio-economic Information Collection and Review	<p>Via literature review, site-walk over (including area of influence), and field surveys (if needed) to collect the following socio-economic baseline data to reflect the objectives of the SIA and to analyses the situation:</p> <ul style="list-style-type: none"> • human environment and socio-economic status (e.g. population, employment status, standards of living, housing, economic activities, land tenure and acquisition of land, archaeological and cultural heritage features, landscape, recreational resources, land use, transport, infrastructure, agricultural development, tourism and human health); and • Develop an effective public plan to involve the potentially affected public. <p>Deliverable: Nil (the baseline information will be incorporated in the SIA Report).</p>

Stage No.	Stage Name	Key Tasks
3	Alternative Masterplan Identification and Evaluation	<p>Examine the proposed masterplan and reasonable alternatives (direct or secondary effects, cumulative impacts, duration and extend of impacts, risks to the human environment and socio-economic system).</p> <p>Deliverable: Nil (the findings will be incorporated in the SIA Report).</p>
4	Identification, Prediction of Impacts and Determination of the Significance of Impacts; Identification of Mitigation Measures & Establishment of a Social Management Plan and Monitoring Framework	<p>Based on the activities at/near the project site and baseline status:</p> <ul style="list-style-type: none"> • to identify and evaluate the impacts (positive and adverse) during the construction and operational phases of the proposed masterplan; and • to determine the significance of the impacts. <p>Identify measures to enhance opportunities and mitigate significant adverse impacts.</p> <p>Establishing a Social Management Plan and a Monitoring Framework for the implementation of the proposed master plan to ensure the proposed mitigation measures are implemented and effective.</p> <p>Deliverable: Nil (the findings will be incorporated in the SIA Report).</p>

Stage No.	Stage Name	Key Tasks
5	Preparation of the Draft SIA Report	<p>The key topics of the SIA Report will include:</p> <ul style="list-style-type: none"> • Introduction; • Project description; • Policy and legal framework; • SIA methodology; • Baseline status; • Impact assessment; • Mitigation measures; • Analysis of alternatives; and • Social Management Plan and Monitoring Framework. <p>Note: The SIA Report may be incorporated in the SEA Report, subject to the decision making of the Competent Authority.</p>
6	Consultation of the Draft SIA Report	Submit the Draft SIA Report to the Client and NEMA for comment (the latter will dispatch the Draft Report to stakeholders (may include the public) for comments).
7	Preparation of the Final SIA Report	Update the SIA Report by addressing the comments issued by the Client, NEMA and stakeholders.

A.1.2.5. TASK 14: LAND USE

Further to the framework plan prepared in Task 11, there will now be sufficient information to locate in general terms the land uses around the study area in order to meet the requirements of the land budget. Specifically these land uses will be considered

- a. Residential. The demographic projections combined with the real estate analysis will establish the appropriate residential mix in terms of size, type, density, building height. An issue will be how close the new residential development should be located to the existing and new public transport routes. There is potential for a double benefit in terms of housing that is convenient for commuters, and Transport Oriented Development which makes public transport more viable with the prospect, for example, of more frequent and higher capacity services.
- b. Employment i.e. industry and offices. As the Core Area will become a major transport hub in Kenya, an important task for the economists and real estate specialists is to recommend how the hub can be used to maximize economic activity and create good quality jobs. The implications of this for land use planning is to make sure that the land budget prepared under Task 12 is designed for optimum economic activity that capitalizes on the pivotal nature of the location. This will be achieved by recommending an optimum mix by location in terms of; industrial units, warehousing, offices, other employment generating activity; an appropriate variety of sizes for units depending on location, the provision of ancillary services such as parking and food and beverage; appropriate building heights, ceiling heights, industrial area specialization such as high tech, biotech, conventional units, "dirty" industry.
- c. Green Areas. These will vary between areas that are kept deliberately wild for ecological reasons, to formal park areas. Parks will be needed not only to support the residential population but also high tech employment areas and some residential areas will need attractive amenity

areas as a setting in order to attract international investors. Landscape design will be an important component of the Master Plans. Task 12 will have established the land requirement and location for parks serving the projected population.

- d. Community facilities. Space and accessibility standards will have been applied to the projected population to estimate the quantity and location of land needed for the schools hierarchy, civic halls, clinics and hospitals. This will need to be compared with existing provision to calculate the amount and location of any shortfall. If necessary, it may be best to increase existing facilities even if not in optimum locations. Also, the intention would be to avoid land that is potentially valuable as commercial sites.
- e. Government, military. The stakeholder engagement will reveal if there is a need for nationwide governmental land uses to be located in the area – or for existing such land uses to expand or to be moved to other locations if the economic benefit of the transport hub might be compromised.
- f. Transportation. This is a major focus for the study and the land use requirement will need to be quantified and located e.g. stations, park and ride, transport corridors, marshalling yards, major roads and junctions.
- g. Other land uses not included in the general categories above.

A.1.2.6. TASK 15: RESETTLEMENT ACTION PLANS

As the transportation proposals evolve, it will be clear that some existing land uses, including residential, will have to be displaced to other locations. As part of the design of the Master Plans, the Consultants will find appropriate locations for displaced land uses. Also, regardless of the impact of the transportation proposals, in assessing the condition of property under Task 5, the Consultants will have identified any low quality housing where conditions are unacceptable and demolition is an option anyway. Displacement also

may be appropriate not only to make way for transport and infrastructure projects but also to make way for more valuable commercial uses which will benefit from good access to the transport network.

For areas of poor quality housing that are not required to be displaced for other reasons, the issue will be – how to improve living conditions? Displacement to other locations and new housing may not always be the appropriate answer because an important advantage of low quality residential areas might be low rents. The Consultants will, if necessary, examine the feasibility of improvements of existing housing areas such as infrastructure upgrades and consider if legal issues are relevant such as tenant security.

The Resettlement Action Plan will include the following:

- > Description of the project area;
- > Understanding, describing and proposing measures adopted to minimise resettlement;
- > Undertaking of census and economic survey in the project affected zones;
- > Review of the legislative framework governing or associated with involuntary resettlement;
- > Preparation of entitlement matrix;
- > Examine requirements for resettlement sites;
- > Income restoration planning;
- > Outline institutional arrangements for resettlement;
- > Outlining of an implementation framework as well as a grievance redress mechanism;
- > Outlining of a monitoring framework; and
- > Estimation of a resettlement budget

A.1.2.7. TASK 16: CONCEPT LANDSCAPE PROPOSALS

The Consultants will provide 2 (two) landscape concept options for the streetscape design of the Core Area. The

streetscape design approach can be summarized as follows:

- > Design for safety, mobility and accessibility by all street users, accommodating all modes of transport
- > Integrating and responding to neighbourhood character and context
- > Design for liveability by creating vibrant public realm spaces along the streetscape (Rights of Way permitting)
- > To provide a clear and consistent design. The aim of the landscape proposal is to create unique streetscapes via the treatment of sidewalks and medians.
- > Bold, creative and inviting setting for pedestrians, taking into consideration cultural heritage.
- > To enhance the existing urban setting by providing colour and form to the streetscape right of way.
- > To evoke visually identifiable streets via the use of paved surfaces, street furniture and lighting. Furthermore the selection of materials and planting will vary from street to street to provide unique character and identity.
- > To maximize vegetation and shade trees on sidewalks where possible, providing respite from heat, dust, noise and asphalt as well as capture and control rain water run-off.
- > To fully consider the aspect of up keep and maintenance as regards the choice of materials and their method of placement.
- > To use indigenous plant species. The use of indigenous plant species is encouraged as part of the overall sustainable approach to planting.

A.1.2.8. TASK 17: TRANSPORTATION

Concept Level Access and Circulation Networks

The Consultants will identify at concept level the multi modal transport networks and infrastructure that will be required to meet the forecast demands for access and movement within the Core and Broader Areas, and to provide connectivity to

external areas. The new infrastructure and the improvements to existing infrastructure that will be required to deliver these networks will then be identified.

It is assumed that two options will be developed for the transport infrastructure in the Core Area, which will be subject to a comparative assessment based on a number of criteria.

The concept designs for access and circulation networks for the Core and Broader Areas will identify:

- > The road hierarchy and right-of-way requirements for each link
- > Junction types
- > Public transport services infrastructure – e.g. segregated rights-of-way, priority lanes, stations, terminals, interchanges, depots, Park and Ride facilities
- > Pedestrian and cycle routes and infrastructure – segregated paths, crossings (at-grade or grade separated)
- > Off-street parking locations and capacity requirements

Projections of the design year demand for network concept development and option assessment will be derived from:

- > Demand forecasts for new transport infrastructure and services, primarily the Standard Gauge Rail (freight and passenger forecasts), commuter rail developments and BRT – from forecasting work undertaken for project development, updated as necessary by the Consultants
- > Trip generation associated with new land uses in the master plan– trip generation/attraction rates based on local data if available (e.g. from the NUIPLAN or Harmonisation Study models) or on the US Institution of Transportation Engineers (ITE) trip generation and parking rates, adjusted as appropriate for application in Nairobi
- > 'Background growth' in base year demand due to increasing incomes and car ownership – based on relationships between trip making and GDP

Modal networks for access and circulation will be developed as described below.

Non-Motorised Transport (NMT)

Desire lines for pedestrian and cycle movement will be identified with reference to the locations of facilities and land uses that will interact to generate NMT movements, and the potential scale of movement on those desire lines. Concept proposals for NMT networks to provide for these movements will then be developed, with reference to the emerging plans for the road network. The concepts will identify the main NMT routes and where dedicated (i.e. segregated from the road network) NMT infrastructure is proposed.

Motorised transport

Motorised (public and private transport) trips from and to each development/zone within the study areas will be distributed to destinations/origins within and outside the study areas with reference to the trip distributions from models developed in previous studies or a bespoke gravity model developed for this project.

Public Transport Network

The matrix of forecast public transport trips thus derived will be analysed in terms of:

- > Corridor passenger flows – to develop options for public transport services and infrastructure to cater for projected demand
- > Passenger trip origins and destinations within the study areas - to assess the requirements for interchanges, terminals and depots

Road Network

The Master Plan road network will be designed to provide for a high standard of access to existing and planned traffic-generating developments, and to facilitate efficient traffic circulation within, to, from and through the study areas, while minimising adverse impacts of traffic on the environment of the areas.

To analyse the future year road network options, a computer model will be developed of the study area road network links and junctions. Forecast year matrices of private vehicle trips and freight movements will be assigned to the 'do minimum' network comprising the existing network, committed improvements and proposed access routes into the development sites/areas.

Measures of the operational 'performance' of the do minimum network, relating to degrees of saturation and delays, will be analysed and concept options identified to address any operational issues that are evident.

While the network concept development process is described above 'mode by mode', the study process will ensure that modal networks are considered as elements of a fully integrated multimodal transport system. Thus, for example, NMT route planning will be integrated with planning for public transport services and facilities, and road network planning will take account of requirements for the operation of efficient and attractive public transport services and for safe and attractive movement on foot and by bicycle.

The study of the transport networks will also be integrated effectively with the study of land use options. While land use options will inform the transport analyses in terms of demand generation and, potentially, in setting environmental or development-related constraints on transport network options, the transport analyses may also feedback into the development of land use options by highlighting where transport-related issues may be mitigated by adjustments to the land use plan.

Assessment of Road Connection Options

Options will be assessed with reference to the key impacts that may differentiate them. These will include:

- > Operational efficiency (Level of Service)
- > Safety
- > Physical impact of infrastructure – visual impact, severance.

- > Land-take
- > Impact on property
- > Social impacts
- > Cost

Appropriate 'indicators' will be developed to measure the impact for each criterion (e.g. related to numbers of persons or properties affected and scale/severity of impact). The 'scores' for each option on each criterion will be summarised within a comprehensive assessment framework. The relative weight to be applied to different criterion in arriving at an overall 'preferred option' will be agreed with stakeholders to reflect stakeholder priorities with regards to the range of objectives for the Master Plan.

Through the above process it will be ensured that option assessment is objective and transparent.

A.1.2.9. TASK 18: UTILITIES INFRASTRUCTURE

The Utilities Framework will include:

- > Power & Telecommunication
- > Water Supply
- > Sewerage
- > Storm Water Drainage Systems
- > Solid Waste Management

With information gathered, the Consultants will develop a refined concept infrastructure framework, integrating as well any previously prepared Master Plan reports on utilities. The pertaining Utilities Strategy will consist of the following core components and will be presented within a report and series of layout diagrams, if necessary.

Power & Telecommunication

The Consultants, based on the collected data for the broader and core areas will identify probable power supply sources to the new developments and provide conceptual load estimate

of the core area, based on the proposed land use plan taking the load and diversity factors at various network levels as per local regulations and international practice.

Estimate of the probable number of HV/MV and MV/LV substations and their required space reservations will be provided for addition in the masterplan.

The Consultants will also provide the below listed to be part of the Concept masterplan report:

- > Proposed Electrical design criteria and guidelines.
- > Proposed Medium voltage, Low voltage and street lighting systems.
- > Telecom Design criteria, estimations for telecom lines in new developments, and description of civil works required to develop the telecom infrastructure in the Core Areas.

Water Supply

The Consultants will:

- > Estimate the required demands based on the overall region population;
- > Study the existing water supply components in the vicinity of the project area.
- > Study existing Master Plan Reports, covering project/ surrounding areas and feasibility of integrating such reports as far as possible with the current project area.
- > Study availability of the project water demand and identify the sources of water supply
- > Identify and distribute the project area into number of zones, in consideration of integrating with existing water supply systems and ongoing Master Plan studies.
- > Water demand of the project area will be worked out based on the proposed land use for the project area.
- > A macro water supply network for the project area will be established, covering the project area, which will include identification of water treatment plant, if required, bulk

water storages with their locations and capacities, and alignment of major looped water supply network.

Sewerage

The Consultants will:

- > Review existing sewerage schemes;
- > Study existing Master Plan Reports, covering project/ surrounding areas and feasibility of integrating such reports as far as possible with the current project area.
- > Identify and distribute the project area into number of zones, depending on topography and proposed land use, integration with existing sewerage systems and under study Master Plan Reports etc.
- > Identify location and type of existing/sewage treatment facilities, their capacities and feasibility of future expansions.
- > A macro sewerage system for the project area, showing alignments collector and trunk mains, probable, sewage lift/pump station locations, new sewage treatment plant locations and capacities will be established for the project area.

Storm Water Drainage

The Consultants will:

- > Review existing macro drainage systems and inundation issues in the project area.
- > Review existing storm water drainage systems in and around project area
- > Identification of bottle necks in existing macro storm drainage system if any and proposing solutions for the same
- > Identifying critical areas, which are prone to inundation. Identifying alignment and size of the macro drainage systems in the project area to resolve such situations.

- > Study existing Master Plan Reports, covering project/ surrounding area and the feasibility of integrating into the proposed project area.

Solid Waste Management

The Consultants will:

- > Initiate contacts and conduct necessary meetings with relevant parties related to Solid Waste Management (SWM) and review of available data (current practices, studies, legislations, reports)
- > Forecast solid waste generation quantities/volumes. This will be based on relevant benchmarking of generation rates with respect to the types and sources of solid waste materials expected to be generated;
- > Classification of solid waste by type; as applicable, mainly Municipal Solid Waste (MSW) components such as glass, metals where relevant data is available;
- > Evaluation of sustainable measures and source-separation of MSW streams (where applicable);
- > Presentation of opportunities and constraints resulting from conventional SWM system scenarios in accordance with project layout. This will include the various proposed upstream SWM system components (Centralized versus Decentralized storage and collection);
- > Proposed means for integration with downstream Municipality SWM treatment/disposal facilities to cater for the estimated project solid waste quantities.

A.1.2.10. TASK 19: LAND ACQUISITION ANALYSIS

Understandably the Client is keen that land acquisition is minimized to avoid expensive compensation. Land ownership information will be needed therefore at the outset for the Consultants to be able to balance the objective of land acquisition minimization with the other planning goals and objectives. Ideally new transportation proposals will be located on public land, but where new land acquisition seems to be

inevitable, it will need to form part of the costing of options to consider what compensation is appropriate and also if this can be mitigated by finding a relocation site that has the same merit to the user as the site proposed to be vacated. If it proves necessary for government bodies and infrastructure agencies to acquire land, this will need to be factored into the phasing and implementation strategy because it may take a long time to negotiate with landowners. For this reason, the Consultants will consider early on whether new land acquisition is inevitable in certain locations, to enable negotiations to start early before the Master Plans have been finalized. In any case, it may be that if negotiations start after the Plans have been approved, land values will rise in the knowledge that government bodies have committed themselves to a particular strategy.

A.1.2.11. TASK 20: CONCEPT MASTER PLAN AREA

All of the above strands will be brought together to complete the Concept Master Plan for the Broader Study Area incorporating the Core Area. Given that the focus of the study is the Core Area and the purpose of the Concept Master Plan for the Broader Study Area is to set the context for the Plan for the Core Area, two options for the Concept Plan will be produced but the second option will only relate to the Core Area.

The Concept Master Plan Options will include the following elements –

1. Proposed land uses.
2. Zoning restrictions such as density, development regulations such as building height, setbacks, on-site parking requirements, FAR.
3. Proposed roads network.
4. Proposed public transportation development including railways, light transit, stations, park and ride, marshalling yards.
5. Concept infrastructure proposals restricted to electricity and wet utilities

A.1.2.12. TASK 21: FINANCIAL PRE-FEASIBILITY ANALYSIS AND DEVELOPMENT DELIVERY STRUCTURES

A financial pre-feasibility analysis of the concept masterplan will be undertaken to assess:

- > The investment which will be required to deliver the concept masterplan – including both the infrastructure and real estate development;
- > The potential returns to the Client and other parties involved in the implementation of the masterplan.

Importantly, the analysis will consider the potential delivery models which may be put in place to oversee implementation of each of the asset classes. Opportunities to engage the private sector – particularly in the development and operation of the real estate classes will also be considered and tested in the financial analysis given such participation can be vital in reducing the financial obligations of the Client. Equally, the analysis will consider opportunities to transferring the cost of investments in infrastructure to the private sector or capturing the uplift in land values from the real estate development to cover these costs.

The Consultants' full methodology for conducting financial analyses is outlined below.

Financial Analysis Methodology

The Consultants have extensive experience in undertaking financial feasibility studies of large-scale real estate and urban developments through the creation of bespoke excel-based discounted cash flow models to derive projects' IRR, NPV and other investment performance ratios. Our financial models project derive cash flows by asset type and phase. As a result of this approach, the model operates as a functional tool for decision-making – helping Clients to understand the key drivers and risks at each stage, and allowing for optimizations to be made to both the mix and phasing of land uses. Main components of the financial model include:

1. Planning Parameters

The model provides a summary of the main land uses and proposed phasing of the project covering:

- The number of stages in which the development will be delivered and the start/end dates of each stage;
- The land, BUA and GLA by asset class to be developed in each stage; and
- The infrastructure to be put in place during each phase.

The model provides for sufficient flexibility for this to be updated and detailed in line with the master planning process.

2. Development Period: CAPEX

Based on the land and assets to be developed during each stage, the model estimates the capital expenditures (capex) which will be incurred by all parties. These comprise:

- Land Costs, site preparation and infrastructure costs.
- Construction costs for each of the asset classes (to be incurred by the Client or Developers);
- Any previous development costs incurred by the Client.
- Other costs, including pre-operating expenses, environmental mitigation costs, marketing and promotion expenses and previous studies
- Working capital requirements to fund initial management and maintenance expenditure post completion until income is received from management charges.

The above costs are typically derived from various sources including: estimates of physical construction costs and general expertise of the Consultants, the Client's internal project costs to date (as available) and other estimates from in-house knowledge and external research. The investment costs are phased on an annual basis (in line with the development programme) and organised to provide a consistent and comprehensive basis for investment appraisal that takes account of inflation.

2. Operations Period (Revenues & Opex)

Revenues

The model estimates the potential returns which may be generated by the Project. The different revenue streams are determined in line with the selected development model. As applicable, this may comprise:

- To the Client: (i) lease/sale of land to developers as applicable; (ii) any service/ management charges to cover utilities, the maintenance of common areas and security of the development and (iii) any other incomes from the direct operation of specific facilities; and
- To the Investors: lease/sale of developed land/BUA to tenants.

Financial Analysis Methodology

Revenue streams are phased in line with the development programme and adjusted annually in line with inflation. Findings of the real estate analysis are used to inform these assumptions – this includes potential occupancy and take up rates, efficiency factors, attainable lease or sale rates (for the various assets) etc.

OPEX

Additionally, as the project is developed, an array of recurrent costs may be incurred in management, operations and maintenance (opex). The range of costs will vary for each party but will include the following provisions:

- The maintenance and operating costs associated with each of the assets within the project.
- Rent payments to the land owner (the Client).
- Sales and marketing expenses associated with the initial and subsequent phases.
- The cost of operations associated with any of the service facilities to be operated directly by the Client.
- Security services and the tending and cleaning of public open spaces.
- Insurance provision for the assets over which the Client retains control or ownership.

Where it is not possible to establish detailed cost estimates of certain recurrent costs, initial budget provisions are determined and err on the side of caution.

3. Results

The financial analysis brings together the above costs and revenues in a discounted cash flow analysis over a 20 year time horizon. Key financial metrics and accounting ratios generated from this analysis include:

- NPV: Pre-tax and post-tax NPV at the Project and Asset Level.
- IRR: Pre-tax and post-tax; real and nominal IRR at Project and Asset Level.
- Simple Payback Period at Project and Asset Level.
- Discounted Payback Period: Project and Asset Level.
- Debt Service Cover Ratio (DSCR): Minimum and average DSCR with corresponding period.

Further, depending on the selected development delivery model, the financial analysis can calculate potential land lease rates which may be charged. These will account for the present value of land based on the projected uses, the investment required by each party and their hurdle rates. As applicable, this may include: land lease payments between the public authority and master developer, as well as land lease for serviced land from the master developer to sub-developers.

Finally, the Consultants run a number of specific sensitivities and conduct scenario analyses to assess the impact of potential risks on the project's key ratios. These sensitivities help guide optimal business and financial decisions and tend to cover both systematic and idiosyncratic risks. Sensitivity tests may be applied to changes in: (i) the land use mix, (ii) attainable market rates, (iii) the phasing of the project etc. in line with Client requirements.

A.1.2.13. TASK 22: SECOND STAKEHOLDER WORKSHOP

The Client representatives, stakeholders and local community representatives will be re-assembled in order to assess the draft Concept Master Plan including the two options prepared for the Core Area. At the first workshop (Task 2) an effort will be made to understand fully the particular interest(s) of each party so that these can be accommodated in the preparation of the Master Plan. If this has been successful, the workshop should not prove to be controversial, however, some conflict will be inevitable and not all interests will be satisfied. In order to expedite the Master Plan process, contact will be maintained with stakeholders throughout so that this workshop will hopefully not produce many surprises.

The purpose of the workshop will be to talk through the proposals to try and achieve consensus on most points. Where this is not possible, the Consultants will minute the unresolvable issues so at least there is good mutual understanding of respective positions.

At the end of the workshop, there will be a private session with the Client in order to agree on the chosen option and what changes need to be made in the preparation of the Final Concept Master Plan for the Broader Study Area.

A.1.2.14. TASK 23: FINALISED CONCEPT MASTER PLAN AND FEASIBILITY REPORT

The Consultants will amend the Concept Master Plan taking on board all of the amendments agreed with the Client at the workshop.

As required, the financial pre-feasibility analysis will also be updated to also account for any feedback and comments from the workshop (and consequent implications on the concept masterplan).

At the End of Stage 2 the Consultants will submit the Feasibility Report for Clients approval.

A.1.3. STAGE 3: DETAILED MASTER PLAN AND URBAN DESIGN FOR THE CORE AREA

A.1.3.1. TASK 24: DETAILED MASTER PLAN

This plan will relate purely to the Core Area and will develop the proposals and policies in the approved Concept Plan for the Core Area. The results of Tasks 10 to 20 in Stage 2 will be developed but purely in respect of the Core Area. As part of this preparation of the Detailed Master Plan, aspects of the Concept Master Plan will be reviewed in the light of the process so far, including the results of the stakeholder engagement. These will include a review of opportunities and constraints as they relate to the Core Area, and a re-examination of the Vision and Goals and Objectives to ensure that the project is still on-track.

Based on the results of the Feasibility Studies in Task 23, a Programme and Development Strategy will form part of the Detailed Master Plan and will include a list of the key projects that will be the focus of the Implementation Strategy (see below).

The Development Guidelines formulated for the Concept Master Plan will be reviewed for their detailed application to the Core Area covering such aspects as density, development regulations such as building height, setbacks, and on-site parking requirements, FAR.

Zoning and Land Use Plan

This task will be to achieve a precision on the boundaries for the land use zone but it will have to be done on an iterative basis with the detailed design of roads and utilities (below) because these designs will have an impact on zonal boundaries. The plan will follow, of course, the approved Concept Master Plan for the Core Area.

Parcelation Plan

This task will be informed by the real estate analysis on the mix and optimum size of plots for different purposes. Again,

this task will need to be carried out on an iterative basis with the design of the roads, infrastructure and utilities because the parcel boundaries will be precise and need to be accurately plotted in relation to transportation and utility corridors. The Consultants will prepare ID sheets with co-ordinates for the accurate definition of parcels for the purposes of legal disposal.

Urban Design Guidelines

Given that the proposed transport hub will be of pivotal importance for the whole nation and also given the importance of attracting local and international investors, the Master Plan will need to be designed to maximize the prospects for a beautiful environment. Whilst the main emphasis is on transportation proposals and there is no architectural component at this stage, the purpose of preparing urban design guidelines is to set a contextual framework of design principles that will guide new developers and their architects towards a built environment which is aesthetically harmonious. The urban design guidelines will apply to the land parcels in addition to the development regulations. Whilst the development regulations are more in the form of rigid criteria, the urban design guidelines will be more in the nature of a design guide of suggestions and benchmarking and will avoid dictating design solutions.

The guidelines will also have an important purpose in seeking to integrate the transportation proposals with the future building on the plots. They will seek to avoid a scenario in which the transportation proposals with their geometric criteria dominate and the development on the plots is what is left over after the transportation proposals have been implemented. The aim will be a seamless aesthetic integration of all the proposals. Massing models will be prepared.

A.1.3.2. TASK 25: UPDATE OF THE FINANCIAL PRE-FEASIBILITY STUDY

The financial pre-feasibility study prepared at the concept level in Task 21 will be updated in line with the detailed masterplan to reflect the updated (and further detailed) land

use programme for the core area. Assumptions related to the delivery structures for the core area will equally be reviewed and updated as required in the analysis.

A.1.3.3. TASK 26: SUPPORTING POLICIES AND GUIDELINES

The Consultants will make proposals for 'soft interventions' (policies and guidelines) that will support the Master Plan in terms of promoting the delivery of an efficient, attractive and sustainable multi-modal transport system. Policies and guidelines may cover topics such as:

- > The provision, regulation and management of parking
- > Network management
- > Integration of modes in network development
- > Incentives to sustainable travel choices
- > Addressing transport impacts in the development control process

A.1.3.4. TASK 27: ACCESS STRATEGY FOR FLIGHT PATH AREAS

In consultation with the stakeholders, the Consultants will identify existing or planned/proposed development within the flight-path areas and the ground accessibility issues associated with them. Options to address those accessibility issues will then be developed that take into account the existing access needs; the future development and movement-generation potential of the areas; the constraints imposed by the flight path restrictions; and the overall network planning context defined by the integrated transport/land use Master Plan for the Broader Area.

Where more than one feasible option exists options will be assessed with reference to criterion based on defined stakeholder requirements/objectives.

The preferred concept-level access strategy will be developed at scale 1:2,500.

A.1.3.5. TASK 28: IDENTIFICATION OF PRIORITY INVESTMENTS

The transport infrastructure interventions required to implement the Master Plan transport networks within the Core Area will be defined, and priorities for investment in road infrastructure identified for detailed design.

It is anticipated that investment priorities will relate to:

- > Improving access to existing development to address current issues
- > Infrastructure required to provide access to development and facilities associated with the Standard Gauge Railway, including infrastructure to facilitate interchange with the urban public transport systems (rail, BRT, bus)
- > Access infrastructure to 'open up' high priority development sites
- > Infrastructure improvements to resolve operational problems on the existing road network that may prejudice development in the Core Area in the short-term – for example to tackle congestion and safety issues on the A104

A.1.3.6. TASK 29: DETAILED DESIGN FOR IDENTIFIED PRIORITY PROJECTS

In this Task, the Consultants will prepare the detailed design for the identified priority projects, in terms of roads and infrastructure utilities.

Road Geometry

The road geometric design will consist of the development of the setting-out details of all horizontal and vertical geometry. Drawings will be prepared at the end of this task containing:

- > Plans at 1/1000 scale for the roads showing reference lines, edge lines, curve radii, cross-falls, super-elevation application, channelization and service crossings such as pedestrian and utility crossings;

- > Profiles at 1/1000H, 1/100V for the roads showing reference lines, gradients, curve data, ground lines, levels and locations of crossing facilities such as culverts, and other structures;
- > Computer-generated horizontal and vertical geometric data sufficient for setting out and for all geometric calculations;
- > Typical road cross-sections including sidewalks and pavement details;
- > Details of junction areas and intersections with sufficient information for setting out;
- > Typical details of intersections, channelling islands, super-elevation application, and any other information necessary for setting out;
- > Signing and marking plans and associated details.

Power and Street Lighting

The detail electrical load estimate based on approved load factors and design criteria from the concept stage will determine the total demand loads in the core development areas.

The Consultants will also establish;

- > Plots reserved for HV/MV and MV substations.
- > Routing of Electrical medium voltage and Low voltage distribution networks.
- > Detailed street lighting design plans for typical road sections.
- > Electrical corridor reservations along the roads.

The Consultants will analyse the phasing of load demands as well as the Phasing of the distribution networks according to the construction and development schedules of the project.

Water Supply

The detailed design will include sizing of main, medium looped networks with all valves and accessories. It will also cover identifying location and capacities of treatment plants if any, water storage reservoirs, and pump stations.

Sewerage

The detailed design will include sizing of trunk main, lateral networks with all manholes and accessories. It will also cover identification/sizing of lift/pump station, required if any, treatment plant location and its capacity.

Storm Water Drainage

The detailed design will include sizing of road side drainage system, sizing of macro channels within the project area with all cross drainage works, outfalls. It will also cover protection, diversion works, ponds at low lying areas, which will help in attenuation of storm runoff, thereby reducing sizes of macro drainage systems.

A.1.3.7. TASK 30: IMPLEMENTATION STRATEGY FOR PRIORITY PROJECTS

The purpose of the Implementation Strategy is to make sure that a robust and realistic programme for the delivery of the priority projects is put in place to kick-start realisation of the development.

This Strategy will comprise the following:

Phasing Plan

A realistic phasing plan will be vital to the success of the project. An important aim will be to generate early momentum for the implementation of the project by identifying “low hanging fruit” – that is, those proposals that will be the most attractive to investors early on in the process. These proposals will offer the prospect of important “anchor” developments early on that will “prime the pump” and lead to an upward spiral of investor interest going into the future. Once important anchor developments are established, more peripheral projects which might otherwise be marginal in their viability, may become viable because of the growing commercial success of the area.

Importantly, this phasing plan will be strongly guided by the Real Estate Development Programme developed in Stage 2 and, as such, will reflect market dynamics and opportunities.

On the basis of this, the sites that could be programmed early on because they will generate high land values especially when associated with the transport and infrastructure investment programme will be identified and prioritised.

The public investment in transport and infrastructure should be programmed to fit in with the aim of attracting early investment to generate momentum. If reliance is to be placed on public/private partnerships then the timing of the income from tolls, concessions should be early and substantial so that prospective investors are not deterred by poor cash flow prospects.

Another potentially important aspect of the Phasing Plan will be the Resettlement Action Plan. This relates to the case of existing development that may have to be displaced to make way for important replacement projects in strategic locations and/or demolished because of being in poor condition where improvement is not viable.

Another dimension to the phasing plan is the demands of stakeholders because, although commercial success is paramount, stakeholders may have their own “wish list” priorities that might be important politically and, therefore, for the public acceptance of the plan. For this reason, the phasing plan will be flexible and allow for different packaging/ options so that a choice is presented at the stakeholders’ workshop.

Delivery & Regulation Structure

As mentioned, the financial feasibility studies will consider the various delivery models which could be considered in the implementation of the masterplan. Importantly, this will include identification of opportunities to engage and partner with the private sector.

However, the success of the strategy will depend on the national and local governance structure being adequate and sufficiently flexible and nimble to facilitate the Implementation Strategy. As required, recommendations for improvements to the governance structure will be made to ensure the public sector is able to both facilitate and regulate/ oversee the private sector’s involvement.

Investment Programme and Sources of Financing

For the list of priority projects (transport and utility infrastructure), preliminary investment costs will be estimated and compiled in an investment programme which assesses the investment required to deliver the key enabling infrastructure.

Additionally, the Consultants will provide recommendations on:

- > The potential to engage investment from international financing institutions such as the World Bank and other development aid bodies in the delivery of key infrastructure;
- > Opportunities to draw on national public funds (the Kenyan Government);
- > Opportunities to engage with the private sector and establish PPPs in the provision and maintenance of key infrastructures.

Such recommendations will be provided at a high level but are intended to provide a basis for further detailed studies on a project by project basis.

In the context of the current Study, the Consultants will shortlist 3-4 priority projects (transport and utility infrastructure) for which financial feasibility studies will be undertaken. This will provide a more solid position upon which potential investors and financiers can be approached, and are intended to support the Client in kick-starting implementation.

A.1.3.8. TASK 31: FINAL STAKEHOLDER WORKSHOP

The Client representatives, stakeholders and local community representatives will be re-assembled in order to assess the Detailed Master Plan for the Core Area. It will have to be made clear to the stakeholders that the workshop is not an opportunity to re-visit issues that were resolved in the Concept Master Plan. Because it is unlikely that all stakeholders will have been satisfied with the Concept Master Plan, it is likely that some will try and ignite old debates.

As ever, in order to expedite the Master Plan process, contact will be maintained with stakeholders throughout so that this workshop will hopefully not produce many surprises.

The purpose of the workshop will be to talk through the proposals to try and achieve consensus on most points. Where this is not possible, the Consultants will minute the unresolvable issues so at least there is good mutual understanding of respective positions.

Given that the stage after the finalization of the Plan will be the submission to the county authority for the approval of the Plan, it will be vital that representatives from the relevant county authority are involved in the discussion as a stakeholder, so that any amendments that may prove necessary to win approval are taken on board.

At the end of the workshop, there will be a private session with the Client in order to agree on the chosen option and what changes need to be made in the preparation of the Final Detailed Master Plan for the Core Area.

A.1.3.9. TASK 32: FINALISE DETAILED MASTER PLAN AND COUNTY AUTHORITY APPROVAL

The Consultants will amend the Detailed Master Plan taking on board all of the amendments agreed with the Client at the workshop. The Consultants will then submit the Plan to the county authority. As set out in the RFP, this process will take 1 month maximum and will involve two presentations to two separate committees. At the end of this, the Plan will be formally approved.

A.1.3.10. TASK 33: FINAL REPORT

This Report will consolidate all of the previous Plans and presentations, minutes of workshops etc. into one cohesive and coherent report to be presented to the Client at the conclusion of the study.

A.2. STAKEHOLDER ENGAGEMENT

The importance of stakeholder engagement in planning is anchored on various laws and policies in Kenya, including:

- > Constitution of Kenya (2010);
- > Urban Areas and Cities Act, 2011;
- > County Government Act, 2012; and
- > Physical and Land Use Planning Act, 2019.

The involvement of the stakeholders in planning is aimed at ensuring that planning is done in an inclusive manner so as to capture the views of the residents and other key stakeholders towards the preparation of the plan. The involvement of the stakeholders further ensures the successful implementation of the plan once it has been prepared. Table A.1 summarises the key stakeholders identified for this Plan.

Table A.1: Key Stakeholders List

Stakeholder	Details
Nairobi City County Government (NCCG)	Some of Planning Area falls within jurisdiction of NCCG
Machakos County Government (MCG)	Some of Planning Area falls within jurisdiction of Machakos County Government
Nairobi City Water and Sewerage Company (NCWSC)	Provision of clean water and sewerage services to Nairobi City County
Directorate of Urban and Metropolitan Development	Formulate, coordinate and administer policy in respect to Nairobi Metropolitan region
Ministry of Transport, Infrastructure, Housing and Urban Development	Comprised of five state departments
Ministry of Lands and Physical Planning	The Plan relies on the Ministry in every stage of its preparation and implementation
National Environmental Management Authority (NEMA)	Supervision and coordination over all matters relating to the environment
Kenya National Bureau of Statistics (KNBS)	KNBS acts as the principle agency of the Government in charge of collecting, analysing and disseminating statistical data for Kenya
Kenya Railways	Manage, operate, improve and regulate railways in Kenya - major project landowner
Kenya National Highways Authority (KeNHA)	Manage, operate, improve and regulate trunk roads in Kenya
Kenya Urban Roads Authority (KURA)	Manage, operate, improve and regulate urban roads in Kenya
Nairobi Metropolitan Area Transport Authority (NAMATA)	Oversees the establishment of an integrated and sustainable transport system within the Nairobi Metropolitan Area
Northern Corridor Transit and Transportation Coordination Authority (NCTTCA)	Coordination of transport infrastructure within East Africa Region
Kenya Ports Authority (KPA)	Manage and regulate the sea ports in Kenya – Planning Area includes inland container port depot
Kenya Civil Aviation Authority (KCAA)	Manage and regulate the civil aviation system in Kenya
Kenya Airports Authority (KAA)	Manage Jomo Kenyatta International Airport – located within Planning Area
Athi Water Services Board (AWSB)	Owner and custodian of water and sewerage infrastructure in Nairobi County
Kenya Wildlife Service (KWS)	Manage Nairobi National Park – located adjacent to Planning Area

Stakeholder	Details
Kenya Tourist Board	Marketing authority for tourism in Kenya
Communications Authority of Kenya (CAK)	The CAK is the regulatory body for the communications sector in Kenya.
Kenya Power and Lighting Company (KPLC)	Company responsible for transmission and distribution of electricity throughout Kenya
Kenya Association of Manufacturers (KAM)	Umbrella organisation representing companies in the manufacturing sector
Kenya Association of Hotelkeepers and Caterers (KAHC)	Umbrella organisation representing companies in the hospitality sector
Kenya Alliance of Resident Associations	Represent local communities
Syokimau Resident Association (SRA)	Represent local communities
Imara Daima Estate Association (IDEA)	Represent local communities
Nyayo Estate Residents Association	Represent local communities
Various	Planning Area includes small-scale operators such as food merchants, hawkers, matatu associations and kiosk operators.

A.2.1. KEY STAKEHOLDER ENGAGEMENT SESSIONS UNDERTAKEN

Table A.2 provides a summary of key stakeholder engagement sessions undertaken.

Table A.2: Summary of Key Stakeholder Engagement Sessions

Stakeholder Engagement Session	Date	Objectives	Attendees
Engagement with the community at Dupoto Settlement	May 2018	<ul style="list-style-type: none"> Informal discussion of the project 	<ul style="list-style-type: none"> Project Implementation Team Dar Community members
Stakeholders Workshop - Launch of Planning Process	June 2018	<ul style="list-style-type: none"> To present the site assessment and analysis of existing conditions. Engage with key stakeholders from the various sectors to obtain their inputs and continuing involvement as the project progresses. Present stakeholders with the opportunity to outline their individual expectations from the project. 	<ul style="list-style-type: none"> Project Implementation Team Dar Nairobi Metropolitan Services Improvement Project Nairobi City County Government Nairobi Metropolitan Area Transport Authority Kenya Airports Authority Kenya Railways Kenya Civil Aviation Authority Kenya Power and Lighting Company Ministry of Energy Kenya Urban Roads Authority Machakos County Government Ministry of Environment and Forestry Nairobi Water Company Regional Commissioner Nairobi Kenya Wildlife Service Directorate of Housing and Urban Development

Stakeholder Engagement Session	Date	Objectives	Attendees
Stakeholders Visioning Workshop	September 2018	<ul style="list-style-type: none"> Describe the project to stakeholders including its parameters, players and expected issues. Generate feedback and input from stakeholders. 	<ul style="list-style-type: none"> Project Implementation Team Dar Kenya National Highways Authority Kenya Airports Authority Nairobi County Machakos County Government Ministry of Transport, Infrastructure, Housing and Urban Development Kenya Urban Roads Authority Athi Water Services Board Kenya Power and Lighting Company Kenya Roads Board Nairobi Water and Sewerage Company Kenya Civil Aviation Authority National Environmental Management Authority World Bank Kenya Wildlife Service Ministry of Interior and Government Co-ordination Ministry of Energy Ministry of Environment, Water and Natural Resources The Treasury Ministry of Industrialisation and Enterprise Development Northern Corridor Transit and Transportation Coordination Authority Nairobi Metropolitan Area Transport Authority Kenya Investment Authority Kenya Association of Manufacturers Kenya National Chamber of Commerce and Industry Kenya Private Sector Alliance Kenya Property Developers Association Kenya Bankers Association Kenya Tourist Board Technology Service Providers of Kenya Kenya Alliance of Residents Association Imara Daima Estate Association Syokimau Residents Association Nyayo Estate Residents Association Local businesses - representatives of small-scale operators such as food merchants, hawkers, matatu(minibus) associations and kiosk operators.

Stakeholder Engagement Session	Date	Objectives	Attendees
Engagement with community representatives – Scoping for the SEA	September 2018	<ul style="list-style-type: none"> To inform community representatives on the Plan under preparation. Consult with community representatives on environmental and social issues. 	<ul style="list-style-type: none"> Dar Community representatives
Engagement with community representatives - planning for the socio-economic survey	September 2018	<ul style="list-style-type: none"> To inform community representatives about plans for a socio economic survey and agree logistics for undertaking it. 	<ul style="list-style-type: none"> Dar Community representatives
Engagement with Area Government Administrators	October 2018	<ul style="list-style-type: none"> To inform the Area Government Administrators of the Plan. 	<ul style="list-style-type: none"> Dar Area Government Administrators
Engagement with communities in all parts of the Planning Areas	October 2018	<ul style="list-style-type: none"> To inform the communities of the Plan and explain the purpose of the socio economic study. 	<ul style="list-style-type: none"> Dar Community members

Stakeholder Engagement Session	Date	Objectives	Attendees
1st Stakeholders Workshop	March 2019	<ul style="list-style-type: none"> • Ensure key stakeholders are aware of the Concept proposals. • Provide a range of methods by which key stakeholders could query and provide comments on the proposals. • Outline to stakeholders how the Plan will be progressed in the next stage of work and future engagement that will be undertaken. 	<ul style="list-style-type: none"> • Project Implementation Team • Dar • Kenya Railways • Kenya National Highways Authority • Kenya Airports Authority • Kenya Ports Authority • Nairobi City County Government • Machakos County Government • Ministry of Transport, Infrastructure, Housing and Urban Development • Kenya Urban Roads Authority • Athi Water Services Board • Kenya Power and Lighting Company • Kenya Roads Board • Nairobi Water and Sewerage Company • Machakos Water and Sewerage Company • Kenya Civil Aviation Authority • National Environmental Management Authority • World Bank • Kenya Wildlife Service • Ministry of Interior and Government Co-ordination • Ministry of Energy • Ministry of Environment, Water and Natural Resources • The National Treasury and Planning • Ministry of Industrialisation and Enterprise Development • Northern Corridor Transit and Transportation Co-ordination Authority • Nairobi Metropolitan Transport Authority • Ministry of Defence • Ministry of Tourism • Consultants undertaking projects within Nairobi Metropolitan Region • Ministry of Lands • Kenya Investment Authority • Kenya Association of Manufacturers • Kenya National Chamber of Commerce and Industry • Kenya Private Sector Alliance • Kenya Bankers Association • Technology Service Providers of Kenya • Kenya Alliance of Resident Associations • Imara Daima Estates Association • Syokimau Residents Association • Nyayo Estate Residents Association

Stakeholder Engagement Session	Date	Objectives	Attendees
(Continued from previous page)	(Continued from previous page)	(Continued from previous page)	<ul style="list-style-type: none"> • Civil society groups • Federation of Kenya Employers • Engineers Registration Board • Institution of Engineers of Kenya • Architects Association of Kenya • Institution of Surveyors of Kenya • Kenya Institute of Planners • University of Nairobi • Jomo Kenyatta University of Agriculture and Technology • Strathmore University • Kenyatta University • MPs from Langata/ Embakasi/ Mavoko constituencies • MCAs from wards in the Planning Area • Local businesses- representatives of small-scale operators • African Development Bank • European Union • Agence Française de Développement (AFD) • Japan International Cooperation Agency • UN Habitat
Engagement with the community at Dupoto Settlement	April 2019	<ul style="list-style-type: none"> • Updating the community and data gathering. 	<ul style="list-style-type: none"> • Dar • Community members

Stakeholder Engagement Session	Date	Objectives	Attendees
2nd Stakeholders Workshop	July 2019	<ul style="list-style-type: none"> To ensure stakeholders are conversant with Concept Plan proposals pertaining to the Core Area Detailed Design Studies, Strategic Policies for Adjoining Areas, the updated Financial Feasibility Study and the Implementation Strategy. To provide opportunities for direct discussion through which stakeholders could query and provide comments on the proposals. To outline to stakeholders how the Plan will be progressed in the next stage of work and future engagement that will be undertaken. 	<ul style="list-style-type: none"> Project Implementation Team Dar Nairobi Metropolitan Services Improvement Project Nairobi City County Government University of Nairobi Kenya Airports Authority Kenya Wildlife Service Ministry of Environment World Bank Kenya Urban Roads Authority Kenyatta University Ministry of Lands and Physical Planning Athi Water Services Board Imara Daima Estates Association Syokimau Residents Association Ministry of Defence Kenya Roads Board Kenya Institute for Public Policy Research and Analysis Jomo Kenyatta University of Agriculture and Technology Technology Service Providers of Kenya Institute of Quantity Surveyors of Kenya Nairobi Water and Sewerage Company Machakos Water and Sewerage Company Kenya Railway Institute of Surveyors of Kenya National Environmental Management Authority
Validation Workshop (Machakos)	July 2019	<ul style="list-style-type: none"> To provide a forum to the Machakos County leadership to deliberate on progress so far on preparation of the Plan. Mutual agreement between Machakos County Government and the Project Implementation Team on priority projects. Understanding the role of the County Government and other stakeholders in the plan implementation. Plan approval modalities by the Machakos County Assembly. 	<ul style="list-style-type: none"> Project Implementation Team Dar Nairobi Metropolitan Services Improvement Project Machakos County Assembly Machakos County Government

Stakeholder Engagement Session	Date	Objectives	Attendees
Validation Workshop (NCCG)	August 2019	<ul style="list-style-type: none"> To provide a forum to the Nairobi City County leadership to deliberate on progress so far on preparation of the Plan. To appreciate the role of the Nairobi City County Government in the preparation and Implementation of the Plan. To provide a basis for understanding the content and scope of the Plan To understand the linkage between the NIUPLAN and the proposed Plan. To appreciate sectoral overview on the various sectors covered by the Plan. To critique and appraise the development proposals presented in the Plan. To build consensus on the proposed priority projects. To discuss and adopt the way forward on the approval and implementation of the plan. 	<ul style="list-style-type: none"> Project Implementation Team Dar Nairobi Metropolitan Services Improvement Project Nairobi City County Assembly

A.2.2. KEY OUTCOMES

A.2.2.1. STAKEHOLDERS WORKSHOP: LAUNCH OF PLANNING PROCESS

The workshop was held in June 2018 and included a welcome address, site assessment presentations and group discussions. During the group discussions, attendees were divided into four groups and assigned topics for discussion: Urban Planning; Transport; Socio-Economics, Utilities and Environment; and Economics. Key points raised during the discussions can be summarised as follows:

Urban Planning:

- > The principal focus of the plan should be transport oriented.
- > Higher level health facilities, mixed commercial developments, housing and recreational facilities were identified as priority social facilities.
- > Provision of a market and light industrial zone to accommodate/provide for informal commercial activities.
- > Appropriate locations for new residential developments are to be: away from industries, away from the transport terminus (airport, SGR terminus), away from the Nairobi National Park (NNP) and where noise levels are lower than 65db.
- > Inclusion of residents in the development through public participation will contribute to local community benefits.

Transport:

- > Expected benefits for connecting the Embakasi Station to the airport include: reduced travel/journey times, connectivity to different nodes, creating job/employment opportunities, freight link integration and increase in land value.
- > The link between the Embakasi Station and Jomo Kenyatta International Airport (JKIA) is expected to improve tourism.

Socio-economics, Utilities and Environment:

- > Population influx: the population influx that will result after project implementation will attract a lot of activities.
- > Solid waste management: currently the area is still struggling with solid waste management. There is a need for a solid waste mechanism.
- > Demand for good infrastructure: having noted the area is mainly industrial and residential there is need for improvement in the infrastructure.
- > Focus on Small to Medium Enterprises (SMEs): there will be need to improve capacity of the locals.
- > Improvement in water system. Currently the residents use borehole water. There is need to study the Mavoko Sewer and Water Master Plans.
- > Use creation of awareness methodologies like radio stations, dissemination of questionnaires, interviews with local leaders.
- > Measures to ensure environmental protection and enhancement: preparation of conclusive and comprehensive SEA and EIA to ensure minimisation of environmental impacts, inclusion of green areas in the planning, storm water harvesting, resource efficiency: walkways, cyclist ways, waste disposal and the implementation of a green construction concept.
- > Impediments to the successful delivery of utilities provision were identified as: population explosion, lack of planning, lack of implementation of the many plans, land acquisition-encroachment of existing public designated land, lack of discipline by consumers-vandalism, deforestation-affecting water catchment area, financial constraints, blockage of storm water pipes causing storms and the existing infrastructure which has not been climate proofed.

Economics:

- > The Core Area can be an interface for Nairobi and the rest of the world, seeing as how people from Machakos,

Mombasa, and JKIA first interact with Nairobi through the General Area of Influence.

- > The Area should be allowed to grow organically and be influenced by the changing economic environment.
- > The area also has heavy tourism potential which should be exploited.
- > Growth of the area is heavily limited by the existence of informal settlements all around.
- > Advised to take advantage of the locally organised leadership to achieve inclusivity.
- > Consider the creation of a Special Job Creation Zone where immediate locals are given preferential consideration in exploiting employment activities taking advantage of the existing local leadership.
- > Limitations/constraints to growth in the area were identified as: water and sanitation (connection to the supply network is very limited), lack of a Solid Waste Management Facility serving Greater Nairobi and in particular that area, inadequate planning which has resulted in a 'land shortage' which inadvertently gives the impression that there is no space to develop and allow for growth, land value capture vis-à-vis proximity to JKIA limits the extent to which development can occur, ergo limits the Return On Investment (ROI) of any development in the area and land value for areas under informal settlements which is expected to rise.

A.2.2.2. STAKEHOLDERS VISIONING WORKSHOP

A visioning workshop was held in September 2018, to encourage Project Stakeholders to develop a vision for the Core Area's development. Stakeholders were given the opportunity to discuss what they would like to see as the final outcome of the development of the area.

Activities undertaken during the Visioning Workshop

Three main activities were undertaken as part of the Visioning Workshop to aid participants into achieving the objectives set out. These are as follows:

Expectations - Activity 1 set out for the participants to list their expectations for the Core Area regarding: Economy, Environmental and Social, Urban Design and Architecture, and Transportation. These are set-out in the following pages.

Values – Activity 2 asked participants to define the key values that they felt were vital to the project. The values were expected to emerge from the expectations in Activity 1.

Vision Statement – Activity 3 focused on defining vision statements that best encapsulated the Values and the Expectations highlighted in the two previous tasks.

The outcomes from Activities 2 and 3 are described in detail in Chapter 10.

Group 1:**A. Economy**

1. Wholesale needed in area
2. Education needed in area
3. More employment opportunities and skilled labour
4. Hospitality industry needs expansion
5. Boost tourism
6. Increase in manufacturing enterprises
7. Reduce the impact of the pinch point at ICD
8. Cargo and passenger from SGR speeds up the process (development)
9. Opportunities to reduce maintenance costs
10. Transport connectivity – airport/railway stations are opportunities to improve tourism
11. ICT important for the future
12. Need freedom of choice for transport modes
13. Integrate planning with NUMATA

B. Social & Environment

1. Need public parks (all the area is built up)
2. Precipitation needs management to reduce flooding
3. Need playgrounds
4. Low levels of income in the area; design out crime
5. Key impacts of activities around the core area need to be included – convergence of transport modes (movement of masses)
6. Make the area pleasant for live/work/play
7. Reduce carbon emissions
8. Make the development with compatible mixed use
9. Mitigate noise
10. Create amenities for place making
11. Include library, sports centre, and green parks.
12. Mitigate storm water with drainage improvements
13. Provide adequate solid waste management
14. Protect the National park
15. Provide public toilets
16. Provide hospitals
17. Provide walkways/sidewalks
18. Ensure structures are approved by aviation authority

C. Urban Design and Architecture

1. Improve transport network
2. Have specifications to design out dust
3. Ensure 'Kenyan' character is captured
4. Consider high rise as a solution to resettling informal housing
5. Provide sustainable design
6. Create an attractive skyline (form)

7. Design public spaces
8. Design should provide a sense of place/community
9. Design broad streets

D. Transportation

1. Reduce dust
2. Provide seamless connections make Imara Diema and Syokimau accessible
3. Improve connectivity
4. Provide organised public transport (design out mutatus was the theme)
5. Provide pedestrian features and cycle routes
6. Design routes to stop 'overlapping'
7. Reduce gridlocks at major junctions
8. Provide efficient police check points

Group 2:**A. Economy:**

1. High end hotels along Mombasa road.
2. Mall (opposite Syokimau Station)
3. Leisure activities.
4. Attracting international and domestic tourism.
5. SGR will be the engine of economy in that area.
6. Entry to National park should be free to particular destination.
7. We need 1 or 2 hotels in the core area overlooking the park.
8. We need commercial activities.
9. Tourism holding point.
10. Shopping centers around the terminals.
11. Job creations.

B. Social/Environment:

1. Cultural centre
2. Hospital/Health Center-Medical Center.
3. Proper management for all of Social/Env./water/solid waste/etc..
4. Need of schools.
5. Provide residential in Core Area.
6. Master Plan should provide all required social facilities.

C. Urban Design/Architectural:

1. Integration of facilities (SGR-Syokimau Stat.-JKIA-Mombasa Rd.)
2. No low rise/provide high rise.
3. Open spaces needed.
4. Green connectivity.
5. Place making.
6. Pedestrian bridges should be appealing.
7. Pedestrian bridges should be monitored to make the more secure.

D. Transportation:

1. Seamless connectivity between stations.
2. Provision of comprehensive road network.
3. Provide facility for integration/interchange of Matatus coming from the southern end of Nairobi in order to feed into the commuter rail.
4. Kitengela area should be taken into consideration (this is under the commuter project).
5. Entry to National Park must be controlled by those managing the park.

Group 3:**A. Economy:**

1. Careful approach to relocate industries.
2. Vibrant
3. Inclusive
4. Promote Cultural tourism
5. Provide conferencing facilities (MICE)
6. Provide hotel facilities for business travelers.
7. Promote the National Park.
8. Convenient access to economic facilities.
9. Take into consideration the visions of NUIPLAN, Machakos and Metro Plan.

B. Social/Environment:

1. Consider compatibility between industry and other uses.
2. Vibrant/active.
3. Inclusive
4. Environmentally Friendly.
5. Energy efficient.
6. More open/recreation space – social interaction.
7. Incorporate Kenyan culture.
8. Create a policy for the national park.
9. Recycling.
10. Reduce flood risks
11. Rainwater harvesting.
12. Waste management.

C. Urban Design/Architectural:

1. Attractive/Beautiful environment.
2. Environmentally sensitive design.
3. Pedestrian – friendly.
4. More open/recreation areas – within building designs.
5. Develop plans for informal housing upgrades.
6. Provide proper planning guidelines for new development.
7. Age inclusive design.
8. Inclusive economic/business design (eg. Formal & informal)
9. Create proper neighborhoods with all required facilities.

D. Transportation:

1. Efficient movement of passengers & cargo.
2. Effective linkage/connectivity between SGR+JKIA.
3. Reduce strain on Mombasa road/re-work weighbridge.
4. NMT.
5. Improved access to national park from – JKIA/Machakos.
6. Provide links between SGR+Konza.
7. Provide trailer parking.

Group 4:**A. Economy:**

1. Small Businesses – Stalls vendors to be included.

B. Social/Environment:

1. Landscape buffer to protect the park.
2. Inclusivity – housing for all income groups.
3. General Hospitality.

C. Urban Design/Architectural:

1. Aesthetic/superior – A model development.
2. Flexible masterplan/with respect to investors.
3. General Hospitality.
4. More commercial centers.
5. Remove industrial from around the transport nodes.
6. Define mixed use properly.
7. Compact city – adequate building heights.
8. Formalizing Infrastructure – Waste water/Telekom/etc..

D. Transportation:

1. Barriers should be overcome (SGR + NCR tracks)
2. Live-work area – Mixed used.
3. NMT (non-motorized transport)
4. Avoid more congestion – adequate access within the core area.
5. Integration of the core area with the metropolitan region.
6. Formalize Bus+Matatu stations.
7. Promote BRT systems.

Group 5:**A. Economy:**

1. Benefit the locals by providing jobs.
2. Improve the Industrial district.
3. Link the Park to the project area, where economy will flourish due to tourism.
4. Make the transport system as efficient as possible in order to increase productivity.
5. Take advantage of growing facilities like JKIA, by providing other facilities like hotels and shopping centers.
6. Provide proper infrastructure for both facilities and people living there.

B. Social/environment:

1. Policies to manage solid waste.
2. Safety should be taken into consideration.
3. Provide drainage systems in the core
4. Collect rainwater.

C. Urban/Architectural:

1. Include informal business in the study – fruit sellers.
2. Specify the owners of vacant land and how to take advantage of them in planning.
3. Green planning/introduce greenery in buildings.
4. Implementation of Kenyan culture in the architecture.
5. Address building restrictions to land development in a proper way.

D. Transportation:

1. Linkage of bus terminal and other public transport facilities to the SGR.
2. Fly overs to pedestrian.
3. Reduce the congestion along Mombasa road especially entering the CBD.
4. Linking the transport modes by have the same ticket along most of them.

2.3.4 Key Expectations per Sector**A. Economy**

- Wholesale needed in area
- Education needed in area
- More employment opportunities and skilled labour
- Hospitality industry needs expansion
- Boost tourism
- Increase in manufacturing enterprises
- Reduce the impact of the pinch point at ICD
- Cargo and passenger from SGR speeds up the process (development)
- Opportunities to reduce maintenance costs
- Transport connectivity – airport/railway stations are opportunities to improve tourism
- ICT important for the future
- Need freedom of choice for transport modes
- Integrate planning with NUMATA
- High end hotels along Mombasa road.
- Mall (opposite Syokimau Station)
- Leisure activities.
- Attracting international and domestic tourism.
- SGR will be the engine of economy in that area.
- Entry to National park should be free to particular destination.
- We need 1 or 2 hotels in the core area overlooking the park.
- We need commercial activities.
- Tourism holding point.
- Shopping centres around the terminals.

- Job creation
- Careful approach to relocate industries.
- Vibrant
- Inclusive
- Promote Cultural tourism
- Provide conferencing facilities (MICE)
- Provide hotel facilities for business travelers.
- Promote the National Park.
- Convenient access to economic facilities.
- Take into consideration the visions of NUIPLAN, Machakos and Metro Plan.
- Small Businesses – Stalls vendors to be included.
- Benefit the locals by providing Jobs.
- Improve the Industrial district.
- Link the Park to the project area, where economy will flourish due to tourism.
- Make the transport system as efficient as possible in order to increase productivity.
- Take advantage of growing facilities like JKIA, by providing other facilities like hotels and shopping centers.
- Provide proper infrastructure for both facilities and people living there.

B. Social & Environment

- Need public parks (all the area is built up)
- Precipitation needs management to reduce flooding
- Need playgrounds
- Low levels of income in the area; design out crime
- Key impacts of activities around the core area need to be included – convergence of transport modes (movement of masses)
- Make the area pleasant for live/work/play
- Reduce carbon emissions
- Make the development with compatible mixed use
- Mitigate noise
- Create amenities for place making
- Include library, sports centre, and green parks.
- Mitigate storm water with drainage improvements
- Provide adequate solid waste management
- Protect the National park
- Provide public toilets
- Provide hospitals
- Provide walkways/sidewalks
- Ensure structures are approved by aviation authority
- Cultural centre
- Hospital/Health Center-Medical Center.
- Proper management for all of Social/Env./water/solid waste/etc..
- Need of schools.
- Provide residential in Core Area.
- Master Plan should provide all required social facilities.
- Consider compatibility between industry and other uses.

- Vibrant/active.
- Environmentally Friendly.
- Energy efficient.
- More open/recreation space – social interaction.
- Create a policy for the national park.
- Recycling.
- Reduce flood risks and Provide drainage systems in the core
- Landscape buffer to protect the park.
- Inclusivity – housing for all income groups.
- Policies to manage solid waste.
- Safety should be taken into consideration.
- Collect rainwater.

C. Urban Design and Architecture

- Have specifications to design out dust
- Ensure 'Kenyan' character is captured
- Consider high rise as a solution to resettling informal housing
- Provide sustainable design
- Create an attractive skyline (form)
- Design public spaces
- Design should provide a sense of place/community
- Design broad streets
- Integration of transport facilities (SGR-Syokimau Stat.-JKIA-Mombasa Rd.)
- No low rise/provide high rise.
- Green connectivity.
- Place making.
- Pedestrian bridges should be appealing
- Create Pedestrian-friendly environment
- Pedestrian bridges should be monitored to make the more secure.
- Attractive/Beautiful environment.
- Environmentally sensitive design.
- More open/recreation areas – within building designs.
- Develop plans for informal housing upgrades.
- Provide proper planning guidelines for new development.
- Age-inclusive design.
- Inclusive economic/business design (eg. Formal & informal)
- Create proper neighborhoods with all required facilities.
- Superior aesthetics – A model development.
- Flexible masterplan/with respect to investors.
- Remove industrial from around the transport node.
- Define mixed use properly.
- Compact city – adequate building heights.
- Formalizing Infrastructure – Waste water/Telecom/etc..
- Green planning/introduce greenery in buildings.

Transport

- Reduce pollution
- Provide seamless connections make Imara Daima and Syokimau accessible
- Improve connectivity
- Provide organised public transport (design out matatus was the theme)
- Provide pedestrian features and cycle routes
- Design routes to stop 'overlapping'
- Reduce gridlocks at major junctions
- Provide efficient police check points
- Provision of comprehensive road network.
- Formalize Bus + Matatu stations and Provide facility for integration/interchange of Matatus coming from the southern end of Nairobi in order to feed into the commuter rail.
- Linkage of bus terminal and other public transport facilities to the SGR.
- Efficient movement of passengers & cargo.
- Effective linkage/connectivity between SGR+JKIA.
- Reduce the congestion along Mombasa road especially entering the CBD.
- Provide truck parking.
- Transport Infrastructure barriers should be overcome (SGR + NCR tracks)
- Encourage NMT (non-motorized transport)
- Good integration of the core area with the metropolitan region.
- Promote BRT systems.
- Pedestrian bridges
- Linking the transport modes by have the same ticket along most of them.

A.2.2.3. IST STAKEHOLDERS WORKSHOP

The 1st Stakeholders Workshop was conducted in March 2019 and continued the ongoing engagement undertaken since project inception.

In total, 70 participants attended the 1st Stakeholder Workshop. Four separate presentations were given covering Planning, Transport, Environment and Economics, each with a Q&A to facilitate the answering of any questions. Group discussions were also held and are summarised in below.

Group Discussions

Following the Q/A session, participants were split into three thematic groups in order to discuss the matters arising from the earlier presentations. Each group contained two facilitators from and the discussions were guided by the following four questions:

1. What do Stakeholders find a key strength of the Core Area Plan?
2. Are there any other components that Stakeholders feel should be considered in the Core Area Plan?
3. What in Stakeholders opinion should be the focus of the transport-related Priority Projects?
4. What other opportunities would Stakeholders like to see considered within Adjoining Areas?

A summary of each group's discussions is set-out below.

Planning Group

1. What do Stakeholders find a key strength of the Core Area Plan?
 - > Links with neighbouring areas
 - > Links between JKIA, SGR Terminus and National Park
 - > Provision of multi-modal transport
 - > Proposed bypass road

- > Will assist in decongesting the city
- > Retention of industrial area around the ICD
- > National Park is protected from development

Are there any other components that Stakeholders feel should be considered in the Core Area Plan?

- > Land uses/activities to attract young people
- > Open spaces for reading, music, art etc
- > Areas for informal urbanism
- > Spaces within retail/commercial areas for small traders to operate
- > Area for a permanent covered market in addition to open air markets
- > Open spaces for street food vendors

What in Stakeholders opinion should be the focus of the transport-related Priority Projects?

- > The ability to provide for both motorized and non-motorised transport
 - > The relationship between the priority roads and land use
 - > Their ability to open up retail/commercial development opportunities
4. What other opportunities would Stakeholders like to see considered within Adjoining Areas?
 - > Extension of the proposed non-motorised transport routes
 - > Agricultural land use
 - > Urban agriculture

Transport Group

1. What do Stakeholders find a key strength of the Core Area Plan?
 - > There will be a number of transport facilities from

different modal choices, strategically located very close to one another within the Core Area or near it (SGR and Commuter Rail, JKIA, BRTs and bus lines, road network, bicycle and path ways) and physically integrated (they can also be operated to be seamless integrated in terms of fare)

- > The Commuter Rail will serve the Core Area, a mass transit system with high quality (high frequency, high capacity, comfortable and reliable) once it has been implemented and, as a backbone network of lines, will broadly connect the Core Area with other metropolitan areas
 - > Proposed improvements on the transport network will help to avoid traffic related problems within the Core Area and also to potentially reduce road traffic congestion on the surrounding areas
2. Are there any other components that Stakeholders feel should be considered in the Core Area Plan?
 - > The Truck Parking with proper hospitality facilities, warehouses and other logistic business sector companies should be integrated though the proposed transportation corridor to the local industry. Another issue raised is about ensuring public access to the eco-tourism area.
 - > Some comments reinforce the importance of careful land use planning to avoid creating more traffic problems rather than just relieving it.
 - > One of the stakeholders recommended the BRT line should pass by the Nairobi Terminus train station. However, a bus/BRT transfer station has been proposed near Nairobi Terminus. A BRT line connecting both systems has not been proposed. The integration is possible by bus feeder lines passing at the stations from both systems. For example, one of the planned bus feeder lines connects the proposed Syokimau Bus Terminus to the Nairobi Terminus train station.
 - > It was highlighted to have a closer look into the potential impact of Mlolongo weighing bridge over some of the proposed road junctions and transport facilities on

Mombasa Rd

- > It was asked to consider a Commuter Rail line along Outer Ring Road to connect JKIA to Pipeline. However, the Commuter Rail Master Plan studies has touched upon this route and it was dropped due to high costs and because there were more feasible alternative routes.
 - > Some stakeholders believe there should be more “entry points” into the CBD for ease of traffic mounting. However, it was clarified during the workshop presentations that this is far beyond the scope of this project and the Planning Area.
 - > Although it does not necessarily fit in the transport section, the land ownership issue was cited, in terms of checking the cost of using the undeveloped land to make the proposed plan feasible. One of the participants highlighted the importance of presenting the issues of various groups of people living in the area regarding environment, education, industries/jobs and transport in the proposal
 - > There is concern on the part of some participants regarding policies to control unplanned development on private land and also, criticisms on the proposed residential land use. Two participants suggested the discouragement of this use, and one of them cited mainly discouragement when near the SGR, promoting instead “light industry and packaging” land use. Another concern cited by two participants is related to the proposal of any land uses very close to National Park, affecting natural resources and biodiversity, and even hampering the implementation of the plan.
3. What in Stakeholders opinion should be the focus of the transport-related Priority Projects?
- > Improving connectivity at transport nodes (mainly for public transport) and between the sub-centres and the CBD are mentioned as priority to avoid creating another zone of traffic conflict. There is concern about how terribly difficult congestion is and about the new roads do not create bottlenecks. Thus, stakeholders mentioned access restrictions as a major guideline, especially at the proposed

new junctions along Mombasa Road. It was also mentioned the importance of designing the intersections at A104 to be seamless. It is specifically mentioned that the Truck Bypass is vital, but you should look carefully to not to build up traffic at the junctions near the Mlolongo weigh bridge and near the Cabanas leisure park.

- > The integrated public transport network and improving the roads capacity are proposed to avoid congestion along Mombasa Rd. Additionally, the seized road capacity of Truck Bypass is to contribute to the relief of traffic on Mombasa Rd as well.
 - > One stakeholder emphasizes the need for completion of the SGR to the Southern Bypass and brings to attention the demand estimate at Syokimau Station, and as also previously mentioned, the Truck Parking with facilities such as hotels and garage amenities.
 - > The importance of non-motorized transport infrastructure is also mentioned, as well as providing footbridges, flyovers at interchanges and implementing fast and low-cost transport systems.
 - > Although presented in the topic of transportation, there were also issues raised on facilities, such as design for storm water drainage system at Syokimau area.
4. What other opportunities would Stakeholders like to see considered within Adjoining Areas?
- > The interaction of the Mlolongo weighing bridge with the transport network is cited as something to be considered in the Adjoining Areas.
 - > Connectivity with the CBD. For greater connectivity of the new sub-centres with the CBD, promote greater decentralization and other points of entry in the CBD to alleviate traffic
 - > Commuter Rail line from Pipeline as an alternative route to connect to JKIA - this line was discarded in the Commuter Rail Master Plan, since the JKIA connection from Nairobi Terminus proved to be more relevant. A feeder bus line was

proposed that provide such connection as well.

- > Stakeholders would like to see more references on how to integrate this project with other proposed projects for the region: General Metropolitan Master Plan, Machakos Master Plan, and Kajiado Master Plan.
- > Other comments suggest to provide connection to Konza City to help boosting industrialization, to extend the BRT line to Kitengela and proposes a train station at Mlolongo, near the proposed Marinbeti train Station. In the past, it used to be one of the busiest halt for the train to Athi River. Service was discontinued around 2013 due to rolling stock restrictions. There was also request to improve connectivity from Embakasi Village northwards to Kangundo Road, providing an alternative route from the northern area.
- > Syokimau Area can be a major country bus terminus where could be possible to link with the commuter rail and the BRT to the CBD.
- > Some plans fall much beyond Adjoining Areas and should not be the context of the study. However, regarding to the Commuter Rail Master Plan, extending it to Konza, adding a train station at Mlolongo, extending it to the northern of Embakasi Village to Ruai, were taken into consideration in the Commuter Rail Master Plan but not included in Core Scenario although some of them could be for long-term plans (beyond 2030) and more elaborate references from the Master Plan will be transcribed to the 2nd Interim Report. Additional bus feeder routes can be developed to address connectivity between specific areas.
- > Other comments that are not necessarily addressed to transport concerned to land use, inclusion of informal business sector, inclusion of needs for lower income groups and place making for sports stadiums within the Core Area. Additionally, emphasis is given to the National Park as a great tourist attraction for those short-stay airport travellers.

Other comments from Stakeholders?

- > Participants were encouraged to freely comment about

the project and the presentation that was given. First comments were about the initiative of the Truck Park near the ICD area. Additionally, it was suggested that the Truck Park should be adopted as a Priority Project. It was proposed to integrate - through ITS technologies, the scheduling of the trucks to enter the ICD and the booking online for entering the Truck Parking, thus allowing a better organization of the truck's traffic in the area. The discussion pointed out that the Truck Bypass Road still seems a priority because its benefit is more comprehensive.

- > Although it is not directly related to transportation, it was said that due to the location of the area and the proposed improvements, more warehouses and other logistics sector related companies may end up installed at the area instead of industries thus eventually competing with more residential land use.
- > It was emphasized the importance of policies to monitor and control land use development, mainly avoiding unwanted occupation in the vicinity of the junctions which could undermine ease traffic flow and access should happen preferably from the back of the plots rather than the front to avoid congestion due to vehicles slow down.

Business and Environment Group

1. What do Stakeholders find a key strength of the Core Area Plan?
 - > Captured multi-modal nature of the projects with beneficial transport improvements
 - > Proposed integrated mixed land use seen as a strength
 - > Captured benefits of neighbourhoods and social integration and inclusivity
2. Are there any other components that Stakeholders feel should be considered in the Core Area Plan?
 - > Ensure integration with current built assets and land ownership and be clearer on flight path impingement
 - > Intrinsic consideration of corridor planning as tool to

deliver solutions needs consideration

- > Resettlement policy and action plan is critical
 - > Expound strategy for institutional structures and governance (including organisational delivery structure)
 - > Clarity on provision of social infrastructure is important
 - > Provide community facilities for the elderly
3. What in Stakeholders opinion should be the focus of the transport-related Priority Projects?
 - > By-pass alleviating pressure on Mombasa Road (5 responses)
 - > Improve internal core area network (9 responses)
 4. What other opportunities would Stakeholders like to see considered within Adjoining Areas?
 - > Clear complementarity with improved links of economic and social activities between Core and Broader
 - > Explicit illustrations of employment opportunities
 - > Large sports facilities
 - > Conference centre
 - > Seamless infrastructure
 - > Capturing and conserving cultural and historical diversity
 - > Enable non-motorised movement of people

A.2.2.4.2ND STAKEHOLDERS WORKSHOP

The 2nd Stakeholders Workshop was held in July 2019. The aim was to clarify proposals within the 2nd Interim Report and obtain initial stakeholder feedback on these. The main objectives were to:

- > Ensure key stakeholders are conversant with Concept Master Plan proposals pertaining to the Core Area Detailed Design Studies, Strategic Policies for Adjoining Areas, the updated Financial Feasibility Study and the Implementation Strategy
- > Provide opportunities for direct discussion through which key stakeholders could query and provide comments on the proposals; and
- > Outline to stakeholders how the master plan will be progressed in the next stage of work and future engagement that will be undertaken.

The workshop comprised a series of presentations on the different aspects of the Report with associated question and answer sessions.

A.3. NOTICE OF INTENTION TO PLAN



Republic of Kenya



Kenya Railways



Nairobi City County

MINISTRY OF TRANSPORT, INFRASTRUCTURE, HOUSING AND URBAN DEVELOPMENT

PHYSICAL PLANNING ACT (CAP 286)

NOTICE OF INTENTION TO PLAN

Reference is made to the Constitution of Kenya articles 6,60,66,67,186, and the First and the Fourth Schedules; Physical Planning Act Cap 286; Physical Planners' Registration Act of 1996; National Land Commission Act; County Government Act of 2012; Urban Areas and Cities Act; and other enabling legislations.

Notice is hereby given that the Kenya Railways Corporation, in conjunction with the Nairobi City County and the Directorate of Urban and Metropolitan Development in the Ministry of Transport, Infrastructure, Housing and Urban Development intend to prepare a Local Physical Development Plan (LPDP) for the SGR Embakasi Railway Station Area. The project area includes key facilities, namely the SGR Station, the Embakasi Village Commuter Railway Station, the Syokimau Commuter Railway Station, Imara Daima Commuter Railway Station, the Inland Container Depot, Jomo Kenyatta International Airport, Mlolongo Freight Logistics Area, and relevant sections of Highway A8. The project area also includes the areas located within a 1 kilometre radius of the facilities.

The exercise will be carried out under the Nairobi Metropolitan Services Improvement Project (NaMSIP), a government project intended to strengthen service delivery in the metropolitan region by investing in local infrastructure and in providing large-scale metropolitan infrastructure in the area of solid waste, transport, and sewerage services. The project will help to improve service delivery by strengthening the capacity of current and future entities responsible for service delivery.

This process will entail the undertaking of a detailed land use plan and urban design for the proposed development around the SGR Embakasi Station Area and harmonise existing plans for the area of influence. The plan preparation period is 12 months.

The preparation of this plan will be participatory and therefore all stakeholders are invited to the planning process. Any comments, enquiries or suggestions on the same may be done in writing to:

Principal Secretary,

Ministry of Transport, Infrastructure, Housing and Urban Development

P.O. Box 52692 – 00200,

Nairobi.

A.4. NOTICE OF COMPLETION OF DEVELOPMENT PLAN'

18 *Monday, August 19, 2019*






MINISTRY OF LANDS AND PHYSICAL PLANNING
FIRST SCHEDULE
PHYSICAL PLANNING ACT (CAP 286)

Form P.P.A.3 r. 3. (3)

NOTICE OF COMPLETION OF DEVELOPMENT PLAN

Title of Plan: Regional Development Plan for SGR Embakasi Station Area, Syokimau Station, Nairobi Inland Container Depot and Adjoining Areas
 Plan No. 42/14/2019/01

Notice is given that the preparation of the above Development Plan was on the day of 29th of July, 2019 completed.

The Development Plan relates to land situated in SGR Embakasi Station area including SGR Nairobi Station's marshalling yard and passenger terminal, Embakasi Commuter Railway Station, Syokimau Commuter Railway Station, Embakasi Inland Container Depot, JKIA, Migongo Freight Logistics Area and the adjoining areas. The planning area covers parts of Nairobi City and Machakos counties respectively.

Copies of the Development Plan as prepared have been deposited for public inspection at the offices of the Director, Urban Policy and Research - Nairobi City County Government at City Hall and the Director of Physical Planning - Machakos County Government at the Lands and Physical Planning Offices at Machakos Town opposite County Commissioner's office and Athi River Town, Adjacent Athi River Health Centre. The copies so deposited are available for inspection free of charge between the hours of 0800 to 1700 Monday to Friday.

Any interested person (s) who wishes to make any representation in connection with or objection to the above Development Plan may send such representations or objections in writing to be received by the following offices not later than sixty (60) days from the date of this Notice and any such representations or objections shall state the ground on which it is made:

Director, Urban Policy and Research Nairobi City County Government P. O. Box 30075-00100 NAIROBI	Director of Physical Planning Machakos County Government P. O. Box 1986-90100 MACHAKOS
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Dated: 29th July 2019

Augustine K. Masinde, EBS.
NATIONAL DIRECTOR OF PHYSICAL PLANNING

A.4.I. REPRESENTATIONS RECEIVED

The published Notice of Completion of Development Plan provided a 60 day period during which any person could submit written representations in connection with the Plan to either Nairobi City County or Machakos County Governments.

Nairobi City County Government did not provide any such representations received. Machakos County Government provided six representations received, raising the following points:

1. 'This is an excellent plan. I live in Syokimau estate. Implementation of the plan will facilitate growth and improvement of the estate';
2. 'Well thought to amend current traffic in Nairobi';
3. 'Please provide the soft copy by email (pdf) for further scrutiny. A step in the right direction. Looking forward to the physical implementation of the same';
4. 'We require a soft copy of the Plan to enable us make substantive representation/comments';
5. 'Kindly avail a soft copy'; and
6. 'Advocate more on the implementation of the plan. Good job'.

Given the content of the representations provided, they did not require any changes to be made to the Plan.

A.5. LANDSCAPE DESIGN GUIDANCE

This chapter provides direction for the design of all spaces within the public and private realm. Nairobi's public realm generally suffers from poor design and insufficient maintenance, and stakeholders have identified the importance of reversing this trend.

The purpose of the landscape design guidance 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 guidance provides a series of recommendations that support the scale, natural environment and public open spaces that define the development area.



A.5.1. SUSTAINABLE DESIGN

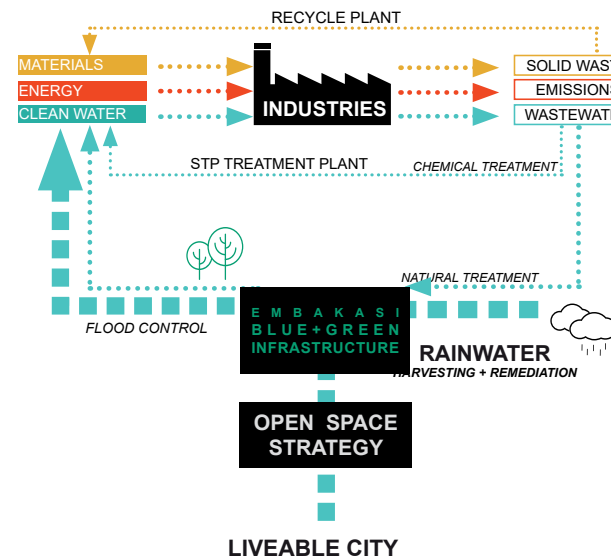
Objective: To conserve water and energy, reduce waste and decrease runoff, respect, protect and enhance ecosystems.

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-proof 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.

A.5.2. 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 describe the sense 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 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.
- > Identify 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.



A.5.3. 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.
- > 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 impairments. Wayfinding and interpretation shall include braille and be located at an accessible height. Planting can assist way finding through sound and scent and colour.

A.5.4. PUBLIC REALM

Typologies:

- > Parks
- > Public Plaza
- > Private Plaza
- > Pocket park

Public Realm General Guidelines:

- > Ensure high quality materials and fixtures.
- > 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.
- > Creates pedestrian linkages that Connect the plan together with main cyclist route running through the corridor.



A.5.5. ROADS

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.
- > 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.

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.



A.5.6. 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 and abilities.

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 through development to guide cyclists on their commute.



A.5.7. HARDSCAPE

Typologies:

- > Streetscapes
- > Public footpaths
- > Plazas / Event spaces
- > Private open spaces

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 pervious 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:

- > 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.



A.5.8. SOFTSCAPE

Typologies:

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

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.

General Softscape Guidelines:

- > All tree and plant selection will comply with the latest edition of Nairobi's Standard for Nursery Stock.
- > 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.
- > 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.



A.5.9. 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.



A.5.10. 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.

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.
- > 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.
- > 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.



A.5.1.1. NATURAL WATER COURSES

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.

General Natural 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.

BEFORE



Pollution in rivers path vegetation



AFTER



Cleared river



A.5.12. 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 throughout 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 path vegetation



Vegetated cracks in decorative rocks



Water rill



Water rill

A.5.13. 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 tank or pipe storage must be justified.
- > Where 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 vegetation



Rain garden inside the planting bed



Rain garden on side of pedestrian path



Rain gardens forming the pocket parks

A.5.14. 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 storms should 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 with a decorative design



Water retention ponds fully filled with vegetation



Water retention ponds with part vegetation

A.5.15. SUSTAINABLE ROOFS

Typologies:

- > Extensive Green roof
- > Intensive Green roof
- > Semi-Intensive Green roof
- > Brown roof
- > Unvegetated Accessible Roof

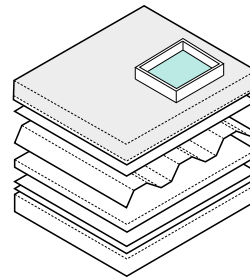
Design approach:

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.

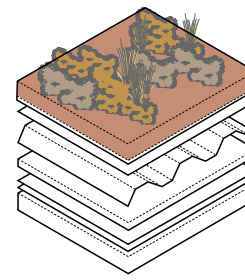
The landscape of the roofscape must follow the design intent of the public open spaces to ensure the proposed flora does not change the aesthetic appearance of the park. Although some roofs may have potential to be fully intensive spaces, there is the sustainable and environmental benefits for buildings 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.

General Roofscape Requirements:

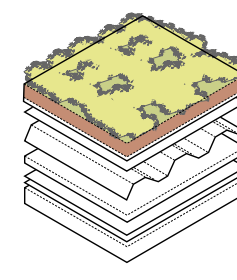
- > All rooftops should be assessed on whether they can contribute to environmental gains.
- > Low cost solutions such as brown roofs, can have large benefits to biodiversity and sustainable goals.
- > Intensive green roofs should only be used in very special circumstances and where sufficient visitor numbers will benefit.
- > Roof construction to be developed with specialist contractor.



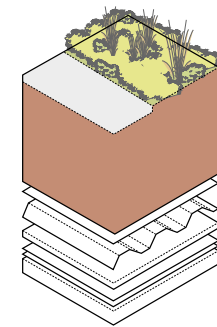
Plain Roof Typology Diagram



Brown Roof Typology Diagram



Extensive Green Roof Typology Diagram



Intensive Green Roof Typology Diagram



A.5.16. 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.

General Urban Farming Guidelines:

- > 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.



Urban allotment



Orchards



Vertical Farm



Urban beekeeping

A.5.17. RECREATION

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



Basketball



Tennis



Volleyball

A.5.18. 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 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.



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