

DETAILED DISTRICT PHYSICAL PLANS
FOR KICUKIRO & GASABO
KIGALI, RWANDA

KIGALI CITY
MASTER PLAN REPORT

MAY 2013

TASK ORDER 3: CONCEPT PLANNING



CITY OF KIGALI

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PREFACE

PROJECT BACKGROUND

The City of Kigali (CoK), one of the most active and progressive City Councils of Africa, aspires to see Kigali develop as a competitive, safe and clean modern city. In the recent past, the Government of Rwanda has undertaken the preparation of several urban development plans as well as other studies related to transport, infrastructure, housing and environment for Kigali. Having completed the Kigali Conceptual Master Plan (2008) and Detailed Master Plans for Nyarugenge District (2010) as well as various other sub-areas of Kigali, the City now intends to develop Detailed Physical Plans for the other two Districts, namely, Gasabo and Kicukiro, so as to have an integrated detailed plan for the entire City.

PROJECT COMMISSIONING AND SCOPE

In early 2010, Surbana International Consultants, Singapore (Surbana) completed the Detailed Planning of Nyarugenge District, which included Detailed Urban Design for Kigali's CBD. In October 2011, through a public tender, the City of Kigali awarded the 'Design of Detailed District Physical Plans for Kicukiro & Gasabo' to Surbana.

This master planning project, in addition to the detailed planning of the two districts, has the following objectives:

- To review the planning direction and strategies for the entire City of Kigali, while integrating all the past planning and development initiatives undertaken.
- To prepare detailed master plan, urban design (for key areas) and development control guidelines for the two districts of Kigali, namely Gasabo & Kicukiro. This would also include the review and

revision of the Detailed Master Plan for Nyarugenge District.

- To establish a GIS database for the entire City which has a coordinated base map, proposed land use plan & development control information for all areas of the City of Kigali. This GIS system would form a part of the MIS system being put in place by the Government.
- To ensure participation of the various stakeholders in the development of the Master Plan so as to develop a plan that reflects the needs and aspirations of the City's residents.
- To conduct capacity building of the CoK staff through training programmes in Singapore and Kigali.

PROJECT ORGANIZATION & SCHEDULE

The project is spread over one year period and comprises of the following 6 task orders, each with a duration of 2-4 months:

Task Order 1: Start-up, Reconnaissance & Base-mapping

Task Order 2: Existing Conditions, Analysis & Vision Formulation

Task Order 3: Preparation of Conceptual District Plan

Task Order 4: Preparation of Schematic District Plans

Task Order 5: Preparation of Detailed Urban Design

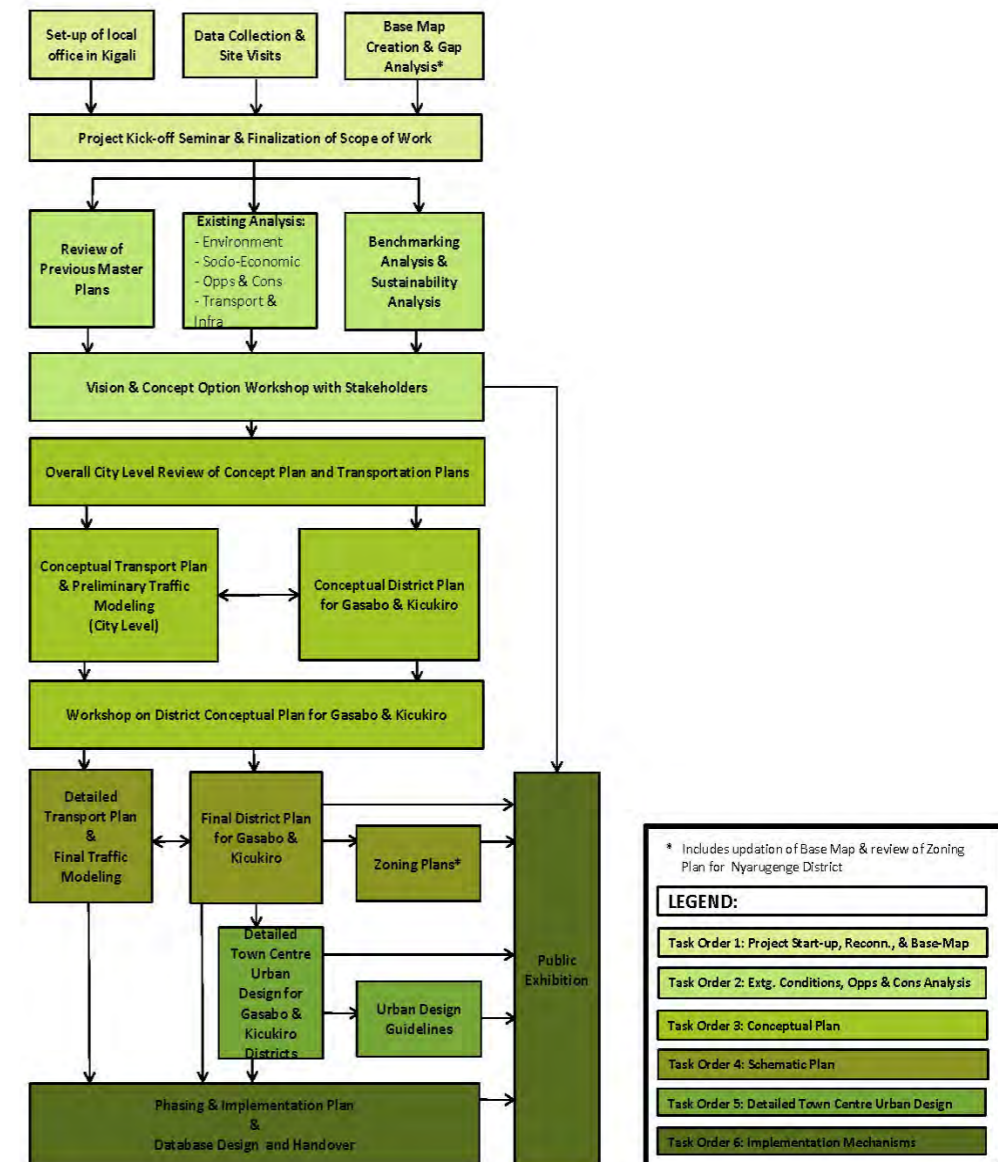
Task Order 6: Preparation of Implementation Plans

PROJECT PROCESS

In line with the project scope discussed above, the process to be adopted for this project is as elaborated below:

- Establishment of a proper working base map which incorporates all land use related information for developing the master plan.
- In-depth analysis of various existing issues facing the City and stock-taking and review of previous master plans and infrastructure planning initiative in the City in order to develop an integrated Master plan.
- Establishing the strategic Urban Sustainability Framework for Kigali, that will become the overarching framework, guiding the City to address its key economic, social & environmental issues.
- Benchmarking with international best practices in city planning and management, determining the future growth scenario, and setting the development vision and the strategic growth direction for the city.
- Development of a conceptual transportation master plan, infrastructure plan & environmental management strategy for the entire city.
- Mapping out implementation process to direct the implementation process.
- Putting in place an integrated land-use data management system which incorporates the base map, the Master plan and planning approval process.

The planning process adopted for this project is further illustrated in the following chart.



PROJECT DELIVERABLE

Various reports, corresponding to the various task orders are to be submitted, which include:

Task Order 1:

- Inception Report

Task Order 2:

- Analysis, benchmarking and Visioning Report

Task Order 3:

- Conceptual Transportation Plan report
- Conceptual Plan report

Task Order 4:

- Final Transportation Plan report
- Final Gasabo Master Plan report
- Final Kicukiro Master Plan report
- Gasabo Zoning booklet
- Kicukiro Zoning booklet

Task Order 5:

- Gasabo Town Centre Urban Design report
- Kicukiro Town Centre Urban Design report
- Gasabo Town Centre Zoning booklet
- Kicukiro Town Centre Zoning booklet

Task Order 6:

- Implementation report

In addition to the above reports, various marketing and promotional materials to illustrate the master plan would also be prepared for the public exhibition.

A Geodatabase, incorporating the existing land use map, the proposed land use plan & the development control information would be submitted at the completion of the project.

STAKEHOLDERS' PARTICIPATION & CAPACITY BUILDING

A key component of the project would be to ensure adequate participation in the planning process from various stakeholders such as decision-makers, from public and private sectors focus groups, community organizations and various public interest groups. Accordingly numerous meetings, seminars and workshops are to be conducted at all stages of the project. A public exhibition of the master plan will be undertaken at the end of the project with an objective to launch the master plan.

In addition a communication plan, executed through various print, broadcasting & online media would ensure participation and feedback from the wider public.

This comprehensive city wide plan, incorporating the detailed physical plans of the two districts as well as all the past planning initiatives would become the long term development framework for Kigali City guiding it into an era of progressive and holistic city development.

ENVISIONING THE FUTURE OF KIGALI



“The Centre of Urban Excellence”

Focus for the 3 districts of Kigali

NYARUGENGE :

“Green Financial Hub and Vibrant Growth Centre”

GASABO :

“Diverse Employment Hub and Cultural Heartland”

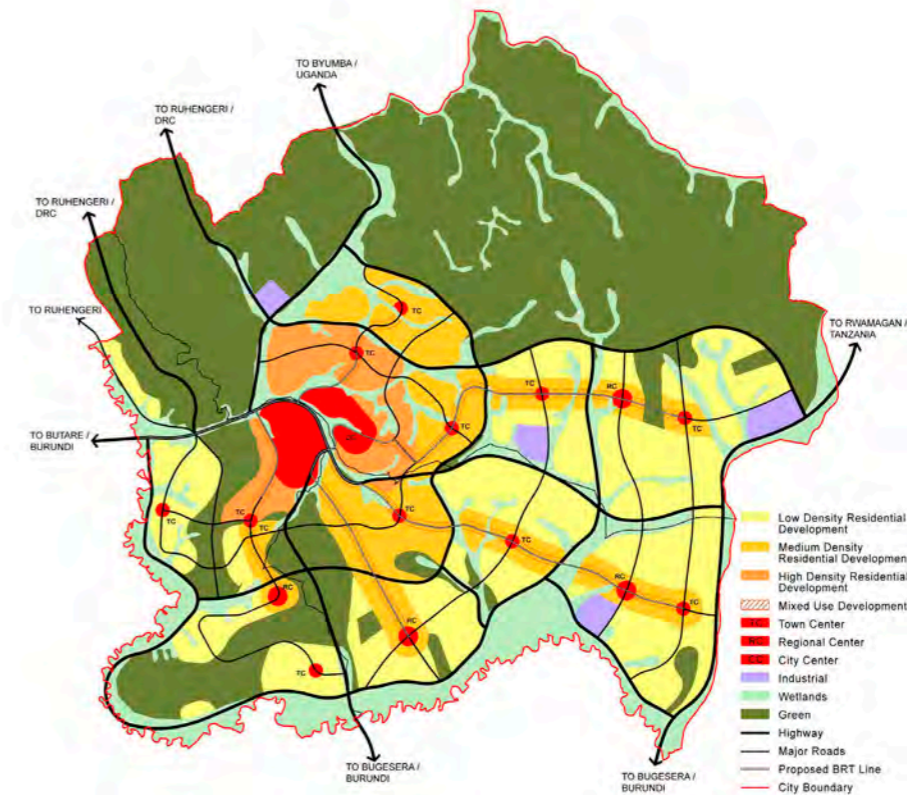
KICUKIRO :

“Knowledge Hub and Green Gateway of Kigali”

GOALS FOR KIGALI

To achieve the medium and long term visions for Kigali, a set of goals covering 6 critical sectors of development is proposed. These key goals will guide the physical planning for the City.

- 1 **CITY OF CHARACTER, VIBRANT ECONOMY AND DIVERSITY**
- 2 **CITY OF GREEN TRANSPORT**
- 3 **CITY OF AFFORDABLE HOMES**
- 4 **CITY OF ENCHANTING NATURE & BIODIVERSITY**
- 5 **CITY OF ENDEARING CHARACTER AND UNIQUE LOCAL IDENTITY**
- 6 **CITY OF SUSTAINABLE RESOURCE MANAGEMENT**



Proposed Radial City - Conceptual Structure Plan

STRATEGIES FOR TRANSFORMATION...

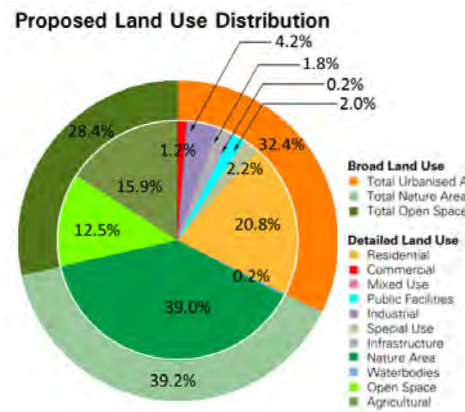
- ESTABLISHING A RANGE OF EMPLOYMENT CENTERS IN KIGALI.
- CREATING AFFORDABLE AND QUALITY LIVING ENVIRONMENTS IN KIGALI.
- TO DEVELOP A COMPACT, VIBRANT & TRANSIT ORIENTED CITY
- MANAGING AND IMPROVING THE ENVIRONMENT & INFRASTRUCTURE.
- TO PRESERVE URBAN HERITAGE & ENHANCE PUBLIC GREENS
- TO CONSOLIDATE AND RESERVE LAND FOR FUTURE NEEDS



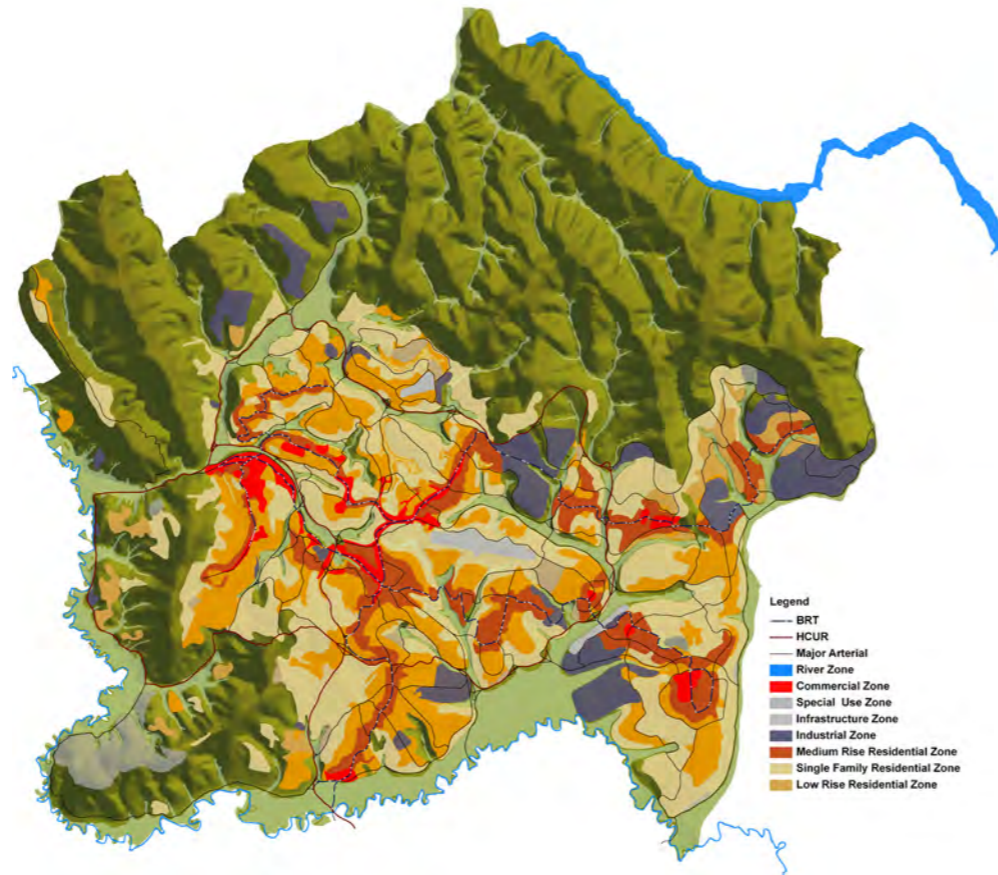
Existing Land Use Map



Proposed Density Distribution for Kigali



Proposed Land Use Distribution



Proposed Kigali Conceptual Master Plan

PROPOSED LAND UTILIZATION STRATEGY

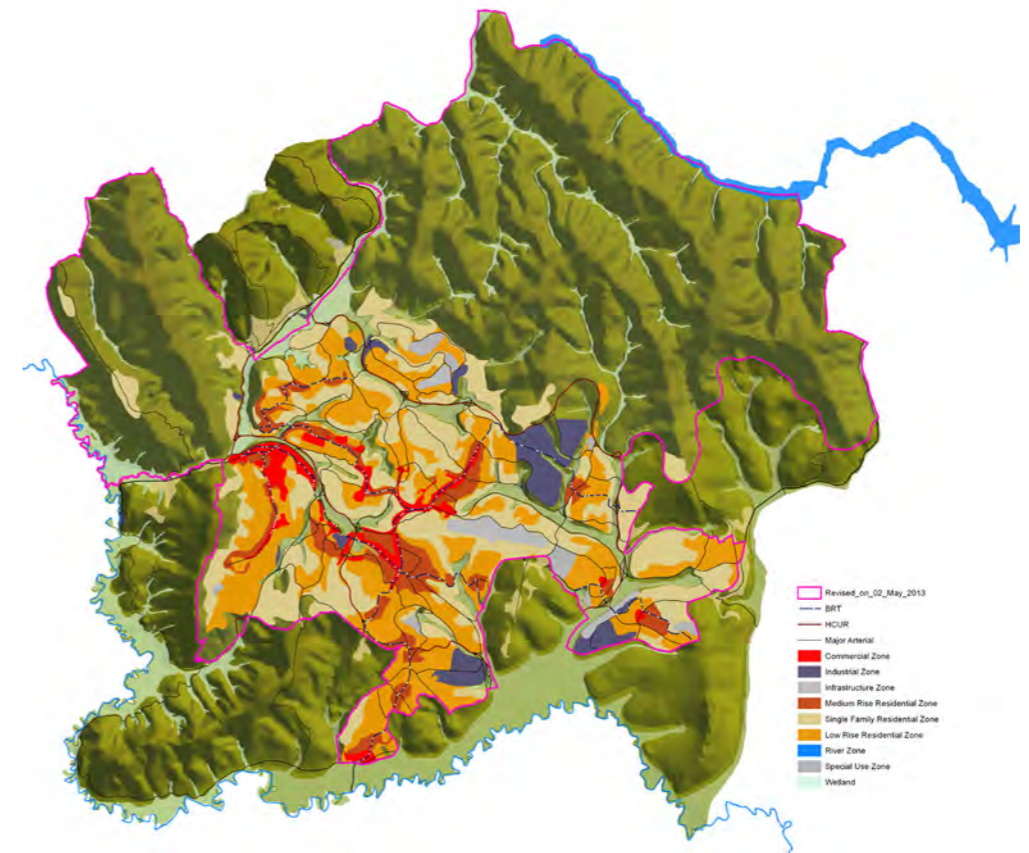
The proposed land utilization strategy focuses on the following key aspects:

- Identifying, strengthening and organizing of the existing City Centre.
- Identifying & organizing City Fringe Areas.
- Defining the urbanizable new growth areas & organizing these as the Suburban Areas.
- Defining the un-buildable areas in the outskirts as Rural Area and developing relevant strategies.

TOWARDS A CITY OF URBAN EXCELLENCE: PROPOSED BROAD LAND USE PLAN YEAR X

A broad land use plan is prepared for Year X showing the ultimate development envisioned for the Kigali City. The key land use proposals are:

- To expand and strengthen the City Centre by allowing high density commercial and vibrant mixed use developments.
- To introduce regional level commercial areas in Fringe and suburban areas.
- To safeguard land for consolidated Industrial Estates for general.



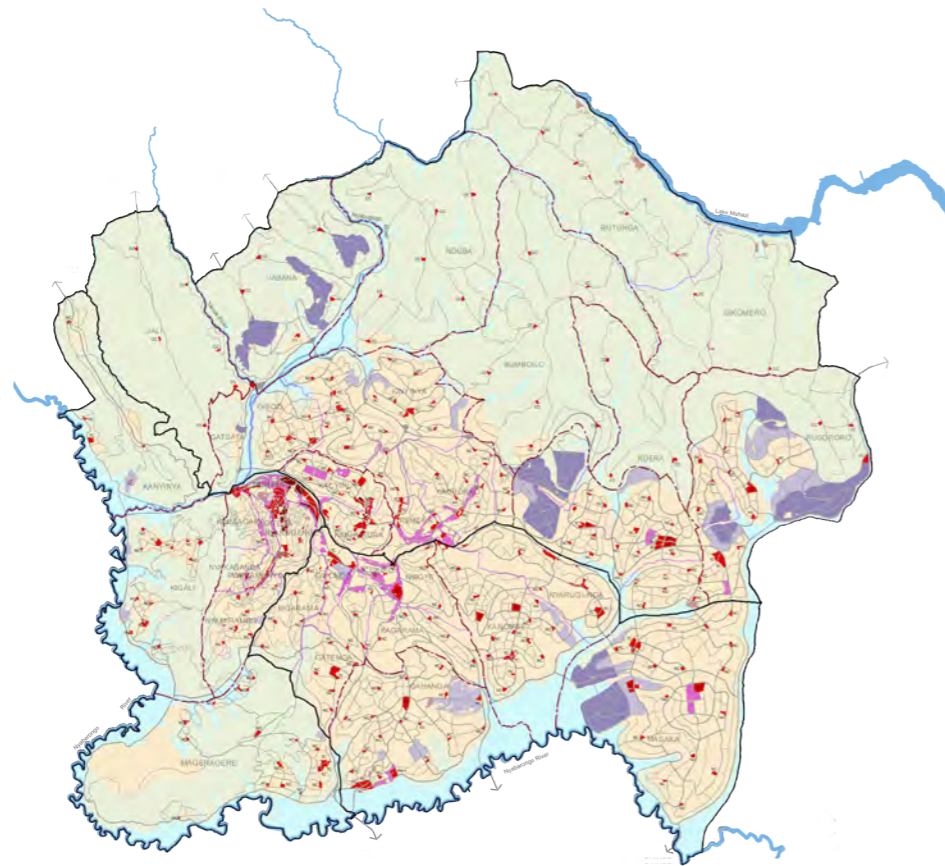
Proposed Broad Land Use Plan 2025

- To establish an efficient highway grid and arterial system ensuring the long-term regional and local connectivity.
- To redevelop existing unplanned settlements into medium-rise residential.
- To develop new suburban townships with integrated facilities and light industries.
- To conserve nature areas such as forests, wetlands and to protect steep slopes.
- To introduce iconic regional recreation and tourism destinations.
- To provide land for farming in the unbuildable areas.
- To develop key infrastructure.

DEVELOPMENT PHASING

To move progressively from existing city conditions towards the long term vision, the City is recommended to stage its development in 3 phases.

- Short term development focusing on immediate 5 years as launch phase to catalyze the development.
- Medium term development focusing upto 2025 as a platforming phase to further improve quality of life
- Long term development focusing on achieving urban excellence.



Proposed Employment and Connectivity Plan Year X

VIBRANT ECONOMY AND EMPLOYMENT FOR ALL:

PROPOSED COMMERCIAL PLAN YEAR X

The Commercial Plan Year X focuses on creating 11.5 mill sqm of commercial space for 1.6 million service sector jobs. It focuses on creating a hierarchy of commercial centres distributed in Kigali so as to bring jobs closer to homes which are:

- CBD and City Centre
- 3 new Regional Centre
- 3 Fringe Centres
- 19 Town Centres

- Neighborhood Centres
- Other Commercial

PROPOSED INDUSTRIAL PLAN YEAR X

The Industrial Plan Year X proposes to provide 30.5 sqkm of industrial space which will prove working space for 67000 people in the industrial sector. The industrial plan proposes:

- 2900 ha of land distributed between 4 large heavy industrial zones
- 765 ha of Light industries lands within townships



Proposed Residential and Facilities Plan Year X

CITY OF QUALITY AFFORDABLE HOMES: PROPOSED RESIDENTIAL PLAN YEAR X

The Residential Plan Year X proposes to provide affordable homes & public facilities for 5 million people by Year X. Its focuses on:

- Rehabilitation and regeneration of unplanned areas in Kigali to create a slum free Kigali in Year X.
- Create 90% home ownership and 60% of homes to be affordable housing.
- Easy access to quality, affordable facilities within all residential areas

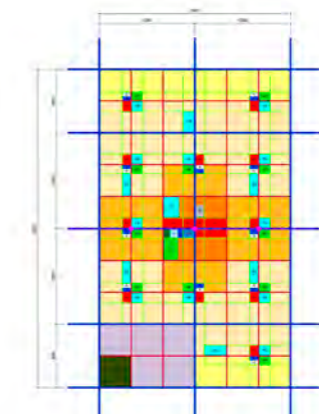
- Develop integrated transit oriented townships.
- Variety of residential choices: Single Family residential, Low Density Residential, Medium Density residential, High Density Residential.

CITY OF GREEN TRANSPORT: PROPOSED TRANSPORTATION PLAN -YEAR X

The Transportation Plan Year X proposes an extensive new road network to cater to the 5 million population. It proposes:



Proposed Township Boundary



Proposed Township Model

- Township organization - compact, walkable neighborhoods with easy access.
- Connections to daily necessities, schools, health care & recreation.
- Public transit based City organization to connect to employment nodes & regional facilities (Max 1 hr. travel time)
- 80% share of public transit.
- Efficient management of private transport & parking.
- Quick connectivity to current & future airport.
- Goods vehicle to bypass city areas.



Proposed Green and Blue Plan Year X

CITY OF ENCHANTING NATURE AND BIODIVERSITY:

PROPOSED GREEN & BLUE PLAN -YEAR X

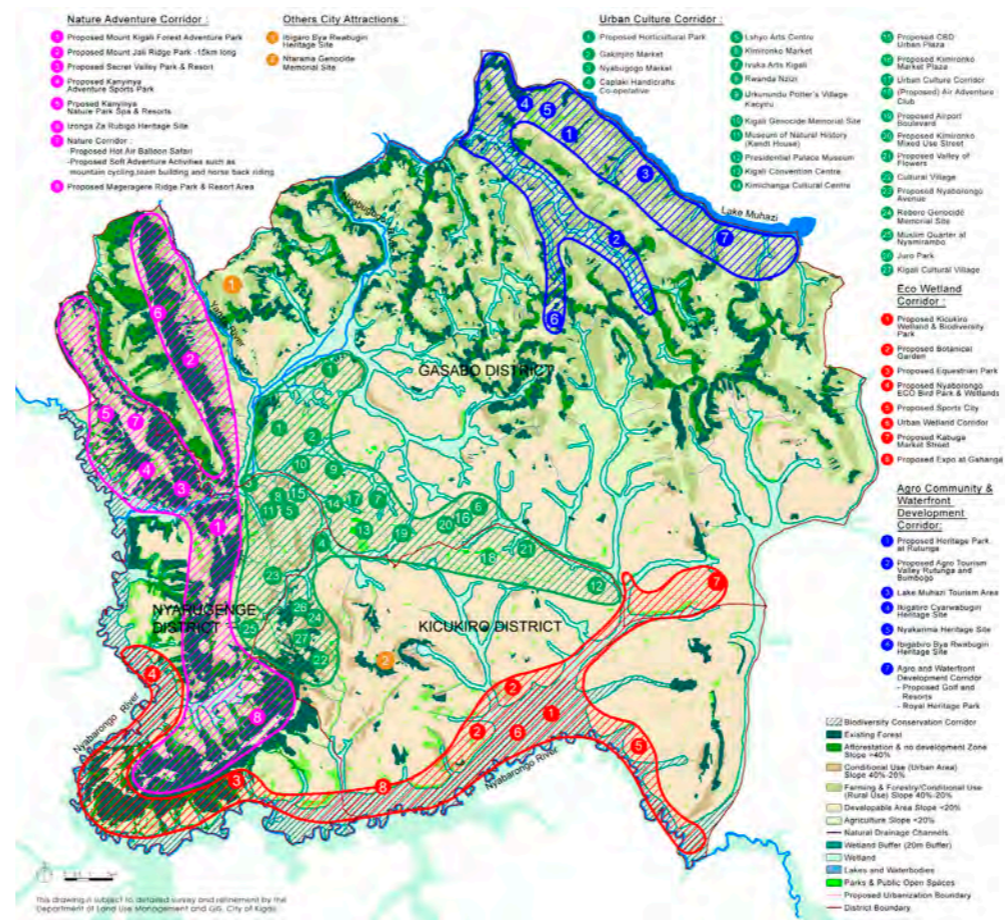
The Green & Blue Plan proposes specific environment strategies and a range of open spaces banking on the various wetlands and terrain.

The plan proposes to:

- Strengthen the existing natural drainage systems and wetland network to improve the quality of the downstream water.
- Allow agriculture in arable land along

wetlands and unbuildable zones.

- Encourage afforestation in steep slopes more than 40%
- Manage watersheds and slopes.
- Provide variety of public parks and open spaces; classified as Regional Parks, City Parks, Town Parks, Local Parks and Park Connector Network.
- Develop variety of attractive parks and recreational features such as themed botanic gardens, bio-diversity parks, eco-bird park, horticulture park, etc.



Proposed Tourism and Recreation Strategy Plan

CITY OF ENDEARING CHARACTER AND UNIQUE LOCAL IDENTITY:

The unique physical and natural assets of Kigali needs to be retained and further enhanced to make the city uniquely identifiable in the region. Existing features with high tourism potential as well as new tourism features also need to be identified to make Kigali special and attractive destination. Hence, to have an endearing character and unique local identity, Kigali City should focus on developing:

- A Tourism Development Strategy

- Local Identity Development Strategy

As part of the Tourism Development Strategy, four major tourism development corridors are proposed:

- Urban Culture Corridor:
- Nature Adventure Corridor
- Eco-Wetland Corridor
- Agro Community and Waterfront Development Corridor

To showcase City's identity and character and highlight as well as develop the local character of places, the city needs to focus

on developing:

- **SPECIAL PRECINCTS** comprising of heritage and urban precincts.
- **UNIQUE LANDMARKS** comprising of Heritage buildings, cultural/ religious buildings and/ or other urban icons.
- **DISTINCTIVE STREETSCAPES** comprising of streets with special character.
- **ATTRACTIVE PUBLIC PLACES** comprising of special urban plazas.
- **SPECIAL CITY ATTRACTIONS** comprising of regional recreational and tourism destinations.

1 INTRODUCTION

REPORT BACKGROUND AND PURPOSE

The project comprises of 6 Task Orders. Task Order 1 and 2 include data collection, field investigations, existing context analysis, visioning process and concept options development. Having completed the first two task orders, this Conceptual Plan Report- Task Order 3 covers the further expansion of the vision and the preferred concept into a specific Concept Plan for Kigali.

Presented below is a list of reports that will be submitted for this project. Though this report precedes the later Task Orders (4-6) it is advisable to be read in conjunction with the rest of the reports for this project:

Task Order 1:

- Inception Report

Task Order 2:

- Analysis, benchmarking and Visioning Report

Task Order 3:

- Transportation Master Plan report
- Kigali City Master Plan report

Task Order 4:

- Gasabo District Detailed Master Plan Report
- Kicukiro District Detailed Master Plan Report
- Gasabo District Zoning Plan Report (inclusive of Urban Design Guidelines)
- Kicukiro District Zoning Plan Report (inclusive of Urban Design Guidelines)

Task Order 5:

- Gasabo District - Kimironko Urban Design report
- Kicukiro District -Gahanga Urban Design report

Task Order 6:

- Implementation report

METHODOLOGY

Having identified the current issues, challenges, vision and preferred development direction, the Broad Land Use plan for Kigali is developed at this stage.

The methodology and the process in preparation of the plan is elaborated below:

DEVELOPMENT OF BROAD LAND USE REQUIREMENT:

A broad landuse requirements housing and economic activities in Kigali is developed based on the vision, proposed economic growth and the projected populations. The developable land and the areas to be protected is also identified from the analysis in the previous stage.

MAKING LAND UTILIZATION STRATEGY:

A land utilization, and urban density distribution strategy for Kigali is developed based on the existing analysis and the broad landuse requirements. An integrated township model to suit the topography of Kigali is developed and township boundaries are defined. Employment and population distribution for the townships are defined that will further guide the broad landuse development.

DEVELOPMENT OF BROAD LANDUSE PLAN

Land use plans for Kigali City is developed which focuses on developing detailed strategies for various sectors such as: employment, housing, transportation, public transit, public facilities, environment, open spaces, and creating unique identity.

PHASING THE DEVELOPMENT

The broad landuse plan is developed for a horizon of 30years. However, an intermediate plans is prepared to showcase development upto the year 2025.

HOLDING STAKEHOLDERS CONSULTATIONS

Constructive and interactive stakeholders and focus group meetings were held at various stages of the Task Order so as to gather valuable inputs to guide the development of the plan.

ORGANIZATION OF THE REPORT

In addition to this chapter, the report consists of the following chapters:

CHAPTER 2: KIGALI CITY : TOWARDS A CENTRE OF URBAN EXCELLENCE

The key objective of this section is to present the findings of the previous Task Order. It elaborates on the key economic and socio-demographic projections, the vision for the City and its development goals as well as the roles defined for the three Districts. The preferred Concept options and its key features are also explained.

CHAPTER 3: KIGALI CITY PROPOSED MASTER PLAN

This section explains Broad Land Utilization Strategy in Kigali. It highlights the strategies adopted to maximise the development potential on the very limited buildable land in the City. The quantum of land allotted for each development type is also explained here.

The density distribution plan recommending different urban densities to address the current structural differences in the density distribution is explained. Further to this, proposed organized typical township model with comprehensive facilities is also explained in-depth. These integrated comprehensive townships not only accommodate the population but also infuse better quality of life. The total number of townships proposed in Kigali, their areas,

and the distribution of population and employment is also discussed here.

The last section presents the Broad Land Use Plan for the year 2025. This plan highlights the development priority areas for the City to focus its growth in the intermediate term. Key catalyst projects and land reserves to safeguard future growth are also identified briefly, which will be further elaborated in Task Order 6.

CHAPTER 4: CITY OF VIBRANT ECONOMY & EMPLOYMENT FOR ALL

The first goal for Kigali is to become a vibrant and prosperous city that consolidates business and provides industrial services. This chapter takes a closer look at the existing service sector and the established commercial nodes at Kigali City Centre and highway corridor. In order to expand the employment and commercial base as per the future economic outlook, decentralized Commercial Plan is proposed with a clear hierarchy of commercial centres distributed across the City. The strategic location of each commercial centre, the employment scale, and supportive facilities like retail, recreation and residential layouts are discussed in detail.

The proposed Commercial plan 2025 illustrates the phasing of the commercial nodes in order to strengthen the City Centre as the regional Financial Hub in the medium term. It also highlights the key catalyst commercial developments.

The chapter also explains the development of the industrial sector in Kigali, which is anticipated to be a major employer. It reviews the key issues and the vision 2020 target set by National Industrial Policy. The proposed Industrial profile sets to fast track and compliment the set vision

by allocating and safeguarding land for this sectors growth. Industrial types and the employment generated is discussed in depth.

CHAPTER 5: CITY OF GREEN TRANSPORT

The second goal for the city is to develop a modern, efficient and convenient transport system. This chapter looks at the existing road infrastructure, public transport, parking facilities, pedestrian network and traffic management systems. It highlights the need to drastically improve the road network and public transport to capacitate the growing population and the new vision for the City. It further describes the guiding strategies for planning considerations.

The proposed Transport plan for the year 2025 and Year X underlines the transitional steps from the existing infrastructure under four main topics:

- Road Network Plan
- Public Transit Plan
- Non Motorized Transit Plan
- Transport Policy plan

CHAPTER 6: CITY OF AFFORDABLE HOMES & QUALITY LIFESTYLE

The third goal for the City of Kigali is to offer a high quality of life and residential choices for its residents. This chapter presents an in-depth analysis of the existing housing typology, supply, quality and the immediate and dire need for the City authorities to lay down policies and direction to address the housing issues of Kigali. The key principles for the housing sector to achieve quality housing are elaborated.

The proposed Housing Plan Year X clearly lists innovative housing typologies, their

density distribution and location. For the intermediate 2025 Housing Plan, various upcoming residential developments and new proposed residential layouts are highlighted. The Structure Plan presents the specialized and the basic facilities that are necessary to achieve quality life.

CHAPTER 7: CITY OF ENCHANTING NATURE AND BIODIVERSITY

The fourth goal is to conserve the natural wetlands, forests and bio-diversity, and to develop Kigali City as the central destination for adventure and nature related tourism. This chapter examines the existing environmental issues and challenges, natural wetlands and the diminishing forest cover in particular. The various environment conservation strategies to protect waterways, wetlands, forests and slope management are enunciated in detail. The City's Green & Blue Plan clearly defines the City's ambitious plan to increase its green and open spaces and mark itself as a tourist and adventure friendly city. It describes the various destinations, attractions and parks. Phasing strategies for these projects in the intermediate term is explained in the 2025 Green and Blue Plan.

CHAPTER 8: CITY OF ENDEARING CHARACTER AND UNIQUE LOCAL IDENTITY

Some of the world's greatest cities are the ones that did not let urbanization rule out their traditions and local character. This chapter elaborates the City's potential for a unique identity through its natural

landscape, culture and heritage and urban environments. It brings forth strategies to retain and enhance the same.

Special heritage & urban precincts, landmarks, public places, vibrant streetscapes and city attractions are proposed to enhance the City's identity and character through Urban Design and Heritage Conservation.

CHAPTER 9: A GREEN CITY WITH SUSTAINABLE RESOURCE MANAGEMENT

The fifth goal for the City of Kigali is to manage the water and energy resources and develop infrastructure facilities for the City with proper targets and to reduce wastage. The chapter discusses the existing condition of water supply, sewer, storm water and power supply in detail. It also highlights the key issues that arise while expanding the current infrastructure network for a population of five million by the Year X.

Topography and natural constraints make service distribution and planning unique to the City. With the existing figures being inadequate, the City has to prepare extensively for the projected population. The different strategies approached for water demand management, distribution and potential water resources are defined clearly. Sustainable approaches to sewer treatment and storm water management are discussed in detail. With increasing demand for energy, the chapter explains alternative power supply and ways to reducing demand through efficient grid systems.

CHAPTER 10: WAY FORWARD

This chapter concludes with a highlight of next focus of work and planning process.

2 KIGALI CITY: TOWARDS A CENTRE OF URBAN EXCELLENCE

2.1 Regional Context

2.1.1 LOCATION AND CONNECTIVITY

Kigali - the Capital City of Rwanda, is centrally located within the country and is well connected to neighboring countries in the region including Uganda, Tanzania, Burundi and the Democratic Republic of Congo. The City is also connected internationally by the Kigali International Airport located in the heart of Kigali. Additionally, a new international airport is being proposed at Bugesera 26 km south of Kigali to cater to the increasing air traffic in Kigali. The connection between Kigali City and the Bugesera Airport holds a great significance and a tremendous potential for development.

The proposed International Freight Rail corridor also provides Kigali with an opportunity to strengthen connections with neighboring countries in the region.

Thus, Kigali has strong potential to become a regional hub due to the combined rail, air and road connectivity linking the city to other parts of the region.

2.1.2 REGIONAL CONTEXT

Kigali City is the largest City in Rwanda. Some of the other main cities in Rwanda with more than 50,000 population are Gitarama, Butare, Ruhengeri, Gisenyi, Byumba, Cyangugu, Nyanza and Kabuga. Other significant growth nodes include Rwamagana, Kibuye, Gikongoro, Kibungo and Nyagatara. The decentralization policy of Rwanda promotes urban development in these nodes.



Fig.2.2 Existing Regional Connectivity in Rwanda

In the national context, Kigali acts as a natural magnet for urban-rural migration due to its central location, economic opportunities and administrative role within Rwanda. Besides Kigali, Butare in the southern province and to some degree the city of Rwamagana act as other major magnets for urban-rural migration in Rwanda.

Lake Kivu and the proposed eco-habitat corridor from Gshati to Nyungne are major tourism attractions in the western province of the country. In the north, the famous Volcanoes National Park near Ruhengeri is at about 3 hours drive from Kigali. Thus, Kigali plays an important role in Rwandan tourism due to its central location, good

connectivity and rich cultural context.

Additionally, in the immediate context, the scenic Lake Muhazi lies to the north east of the city. This provides Kigali with a special tourism corridor in the north. Thus, the proposed development for lake Muhazi has been identified and acknowledged in the revised conceptual Master Plan.

2.1.3 KIGALI CITY AND SURROUNDING CONTEXT

At present, Kigali city acts as a major economic and employment node within its surrounding context. Growth and development within Kigali shall both support and propagate growth in

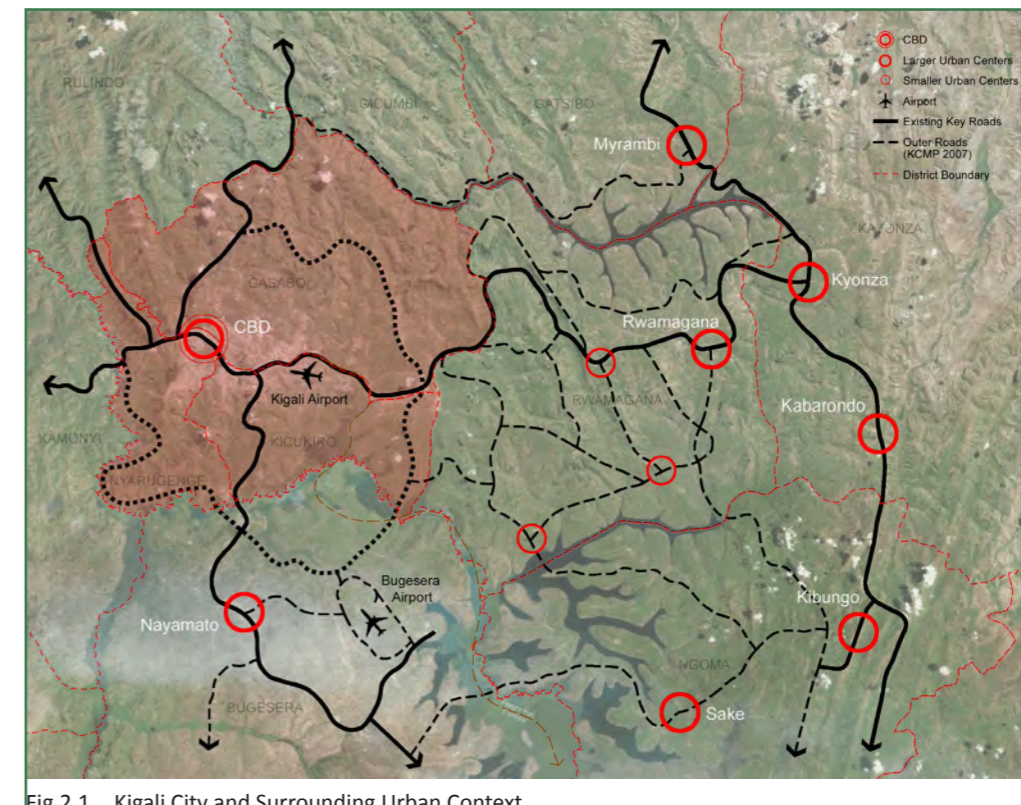


Fig.2.1 Kigali City and Surrounding Urban Context

neighboring towns as indicated in Figure 2.1.

Thus, tapping on Kigali's projected growth, the upcoming Bugesera international airport and the international freight corridor, these towns also have high potential to become secondary urban nodes to Kigali city.

For instance, the neighboring town of Rwamagana to the east has tremendous potential to become a satellite town to the growing Kigali city due its strategical location that links Kigali to the regional port in Dar-es-Salaam (Tanzania). The proposed airport enterprise zone with warehouse and manufacturing at Nyamata to the south shall also support economic growth in the

region as it lies on the road that connects Kigali to the future Bugesera airport.

Upon identifying these potential nodes, the KCMP (2008) had proposed strong road connectivity between Kigali and these neighboring towns to establish potential growth corridors within the surrounding context.

The revised conceptual Master Plan further identifies and strengthens these potential nodes and growth corridors to guide development with Kigali.

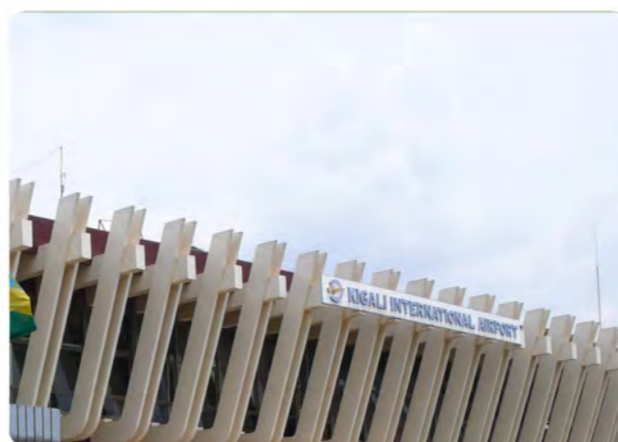
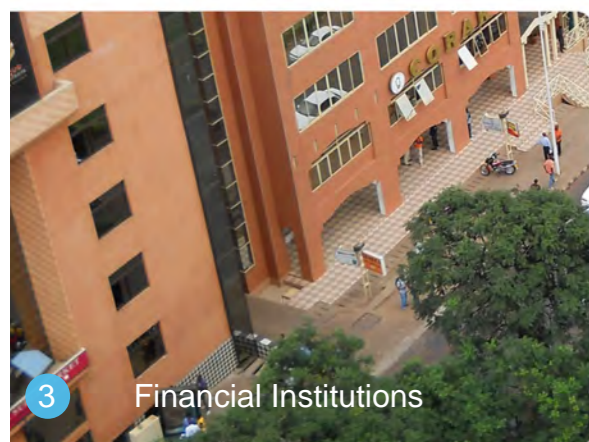
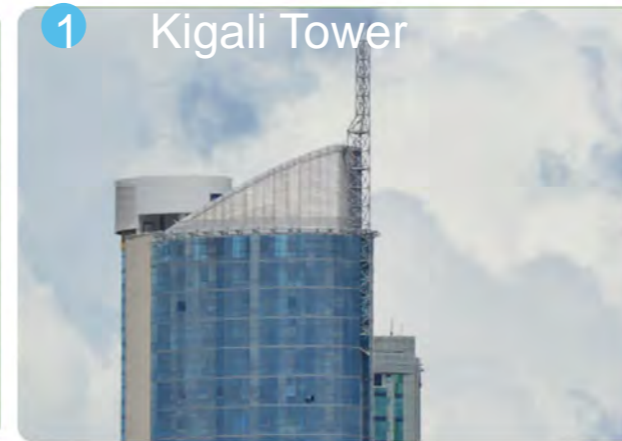
KIGALI TODAY



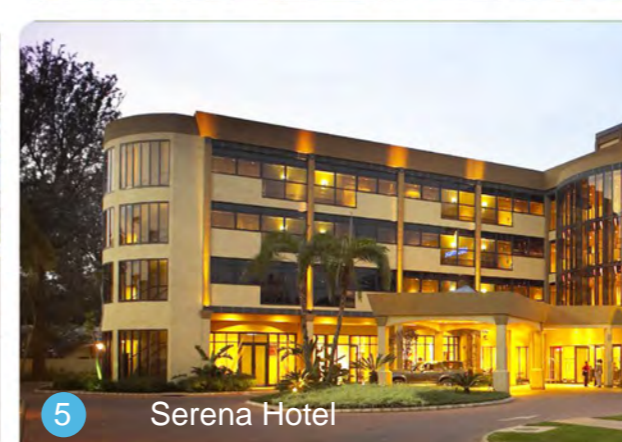
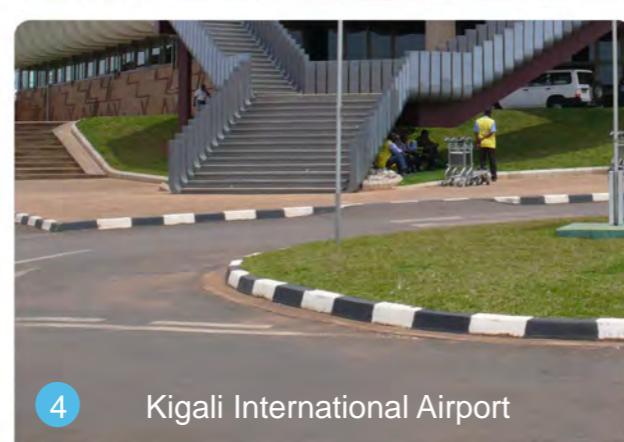
1.3 million
City Population 2013



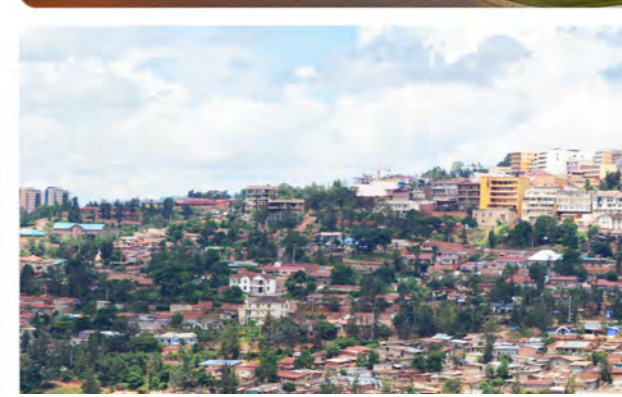
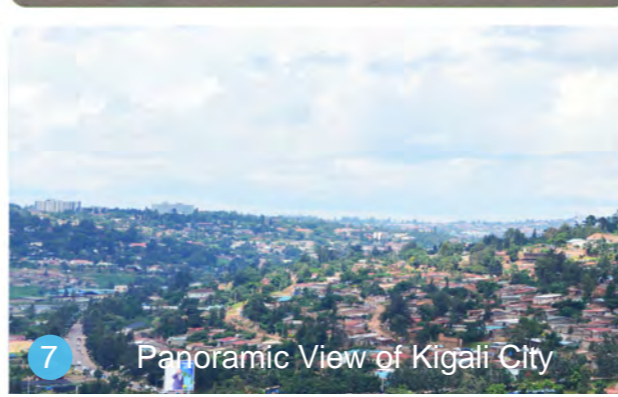
730 km²
City of Kigali Area 2012



35 sectors
10 sectors in Nyarugenge district
15 in Gasabo and
10 in Kicukiro
3 districts



Enchanting hills in the north and captivating southern wetlands give Kigali its unique natural setting.



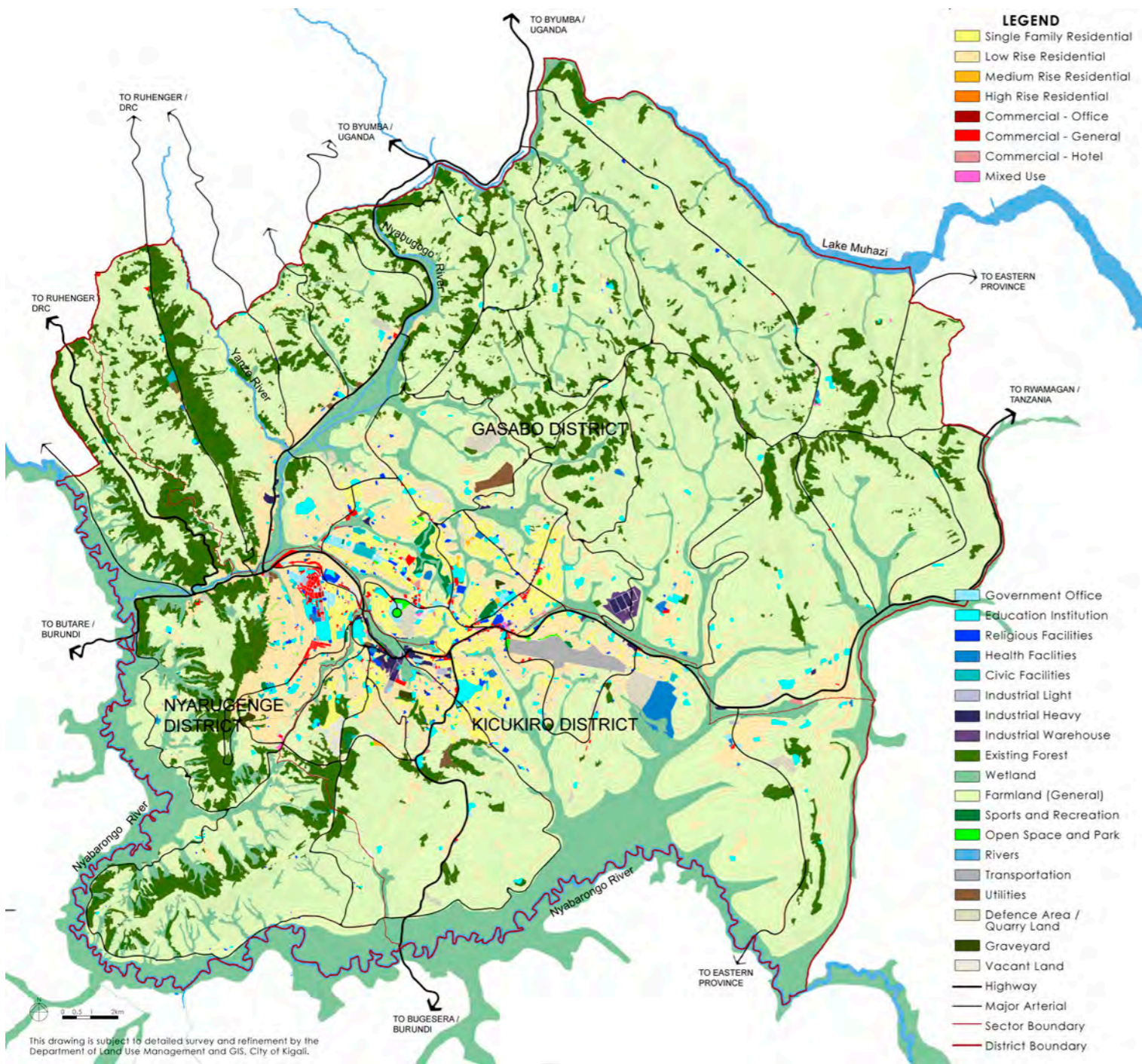


Fig.2.3 Kigali City, Existing Land Use Plan

2.2 Kigali Present Condition

83% of the City's land is natural and rural agrarian. The urban area occupies around 17% of land area of which 7% is covered by unplanned settlements. The historic core and the main city centre are clustered around the Nyarugenge sector and spread towards the International Airport in the east along the east west corridor

In Nyarugenge the commercial activities are centered around the Centre Ville Roundabout and along the ridge. This existing commercial city core is strengthened with the launch of CBD phase 1 in Muhima, allowing growth of a contemporary Central Business District in Kigali. Clusters of government institutes, embassies, civic uses and other non government organizations are present in Kacyiru, Kimihurura and Nyarugenge. Gikonda, Gatsata (along Northern highway). The recently developed Kigali Free Trade Zone Phase 1 comprises of industrial areas.

Table 2.1 Existing Land Use Distribution

LAND USE TYPES	AREA IN SQKM	PERCENT
RESIDENTIAL	67.58	9.2 %
COMMERCIAL	2.85	0.4 %
MIXED USE	0.22	0.0 %
PUBLIC FACILITIES	13.74	1.9 %
INDUSTRIES	4.41	0.6 %
NATURE AREA	141.98	19.4 %
AGRICULTURE	461.37	63.1 %
OPEN SPACE	2.171	0.3 %
WATER BODIES	2.905	0.4 %
INFRASTRUCTURE/ROADS	20.84	2.8 %
SPECIAL USE	13.46	1.8 %
TOTAL AREA	731.53	100%

2.2.1 DEVELOPMENT CONSTRAINTS & OPPORTUNITIES

With around 19% of the area occupied by wetlands and 31% of the area by steep slopes (greater than 20%), just one-third of City's land is available for development. Currently, the low density residential, certain pollutive industries, dry port, etc are located in strategic prime areas in close proximity to city core that have higher development potentials. The current airport at Kanombe restricts new development due to height restriction imposed. Large parcels of land in the prime east west corridor are under military use.

The City is provided with many growth opportunities in terms of available undeveloped land, and low density areas with potential to be redeveloped. With the proposed international freight line through Kigali, logistics and industrial activities can be strengthened. Scenic nature scape and the salubrious climate offers potential to make Kigali a unique tourism destination.

2.3 Kigali Future Outlook

2.3.1 PROJECTED ECONOMIC GROWTH SCENARIO

Kigali is expected to be the Centre for Urban Excellence with a high end services based economy and a large industrial base.

ECONOMIC PROJECTIONS

- Kigali's GDP is projected to range from a minimum of RWF 4.7 billion to a maximum of RWF 5.7 trillion in 2025, and a minimum of RWF 12.29 trillion and a maximum of RWF 21.28 trillion in 2040.
- Total workforce growth of 5.6% p.a is expected over the next decade.
- Agricultural growth is expected to be low due to a shift in employment, however agricultural productivity will rise due to improved skills.
- Key drivers of economy would be the service sector and the Industry sector

PROJECTED GROWTH SCENARIO FOR VARIOUS EMPLOYMENT SECTORS

- The service sector will benefit from significant improvements in productivity. Strong growth is expected after 2020 due to improved skill and continued expansion of finance and insurance market.
- The industrial sector will be a major contributor to the economy until 2020 and is expected to slow down then after.
- Contribution to agriculture is expected to decline significantly after 2015 with diminishing agricultural land due to land pressures for city expansion. Productivity levels will rise as specialization and skills will improve.
- It is projected that the household income will increase from RWF 3.1 million (approx. \$5100) in 2011 to RWF 5.0 million (approx. \$8250) by 2020, and RWF 10.2 million (approx. \$16,800) by 2040.

Table 2.2 Projected Economic Scenarios for Kigali City 2011-2040

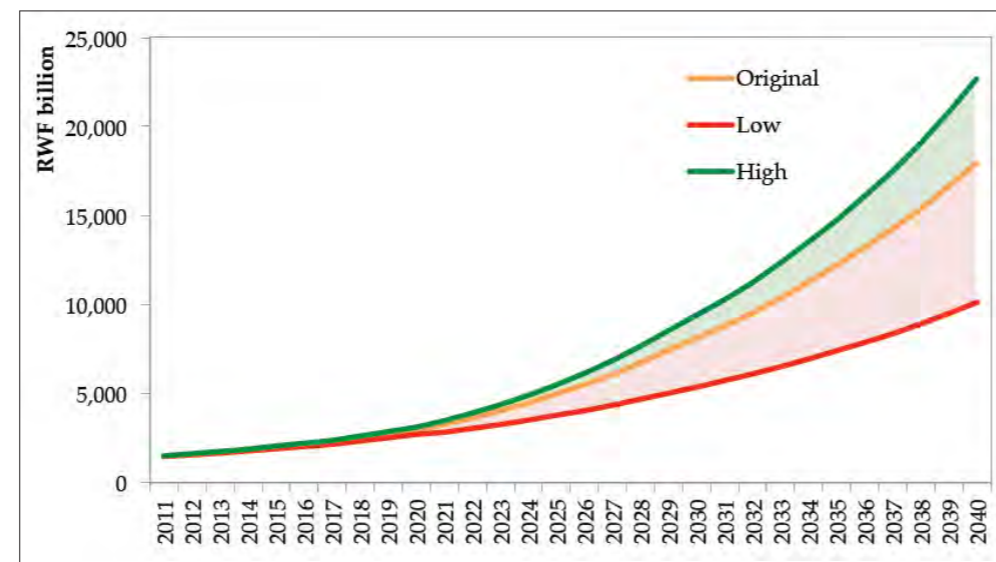
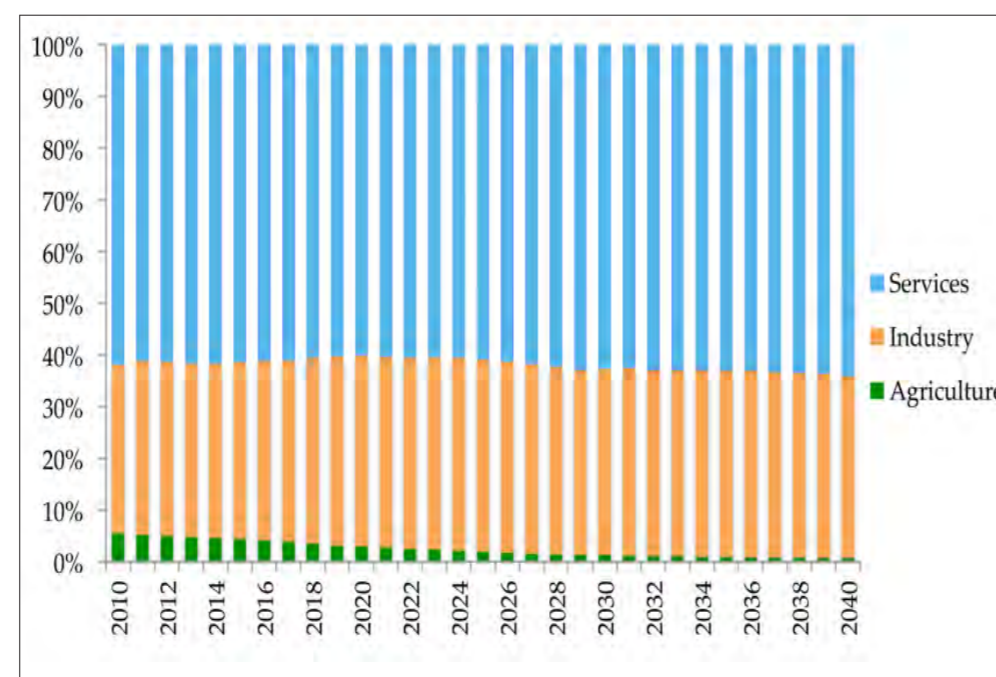


Table 2.3 Sector composition of GDP of Kigali City 2011-2040



Source - National Institute of Statistics, GDP Estimates 2010/11, 2005 prices

Table 2.4 Projected Employment Scenario by Sector Kigali City 2011-2040

PROJECTED EMPLOYMENT ('000s) SCENARIO			
	2011	2025	2040
AGRICULTURE			
LOW	116	108	75
MEDIUM	117	120	83
HIGH	116	92	42
INDUSTRY			
LOW	107	287	505
MEDIUM	108	317	560
HIGH	109	308	670
SERVICES			
LOW	296	724	1051
MEDIUM	297	758	1320
HIGH	300	960	1624
TOTAL EMPLOYMENT			
LOW	524	1119	1631
MEDIUM	523	1196	1963
HIGH	526	1360	2336

Table 2.5 Sub Sector Employment Projections 2011-2020

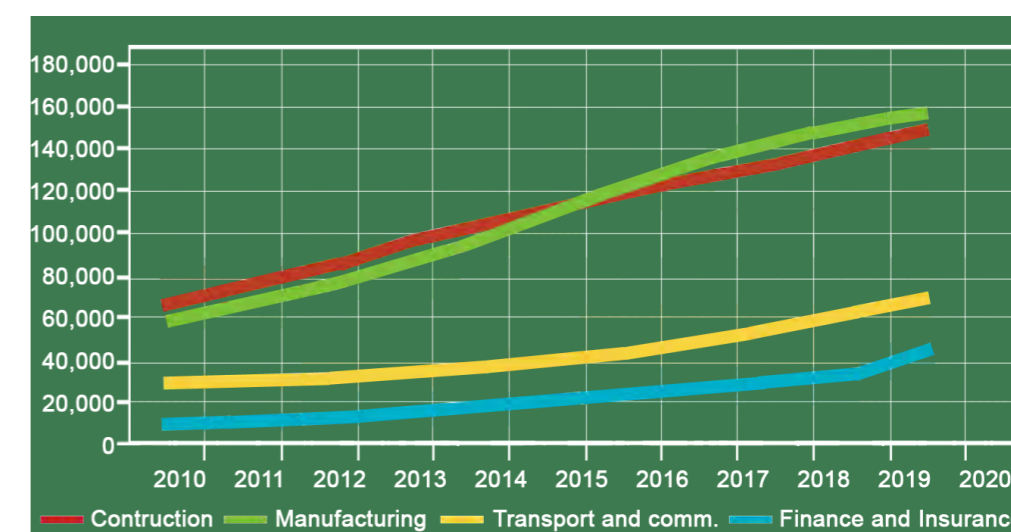


Table 2.6 Kigali City Projected Population

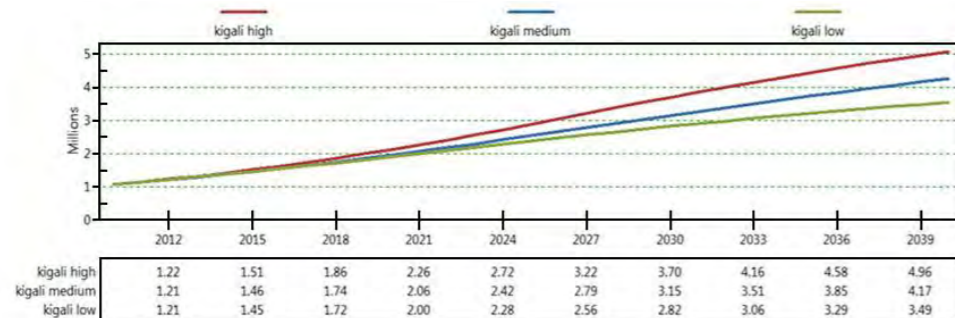


Table 2.7 Kigali City Annual Population Growth Rate

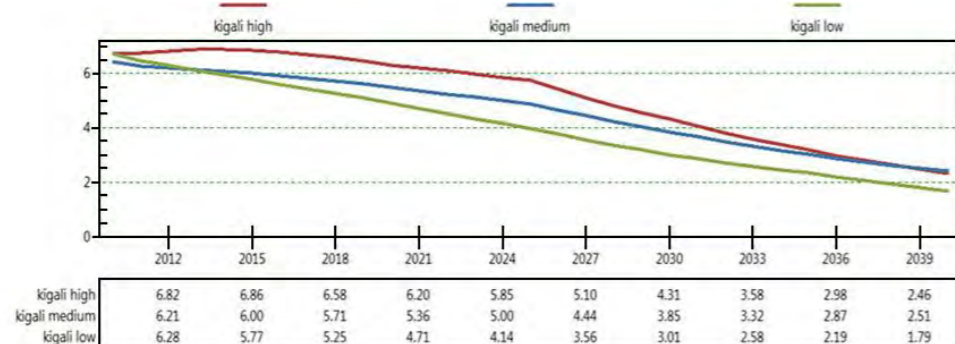


Table 2.8 Kigali City Projected Net Migration

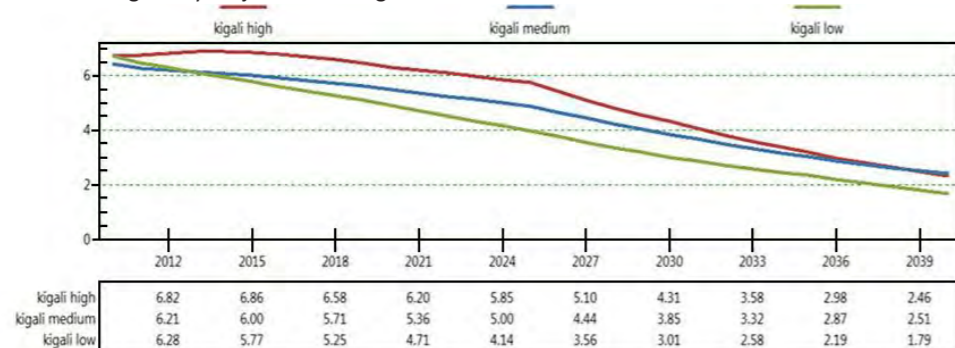


Table 2.9 Kigali City Current Household Size

	NUMBER OF HOUSEHOLDS		
	HH	POP.	SIZE
NYARUGENGE	60262	282,730	4.7
GASABO	99447	476,250	4.8
KICUKIRO	64056	301,486	4.7
KIGALI CITY	223765	1060466	4.7

Source: DHS 2010

2.3.2 KIGALI'S PROJECTED SOCIO- DEMOGRAPHIC GROWTH SCENARIO

POPULATION GROWTH SCENARIOS

Kigali City is currently witnessing a growth of 6.2% p.a. as against 2.8% for the rest of the country. Population growth projections for the future population are created for three scenarios: A high growth, medium growth, and low growth scenario are projected by taking EICV3 2011 as the base year.

The low growth rate assumes a growth rate of 4.1% until 2025 which reduces to 1.8% by 2040. The medium growth rate scenario assumes a growth rate of 5% until 2025 and 2.5% hence. And the high growth rate scenario assumes growth rate of 5.8% till 2025 and 2.5% thereafter. The two population main growth factors being:

- Fertility rate at the current rate of 3.5 until 2025 and 3.0 in 2040.
- Immigration into the city.

The assumptions for the three projections are as follows:

- In the low case scenario the population of the city is projected to be 2.3 million by 2025 and 3.5 million by 2040.
- In the medium case scenario, the projected population by 2025 is 2.5 million and 4.3 million by 2040.
- In the high case scenario, the population is projected to be 2.9 million by 2025 and 5 million by 2040.

SOCIO-DEMOGRAPHIC PROJECTIONS

Migration is projected increase due to shift of employment from agriculture to increased off-farm employment.

- The low case scenario assumes migration to remain constant until 2025 and decrease thereon to become half the current value.

- The medium case scenario assumes migration doubles by 2025 and thereon decreases to its current level by 2040
- The high case assumes migration to increase by 250% to a peak by 2025 and then decrease back to its current levels by 2040.

PLANNING FOR THE ULTIMATE CASE

The population of Kigali City by 2040 is proposed to grow from the current population of 1.3 million to be 5 million as per the high case scenario and 3.5 million as per the low case scenario. Provision of land and reserves for infrastructure, housing and facilities need to be safeguarded for the ultimate population (high case scenario). However this ultimate population may not be achieved by 2040 and Year X is proposed as the stage when Kigali would have reached this ultimate population.

The literacy levels in general will increase with more women in the work force, further attributing to a decrease in household size for all three scenarios.

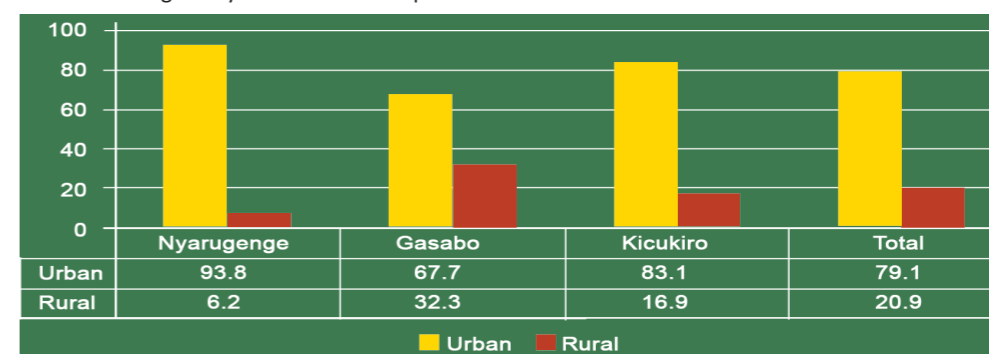
Table 2.10 Kigali City Population Projection Growth Scenarios

POPULATION GROWTH SCENARIOS	LOW	MEDIUM	HIGH
GROWTH RATE 2012-2025	4.1%	5%	5.8%
GROWTH RATE 2025-2040	1.8%	2.5%	2.5%
TOTAL	3.5 MILLION	4.3 MILLION	5 MILLION

Table 2.11 Kigali City Household Size Projections (2010-2040)

HOUSEHOLD SIZE & (HOUSEHOLDS IN MIL)	2010	2015	2020	2025	2030	2035	2040
HIGH	4.75 (.22 MIL)	4.35 (.35 MIL)	4.25 (.53 MIL)	4.15 (.65 MIL)	4.05 (.91 MIL)	3.95 (1.2 MIL)	3.85 (1.3 MIL)
MEDIUM		4.35 (.34 MIL)	4.05 (.51 MIL)	4.05 (.60 MIL)	4.05 (.77 MIL)	3.85 (1.0 MIL)	3.55 (1.2 MIL)
LOW		4.35 (.33 MIL)	3.85 (.52 MIL)	3.85 (.59 MIL)	3.55 (.79 MIL)	3.35 (.96 MIL)	3.35 (1.0 MIL)

Table 2.12 Kigali City Distribution of Population in Districts



2.4 Reviewing Kigali City Master Plan 2007

Over the last five years besides the KCMP 2007 many new sub area plans and projects have been approved in Kigali. A review and integration of all the master plans is critical at this point to regularize, optimize and streamline the implementation and planning approval process.

2.4.1 KEY ISSUES TO BE REVIEWED FOR KCMP 2007:

The key objective of the Kigali Conceptual Master Plan 2007 was to move forward from the National Strategic Plan proposed in Vision 2020, and to develop a long range plan for the Capital City that would guide the key infrastructure and systems required for the future growth of Kigali.

The key proposals of Kigali Concept Plan 2007 were:

1. CITY DEVELOPMENT DIRECTION

Kigali City was to develop towards the south (Gahanga), and east towards Masaka with a new centre proposed at Masaka. Kinyinya

would be another such growth area. A large Industrial area was also proposed at Ndera.

2. DEVELOPMENT DENSITY & ENVIRONMENTAL CONSIDERATIONS

The plan focuses on preservation of naturally sensitive areas and it projects a total population of 3.3 million for Kigali by 2030. This translates into a low density eco development for Kigali

3. TRANSECT MODEL

Developing from existing land value, where the land on the hilltop is preferred over those in the valley, transect model was proposed as the development model for Kigali.

4. NEW CITY CENTRE AND THE SUB-CENTRES

The concept plan proposed a new city centre, considering that the existing city centre is aged and need to be preserved. It also proposed a range of sub centres to serve the surrounding population.

The growth of Kigali has been higher than anticipated with the population of 1.3 million being realized in 2013. The rapid



Fig.2.4 Proposed Transect Model for Kigali, KCMP
Source: KCMP

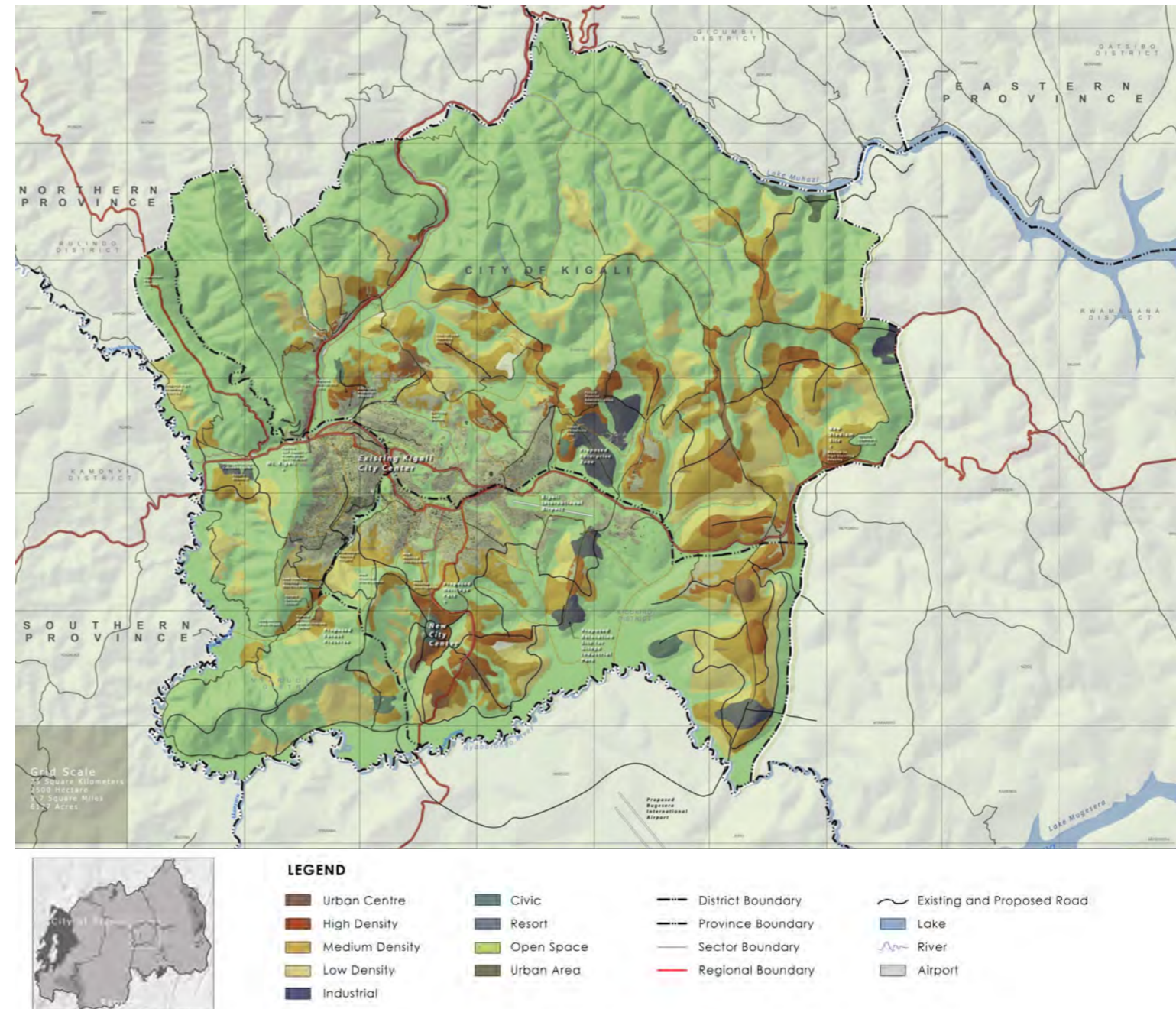


Fig.2.5 Kigali City Masterplan 2007
Source: KCMP

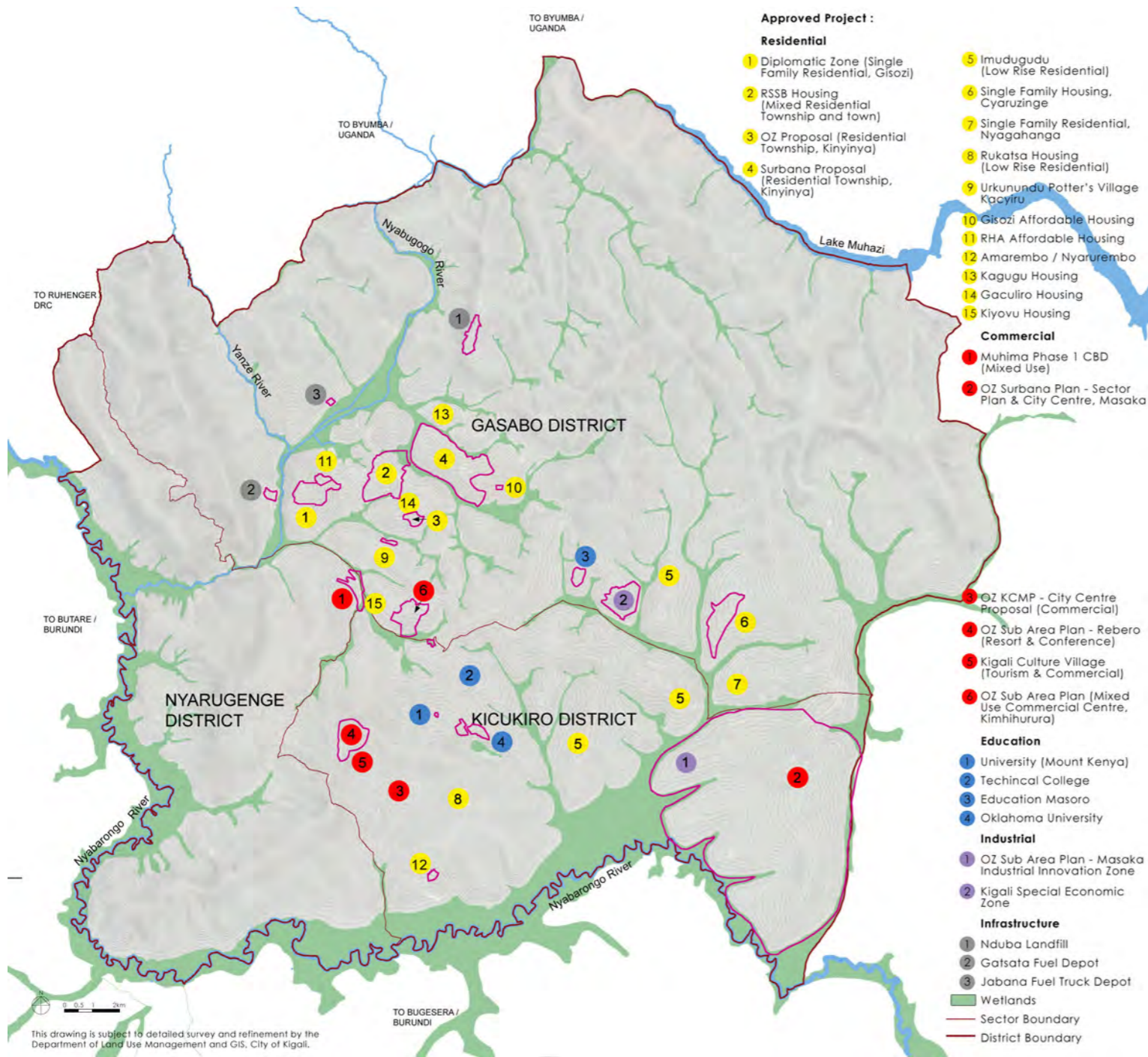


Fig.2.6 Kigali City - Approved projects

urban growth has created development pressures as well as social issues in Kigali today. Though the salient features and broad development directions of KCMP are still relevant, however a revised KCMP will address some of the growing development paradigms and also integrate the new developments that have been since approved.

Some of the issues to be reviewed and incorporated in the new concept plan:

1. POPULATION GROWTH AND DENSITY.

The urban growth in Kigali is faster than projected. Considering the Rwandan population projection and urbanization scenarios, the population projection for Kigali has been revised to be able to accommodate 5 million instead of 3 million projected earlier.

2. TRANSIT SYSTEM AND TRANSIT CORRIDOR

With the aim to be the centre of urban excellence and anticipating needs of good public transport system, Kigali needs to have a good transit system in the future to ensure that majority of the population will be served by public transit that will minimize the traffic volume on the road. Accordingly medium density transit corridor needs to be identified to ensure the success of the transit system.

3. REDEVELOPMENT OF EXISTING URBAN AREA

The concept plan needs to address the redevelopment of the existing urban areas, which is very crucial considering that the important role of the existing CBD and the higher land value for the area around the CBD.

4. THE TOWNSHIP DEVELOPMENT MODEL AND AFFORDABLE HOUSING NEEDS

Considering the proposed densification as

well as redevelopment of existing areas, the concept plan needs to develop township development model to restructure the whole city of Kigali. In addition, this model is also needed to address the promotion of affordable housing which is very much needed in Kigali.

5. AMENITIES, JOBS, ROAD NETWORK AND INFRASTRUCTURE FOR 5 MILLION POPULATION.

Considering the projected increase in capacity, the needs for more road and amenities have to be calculated for the city of Kigali.

2.4.2 PLANNING IMPLICATIONS

The development direction proposed in the concept plan 2007 is strengthened but the population and development density in the city has to be increased to allow Kigali to accommodate 5 million population beyond 2040. East -West and North-South Transit corridors are introduced to prepare the city for the development of public transit corridor in the future. Integrated within this transit corridors are the new urban centres and regional centres.

Another model, so called "township model", which looks into the road spacing standard, the location of medium rise affordable housing and the public facilities distribution is added to the transect model, such that it will be able to help in restructuring the city and achieving the desired urban density and amenities distribution for 5 million population.

The new transect model is generally applicable in most areas. In some areas, such as the CBD, the development doesn't follow the transect because of site constraints and existing urban context.

ENVISIONING THE FUTURE OF KIGALI



The case of Kigali is unique. It has garnered global recognition for good governance and City management. The long term vision for Kigali capitalizes on this strength. Several cities in the world have used good urban planning as a tool to position itself as a regional leader in city development. As such the proposed vision for City of Kigali is to become...

“The Centre of Urban Excellence”

GOALS FOR KIGALI

To achieve the medium and long term visions for Kigali, a set of goals covering 5 critical of development is proposed. These key goals will guide the physical planning for the City.

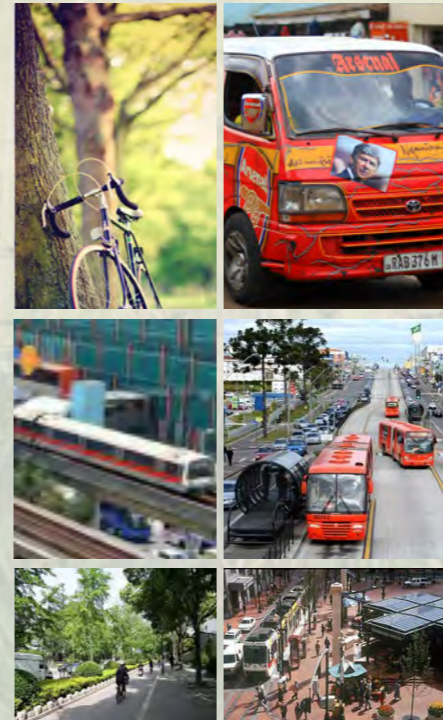
1 CITY OF VIBRANT ECONOMY

- Making Kigali a modern Regional Financial Hub in Africa
- Providing adequate working spaces for 1.1 mil in service sector jobs
- Providing adequate working spaces for 0.6 mil in industrial sector
- Promote high-value added agriculture and agro-based industries



2 CITY OF GREEN TRANSPORT

- Public : Private Transport ratio of 70:30 with excellent quality of public transportation
- 10% non-motorized Green Trips
- Length of expressway = 30 km / mil population
- 100% of National Roads and Class 1 District roads to be paved and designed to international standards
- 1 hour connectivity to international transport terminal (e.g. airport, international rail station)
- 1 hour connectivity to major employment node
- 100% provision of pedestrian walkway along development side of the road
- 20 km / million Green Network



3 CITY OF AFFORDABLE HOMES

- Slum Free City
- 90% home ownership
- 60% affordable housing
- 4 sqm Public Recreation Open space / Capita
- 1 local open space within 400 m walking distance



FOCUS FOR EACH DISTRICT

While the central objective of the city vision is to obtain urban excellence, its 3 districts have been attributed with specific economic and social goals based on their innate strengths and potentials. As such the development focus for the three districts are:

Nyarugenge

'Green Financial Hub and Vibrant Growth Centre'

Gasabo

'Diverse Employment Hub and Cultural Heartland'

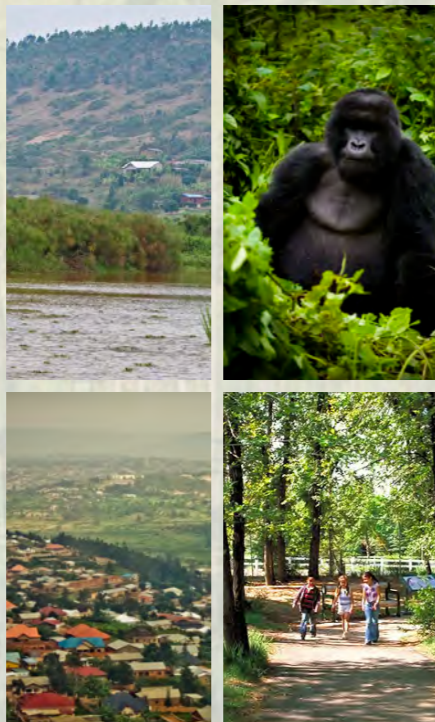
Kicukiro

'Knowledge Hub and Green Gateway of Kigali'



4 CITY OF ENCHANTING NATURE & BIODIVERSITY

- No development on steep slope
- Relocation of unplanned communities in steep slopes and full restoration of slopes above 40%
- Mandatory soil stabilization of all slopes above 20%
- A citywide Watershed Management Plan
- Flood free city for a 50 years of flood return period
- 100% conservation of all water bodies
- 20 m mandatory buffer for all water bodies (Organic Law)
- Zero net loss of existing forests
- Afforestation in slopes > 60%
- Reforestation to restore former forests
- Creation of innovative urban agriculture for slopes > 20%



5 CITY OF ENDEARING CHARACTER & UNIQUE LOCAL IDENTITY

- Preservation of all historic and culturally important sites, and promotion of culture & heritage for locals and tourism.
- Minimum of 1 regional & recreational destination in each district
- Tourism Strategy for Kigali to enhance the character of different areas
- Urban Design strategies for key urban areas in the city to enhance their identity and character



6 CITY OF SUSTAINABLE RESOURCE MANAGEMENT

- 20% lower water usage than world average
- Water Supply Network coverage: 75%
- Available supply: 80 lpcd(2025) & 120 lpcd (Yr X)
- Rainwater harvesting & Water saving devices: for all new urban developments above 0.4 ha
- Water leakage loss: 30% (2025) & 15% (Yr X)
- Temporary on-site STP for all new urban developments of 0.4 ha and above (2025); Centralised STP for each sector (Yr X)
- Sewerage Coverage: 20% (2025) & 75% (Yr X)
- Rural sanitation: Ecosan system or septic tanks developments of 0.4 ha and above



- Separate wastewater sewerage and storm water drainage: 20% (2025) & 75% (Yr X)
- Use of swales and constructed wetland to slow down storm water runoff in all new urban developments of 0.4 ha and above
- Recycling rate: 15% (2025) & 50% (Yr X)
- Illegal dumping & open burning: 25% (2025) & 0% (Yr X)
- 20% lower energy usage than world average
- 20% alternative energy sources

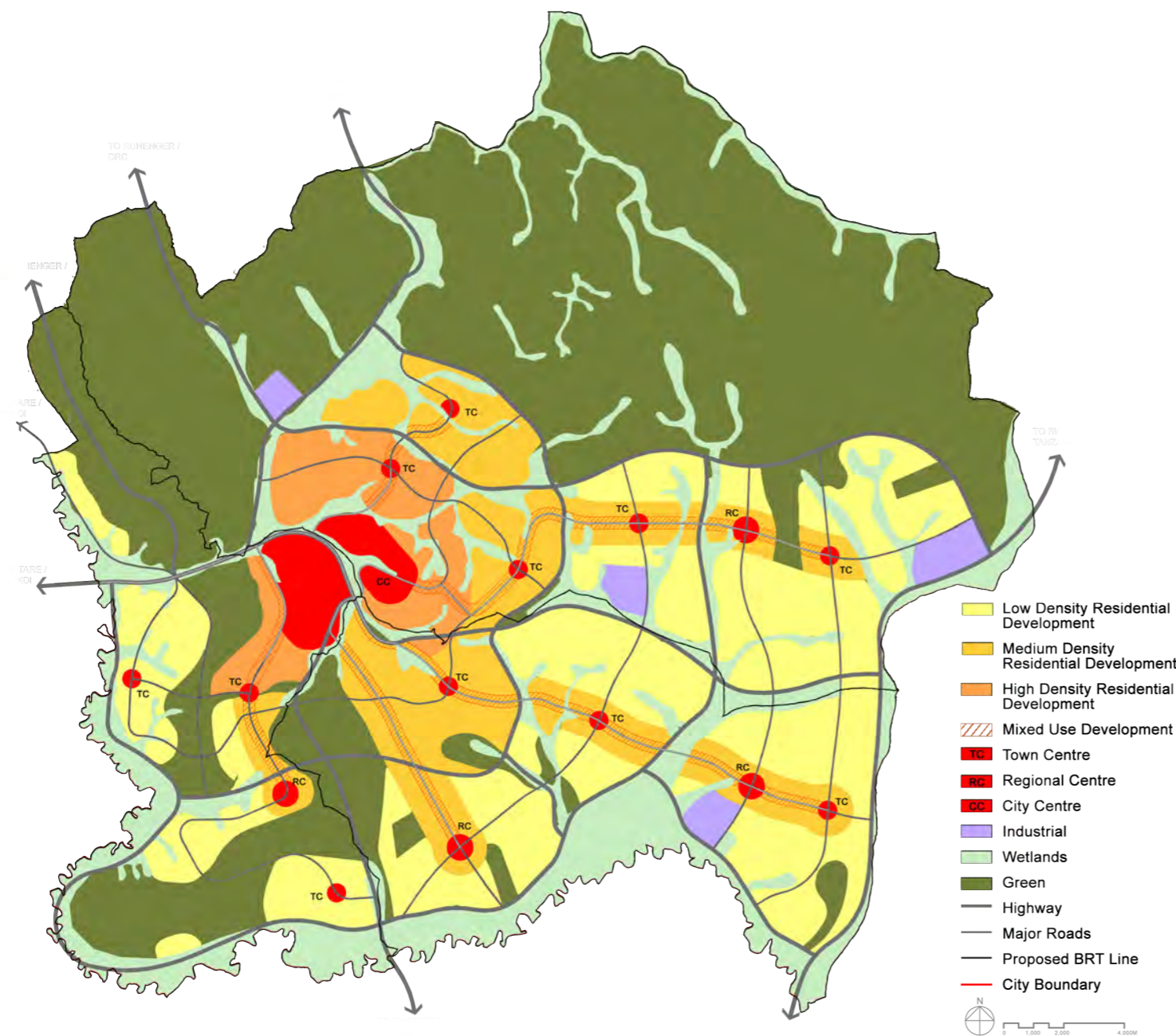


Fig.2.7 Selected Kigali City Structure Plan - Radial City Concept

2.5 Proposed Development Concept

The key considerations for the development of Kigali City Masterplan were:

- Establishing a range of employment centers in Kigali.
- Creating affordable and quality living environments in Kigali.
- To develop a compact, vibrant & transit oriented city
- Managing and improving the environment & infrastructure.
- To preserve urban heritage & enhance public greens
- To consolidate and reserve land for future needs

Guided by these broad principles, the City Masterplan for Kigali was updated. The selected concept for Kigali was the Radial City Structure which promotes transit oriented development corridors and development of comprehensive new townships along it. This plan focuses on linking the development corridors radiating out from the CBD and connecting the various areas of Kigali to the city centre.

The key features of the proposal are:

- **NEW DEVELOPMENT CORRIDORS:** The proposal focuses on the new developments in the green field areas, while intensifying the inner city area surrounding the CBD. The development corridor will connect key features of the city as well as the proposed new employment nodes. The 5 million projected population of Kigali will be distributed along these development corridors.
- **DEVELOPMENT OF NEW REGIONAL NODES:** The conceptual structure proposes

several new development nodes along the corridors. These nodes will be well integrated to the transit. Three new regional nodes are proposed which will be located in Masaka, Ndera, and Gahanga. These regional centres will cater to a larger catchment area and will include regional level facilities and commercial activities. The regional centres will also be key employment destinations in the city offsetting the pressure from the CBD.

- **TOWNSHIPS INTEGRATED WITH BRT (TRANSIT) CORRIDORS:** The transit corridor forms an integral component of the transportation plan. The transit corridor links the various townships in Kigali and makes travelling from one part of the city to another a seamless experience. High density development is proposed along these corridors by developing new townships around these transit corridors. The transit corridors initially will have Bus Rapid Transit with transit stops distributed at regular intervals. However in the future with enough population catchment and necessary funding, high capacity MRT corridor may be explored.

- **BETTER REGIONAL CONNECTIVITY:** A network of expressways link the various districts of Kigali. A radial road network with well spaced highways caters to smooth city travel and fast connections within the city and better linkage to the new airport at Bugesera. The ring road also provides alternate bypass to heavy good vehicles travelling across the country. The proposed trans-national rail line to the SEZ will further strengthen the logistics role of the SEZ and allow future passenger rail service linkage from the city to the Bugesera airport and the Southern Province.

3 PROPOSED KIGALI CITY MASTER PLAN

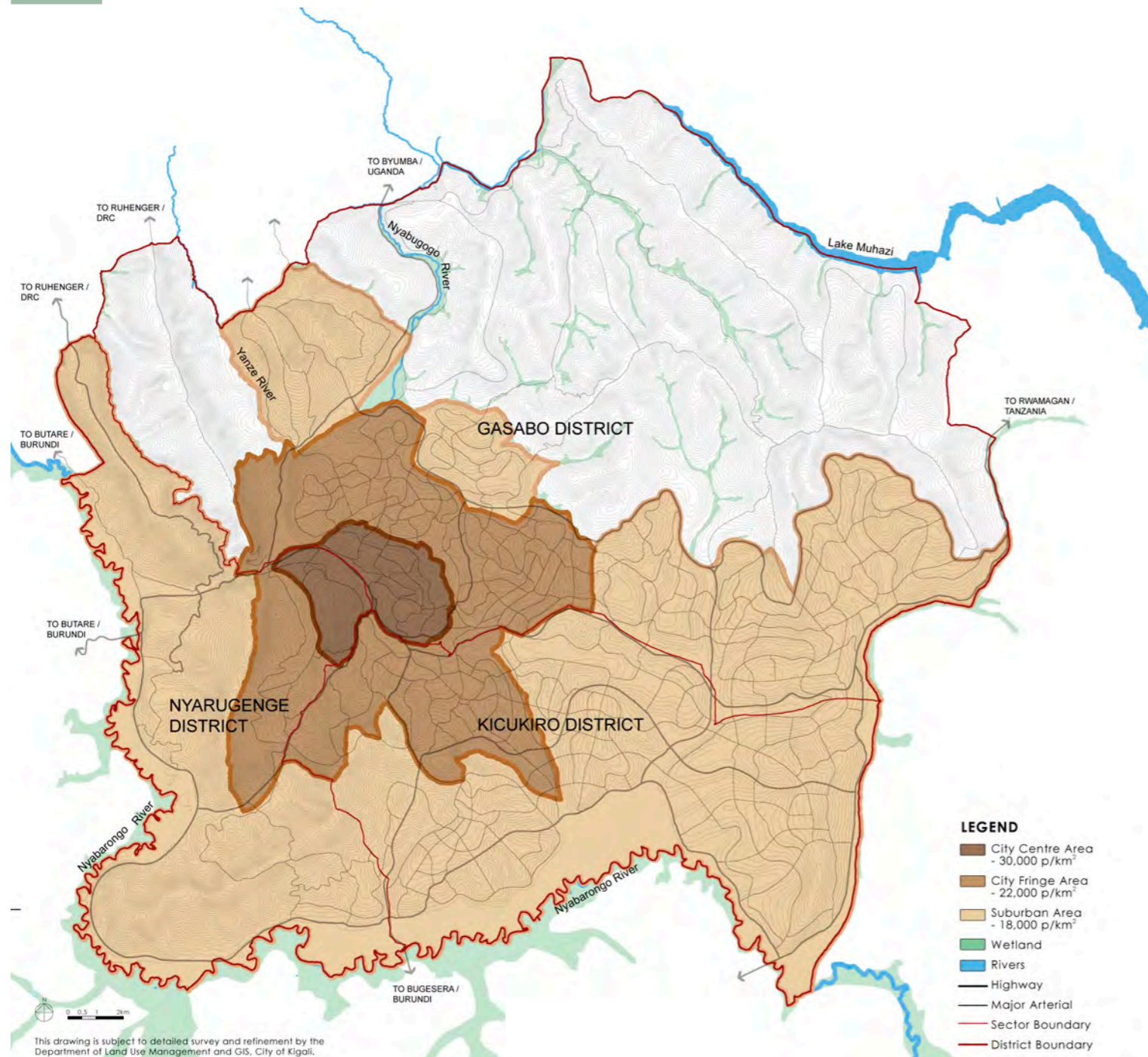


Fig.3.1 Proposed Land Utilization Strategy for Kigali

3.1 Broad Land Use

Following the preferred concept option for Kigali City, the Broad Land Use Plan proposes the overall land utilization strategy for the City of Kigali and further contextualizes the preferred concept option into a broad land use plan.

3.1.1 PROPOSED LAND UTILIZATION STRATEGY

Upon analysis of the current growth pattern, it can be concluded that Kigali is seeing a rapid urban sprawl with low density development mushrooming particularly in the urban periphery. In order to maximize the potential of the limited developable land, an overall land utilization strategy needs to be adopted for Kigali.

The proposed land utilization strategy focuses on the following key aspects:

- Identifying a defined urban boundary for City Centre Area and, strengthening and organizing of the existing City Centre.
- Identifying the existing urban areas that are adjacent to City Centre and organizing these areas as City Fringe Areas.
- Defining the existing urban areas and urbanizable new growth areas in the urban periphery and organizing these areas as the Suburban Areas.
- Defining the unbuildable areas in the outskirts as Rural Area and developing relevant strategies for various rural uses.

3.1.2 PROPOSED DISTRIBUTION OF DENSITY

The existing average urban density in Kigali is around 7,000 persons per sq. km and the City's gross density is 1,780 persons per sq. km. The current density distribution in Kigali ranges from 3,000 persons/ sq. km in low density single family areas to as

high as 25,000 persons per sq. km in high density unplanned areas. To address this structural differences in distribution of urban densities, an area specific density distribution is proposed.

In the proposed land use plan, 43% of Kigali City's land is proposed to be urbanized in order to accommodate the long term population. Although, the amount of land consumption is multiple fold compared to the present scenario, the urban land will fall short if the population densities remain mismanaged. Hence, taking a much compact and sustainable development approach, the average urban density for Kigali Year X is proposed to be 16000 persons/sq km.

The density distribution plan in Fig.3.1 shows the different urban densities that are proposed for the three restructured urban areas.

CITY CENTRE

The City Centre area is the most strategic area and prime in terms of real estate value. While the city centre will accommodate major regional level commercial uses and civic facilities; it is essential to encourage the high density residential development in the City Centre in order to provide homes close to the major job centre of the City. Hence, a higher urban density of 30,000 persons per sq. km is proposed for the City Centre Area. With this proposed density, the City centre is able to accommodate 480,000 population which is around 10% of the City's population.

The existing core of the City Centre mainly constitutes of Nyarugenge and Muhima sectors in Nyarugenge District. Prime civic uses and diplomatic uses are also spread

around Kacyiru and Kimihurura sectors in Gasabo District. These 4 sectors are comprise the City Centre of the Kigali City. The CBD at Muhima is the focus of the City centre and is proposed to be revitalized as the new regional commercial financial hub of the region.

FRINGE AREAS

Being sited around the immediate vicinity of the City Centre, the urban fringe area will also remain as prime land for residential uses. The majority of Kigali's Population are expected to live in the urban fringe and hence, the City's fringe density is proposed to be 22,000 persons/ sq km. The urban fringe is able to accommodate 1.4 million population which is almost one third of the total City's population.

The built-up residential areas within the immediate surroundings of the City Centre are proposed to be organized as Kigali City Fringe Area. The fringe area is proposed as mid and high density residential development to support the thriving City Centre. The urban sectors of Gitega, Kimisagara, Nyakabanda, Rwezamenyo, Nyamirambo in Nyarugenge District; Kigarama, Gikondo, Kicukiro, Kagarama, Niboye in Kicukiro District; and Kimironko, Remera, Southern Kinyinya, Gisozi and Gatsata in Gasabo District falls within the proposed City Fringe Area.

SUBURBAN AREAS

It is realized that the current trend of developments is quite low in density and with such low urban densities it will not be possible to meet the City's future urban land demand. Hence, the developments in suburban areas are also proposed to be intensified and supported with integrated public facilities. The gross urban density

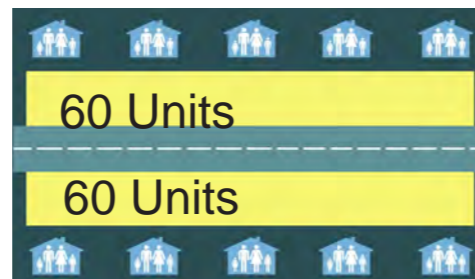
Kigali Today

1.3 million

Population of Kigali

1780 person/km²

Average Density

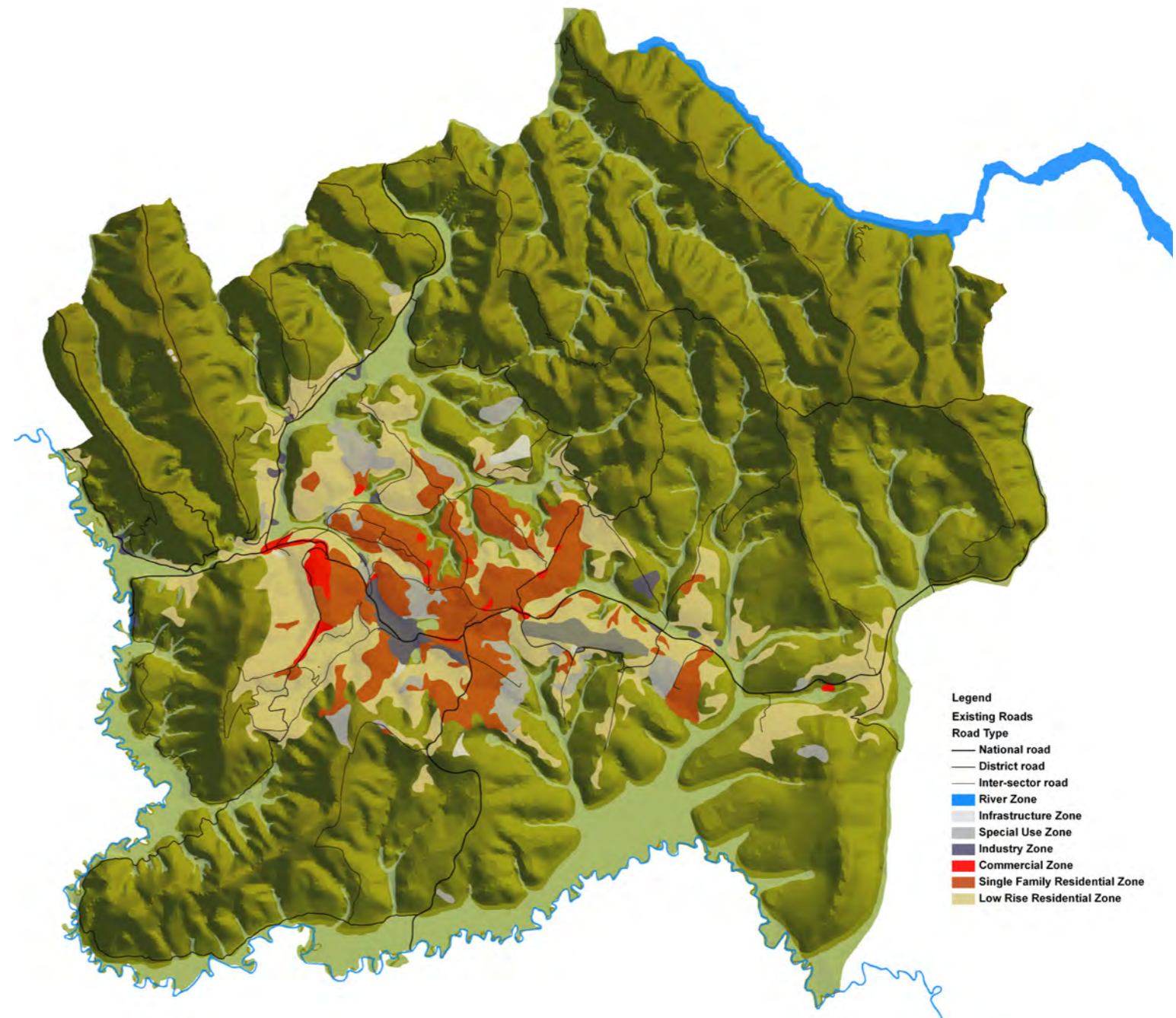


Today, 1 km of road only services 120 du's = 500 people



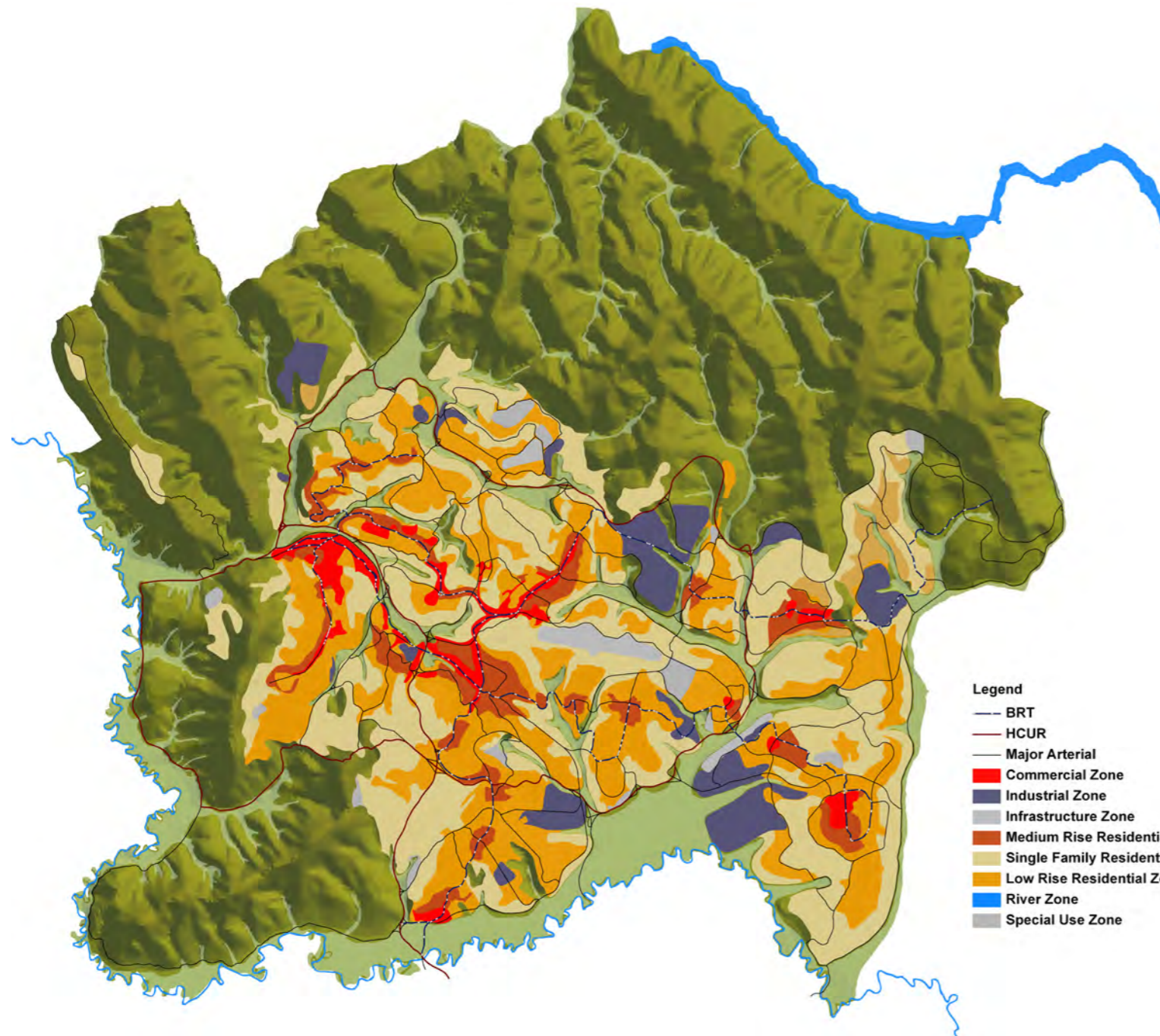
20 du/ha

Density of Kigali by 2040



- Legend**
- Existing Roads**
- Road Type**
- National road
 - District road
 - Inter-sector road
 - River Zone
 - Infrastructure Zone
 - Special Use Zone
 - Industry Zone
 - Commercial Zone
 - Single Family Residential Zone
 - Low Rise Residential Zone

Fig.3.2 Existing Urbanization Plan



- Legend**
- BRT
 - HCUR
 - Major Arterial
 - Commercial Zone
 - Industrial Zone
 - Infrastructure Zone
 - Medium Rise Residential
 - Single Family Residential
 - Low Rise Residential Zone
 - River Zone
 - Special Use Zone

Fig.3.3 Urbanization Plan 2040

Kigali 2040

4.2 million

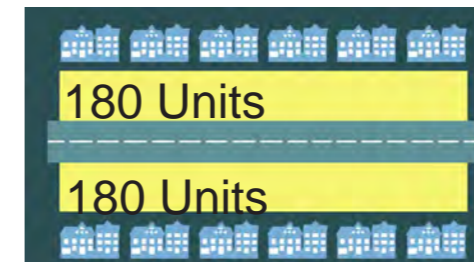
Population of Kigali

5750 person/km²

Gross Density

13400 person/km²

Urban Density



By 2040, 1 km of road only services 360 du's = 1400 people



65 du/ha
Density of Kigali by 2040

3.2 Accommodating 5 million in Kigali

proposed for the suburban areas is 18000 persons per sq km. With this density, 60% of City's population will be living in the suburban townships. The suburban areas will be organized as a series of high density townships. Various large employment nodes such as industries, regional centres will offer employment in these areas, thus reducing the need to commute to the city centre for work.

The largely undeveloped outlying urban sectors namely Kanyinya, Kigali, Mageragare in Nyarugenge District; Kanombe and Masaka Sectors in Kicukiro District; and Ndera and Rusororo sectors in Gasabo District are identified as the Suburban Areas of Kigali City and are proposed to be organized as comprehensive suburban townships.

RURAL AREAS

Large parts of Gasabo District, specifically the northern sectors of Jali, Rutunga, Gikomero and Bumbugo and some parts of Kigali, Kanyinya and Mageragare Sectors in Nyarugenge District are proposed to be retained as Rural Area. Proposed Urbanization Year X

Kigali Year X

5 million

Population of Kigali

6850 person/km²

Gross Density

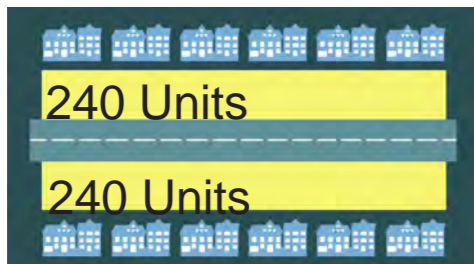
16000 person/km²

Urban Density



80 du/ha

Density of Kigali by 2040



By 2040, 1 km of road only services 480 du's = 1850 people

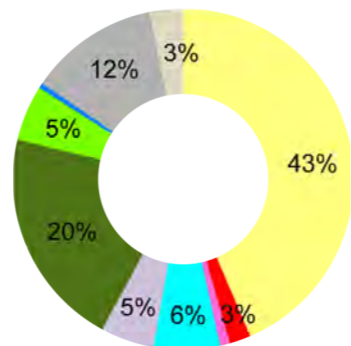


Fig.3.4 Land Use Distribution

3.2.1 BROAD LAND USE DISTRIBUTION

Currently, 17% of Kigali city's land is urbanized and is home to 1.3 Million population. The socioeconomic study projected that the City's population will reach 5 million by Year X. To meet this increasing demand for urbanization, the urban area within the City is proposed to be expanded by two and half folds based on the available developable land.

The broad land use plan for Year X shows the ultimate development envisioned for the Kigali City. The key land use proposals are:

- To expand and strengthen the City Centre by allowing high density commercial and vibrant mixed use developments with premium office, retail, hotel and residential developments.
- To introduce regional level commercial areas in the Fringe Towns and the new townships in suburban areas.
- To safeguard land for consolidated Industrial Estates for general industries.
- To establish an efficient highway and arterial system ensuring long-term regional connectivity and internal linkages.
- To redevelop existing dense unplanned settlements into medium-rise residential zones in the urban-fringe area.

- 43%** Residential
- 26%** Open & Natural Areas
- 5%** Industry
- 3%** Commercial & Mixed use

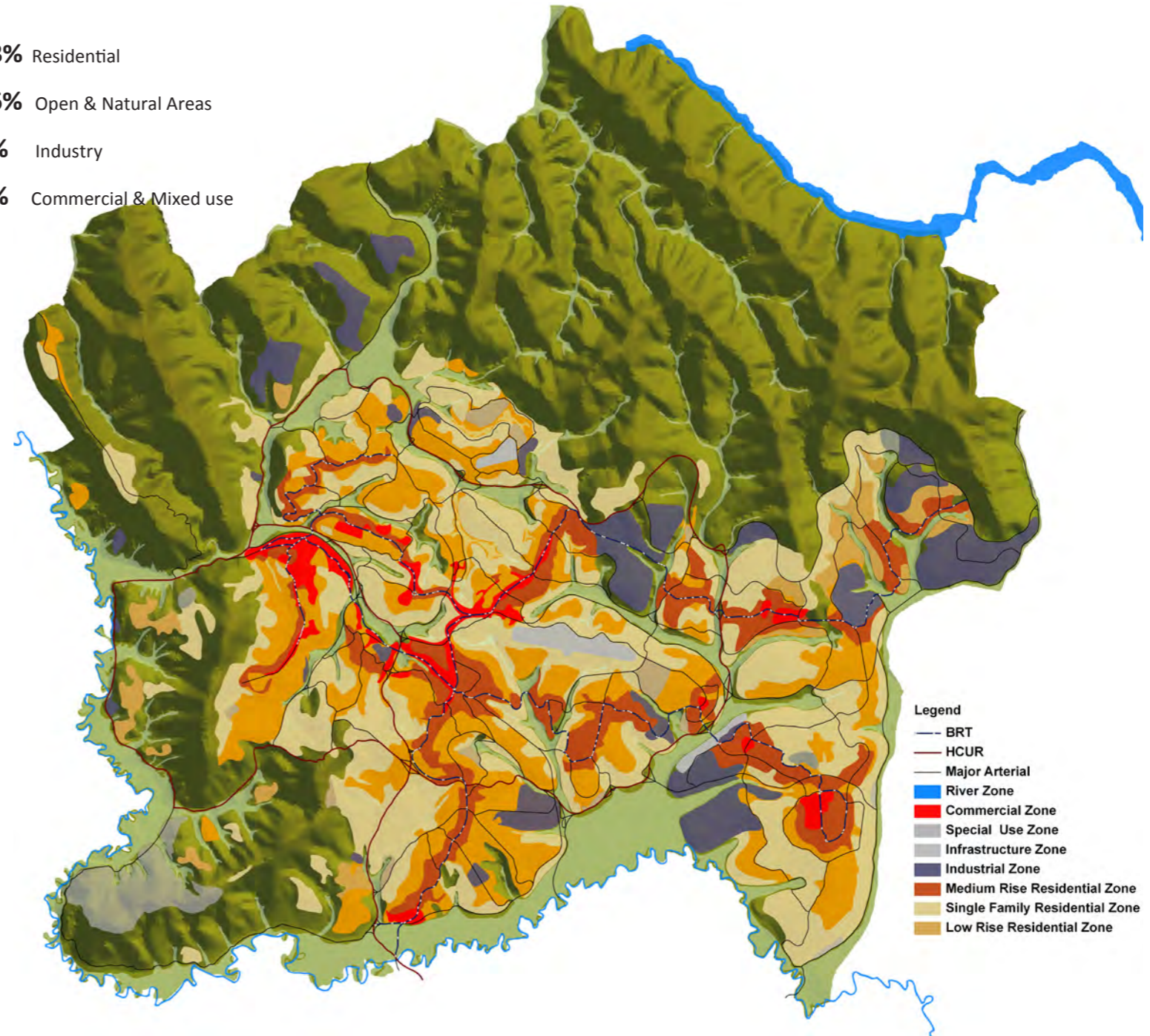


Fig.3.5 Urbanization Plan Year X

RESTRUCTURING AND REDEVELOPMENT OF EXISTING URBAN AREAS BY ADOPTING THE INTEGRATED TOWNSHIP MODEL TO:

- Catalyse redevelopment in the existing areas by laying the necessary infrastructure.
- Provide incentives for re-zoning of existing slums by encouraging redevelopment and densification of the existing urban areas.
- Develop public facilities to ensure sufficient provision of necessary facilities for improving the quality of life in the existing urban areas.

townships with a range of comprehensive facilities. Kigali City is proposed to be restructured into 24 self-sufficient townships. Majority of these townships are proposed to be served by public transit corridor. These transit corridors will become the main structuring element of these townships. The typical township size proposed for Kigali is around 900 to 1000 Ha accommodating an average population of 200,000 residents each.

Generally the townships are organized along the topography with one or two hills combed to constitute one township entity. Arterial Roads form the township boundary and the main central spine is formed by the BRT corridor. The commercial uses and

3.2.4 PROPOSED DISTRIBUTION OF TOWNSHIPS

The city is proposed to be organized in existing and new growth areas as integrated



Fig.3.7 Illustration of new Township along the slopes; Transect Section (below)



Fig.3.8 Proposed Township Boundaries

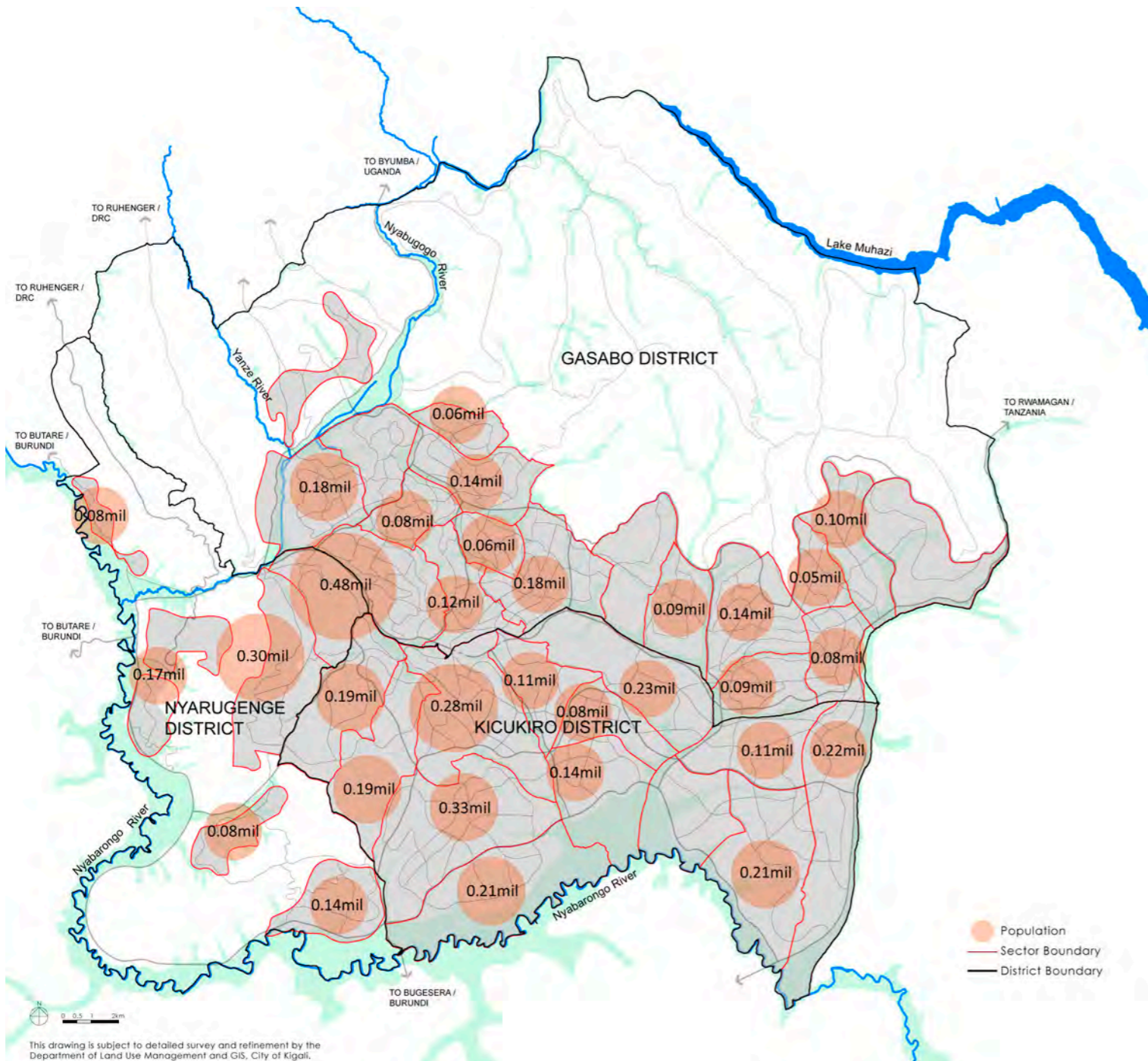


Fig.3.9 Proposed Township Distribution Plan with distribution of Population

major facilities are located along the dense central spine and help create. Reserve corridors for providing a future MRT Line is also safeguarded in all townships. A township model as shown in Fig.3.7 illustrates the key concept for typical new towns organization. The higher density residential neighborhoods are proposed around the town centre and in areas around the walking distance of the public transit corridor, as well as nodes around the proposed MRT stations.

Similar to the KCMP (2008) transect concept, the higher density areas are located along the ridge, and density gradually reduces as one moves away from the transit corridor towards the slopes and the wetlands.

All the townships are proposed to ensure the walkability within its smallest neighborhood cells. Key facilities such as neighborhood centres, primary schools and local parks are located at the walking distance from the living areas. Besides the Town Centre catering to town level commercial needs, other town facilities such as the Vocational Training Institutes, Polyclinics, Bus Interchange, Sports Field, Town Park, Cemetery and Light Industrial Estates, etc are proposed for each township. All these will help generate local employment. Low density residential area are proposed at lower slopes, closer to the scenic wetlands and parks.

PROPOSED TOWNSHIP BOUNDARIES

The township boundaries are determined based on the following criteria:

- The township boundaries are based on the natural boundaries and geographically conglomerated urban areas.
- The township boundaries follow the respective sector boundaries where

possible.

- The developable urban areas are divided by the highway grids of 3-6 kilometers and major arterial roads spaced at 800 to 1200 meters. The township boundaries at some areas are influenced by these road networks.

3.2.5 PROPOSED DISTRIBUTION OF POPULATION

The existing population in Kigali City is 1.3 Million. 65% of this population is living in the urban areas. As per the socioeconomic study, the City's population is estimated to reach 5 million in Year X.

PROPOSED POPULATION DISTRIBUTION

As per the proposed density distribution, 95% of the projected population is to be redistributed within the City Centre and 24 urban townships in city fringe and suburban areas. The remaining population is expected to be distributed in the rural sectors of Kigali.

By population, the township size ranges from smaller townships of 80,000 to 100,000 people in Kanyinya (N1), Northern Mageragere (N4), Western Ndera (G5), Southern Gatenga (K2) and Northern Kanombe (K6); to larger townships such as the ones in Nyamirambo (N3), Kimironko (G4), Kicukiro (K3), Gahanga (K4) and Masaka (K11) which accommodates 200,000 to 350,000 population. These larger townships play a much larger role at the regional level in terms of employment generation and hence, are substantiated with larger population catchments.

The proposed population distribution is shown in Fig.3.9. (Refer Appendix 2 for township population distribution)

3.2.6 PROPOSED DISTRIBUTION OF EMPLOYMENT

Kigali City currently offers a total of 500,000 jobs in services, industrial and other sectoral employments. Majority of these jobs are around the City Centre with some employment in other scattered industrial and commercial areas.

The socioeconomic study projected that the labor participation in the City will be 46% in the year Year X. This requires City to ensure 2.3 million jobs in long term future.

PROPOSED EMPLOYMENT DISTRIBUTION

The Broad Land Use Plan proposes to cater for projected job requirements through the establishment of well distributed new employment nodes around the city inclose proximity to townships. 20% of the City's service jobs are proposed to be provided within the City Centre. Additionally, 13% of the service and light industrial jobs are proposed to be provided in the surrounding Fringe Towns. The proposed general industrial estates are expected to cater to 400,000 Jobs in manufacturing and logistic industries. Further to this, the new self contained townships in the suburban areas are proposed to provide 36 % of the City's jobs, thus supporting a decentralized job distribution and ensuring significant local employment. Additional employment is also provided by several other commercial uses along airport boulevard, resorts in Gahanga and Lake Muhazi, and Business Park at Gikondo.

Table 3.1 Proposed Employment Distribution

TOWNSHIP	SERVICE	INDUSTRY
SP1	493,043	-
N1	8,275	4,940

TOWNSHIP	SERVICE	INDUSTRY
N2	17585	10498
N3	40060	18525
N4	8275	4940
N5	14482	8645
G1	19654	11733
G2	26707	12350
G3	18619	11115
G4	81,954	21613
G5	9310	5558
G6	198,391	14820
G7	23,286	8645
G8	10,344	6175
K1	18619	11115
K2	8275	4940
K3	46736	21613
K4	286,435	19,760
K5	15516	9263
K6	9310	5558
K7	13447	8028
K8	9310	5558
K9	12413	7410
K10	22757	13585
K11	198,391	21613
I1	-	60300
I2	-	123950
I3	-	140700
I4	-	77050
R5	7,043	-
R8	1,761	-
RURAL AREA	-	80000
TOTAL	1,620,000	750000

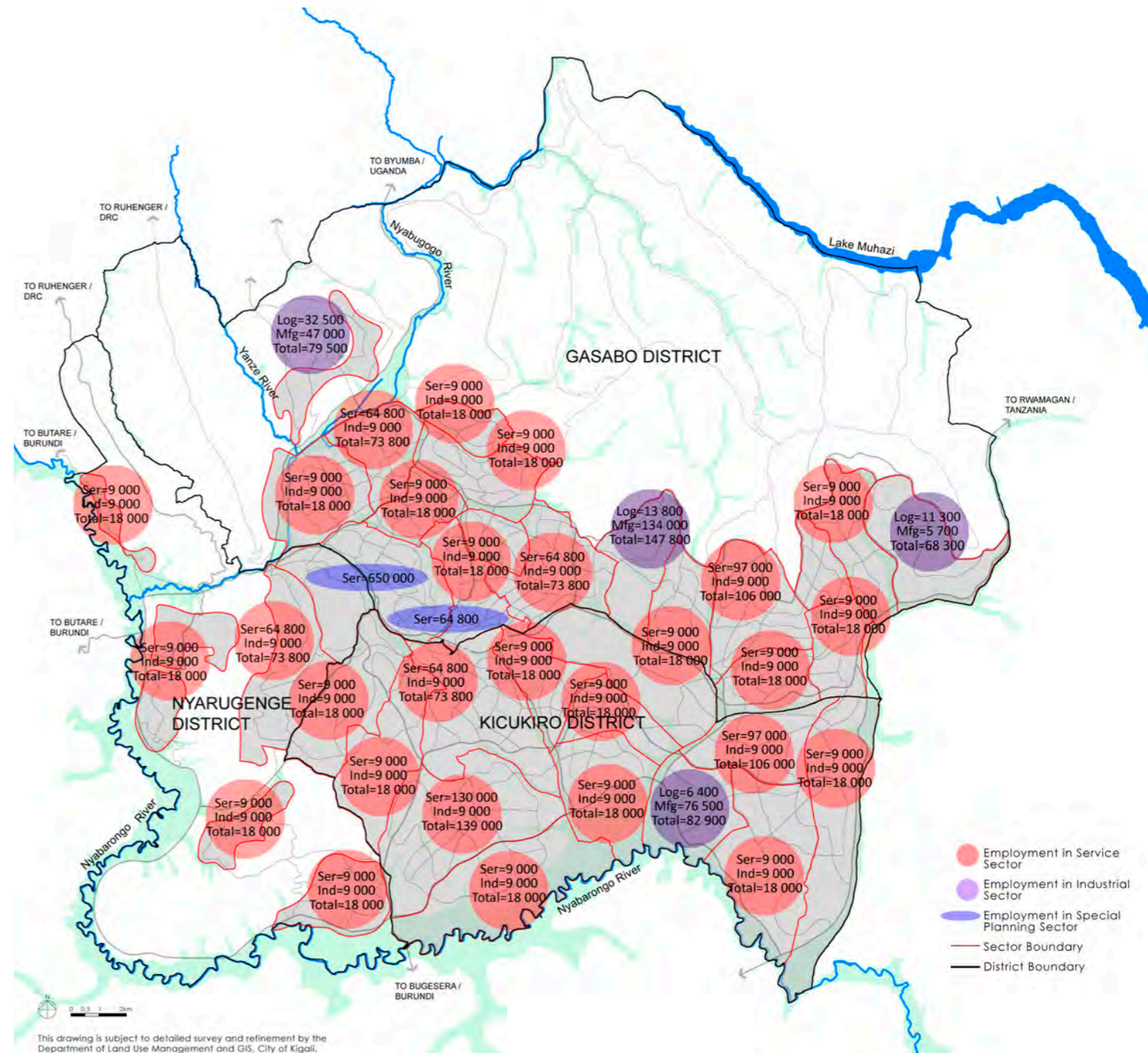


Fig.3.10 Proposed Distribution of Employment Year X

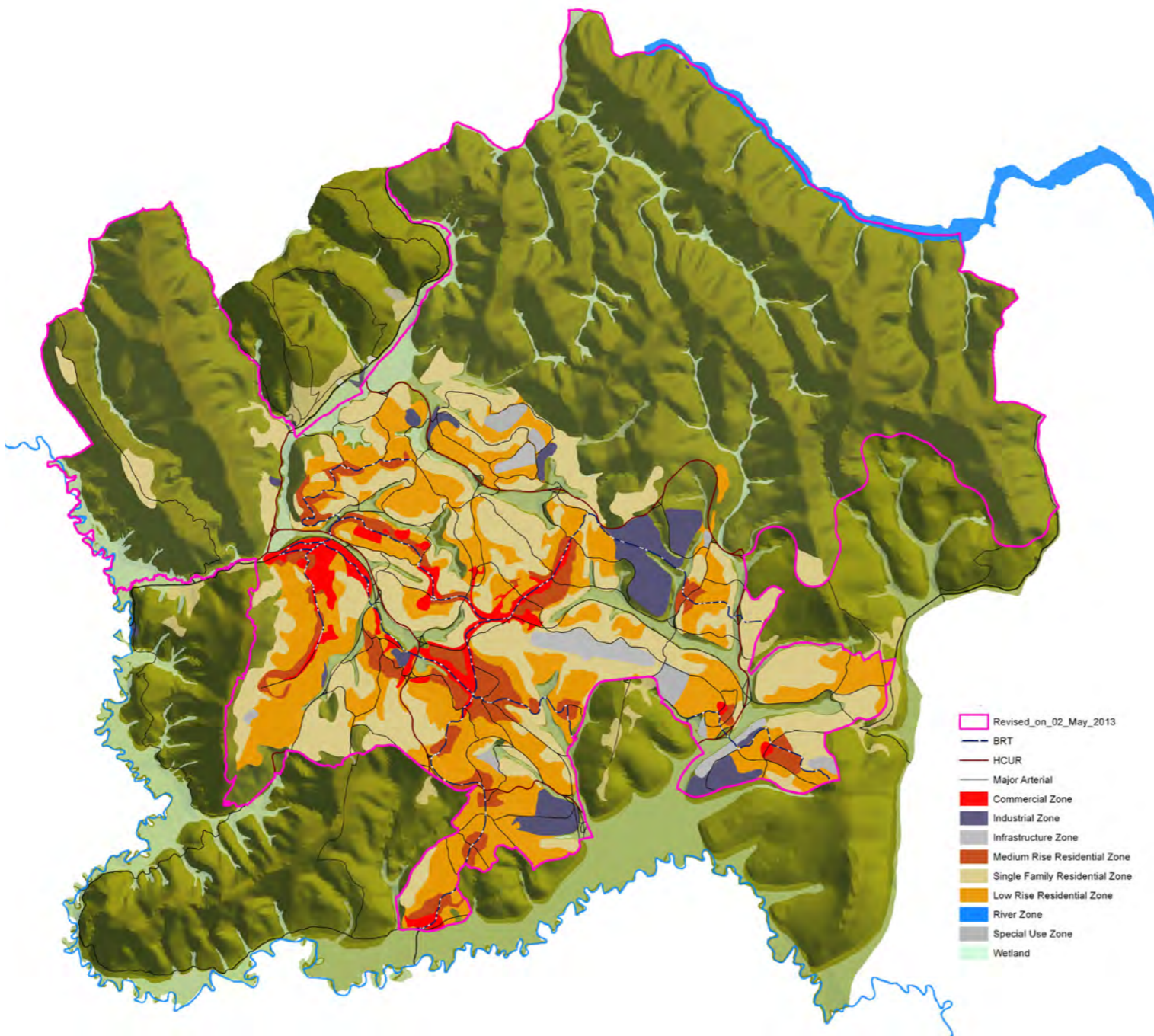


Fig.3.11 Proposed Broad Land Use 2025

3.2.7 PROPOSED BROAD LAND USE PLAN - YEAR 2025

The proposed Broad Land Use Plan 2025 is expected to cater to a population of 2.9 million.

The Broad Land Use Plan 2025 is proposed mainly with an intention to redirect the growth in the priority areas that are contiguous to the existing urban areas and areas with existing main infrastructure in place.

This intermediate Broad Land Use Plan takes into account major on-going and approved projects that are carving the City's peri-urban fabric. Some of these projects include large scale residential developments in Kinyinya, Gisozi and parts of Ndera and Gahanga; few commercial developments in Gatenga and Gahanga; and some development of facilities in Ndera, Kicukiro, Gatenga and Kagarama.

Appendix 1 lists all the Approved projects by the City that are integrated in the Proposed Broad Land Use Plan.

The urban sectors of Muhima, Nyarugenge, Kimisagara, Gitega, Nyakabanda, Rwezamenyo and Nyamirambo are identified as priority zones for 2025 in the Nyarugenge District. Similarly, sectors of Gatsata, Gisozi, Kacyiru, Kimihurura, Remera, Kimironko, Kinyinya and parts of Ndera and Rusororo along the east west corridor in the Gasabo district are identified as priority areas. In Kicukiro District, the sectors of Gikondo, Kigarama, Gatenga, Kicukiro, Niboye, Kagarama, and parts of Gahanga, Nyarugunga and Masaka are identified as the focus area for 2025.

While the land uses for the priority areas

remains unchanged in Year 2025 Land Use Plan, the key differences are:

- In terms of existing uses around the priority urban area, these may not all be redeveloped within the time frame as shown in the Broad Land Use Plan in 2025. However, it is recommended that development of large City level infrastructure to be focused in these priority urban areas.
- Development in future urban areas is allowed however the city will focus the infrastructure efforts only in the priority urban areas within the 2025 boundary.
- The existing or ongoing imudugudus in the future urban areas will remain within these areas until 2025, and will continue in the rural areas.
- In terms of agricultural uses, the plan allows farming within the buildable areas around the imudugudus and housing project sites in future urban areas, although these land are safeguarded and rezoned as comprehensive residential townships in the future.

The Broad Land Use Plan Year 2025 is presented in Fig.3.11 .

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related jobs. The Central Area is a mix of offices, retail and entertainment facilities that caters to the needs of the City as well as the nation. The Central Area of Kigali consists of the CBD and the Financial district at Muhima and the administrative district at Kacyiru. A civic and cultural district is also proposed at Kimihurura. The Central Areas consists of approximately 1,800 ha. The Central Area will cater to 28% (approx. 458,000) of the total jobs in the services sector and will ultimately provide approximately 3.25 million GFA (gross floor area) of commercial space. It comprises of a mix of large retail and office districts with grade A offices required for today's large financial and global companies. The central area will also house large hotels to cater to the visitors and tourists.

REGIONAL CENTRE

Regional Centres are the second tier of commercial centres after the CBD. In line with the strategy to decentralize Kigali, four new Regional Centres are proposed to bring jobs and large amenities closer to the people. Regional Centres help to reduce congestion in the City Centre and also bring the workplace closer to peoples' homes. Regional Centres are located along the transit corridor and are developed as major transit nodes. Complementary high quality retail and entertainment activities will also be provided in the Regional Centres so as to minimize the needs of residents to travel to the inner city for these basic purposes.

The proposed Regional Centres in Kigali are located at Ndera, Masaka, Gahanga, and Nyamirambo. Each Regional Centre caters to a catchment population of 800,000-1,000,000. The Regional Centre is proposed to be around 40-50 ha in size. Regional Centres (RC) also provide for

specialized Business Parks and Centres like Agro-Incubation Centre at Ndera RC, the University Town at Masaka and Expo and Business Park at Gahanga. More mixed use developments are encouraged within the Regional Centres.

FRINGE CENTRE

Fringe Centres are distinctive commercial centres developed around major transit nodes at close proximity to the City centre - typically about three to five kilometres away from the City Centre. Due to their proximity to the Centre, they are well linked by roads and public transit. The Fringe Centres will also incorporate the existing commercial around the City centre and is a good alternative to businesses which do not need to be located in the CBD. This helps the businesses to cut their costs down. The Fringe Centre helps to locate jobs closer to the suburban areas and residential areas and helps to reduce the travelling time.

Four Fringe centres are proposed to be developed in Kigali. Kinyinya, Kimironko, Kicukiro Centre & Nyakabanda form a ring of Fringe Centres around the Central Area. Each Fringe Centre is proposed to be around 10-20 ha in size consisting a mix of retail, housing, office, and public facilities.

TOWN CENTRE

Compact and integrated townships are proposed as a key development strategy for Kigali. Each of these townships will have a Town Centre that caters to the commercial requirements of the township. 16 such Town Centres are proposed in Kigali. Town Centres contain a mix of retail commercial and entertainment needs of the township and are unusually integrated with the public transit. They provide local employment and house retail and offices.



Fig.4.3 City Centre, Regional Centre, Fringe Centre



Fig.4.4 City Fringe Centre, Town Centre, Neighborhood Centre



Fig.4.5 Other Commercial Uses

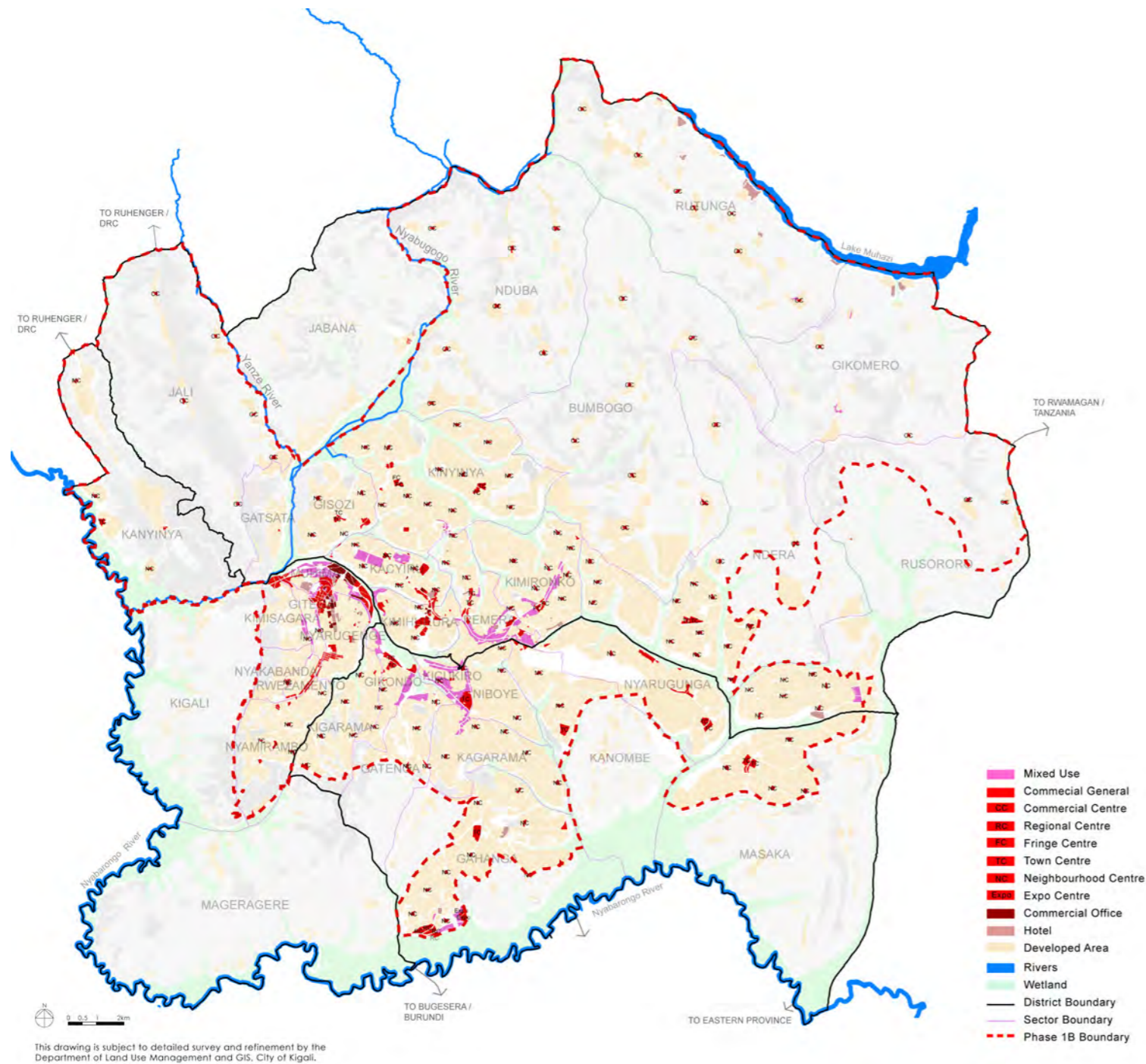


Fig.4.6 Proposed Commercial Plan 2025

Township level facilities are also located in the Town Centres.

NEIGHBORHOOD CENTRE

Townships comprise of several walkable neighborhoods. Each neighborhood caters to a catchment population of 15,000-18,000 people. Neighborhood centres will have markets catering to the daily needs, and smaller local level retail like grocery, Stationery shop etc.

OTHER COMMERCIAL CENTRES

Areas in the City which already have vibrant commercial activity are retained. The infrastructure in areas such as Gisimenti & Giporoso along the Airport Boulevard are examples of such commercial streets which form the 'other commercial'. Specialized commercial like the Expo and SME-Innovation Hub in Gahanga are included within the 'other commercial'. Similarly, specialized resorts and tourism destinations in the City like the Integrated



Fig.4.7 Mixed Use Developments

Wetland Resorts at Gahanga and Lake Muhazi Tourism District also included within the 'other commercial'.

INTEGRATED MIXED USE DEVELOPMENT

To create vibrant and well utilized places, the commercial developments are proposed to be mixed use and well integrated with the public transit network. Mixed use developments can include various types of uses like living working, and shopping etc. Integrated within them. Single use commercial create under utilized commercial centres, while mixed use developments due to the live in population, tend to be active through out the day. Well landscaped, well connected mixed-use developments, with good urban design, create commercial centres with a sense of place which are well used and appreciated by the residents and visitors.

4.2.2 PROPOSED COMMERCIAL PLAN 2025

As per the Broad Land Use 2025, development will focus in the inner city, fringe areas and towards Gahanga. The Commercial Plan 2025 focuses on further developing the City centre to make Kigali a regional financial hub. The Regional Centre areas in Gahanga and the Fringe Centres in Kicukiro, Kimironko and Kinyinya are also to be developed. The Expo in Gahanga is also proposed to be developed within this phase. Town Centers and neighborhood centres will be developed with the new townships. All these developments will provide for the commercial space requirements of the City and will position Kigali to become an attractive Financial Hub in the region.

4.3 Existing Industrial Profile

4.3.1 EXISTING INDUSTRIES IN KIGALI

The industrial sector accounts for 33% of Kigali's GDP and has witnessed growth of 9.7% p.a. in the last five years. As per the socio-demographic studies in 2010, the industrial sector employed approximately 70,000 people in Kigali.

Currently the industrial sector in Kigali is a major employer. This sector consists quarrying, manufacturing, utilities, and construction. Construction is a major employer, and will continue to be so as the country develops.

4.3.2 KEY ISSUES FOR INDUSTRIAL:

Some of the key issues in developing the Industries in Kigali are:

- Many of industries are located in environmentally sensitive areas and wetlands.
- Lack of distribution of industries
- Lack of clear strategy for heavy and light industries.
- Energy cost and transportation cost are other key impediment to the industrial sector.

4.3.3 NATIONAL INDUSTRIAL POLICY

The National Industrial Policy prepared by the Ministry of Trade and Industry highlights that, for Rwanda to reach the Vision 2020 target, the share of industry is required to increase from the current 15% to 26% of national GDP. This will require 12% growth annually. The Industrial Policy uses existing cluster selection exercises and brings them together to specify a clear focus for clusters to be prioritized. This makes the distinction

between clusters that are desirable but only feasible in the longer term and clusters that are desirable and feasible in the shorter term. Thus planning will look to promote the feasibility of all selected clusters while fast-tracking those that are most feasible.¹ The Industrial Policy focus industrial growth upto 2020.

PHASING UPTO 2020 AS PER THE INDUSTRIAL POLICY:

SHORT TERM: Agro-processing (including pyrethrum, dairy, vegetable oil, soaps and detergents); ICT; high-end tourism; textiles (including silk, leather & leather goods); minerals processing;

MEDIUM TERM: Construction materials (including cement); Pharmaceuticals; chemical products (including fertilizers);

LONG TERM: Building materials (metal parts and structures); bio plastics; other high-tech Industries.

4.3.4 SMES PRODUCTION CLUSTERS IN RWANDA

The SME Production Clusters report prepared by the Ministry of Trade and Industry identifies the product clusters per district. A total of 12 unique SMEs product clusters were identified in Kigali.² The clusters identified for the 3 districts of Kigali were:

KICUKIRO: weaving-handcraft, meat, furniture, juice-maize agro-processing & coffee

GASABO: apparels, furniture, maize, basket, bakery

NYARUGENGE: ICT-software development, BPO, restaurant and accommodation, furniture, welding

1 National Industrial Policy
2 SMEs Production Clusters in Rwanda



Construction Industry, Small factory and Dry Port



Food Industry, Manufacturing Industry and Textile Industry



Heavy Industry, Auto mobile Industry and Agro Processing Industry

Fig.4.8 Types of Heavy Industries

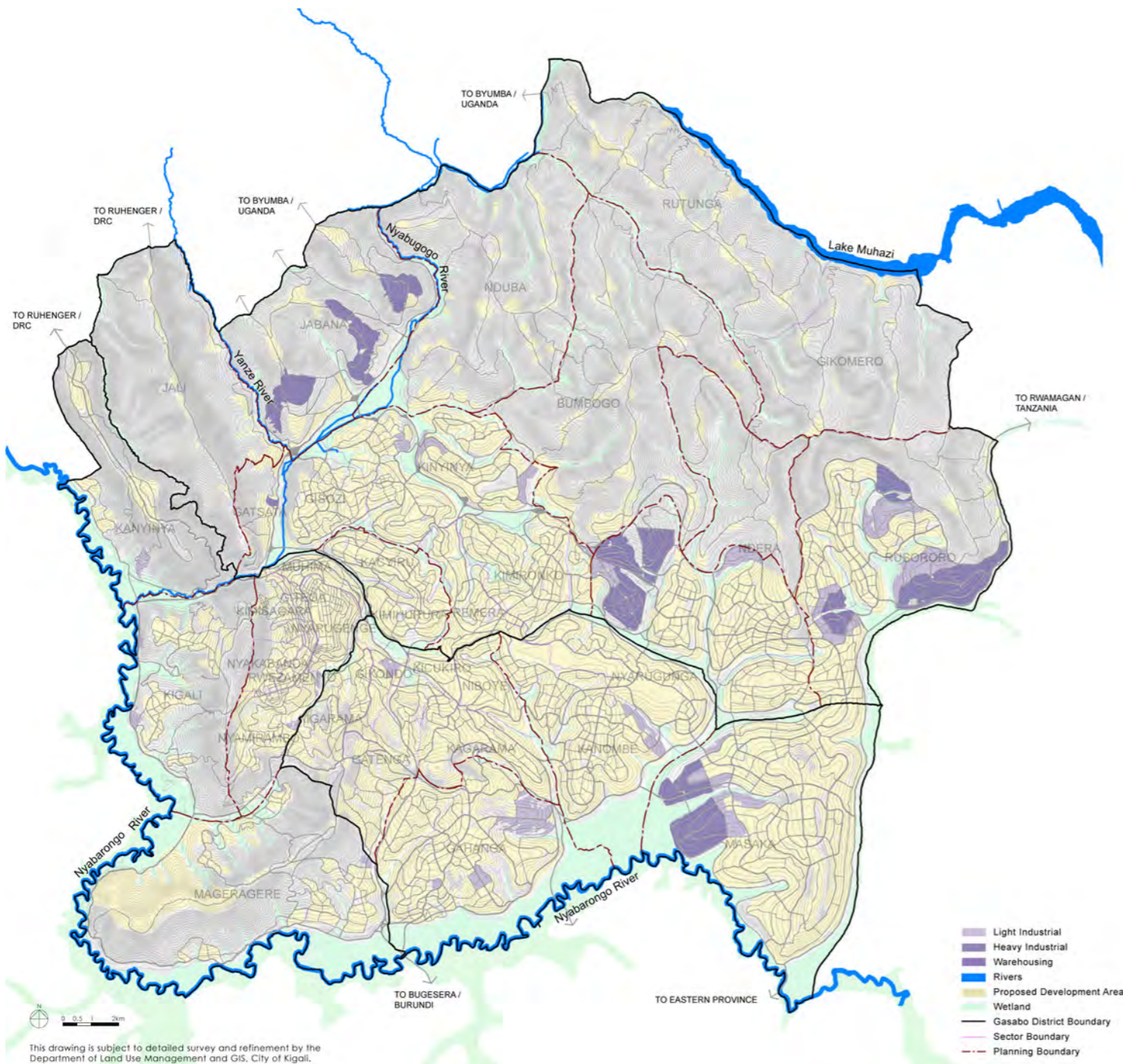


Fig.4.9 Proposed Industrial Plan Year X

4.4 Proposed Industrial Use Plan

4.4.1 PROPOSED INDUSTRIAL PLAN 2040

As per the socio-demographic study, the industrial sector will have 670,000 jobs by 2040.¹ The Industrial Plan addresses the strategic distribution of these jobs in Kigali. The industrial development is proposed to focus on labor and skill intensive jobs in the short term and capital & technology intensive jobs in the long term. Focus will also be provided in give space for developing the identified SME clusters in the immediate term.

The existing industrial areas in the Kicukiro Industrial area and the SEZ are retained but proposed to change from heavy to non polluting industries. Hence continuing with the existing Master Plan. However the industrial developments in the environmentally sensitive areas and the wetlands are proposed to be relocated. It is essential to have industrial areas evenly distributed across the urbanized area of Kigali, so as to ensure availability of jobs near homes. The industrial areas of 30.5 sq km in total is demarcated as shown in Fig.4.8 which amounts to 4.2% of total land.

The Broad industrial land calculation is attached in Appendix 1. This calculation was conducted for the purpose of estimating the industrial land requirements in Kigali. 60% of the employment share of the industrial would be taken up by manufacturing and Logistics while the remaining 40% of the employment share would be taken up by the light industries in the townships.

HEAVY INDUSTRIAL ZONES

Approximately 2,900 ha. of land is safeguarded for heavy industrial zone in Kigali. Besides the existing SEZ industrial zone (570 ha), three more industrial zones are proposed in Kigali which are the Jabana Industrial Zone (450 ha), Rusororo Industrial Zone (1010 ha), and Masaka Industrial Zone (450 ha). The location of the industrial zones is also influenced by the general wind direction in Kigali (which flows from South East to North West) so as to minimize the health hazard to the surrounding residential areas. These industries will provide space for larger industrial clusters such as Agro-processing, electronics, construction materials, plastics & pharmaceuticals timber & metals products, textile, garments. It will also provide space for other heavy industries such as petroleum depot and chemical industries as well as smaller SME clusters. With the proposed trans-national rail line in operation, the Magerwa Dry Port is proposed to be relocated and a new area within the industrial areas is safeguarded for the dry port and supportive logistics based industries. Major logistics operations are cited at Jabana and Masaka Industrial estate with around 40% share each due to their location and connection with the neighboring areas. And Rusororo and the existing SEZ hold 80% of the manufacturing share of the city's Industrial capacity.

LIGHT INDUSTRIAL ZONES WITHIN TOWNSHIPS

Light Industries typically have less environmental impact than those associated with heavy industries and hence are usually located closer to residential area. Besides the four large industrial zones, light industries serving

¹ As per the high case scenario

the surrounding population such as areas for motor workshop, printing companies, light building services and warehouses, and other small clusters of SME will be located in all townships providing jobs closer to homes. 765 ha of land is proposed to be safeguarded for light industries within townships which will provide employment for approximately 268,000 people in 2040.

4.4.2 PROPOSED INDUSTRIAL PLAN 2025

As per the socio-demographic projections, the industrial sector will represent 35% share of the GDP in Kigali. The sector will provide employment to 300,000 people in 2025. The plan focuses on the City centre, fringe and the Gahanga area and some parts of Masaka and Ndera. The proposed Industrial plan 2025 focuses on further development of the current Kigali SEZ. It proposes the completion of all three phases of the Kigali SEZ. The plan proposes the development of several light industrial estates within the SEZ as well as in Gahanga, Kininya, and Gisozi which will provide more jobs centres closer to living areas. It will also help foster SME clusters in line with the industrial policy. The industries in Gikondo wetlands are proposed to be relocated in this phase of the development. However the other industrial developments which are not pollutive can remain in the industrial areas in Kicukiro and Gikondo which can be developed as incubator hubs for new SMEs. The industrial plan 2025 is illustrated in Fig.4.10



Light Industries



Weaving-Handcraft Industry



Fig.4.10 Meat processing Industry

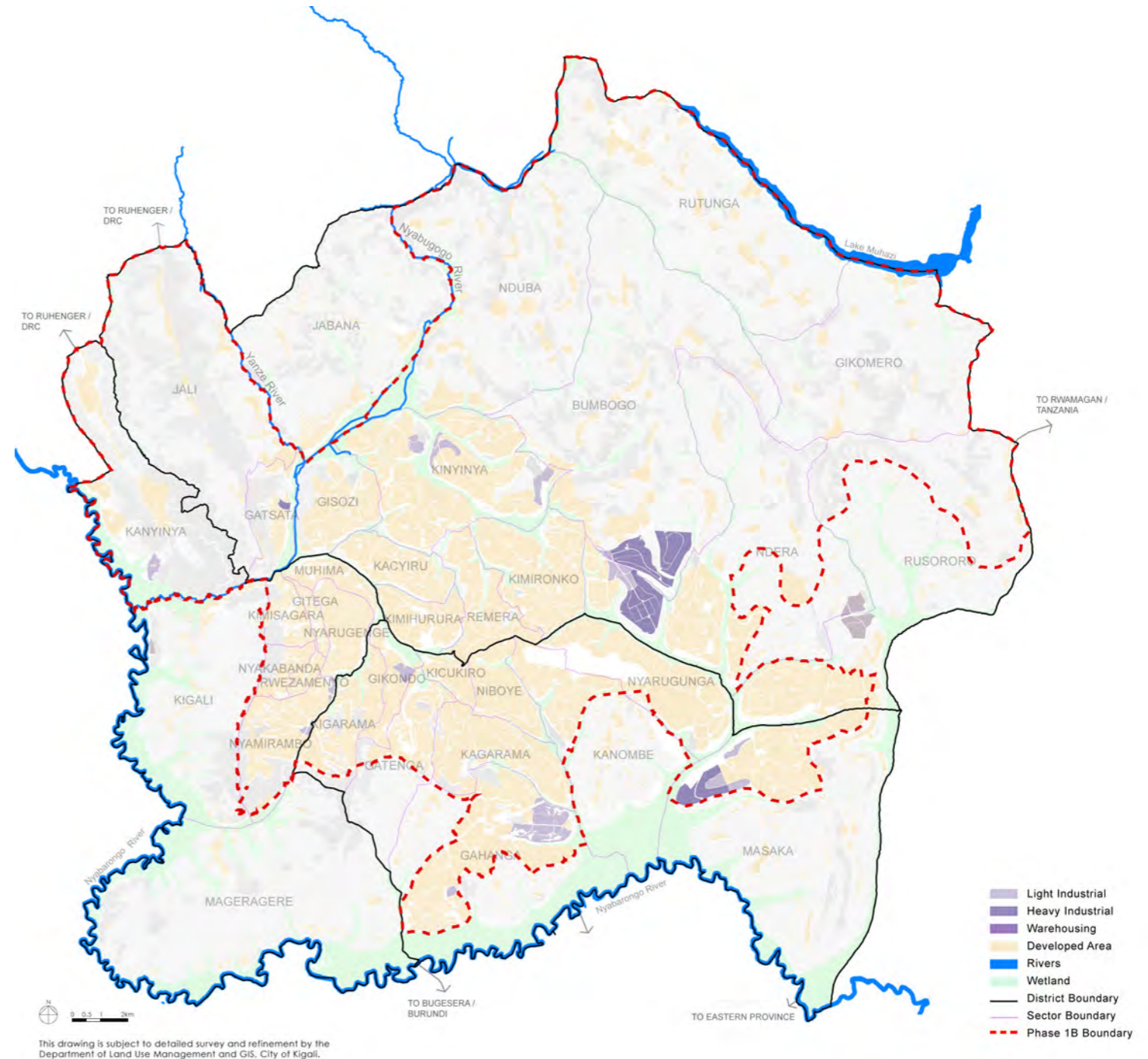


Fig.4.11 Proposed Industrial Plan 2025

5 CITY OF GREEN TRANSPORT



Fig.5.1 Proposed Road Network Year X

5.1 Existing Transportation Profile

5.1.1 EXISTING TRANSPORTATION ISSUES

The City of Kigali currently faces multiple transportation issues. A detailed study of the Transportation Master Plan (TMP) in Kigali has been done to support the Concept Plan. This TMP report explains the transportation concepts and strategies developed for Kigali in-depth. The key issues identified by TMP are as following:

- Low density sprawls which need access
- Poor Connectivity between urban centres and land uses within the city
- Lack of road design standardization and comprehensive traffic policies

5.2 Proposed Transportation Concept

In the conceptual stage, there were three key goals and objectives which formed the basis of the Transportation Concept –

TO BECOME A TRANSIT ORIENTED CITY

- maintain private public modal split of 80:20 by Year X
- provide a private system with average work commuting time of 45 minutes

TO ESTABLISH A COMPREHENSIVE TRANSPORT SYSTEM

- achieve density of roads to be built upto international standards.
- 100% freight route to be constructed by 2025 with terminals and truck interchange

TO CREATE A SUSTAINABLE TRANSPORT NETWORK

- All roads of major arterial category and below to have 100% non motorized transit capability by Year X
- Establishment of pedestrian streets in urban cores and living streets in residential areas.
- 100% of public amenities, services and facilities to be within 500m of transport hub and bus stops.

5.2.1 TRANSPORT PLAN FOR YEAR X

ROAD NETWORK PLAN

The key strategies for the Proposed Road Network Plan is as follows:

- A comprehensive high capacity urban road (HCUR) and arterial network within the City for mobility and quick discharge of traffic to all developments.
- Clear development corridors which support mass transit and inter connect the centres.
- Develop comprehensive collector road and local road networks within townships to create porous and accessible developments.
- Develop a clear freight management strategy for Kigali by developing HCURs which bypass urban centres and links logistics and industrial zones.
- Develop roads standards which can be flexible to adjust as per the context in city centre and urban areas.

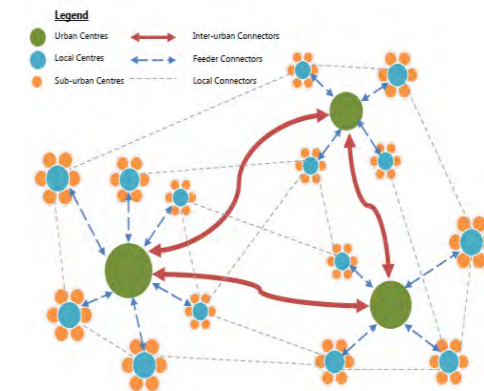


Fig.5.2 Well integrated transport system - hub and spoke

PUBLIC TRANSIT PLAN YEAR X

The key strategies for the Proposed Transit Plan is as follows:

- Provision of Bus Rapid Transit (BRT) in all key high density development corridors.
- 80% of the city to within 500m of the public transport.
- Develop public transport hubs at key interchanges and strategic locations to allow for seamless transfer during journeys.
- Ensure NMT connectivity with public transport hubs and stops to allow for better accessibility.
- To expand the BRT system and the normal bus services (trunk+ feeder) to all developments to serve the estimated population of 5 million
- 5 BRT lines are proposed for Kigali.
 - Line 1- connects Nyamirambo Regional Centre to Nyabogogo interchange.
 - Line 2- connects Nyabogogo interchange to industrial estate at Rusuroro via Kimihurura, Kimironko Fringe Centre, FTZ and Ndera Regional Centre.
 - Line 3- connects Nyabogogo to Masaka via Kicukiro, Kanombe and Nyarugunga.
 - Line 4- is connects the Kimironko interchange to the future airport at Bugesera via the proposed new regional centre at Gahanga.
 - Line 5 - connects Nyabogogo interchange to Kinyinya Fringe Centre. (refer Fig.5.7)
- In the future with adequate ridership, population catchment and affordability, an additional MRT system can be introduced in the city to substantiate the BRT network. Given the topography of the city the rail base mass rapid transit will be limited to only a few key areas which the gradient can be achieved. The MRT lines will require further studies.
- 3 conceptual MRT lines are proposed.



Fig.5.3 Public Transport



Fig.5.4 Extensive BRT System for Kigali



Fig.5.5 Future Safe: Provisioning for future MRT

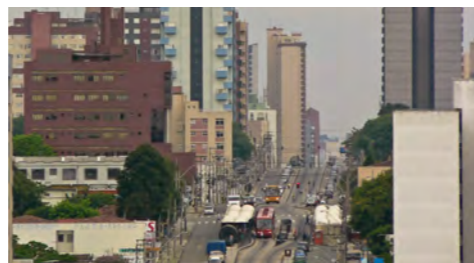


Fig.5.6 Curitiba - High density transit corridor

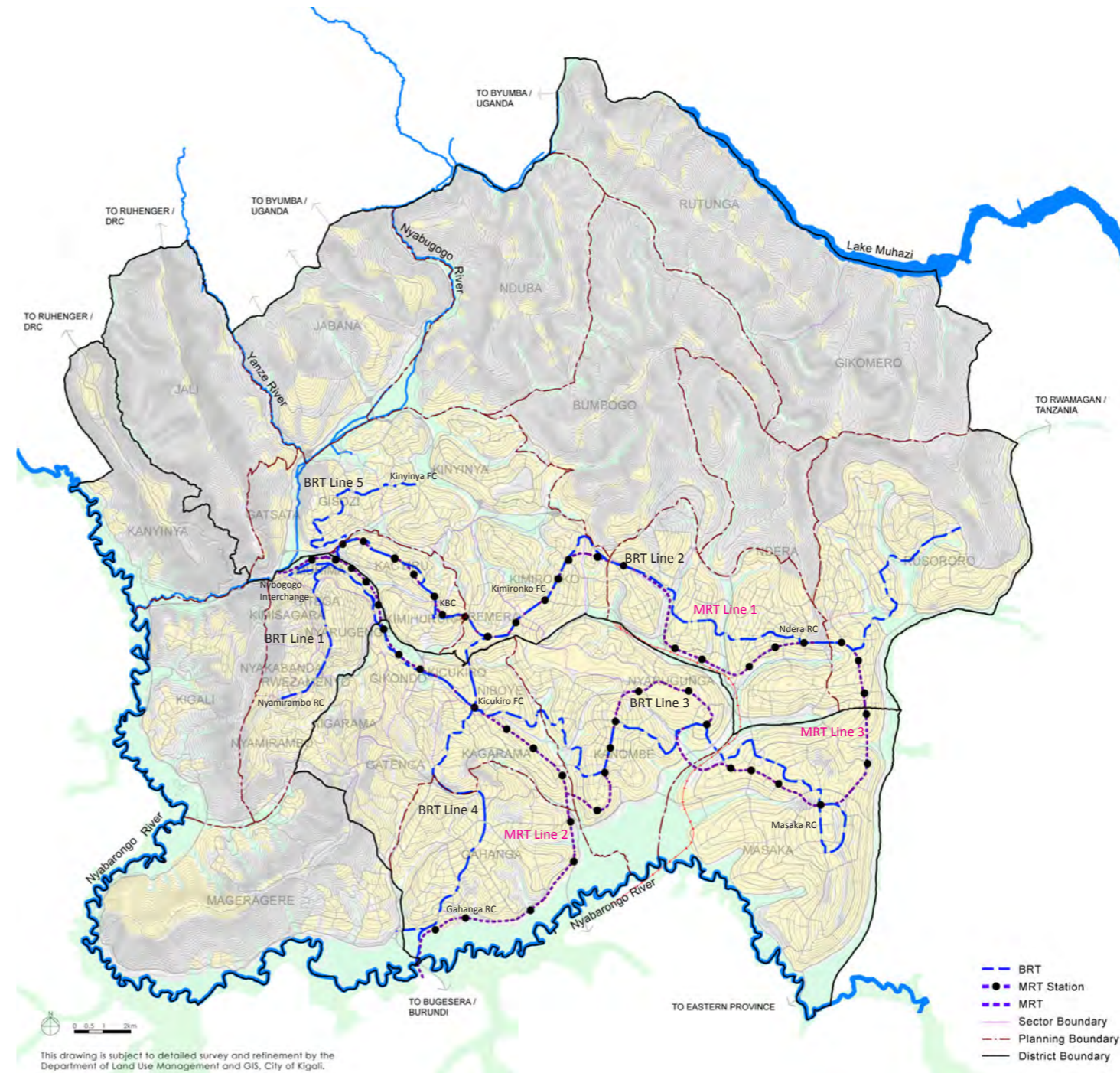


Fig.5.7 Proposed Transit Plan Year X howing BRT and MRT lines

PUBLIC TRANSIT PLAN 2025

- To improve the current public transport system to make it more attractive to the people and competitive with the private car
- To give priority to buses on the roads by providing bus lane along arterials
- Establish first two lines of BRT along the high density development corridors
Line 1: Nyabogogo to Gahanga
Line 2: Nyavogogo to Kimironko
- Develop an extensive bus service (trunk and feeder) to serve the estimated population of 2.9 million
- To consolidate the mini bus services within the City to better serve the commuters
- To construct bus terminals or transport hubs in each district e.g. in the new Regional Centres, Nyabogogo Intechange and Kimironko Interchange.

TRAFFIC MANAGEMENT POLICIES AND INSTITUTIONAL SETUP

A comprehensive transport policy and institutional setup is necessary to be developed for the City of Kigali. This is further discussed in depth in the Transportation Master plan Report as well as the Implementation Report in Task Order 6. The transit policy should focus on:

- To introduce policies to control road usage and car ownerships so as to reduce the number of cars on the roads
- To develop policies and incentives to promote public transportation in Kigali.
- To promote local Non Motorized Transit.
- To develop a comprehensive vehicular parking strategy for Kigali.
- Develop a freight management plan

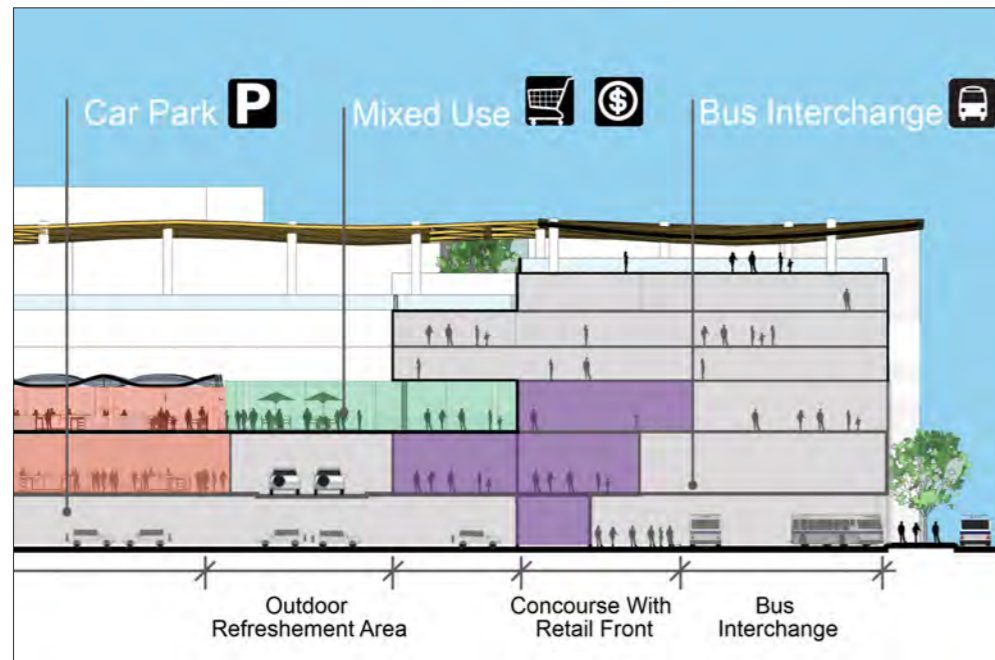


Fig.5.12 Bus Interchange and car parking integrated with development

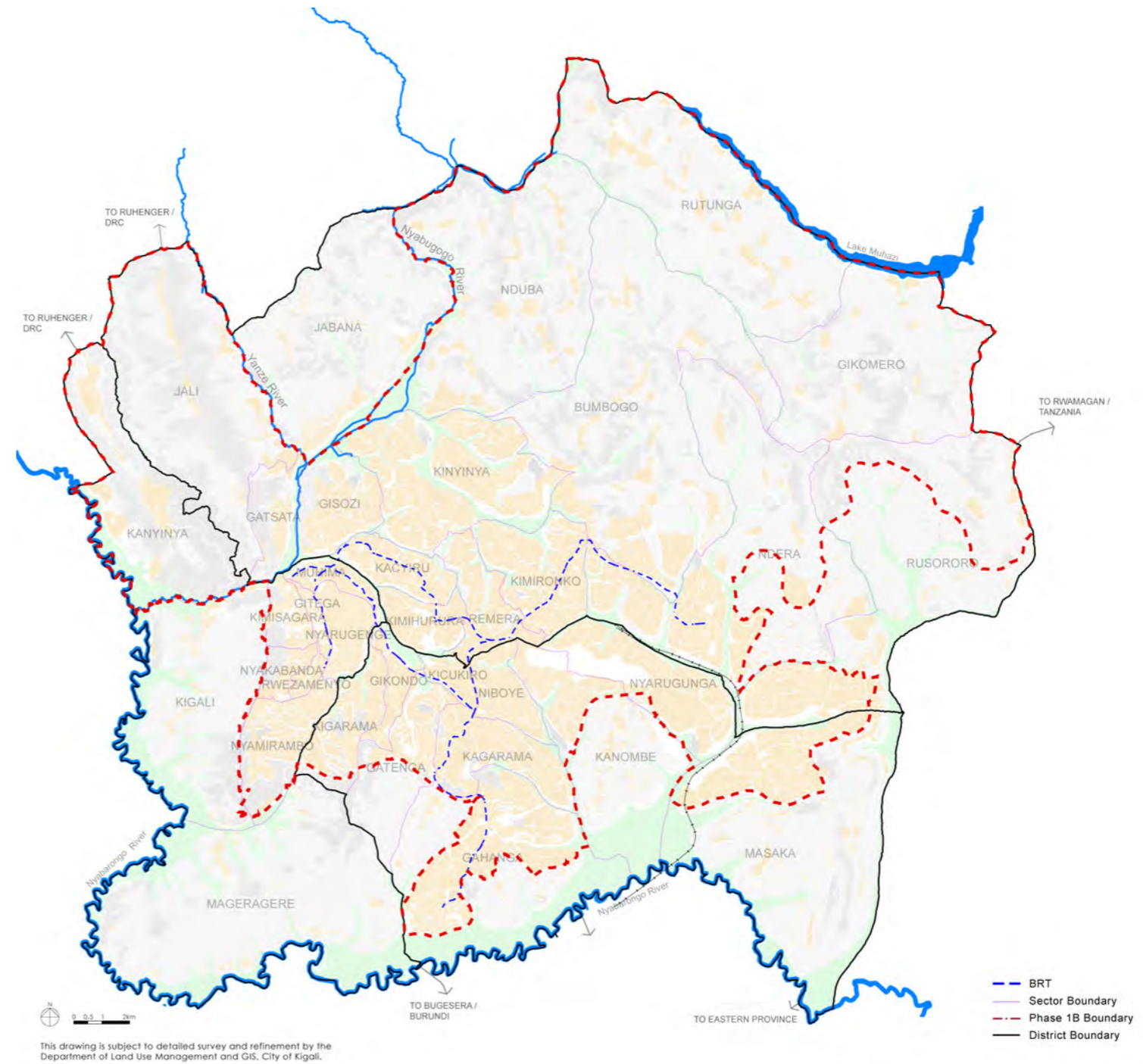


Fig.5.13 Proposed BRT Plan 2025



Fig.5.14 Proposed NMT Network for Kigali, NMT network within townships

5.2.3 NON-MOTORISED TRANSIT PLAN (NMT PLAN)

There are two primary forms of non-motorised transport – pedestrians and cyclists. As the city urbanizes, support for pedestrians and cyclists grow increasingly important. In normal city growth motorised transport more often than not displaces pedestrians and devolves the pedestrian experience.

A significant proportion of daily travel in Kigali City is by foot and to a lesser extent by bicycle. A large proportion of the pedestrian traffic, especially in the AM peak period, is school children. All motorised public transport users become pedestrians for a certain proportion of their daily journey. This is noticeable at the larger taxi parks in the city where hundreds if not thousands of pedestrians move around the public transport facilities during the peak periods.

Although the number of facilities for pedestrians are growing with most of the main/arterial roads having pedestrian footways there is still a need for better provision of NMT infrastructure. Only the paved boulevards and avenues in the CBD area and the roads in the new residential area of Gasabo District have pedestrian sidewalks. In many cases, these are inadequate, not continuous or not fully maintained. Crossing facilities at intersections and across busy arterials are some of the infrastructure elements which seem to be lacking in the city. More footways are required on certain sections of road where pedestrians have to walk on the shoulder of the road with no physical protection from motorised vehicles. Dedicated pedestrian walkways

are generally absent on mud tracks and rural roads. Lack of pedestrian facilities increases the vulnerability of pedestrians to road accidents. The steep terrain is also a challenge in providing a comprehensive cycling network.

The NMT plan in Kigali will be designed to accommodate and improve the pedestrian and cyclist experience. To do these, the following needs to be included for consideration in new traffic schemes and developments:-

- NMT infrastructure to be designed as part of the standard road design.
- Pedestrianisation in key areas in city centres to increase accessibility and utilization of site.
- Provision of pedestrian and cycling facilities to connect with bus stations and oand public transport hubs.
- Pedestrian Safety at Roads, crossings and intersections
- To construct a network of pedestrian footpath in the green space which link to the network of footpath along the roads in the City and within the townships.
- To construct cycling paths within green space and areas where the terrain are not too steep (less than 5%).
- Develop green pedestrian corridors utilizing the drainage corridors.
- Develop extensive recreational cycling and pedestrian green corridors along the wetlands using the wetland buffer.

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6 CITY OF QUALITY AFFORDABLE HOMES

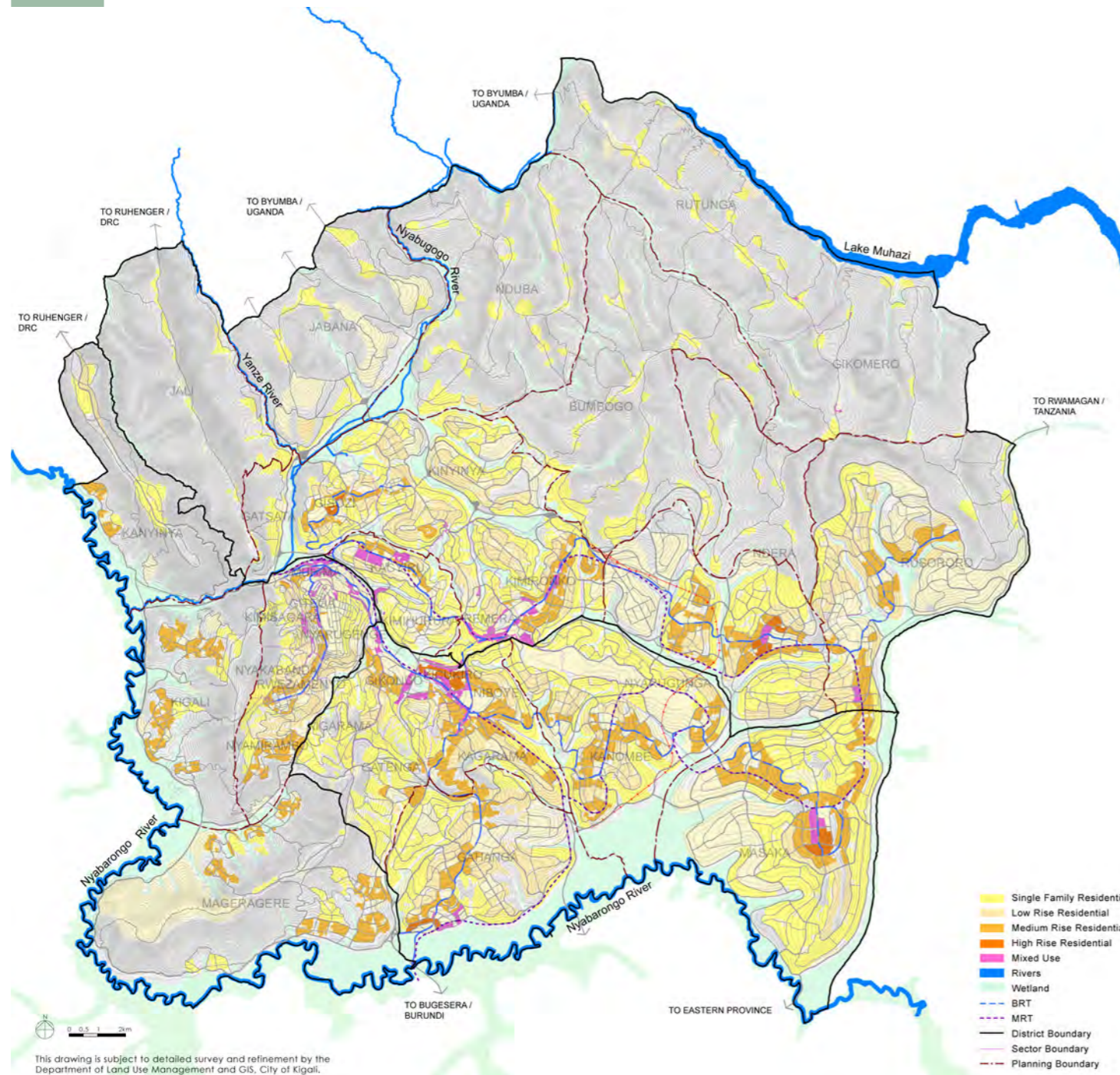


Fig.6.1 Proposed Residential Use Plan Year X

6.1 Existing Housing Profile & Distribution

EXISTING LAND USE

At present only 17% of Kigali is urbanized. 9% (6758 ha) of that existing urbanized area is under residential use. 7% of residential areas in the City are covered by unplanned area and accommodate 78% of the current City population.

POPULATION DISTRIBUTION

Kigali's population in 2013 is estimated to be 1.3 million with a 7% annual growth rate¹. The household size in the city today is estimated to be 4.7 P/DUs (persons/dwelling unit). The City's gross density is currently estimated to be 1,780 p/sq km, and the average urban density to be 7,000 p/sq km.

As per the housing requirements from EU Housing Study, there are 223,000 dwelling units in Kigali today. Only 19% of this housing stock is currently in good condition. While 32% need to be upgraded and 48% needs to be replaced.²

Today, it is estimated that 62.5% of the population is living in informal settlements. Similarly, about 40.5% of the population is living on rental accommodation. It is also estimated that 40.5% of the people living in unplanned areas are renting the accommodation. Hence, approximately 1/3rd of the population would require formal housing. Currently the City requires 20,000 units yearly by 2020 to meet the demand.³

HOUSING TYPOLOGY IN KIGALI

Currently, Kigali City has broadly three types of housing, the high density packed unplanned housing, planned housing which is usually in the form of low density or single family homes, and the government sponsored Imudugudus. Today, 1560ha (23%) of residential area is single family, 5135 ha (75%) is low density and 40ha (0.6%) is medium density.

HOUSING SUPPLY

As per the housing requirements from EU Housing Study, by 2022 the housing requirements in Kigali is projected to be 458,265 dwelling units. It is projected that to support and ultimate population of 5 million with an average household sized of 3.85 Kigali will need 1.33 million dwelling units.

The current housing supply in the City is estimated to be between 800-1,000 DUs per year⁴, of which 25% are apartments and 75% are villas and detached houses. The government is also developing new Imudugudus with 20,000 units planned for the next 5 years.⁵ The city will demand around 31,000 DU per year to house all residents by 2022. Therefore, approximately 30,000 DU must be supplied through other mechanisms.

6.1.1 HOUSING SECTOR ISSUES AND CHALLENGES

The issues and challenges linked to this is evident in the housing sector which are as follows:

- Acute shortage of affordable formal housing in the market has generated large unplanned settlements.
- Need to control the growing unmanaged low density urban sprawl in the City.

1 IMF and Vision 2020
2 EuropeAid Housing Study.
3 CoK Housing Study

4 RSSB, Housing Study
5 MINILOC

- Developments are piecemeal and fragmented and not integrated with infrastructure development.
- Necessity for clear development policies, direction and guidelines to manage and foster growth.
- Need for provisions for housing types offering choice of homes for all the income brackets.

6.2 Proposed Residential Use Plan

6.2.1 HOUSING DEVELOPMENT STRATEGY

The Residential Use Plan for Kigali builds on the strategies adopted by the Conceptual Plan to redistribute the density of Kigali as per the Inner City, City Fringe and Suburban Areas. The key goals to achieve quality affordable housing and living space for the proposed 5 million population in Year X are:

- Rehabilitation and regeneration of unplanned areas in Kigali to create a slum free Kigali in Year X.
- Create 90% home ownership and 60% of homes to be affordable housing.
- Easy access to quality, affordable facilities within all residential areas
- Develop integrated transit oriented townships.

6.2.2 KEY PRINCIPLES

The key principles for the housing sector to achieve quality affordable housing for all in Kigali are as follows:

- Restructuring Kigali into integrated townships with jobs, social infrastructure, recreational spaces and amenities
- New development to respect the topography and context by allowing higher density development along the ridges which gradually becomes less

dense as you approach the low lying wetlands.

- Comprehensive approach to unplanned area rehabilitation that will recognise the unique nature of each of these developments and propose an appropriate strategy for its rehabilitation
- Removal of unplanned developments from steep slopes which are prone to landslides and are hazardous.
- Strategic land acquisition for the new proposed townships along key transit corridors.
- Identifying key government land suitable to kick start catalyst affordable housing projects which can be further emulated.
- Ensuring a system of effective management, and upgrading of these townships through town councils or similar independent mechanisms to secure the value of the developments.
- Phased zoning guidelines and implementation strategies to support development.

6.2.3 PROPOSED RESIDENTIAL USE PLAN YEAR X

The proposed Residential Use Plan Year X as shown in Fig.6.1 exhibits the development of higher density residential development along the key transit corridors of the City. Residential Use comprises of 43% of the Broad Land Use in Kigali. The Residential Use Plan consists of 5 types of residential developments, which caters to the various housing needs of the population. The mentioned residential types are:

SINGLE FAMILY RESIDENTIAL

Single Family Residential consists of low density urban areas as well as rural residential areas and imudugudus. Overall it comprises of 55% of the residential land use but only 28% of the population



Fig.6.2 Proposed Low Density Residential Developments



Fig.6.3 Proposed Medium & High Residential Developments

share. Detached good-class bungalow areas in low density areas of the City like Nyarutarama and Kacyiru form the Single Family Residential land use. Such housing type which already exists within the inner city are maintained for their character. New Single family areas are proposed in selected areas of the City which are close to nature & wetlands, and are usually located away from the transit corridors. They are also proposed for areas with height restrictions e.g. buffer areas around the airport which allow low density development. Single family residential areas are proposed to have an average density of 40 DUs/ha.

Table 6.2 Residential Land use Requirements Year X

HOUSING TYPE	HOUSING SHARE	POP SHARE	HOUSING SIZE (M ²)	AREA (SQKM)	DUS PER HA
SINGLE FAMILY	55%	28%	250	93.12	40
LOW RISE	21.5%	25.5%	120	36.50	90
MEDIUM RISE	20%	40%	90	33.25	160
HIGH RISE	1%	2.5%	90	1.6	200
MIXED USE	2.5%	4%	90	4.08	160
TOTAL	100%	100%		168.6	

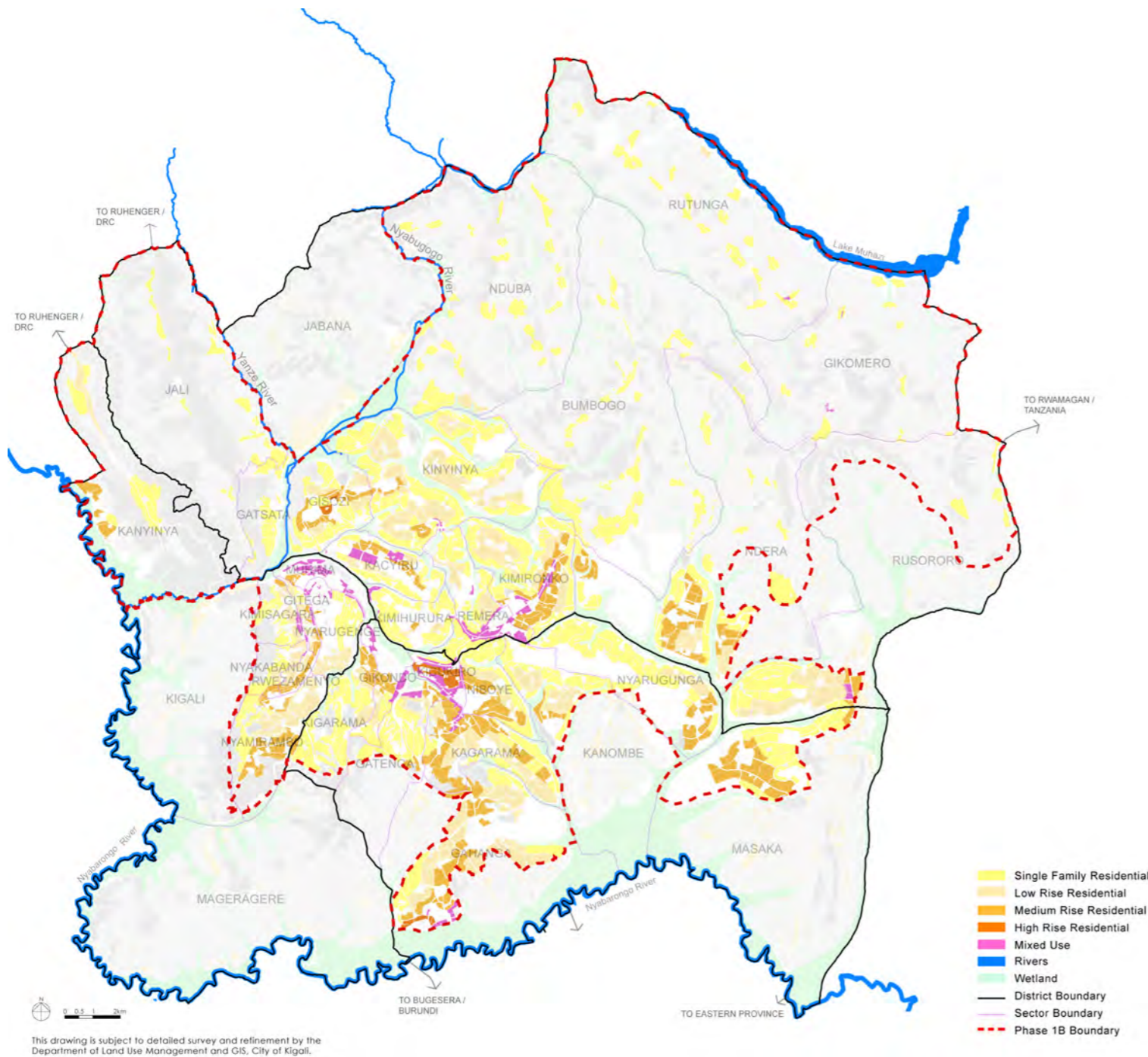


Fig.6.4 Proposed Residential Plan 2025

Low density rural single family residential areas and Imudugudus comprise of 7% of the residential land in Kigali. These developments are located closer to the agricultural areas. In the urban areas the imudugudus will remain in the medium term and will be redeveloped as part of the township in the in the long term.

LOW RISE RESIDENTIAL: Cluster housing, terraced houses and semi detached houses are included in the low rise residential development. Low rise residential areas are proposed in areas suitable for medium density development. Such developments are proposed in townships and in several unplanned areas in Kigali with redevelopment potential. 21.5% of the residential land in Kigali is proposed to developed as low rise residential areas with an average density of 120DUs/ ha. it comprises of 25.5% of the population share.

MEDIUM RISE RESIDENTIAL : Mid rise apartments are proposed along major transit corridor and other areas in the City and within the townships with potential for higher density development are proposed as medium rise residential. 20% of housing in Kigali is proposed to be medium rise residential which will house 40% of the population. The average density is proposed to be 90 DUs/ha.

MIXED USE RESIDENTIAL: Mixed Use medium density apartments are located in key areas of the City such as commercial centres. 80% of the mixed use development will have residential use. 2.5% of the residential area in Kigali is estimated to be mixed use development housing only 4% of the population. It will have an average density of 160 Dus/ha.

HIGH RISE RESIDENTIAL: High density high rise apartments in key areas of the City are included in the high rise residential type. The high rise residential are located in key areas of the CBD area and in the regional centres. Only 1% of the residential area in Kigali is estimated to be high rise residential housing only 2.5% of the population. The density is proposed to be 200 Dus/ha.

6.2.4 PROPOSED RESIDENTIAL USE PLAN 2025

The proposed Residential Use Plan 2025 exhibits the intermediate phase of residential development which caters for an estimated 2.9 million population. Growth is focused around the City Centre area at Kimihurura, Fringe Centres of Kimironko, Kicukiro, and Kinyinya, and along the airport road to Gahanga. Key new town ships are proposed to be developed as catalyst projects e.g. Kinyinya(G3), Gisozi(G1), Gahanga(K4) and Northern Ndera township. In the suburban areas, the existing imudugudus shall be retained and provided with necessary public facilities. The unplanned areas of the inner City and fringe areas such as northern Gatanga, and parts of Gatsata and Kimironko need to be upgraded with public facilities and necessary infrastructure.

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7

CITY OF ENCHANTING NATURE AND BIODIVERSITY



Heavy soil erosion along the steep slopes because of the forest plantation removal



Existing forests dominated by Eucalyptus plantation



Unplanned Development on the steep slopes, Gatsata



Alteration of natural wetland vegetation because of Agriculture activities, Nyabugogo wetlands



Urban encroachment within wetlands, suger factory in the Nyabugogo wetlands



Heavy soil erosion because of unmanaged building & infrastructural work



Increased flooding along Nyabugogo wetland



Farming along the steep slopes without proper soil stabilization methods



Heavy soil erosion along natural drainage valleys, Gikondo

Fig.7.12 Environmental Issues and Challenges

7.1 Existing Green and Blue Profile

7.1.1 INTRODUCTION:

The natural setting of Kigali is characterized by steep forested hills and farmlands on the northern and western hilly regions. Rivers and wetlands dominate the landscape and provide easy accessible recreational opportunities. These unique landscapes contribute to the attractiveness of Kigali as a beautiful place to live and work for local residents and enjoyable place for tourists. Unlike other cities, which are working to reclaim and reinstate their natural features, the city of Kigali has the enviable opportunity to grow into a beautiful, balanced and a sustainable city.

There are many environmental issues and challenges such as rapid depletion of biodiversity, forests and wetlands, urban encroachment on the steep slopes etc. But the protection of natural beauty of the city's setting, its most valuable asset, will ensure Kigali remains a highly livable, attractive and memorable place to live, work and play.

7.1.2 ISSUES AND CHALLENGES

In Kigali, Lakes, rivers, streams, wetlands, forests and steep slopes combined with the existing agricultural areas constitute to 83% of the City's land area. The environmental issues and challenges related to these nature areas are as follows and also illustrated in figure 7.1:

- Steep slopes greater than 20% occupy 35% of City's land area. Kigali land area falls under medium to high-risk erosion zone where more than 5% slope is susceptible to heavy erosion.
- The wetlands, watersheds and flood plains are intensively used for settlement

structures, cultivation and grazing, thus altering the watershed. This has resulted in soil erosion, depletion of the river, siltation, and reduced soil fertility, wetland habitats and vegetation.

- Rapid urbanization, extensive subsistence farming, large land clearance, over cultivation and burning of forests under traditional pastoral system is adding to the loss of natural vegetation and biodiversity. Although government is taking initiatives through laws and planning policies to protect the natural environment, these approaches remain piecemeal. The City needs a robust legal framework for integrated biodiversity management that allows urban growth, while prioritizing agriculture and environmental protection.

7.2 Proposed Natural Environmental Management (NEM) Strategies

In a city, natural environment management is not just about ecosystem protection, although it is a central component of NEM Strategies plan. There are many features of well designed manmade environment like, efficient infrastructure, urban development and recreational areas which can enhance and impact the natural areas on which a city is built upon.

For Kigali, NEM strategy is intended to provide an effective guidance in Landuse decision-making. It will guide Concept Plan strategically to approach environmental and recreational planning, complementing each other. Also, its comprehensive goal is intended to apply across all management areas.

The NEM areas will act as an overlay to work in coordination with the zoning and development guidelines. The NEM strategy will provide clear direction for

the management of existing natural areas, significant habitats and protected areas. This management area approach is intended to simplify the process of identifying the areas which contains sensitive ecosystems and natural features, and to clarify expectations for environmental surveys, habitat assessments and land use requirements to be conducted as part of the development approval process for each management area.

In this chapter NEM priority includes conservation, restoration and management of biodiversity areas, landscapes, watershed and steep slope areas. Other environmental issues like air, energy, water, waste etc. are addressed in Chapter 9 (under infrastructure section).

The key goals for natural environmental management are broadly classified as under:

1. Manage abundant wetlands and water bodies
2. Improve farming and forestry
3. Conserve diminishing forests and biodiversity
4. Protect steep slopes and watershed areas
5. Protect open spaces and allow access to natural amenities
6. Integrate natural landscapes with the urban landscapes

The NEM strategies have identified key critical ecosystems and natural areas essential to the quality of life and attractiveness of the city of Kigali. These strategies provide guidelines aimed at the protection, maintenance and enhancement of the beauty of the area that provides the natural physical foundation for Kigali while acknowledging the need to accommodate growth.

The summarized version for MEN strategies

adopted in the Conceptual Masterplan is explained below and illustrated in the Fig.7.13. The NEM strategies for the above described goals are further explained in the upcoming sections.

- 1. Existing Forest:** Protected areas, Zero net loss of existing forests and biodiversity areas, slope restoration.
- 2. Afforestation & No Development Zone:** Slopes >40%, appropriate slope management and protection, use of native plants for afforestation.
- 3. Conditional Use (Urban Area):** Slopes 40% to 20%: use subjected to EIA, appropriate slope management and protection strategy.
- 4. Farming & Forestry/ Conditional Use (Rural Area):** Slopes 40% to 20%, suitable farming and forestry along the slopes. Conditional use subjected to EIA, appropriate slope management and protection strategy.
- 5. Developable area (Urban Area):** Slope < 20%, slopes >5% needs soil stabilization and erosion control measures.
- 6. Developable area (Rural Area):** Slope < 20%, land consolidation and agricultural modernization.
- 7. Natural Drainage channels:** Protection of existing drainage lines and implementation of 20m to 50m buffer from the development.
- 8. Wetlands:** 20m buffer to the wetland boundary established by REMA, Zero loss of existing wetlands.
- 9. Lakes:** 50m buffer to the lake boundary established by REMA.
- 10. Parks & Public Open Spaces:** Existing scattered patches of nature areas to be developed as city & community level nature parks.

The environmental management strategies for the six key goals are explained below;

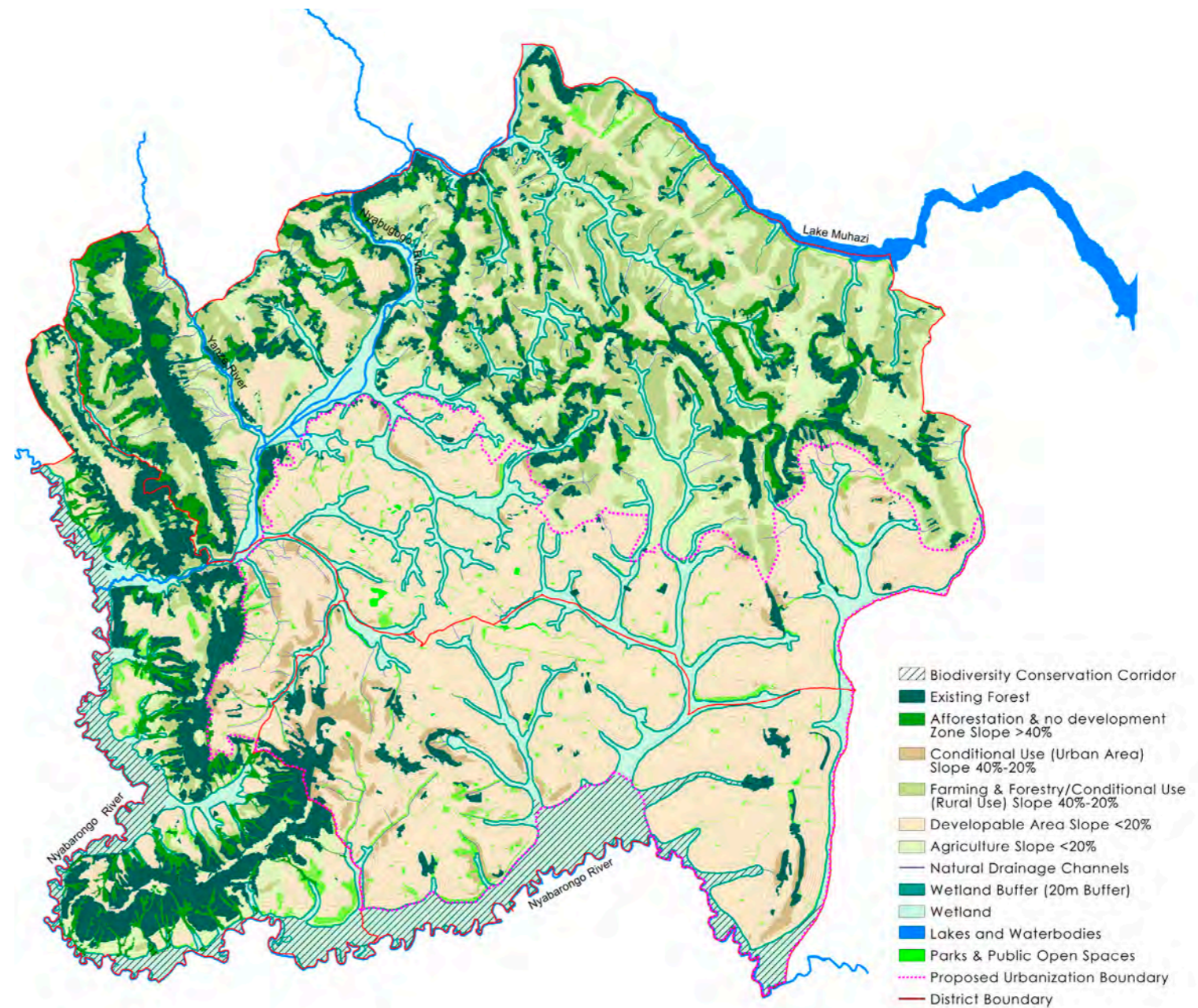


Fig.7.13 Proposed Environment Management Strategy Plan - 2040

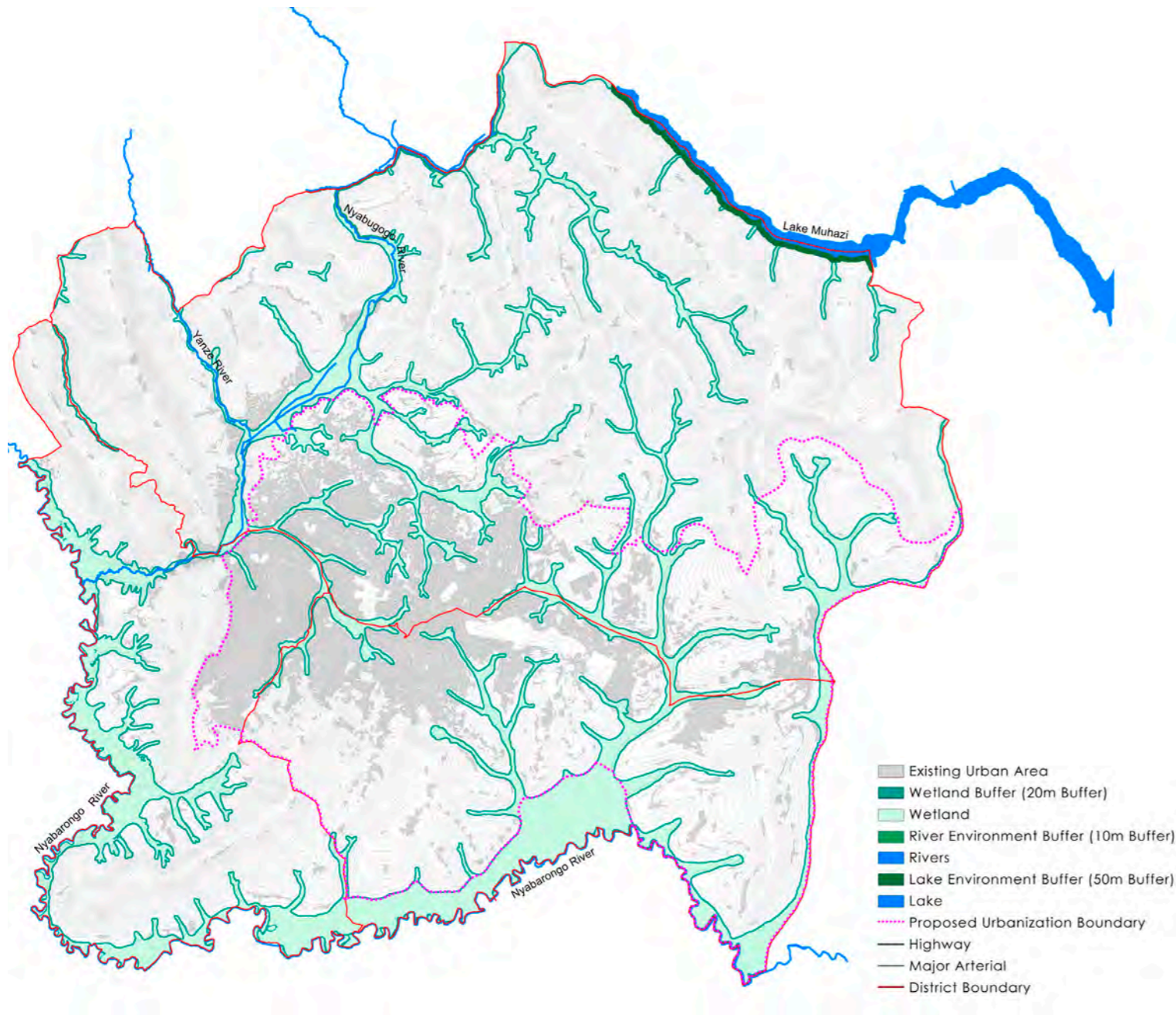


Fig.7.14 Wetlands & Water bodies management plan

7.2.1 MANAGE ABUNDANT WETLANDS AND WATER BODIES

WETLANDS:

Kigali wetlands cover 14% of the total land area in city (approximately 10,000 ha), most of which is altered because of the urbanization and extensive substance farming. It is estimated that today there are only 24% pre-settlement wetlands exists in the City.

In Rwanda, wetlands are protected and their utilization is managed by Organic Law. Currently Rwanda Environmental Management Authority (REMA) is working towards establishing wetland boundaries to save wetlands from further encroachment. After the detailed study; for the better management and implementation of the policy, wetlands will be further divided into 3 categories namely; Total Protection Wetlands, Conditional Use Wetlands and Unconditional Use Wetlands (Source: REMA).

Apart from the encroachment, other issues associated with the wetland environment are soil erosion from the steep slopes surrounding the wetlands, sedimentation, depleting water and wetland biodiversity and increased flooding. Sanitation and garbage disposal is a threat to wetlands. In Kigali; wetland biodiversity is severely affected by the industrial and domestic waste. In many parts of Kigali; sanitation is improved and managed, but in Nyabugogo wetlands there still a problem. The channels, which collect wastewater from houses and garages, go through the wetlands and spread pollutants in the wetlands. Other sources of pollution include the use of agricultural inputs such as industrial fertilizers, pesticides or herbicides. In Kigali; rapid and unmanaged urbanization is causing increased flooding

which amplifies the spread of pollutants and reduction in precipitations causing adverse affects on plant diversity. This pollution affects the vegetation profile; reduce the plants ability of slowing the water flood, as a result erosion and inundation are more likely inevitable.

The wetlands play an important role in improving water quality and quantity, reducing flood and soil erosion, providing biodiversity, moderating climate conditions, contributing to an aesthetic urban design, and providing educational and recreational opportunities. To ensure that these benefits remain viable and sustainable for our future generations, the Master plan proposes Wetland Management Plan (Refer to figure 7.3), and Strategies which sets priorities and explores alternatives for wetland conservation in order to guide future urban development in Kigali.

WETLAND MANAGEMENT STRATEGIES:

The primary objectives and management strategies for the wetland conservation are:

- Balance conservation of wetlands within the context of Kigali's urban development;
- Allow the integration of wetlands into urban development but, efforts should be made to avoid any impact from the development on to wetlands.
- Strictly implement 20m environmental buffer for wetlands.
- Use native vegetation and wherever possible introduce constructed wetlands along the environmental buffers to control flow of water, reduce erosion and trap pollutants from the catchment.
- Propose zoning guidelines to control human activities near wetlands.
- Wetland Management Plan should be further reinforced with the Standardized policies and development guidelines to incorporate sustainable wetland

management in the city.

- Integrate wetlands with the citywide green system through park connectors and linear parks along the wetlands.
- No net loss of existing wetlands;
- Wetland mitigation policy should be developed which balances lost or disturbed wetlands through wetland restoration, enhancement and creation.
- Mitigation for loss of existing wetlands should occur within the same watershed and/ or aquifer and then connected to the larger wetland system of Kigali.
- Promote Management, monitoring and research on the wetland;
- Kigali will support wetland monitoring, research and development program in partnership with various communities, private and government organizations that will develop standards for, and measure the success of incorporating existing restored, enhanced and created wetlands into the urban landscapes.
- Educate citizens about environment, social and economic benefits of wetlands.

WATER BODIES:

In Kigali undulating landform allows existence of rivers, seasonal streams and lakes. The Kigali city is surrounded by major lakes and rivers which are, Muhazi Lake along northeast border of Gasabo District, Nyabarongo River bordering Nyarugenge and Kicukiro Districts along the southwest. There are also other rivers and streams, such as Yanze, Kibumba, Rwazangoro, Ruganwa, which flow into the Nyabugogo stream and in turn flows into the Nyabarongo River in the west. Many other streams from the southern hills of the city directly flow down into the Nyabarongo River which finally drains into Lake Rweru, one of the sources for the Akagera River feeding Lake Victoria. The common issues associated with the

water bodies in the Kigali are:

Floodplains and the biodiversity along the Nyabarongo River are severely altered to accommodate rice plantations. Being located in the heart of Kigali Nyabugogo River is receiving serious pressure of urban encroachment along the flood plains. Other issues common to all water bodies are sedimentation, river and lakeshore habitat destruction, water extraction, fishing, and introduction of exotic species, household pollution and the pollutants from watershed runoff.

Rivers and wetlands are integral to the stormwater management system and are important component of the city's biodiversity network, which represent an essential element in restoring the urban fabric of the city by providing both recreational and economic opportunities. To ensure that these benefits remain viable, Masterplan proposes Water bodies Management Plan (Refer to figure 7.3) and Strategies as explained below.

WATER BODIES MANAGEMENT STRATEGIES:

The management strategies for the water bodies' conservation are:

- Reduces exposure to flood risk by avoiding hazardous, uneconomic or unwise use of floodplains, thereby protecting life, property and community infrastructure.
- Identify flood plain boundaries based on the 100 years flood data. These flood zones can be further divided into high, medium and low risk zone established by 20yr, 50yr and 100yr flood line. Based on this permissible extent, nature of Landuse and floodplain management guidelines can be established.
- Protect the natural flood carrying capacity of watercourses and wetlands.
- Manage and treat stormwater flow before it is finally discharged into waterways and

wetlands.

- Strictly implement 10m environmental buffer for rivers and 50m for lakes as per Organic Law. Use natural vegetation along these buffers.
- Integration of water bodies into the urban landscape by creating an aesthetically pleasing public resource which will ultimately allow for the social and economic up-liftment of communities adjacent to waterways and wetlands.
- Redefine landuse, wherever both surface water and groundwater resources are being impacted due to biodiversity along the waterways and landfill like Gikondo Industrial District.
- Set up Sewage Treatment Plants along the waterways for treating the diverted sewage.
- Intercept and divert raw sewage flowing into the waterways through open drains and divert them for treatment.

7.2.2 IMPROVE FARMING AND FORESTRY

FARMING

The Kigali city has a total agricultural land of 461 km², of which most of the arable land is located along the swamps and lowlands. Usually in Kigali the agriculture is managed in three levels; Plot level, within the marshlands and along the steep slopes.

1. Agriculture within the lots - is mainly used to satisfy everyday needs like fruits, vegetables, medicinal plants and small livestock development.
2. Agriculture along marshlands - is used to harvest value crops, horticulture, sugarcane, sericulture and fish ponds mainly along the wetlands in the urban areas of Kicukiro, Muhima and Kimihurura. In Rural areas, marshlands are dominated by sugarcane and rice plantations. Recently MANAGRI initiated the seed multiplication



Lake muhazi



Nyabarongo river valley



Wetlands along Nyabugogo river



Nyarutarama lake

Fig.7.15 Scenic Wetlands & Waterways in Kigali: provides environmental, recreational and economic opportunities for the city, Hence, it is vital to conserve these natural assets by providing environmental buffer and adopt zero net loss strategy to manage existing and restore depleting wetlands. Allow agriculture and recreational development along the wetlands and waterways with the due consideration to the existing biodiversity conservation. Use them as the key landscape feature as it meanders throughout the city.

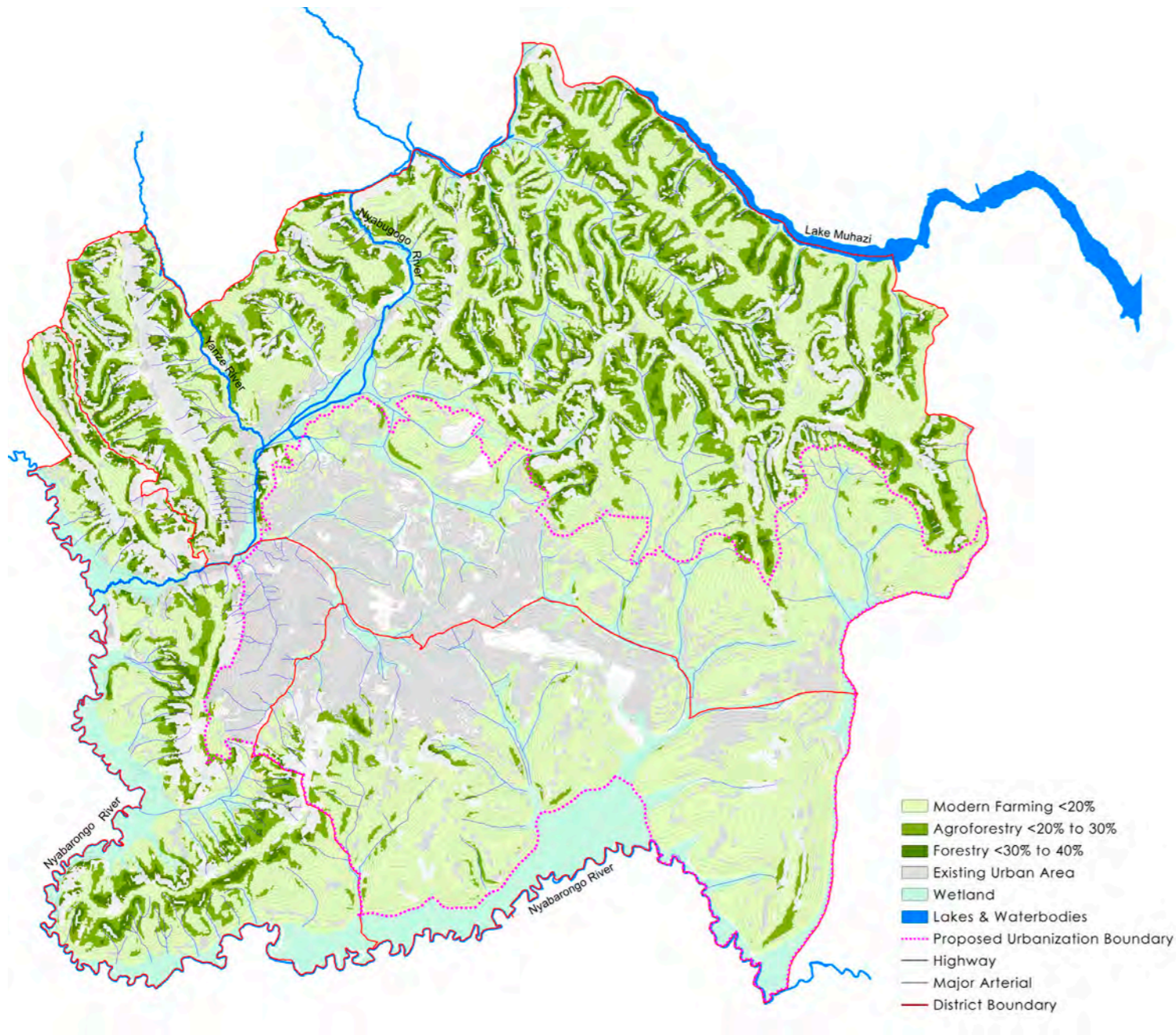


Fig.7.16 Agriculture & Forestry management plan

and horticulture programs along the wetlands near airport, as the site location will allow the easy transport of goods to the airport for the export.

3. Farming along the slopes - is dominated by Agro forestry, fruits and vegetable plantations mainly banana, beans, potatoes, cassava, maize etc.

There is a sizeable area of around 23.75 ha is used for dairy farming in the City, which is dominated by goat, poultry and cattle's. As per the Kigali Economic Development Strategy Report the agriculture sector provides employment to about 5% population of which 73% are women. And, the average acreage per farmers household is 0.7ha out of which an average 0.68 ha is cultivated. Issues related to agriculture include reduction and fragmentation of farmlands. The lack of proper farming practices lead to soil erosion and loss of fertile topsoil. The increasing use of fertilizers is polluting water, soil and wetlands (source: Kigali Economic development Strategy 2002).

As per the Rwanda Landuse Masterplan, modernization of agriculture is considered as one of the six pillars of Vision 2020. Based on its priority programs several agricultural management projects like Land tenure Reform Program (Imudugudu Villages), production of export oriented agriculture, construction of silos in Gasabo district as a part of post Harvest handling and Storage (PHHS) program and high value crops production, are in progress. Government is also promoting funding and training programs for the farmers to manage crops, soil and irrigation.

FARMING MANAGEMENT STRATEGIES:

The proposed management strategies for the farming sector are explained below and summarized in figure 7.5:

- Conserve arable land below 15% especially along wetlands, waterways and rural areas for farming.
- Limit intensive, modern and mechanized farming for the gradual slopes less than 15%, as steep slopes provides risk for the use of tractors and other modernized techniques.
- According to crop regionalization guidelines set by agriculture policies in Rwanda, maize, vegetables, beans, fruits, rice and soybeans are the priority crops to be cultivated in Gasabo District, coffee and fruits are priority crops to be cultivated in Kicukiro District.
- For the farmlands between 15% and 25% promote agroforestry. Give incentives to farmers to adopt terracing and alley cropping techniques and educate them with the various techniques to minimize erosion.
- For the farmlands above 25% slope, promote forestry. Give incentives to farmers in these areas to shift from cultivation to forestry and alternative livelihood.
- Promote sustainable irrigation and fertilizing methods and promote Crops education programs for the farmers.

FORESTRY:

In Kigali, forestry sector is playing key role in supporting the livelihood of the suburban population by providing food, medical and energy source. The commercial wood production is mainly used for construction and furniture. But, the demand for wood is more than supply and the high competition amongst different land uses is continuously depleting forest cover. Most

of the agroforestry is happening along the steep slopes greater than 15% without proper erosion control and soil stabilization methods. The trees used for forest plantation are predominantly eucalyptus and Pinus trees, which are prone to fire hazards. The administrative structure for the implementation of existing forest laws, regulations and other legal instruments are not very well organized (Rwanda Landuse Masterplan 2009-2010).

FORESTRY MANAGEMENT STRATEGIES:

The management strategies for the forestry sector are explained below and illustrated in the figure 7.5:

- The non buildable land between 20% and 40% should be extensively used for forestry and agroforestry with proper slope management, soil stabilization, erosion control and terrace farming techniques.
- Encourage Silviculture and agroforestry practices to create more diverse, productive, profitable, healthy and sustainable Landuse system.
- Make sure that the forestry practice maintains the long term pool of soil nutrients without measureable soil loss due to erosion and compaction activities.
- Encourage forestry and agroforestry research.
- In areas that are managed for timber productions maintain and /or enhance tree productivity and long term sustainable wood supply.
- For the forest industries promote value added manufacturing and non timber forest products.
- Maximize employment benefits derived from all uses of the forest and agroforestry resources
- Promote agro tourism in the northern part of Gasabo and Nyarugenge sector to

generate additional employment for rural communities.

7.2.3 CONSERVE DIMINISHING FORESTS AND BIODIVERSITY

NATURAL FORESTS:

Out of 731 km² land in Kigali, only 141.9 km² (19%) is classified as forest land. Due to urbanization pressure and extensive substance farming much of the native forests have been disappeared. Today; in Kigali, forests can be found in small scattered patches under district or private ownership with many of them are commercial forests. There are two types of forests identified in the City, natural forests and plantations

- Natural forests: these are the small patches of forests owned by the central government (mostly state level plantation projects are happening in these areas).
- Plantations: these are the forested areas owned by private as well as district government. There are no specific guidelines to control the development and plantation in the privately owned forested lands. But development more than 5 ha needs approval from the authorities. The district owned forested lands are used for small community level projects initiated by NGO's and community level organizations. The issues associated with the forestry sector are:

There is lack of comprehensive forestry information at city level like exact boundaries of natural forest, plantation and ownership of the forest. Majority of the existing forests in the city are dominated by Eucalyptus plantation, which is responsible for depleting soil quality and ground water level. Most of the plantations take place in the steep slope areas more than 15% without any soil stabilization methods. Another factor being lack of control on



Encourage mix planting along the marshlands and mechanized farming along gentle slopes.

Fig.7.17 Proposed agriculture along marshlands and gentle slopes



Encourage mix planting, and agroforestry along the moderate slopes (15% to 25% slopes).

Fig.7.18 Proposed agriculture along moderate slopes



Encourage agroforestry and commercial forestry between 25% and 40% slopes.

Fig.7.19 Proposed agriculture along steep slopes



Promote crop rotation and plantation of Maize, Sorghum, Cabbage, beans, Rice etc in these areas.



Promote Soybean, maize, Beans, Fruits and coffee plantations along the moderate slopes with proper soil & slope stabilization



Promote agroforestry plants which can be used as cattle fodder, firewood, gives shade, control soil erosion and complement the agricultural crops.

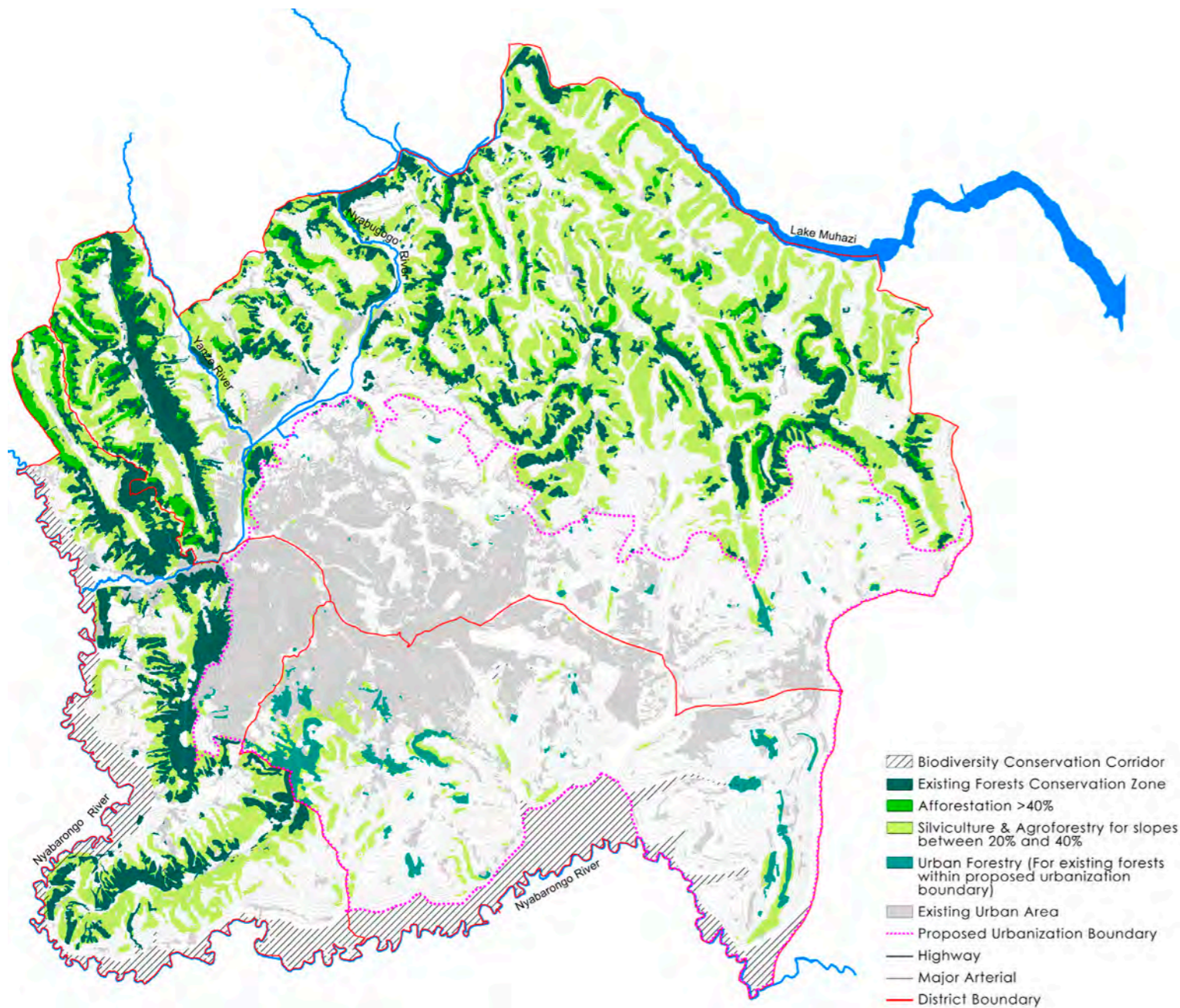


Fig.7.20 Forest & Biodiversity management plan

the types of plantations and there are no detail environment management guidelines available. Also in the district forest lands, the projects are approved case by case basis depending on the objectives established by community organizations and NGO's. The Rwanda forestry resource is governed by the Forestry Law but not many efforts are observed for the conservation and management of the forestry resource. Hence it is important to understand importance of forestry in controlling soil erosion, increasing land productivity, and improving rural off-farm livelihoods through multiple benefits from agro-forestry, biodiversity and forest land conservation. The primary objective of the Forestry conservation plan is to maintain the long-term health of forest ecosystems while providing ecological, economic and cultural opportunities for the benefit of present and future generations.

Figure 7.9 indicates the Forestry Management Plan and the strategies are explained below.

FOREST MANAGEMENT STRATEGIES:

1. Ecology based forestry management
 - The Masterplan proposes 100% conservation of existing forest land with no permanent net loss of forest area due to human activity.
 - Propose afforestation along the barren steep slopes greater than 40%, which will help to increase cities forest cover and stabilize steep slopes.
 - Maintain and improve productivity of the forest ecosystem by ensuring prompt regeneration (either naturally or by planting) of cutovers and naturally disturbed areas by ensuring native species plantation.
 - Protect forest habitats through the preservation of canopy cover, multi-story

stands and maintenance of understory plants and debris.

- Maintain and protect existing wildlife habitat in the existing forest and allow forest habitat connectivity.
- Establish no cut buffer zones along existing forest and afforestation areas.
- Consider the effects of forest management activities on the existing biodiversity such as forest land fragmentation, habitat loss, vegetation species composition, management of old growth forests etc.
- Establish special plans for the protected areas to preserve biological distinctive or unique features.

2. Economic Considerations:

- Consolidate district level forest data and clearly define the boundaries for the conserved forest along with the forest that can be used for timber production.
- Promote value addition of non wood forest products.
- Promote forest based recreation activities like hiking, mountain biking, passive recreation, trails with the spots for watching birds, biodiversity exploration, scenic view spots, camping sites etc.

3. Social Considerations:

- Promote community based forest management in the rural areas of Kigali and encourage them to adopt agroforestry practice.
- Introduce technologies and wood alternatives in rural areas to reduce consumption of fuel wood.
- Use active public participation in forest management, planning and other forest decision-making processes.
- Develop small scale forest based industries and promote gender and other cross-cutting socioeconomic issues into forest management.

4. Urban Forestry

Adaptation of urban forestry is an efficient way of maintaining tree cover in the urban areas. Urban forestry guides; tree planting, care, production and overall management of trees as a collective resource.

In Kigali, there are many small scattered patches of forest lands within the urban development boundary conserving them with urban forestry initiative. Also, in urban areas tree cover can be enhanced by promoting plantations along rivers, streams, wetland, roadside, public open space and gardens.

BIODIVERSITY

Kigali is located along the most biologically diverse regions of Rwanda. However, loss of existing vegetation has led to the serious destruction of biodiversity in Kigali. In terms of flora the natural forests are remaining in the scattered patches and the manmade forests are dominated by Eucalyptus plantation. However, the natural forests are available in the small scattered patches and the wild plants exist in the marshes and non cultivated areas. The wetlands in the City are heavily altered to accommodate development and agriculture. Similarly, riparian buffers along the water bodies and drainage channels are severely compromised to make space for urban development. There is a very little natural vegetation exists along the source of Nyabugogo river and few patches along Nyabarongo river.

The extent of fauna in Kigali is relatively low and it is composed of species of birds and reptiles hares, jackals, few species of snakes and fishes. Only Nyabarongo River Wetlands which borders the Kigali on the Western and Southern edge is identified as Important Bird Area (IBA) biodiversity

conservation hotspot in the RNLMP, as it receives exceptionally large number of migratory and congregatory birds every year¹.

In terms of government strategies for biodiversity management in Rwanda, Vision2020 identifies Environment protection as one of the important crosscutting area and the suggested strategies recommends 3 km development buffer for the biodiversity protection areas and habitat corridors. But there is a lack of comprehensive national level legal framework and management policies for the integrated wildlife and biodiversity management.

Biodiversity conservation is fundamental to achieve Ecologically Sustainable Development for any city. Biodiversity is best conserved in situ, through restoring degraded areas, controlling threatening processes and by not introducing new pressures. Its effectiveness is dependent on adequate funding, sustainable land use planning and public awareness.

The aim of biodiversity conservation and management strategy in Kigali is to protect, restore and maintain ecosystems and ecological processes through the delivery of non-ground works and planning controls.

BIODIVERSITY CONSERVATION STRATEGY:

The key strategies proposed for the biodiversity conservation are explained below and illustrated in the figure 7.9:

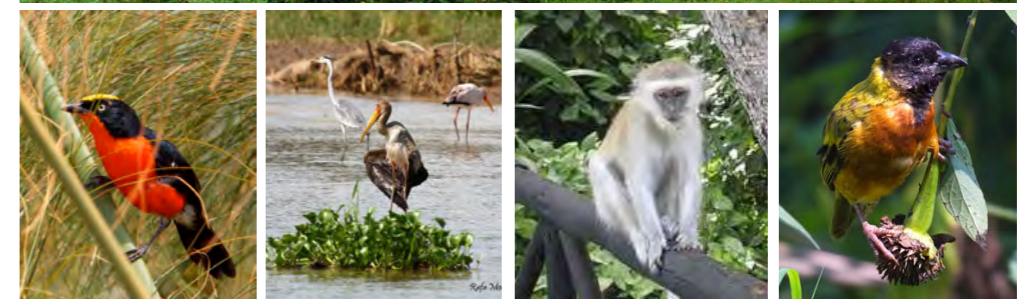
- Identify and quantify current vegetation and wildlife habitat resources within the City of Kigali.
- Improve the existing condition of Kigali's ecosystem by adopting "No net loss of existing biodiversity strategy" applicable

to all ecological communities.

- Identify high value conservation vegetation, habitats and wildlife corridors; and develop regulatory framework for their protection and management. For example, there is a need to develop biodiversity management guidelines for Nyabarongo River.
- Identify clear biodiversity protection zones and develop planning controls to manage these areas. Introduce minimum standard guidelines for biodiversity assessment and reporting for submission with a development application.
- Establish habitat conservation criteria such as corridor widths, sites and hubs in support of maintaining biodiversity and specific ecosystems and wildlife across the City.
- Identify those land, which should be managed as biodiversity corridors to maintain a network of natural areas throughout the city
- Ensure new development protects habitat for sensitive and protected species identified during environmental assessment process. Also, ensure new development provides habitat connectivity through the creation of wildlife corridors and there are no conflicting situations between wildlife and residents.
- Establish indicators and measures that will be monitored over time to assist in measuring progress on and the effectiveness of the Strategy, which will assist in ensuring that amendments are made to the Strategy when necessary.



Ensure no net loss of existing forests and propose afforestation along the steep slopes greater than 40%



Conserve biodiversity hotspots and ensure sustainable management of flora & fauna in the City.

Fig.7.21 Proposed Forest & Biodiversity management in the City

¹ Rwanda Landuse Masterplan 2009-2010

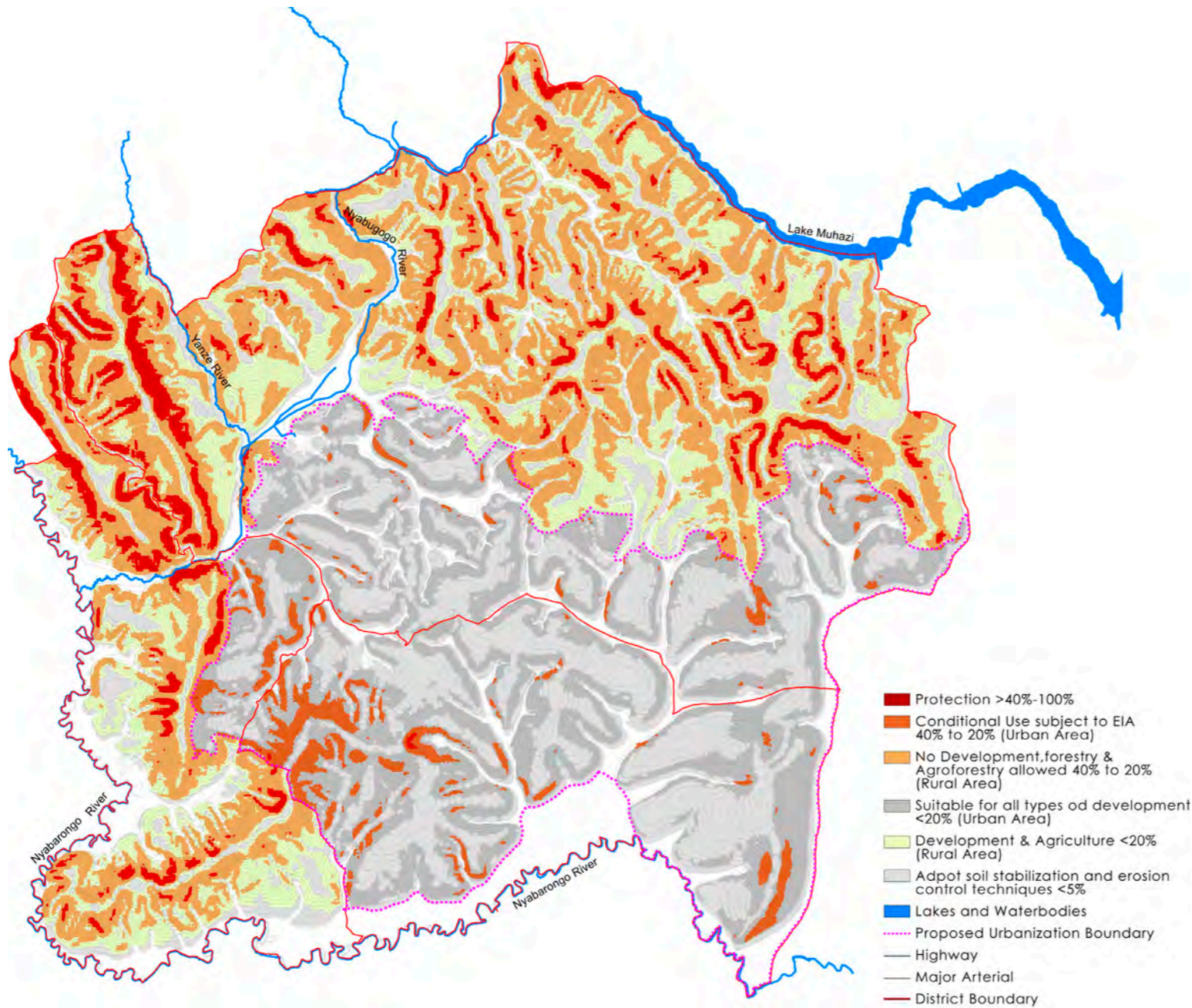


Fig.7.22 Proposed Steep Slope Protection Map

7.2.4 PROTECT STEEP SLOPES AND WATERSHED AREAS

SLOPE MANAGEMENT:

The city land area of 35% is dominated by steep slopes of more than 20%, 21% of which are not yet built and 14% located within urban areas, mostly encroached by urban settlements. There are number of issues associated with the development on the steep slopes like erosion, landslides, fire, health and safety risks. In Kigali, rapid erosion and sedimentation in rivers and wetlands, is affecting water quality and aquatic biodiversity. Another factor is the aesthetic quality of hillsides and ridgelines which is depleting because of the development. Hence, it is crucial to protect hillsides and steep slopes from development to preserve the unique environmental qualities that people value. The primary objective of the steep slope conservation plan is to limit the nature and intensity of development that can be harmoniously, appropriately and safely located on steep slopes and thereby serve the following additional objectives: (1) prevent soil erosion; (2) protect surface waters from sedimentation, turbidity, runoff of stormwater and effluent from sewage disposal systems; (3) preserve tree cover and other vegetative cover; (4) protect wildlife habitat; (5) preserve scenic views; (6) protect natural areas; and (7) maintain ecological balance.

Fig.7.22 indicates slope conservation plan which identifies low moderate and high risk slope areas for which detail management strategies are described below. Also, along with this refer Slope Overlay in Zoning Plan Report which further provides detail developmental guidelines for the site design, sub-division planning, infrastructure and buildings on the steep slopes.

SLOPE MANAGEMENT STRATEGIES:

1. High Risk Slope Areas (slopes >40%)

As per the slopes identified in the Fig.7.22, more than 20% area is occupied by slopes greater than 40%. The environmental management issues identified specifically for this area includes steep slope management, hilltop and ridge line protection. Slopes with such steepness are extremely critical and posses high risk of landslides and heavy erosion if disturbed. The key management strategies are explained below:

- The Masterplan proposes 100% protection of these slopes from the development.
- The few conditional uses like infrastructure and passive recreation is allowed as per the P4 protected areas overlay in the Zoning Report.
- Apart from the zoning regulation no development should be allowed on the mountain ridge more than 900m elevation.
- Along with the detail site survey and Environmental Impact Assessment (EIA) local authority should check landslide hazard areas before approving the plan.
- During development of conditional uses, appropriate slope management and protection techniques should be adopted.
- Minimize erosion, excavation and vegetation removal.
- No roads should be developed along this terrain.
- Propose afforestation on the non vegetated steep slopes.
- Encourage native plantation.

2. Medium Risk Slope Areas (slopes 40% to 20%)

Slopes with 20% to 30% steepness, begin to create problems for development and

between 30% and 40% are critical for any development. Development on such slopes causes soil erosion and stream sedimentation; unnecessary loss of vegetative ground cover and destruction of trees; on-site waste disposal problems; difficult street construction; and expensive street maintenance.

The key management strategies for the above slope category are explained below:

- The Masterplan allows conditional development of land only for those uses which are suitable on steep slopes like passive recreation, trails, open space, small scale public facilities, single family residences (R1 zoning category only).
- For the single family residential development refer slope overlay guidelines in the zoning report.
- Other conditional uses like infrastructure and roads are allowed as per the overall Masterplan requirement and should be developed as per the strategies explained in the previous section.
- For the slope between 20% and 30%, Roads must run diagonal than perpendicular. Avoid development of roads between 30% and 40%.
- No development should be allowed on the mountain ridge more than 900m elevation.
- Along with the detail site survey and Environmental Impact Assessment (EIA), local authority should check landslide hazard areas before approving the plan.
- Restrict development, excavation and vegetation removal in areas with 30% to 40% slopes.

3. Low Risk Slope Areas (slopes < 20%)

Slopes less than 20% are not generally considered hilly and suitable for all types of development, although rolling lands with slope greater than 5% are commonly

considered to be hilly.

The key management strategies for the above slope category are explained below:

- These low risk slope area's still require site specific environmental information and detail site survey to contribute to the overall NEM strategy.
- Protect environmentally significant features of the site such as wildlife, trees, natural drains, rolling slopes and soil stability.
- Slopes >5% needs soil stabilization and erosion control measures.
- Roads more than 12% must run diagonally than perpendicular to the slopes, except few short distances.

WATERSHED MANAGEMENT:

A watershed is a catchment basin that is bound by topographic features draining stormwater to a destination such as river, pond, streams, lake, or estuary. Watersheds receive water from the atmosphere, which results infiltration and percolation to subsurface. The stormwater channels allow runoff of excess water which cannot find way to subsurface. Hence conservation of watershed and existing stormwater channels is crucial to manage long term sustainability of the rivers and water bodies. In Kigali there are 25 watershed areas with the slope varying from 45% to 2%. Within each catchment area, there is an extensive network of natural drains that collects and discharge water to wetlands and streams that are finally connected to Lake Muhazi and Nyabarongo River. The biggest threat to Kigali's watershed is the high urbanization rate in Kicukiro and southern part of Gasabo and the agricultural activities in the Northern Gasabo and Nyarugenge district. These unplanned developments are altering stream channels and reducing riparian

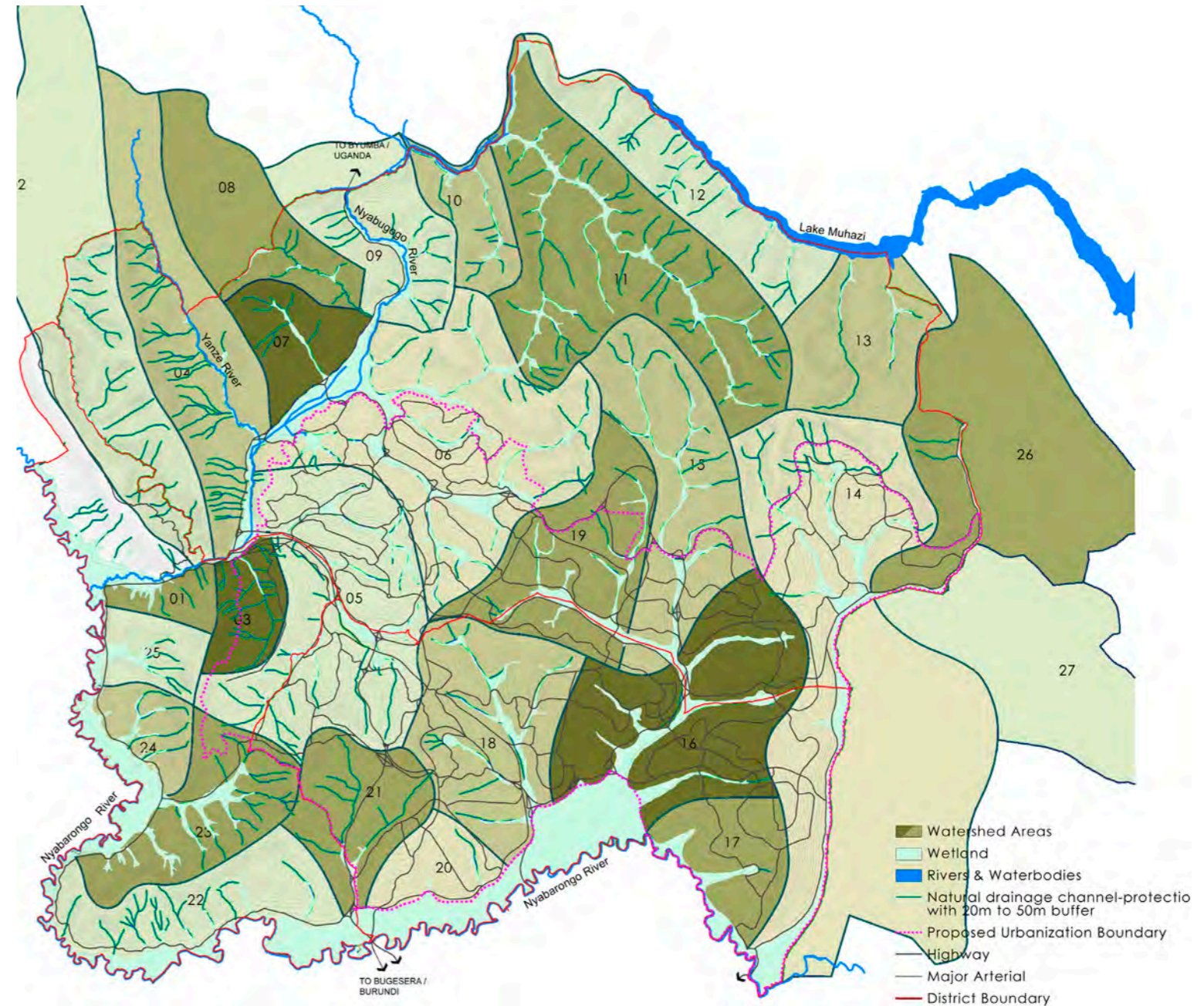


Fig.7.23 Proposed Forest & Biodiversity management in the City



Use appropriate slope management techniques like rock slope protection, Slope Roughening, Terracing, and Rounding, mulching, erosion control mats etc for different slope categories
 Fig.7.24 Slope stabilization & erosion control techniques



Use appropriate stormwater management techniques from unit to neighborhood level before it gets discharged into natural drains and wetlands. Like rainwater collection from rooftop, rain gardens, bioswales, retention ponds etc.



Propose vegetative buffer along natural drains to control soil erosion and allow habitat flow
 Use environmental buffers along the natural drains as park
 Fig.7.25 Watershed and stormwater management techniques

corridors resulting into increased run off carrying pollutants and siltation to the wetlands and the water bodies. Recently, increased flooding has been observed along Nyabugogo and Gikondo industrial park. Hence, it is crucial to manage watershed slopes and protect natural stormwater channels from development to achieve the vision of flood free city for the future generation to enjoy.

WATERSHED MANAGEMENT STRATEGY:

The key objectives management strategies for the watershed conservation are explained below and illustrated in the Fig.7.23:

- Ensure stormwater management and Water quality improvement
- Control non-point source pollution from the watershed source like urban land uses, agricultural activities and forest practices
- Promote onsite recharge and infiltration of the rainwater
- Ensure new development and redevelopment, address stormwater quality, quantity, reuse and infiltration
- Link patterns of land use within watersheds to access impact of the development on the watershed. Propose management and mitigation strategies.
- Flood hazard reduction:
 - Propose interconnected stormwater network which detains, spreads slow down and cleans the flow before it finally discharged into water bodies:
 - Conserve natural drainage channels for stormwater flow.
 - Combine storm water detention facilities with open spaces, parks, sports fields or other public recreational facilities that have minimal building developments
 - Natural drainage channels and riparian restoration:
 - Protect existing natural drainage channels

and propose 20m to 50m buffer from the development.

- Conserve existing riparian corridors and introduce new riparian corridors along the restored natural drainage channels.
- Use native vegetation along the riparian corridor to control flow of water, reduce erosion and trap pollutants from the catchment.
- Integrate these channels with the citywide green network.
- Sustainable Development along steep slopes for mitigating water related hazards:
 - Refer steep slope management strategies and zoning guidelines explained in the previous section.
 - Allow conditional uses along watershed and around natural drainage channels but efforts should be made to avoid any adverse impacts on these areas.
 - A comprehensive watershed management plan should be developed to provide policies and development guidelines for the sustainable watershed management in the city.

7.2.5 PROTECT OPEN SPACES AND ALLOW ACCESS TO NATURAL AMENITIES

PARKS AND PUBLIC OPEN SPACE MANAGEMENT

Parks and open spaces are the key to public amenities, providing a wide range of recreational, social and cultural activities including sports, walking, play, outdoor events and other more passive forms of recreation. Open spaces help to manage flood and stormwater, habitat preservation, air and surface water quality improvement, protection of groundwater recharge areas. Also, these spaces provide a unique landscape that supports a diversity of flora and fauna and provides an ever expanding human population with direct access to

nature.

So far, within the city limit, there is no established system of parks and open spaces like community level or city level parks and recreation areas. Recently Kigali city has established a Gardens Department that is working on landscape beautification works like Kigali Centenary Park and Kanombe Airport Park but no activities are planned yet. There are four proposed recreation parks namely; Kimisagara, site near free trade zone, Nyabarongo and near artificial lake but all the proposals are in initial consideration stage. The Gardens Department is also working on Kigali greening master plan, which is in collaboration with the NGO's and community organizations to develop landscaping along residential areas, public and government buildings, schools and other recreation centers. The department is also conducting a roadside plantation and roundabouts beautification works. But for the above mentioned works, the development is piecemeal and there are no Parks and Recreation Master Plan or management strategies developed yet. The overall vision to parks and open space strategy is to "Provide high quality multi-functional open space that is easily accessible, safe, welcoming, and rich in biodiversity and sustainably managed for the future; which encourages a sense of belonging, and enhances the quality of life of those people who live, work and visit Kigali.

PARKS & PUBLIC OPEN SPACE MANAGEMENT STRATEGY:

- The open space, greater than 20% slope and scattered forest patches in the urban area to be protected and developed as nature parks.
- Large open spaces, less than 20%

slope and which cater to the township recreation are developed as community parks

- Integrate protected landscapes with the City Parks and Open Space Network plan and enhance them through park planning, design, and the use of environmental best management practices.
- Interconnect parks, trails and greenways with as much universal accessibility as possible.
- Apart from the use of existing open spaces ensure that parks are well distributed throughout the community, particularly in higher density areas.
- Work with neighborhoods to identify public parks and recreational needs and assess the level of access and distribution of park resources. Target the location of Community Park within 10 to 15 min walk from the majority of the residential neighborhoods, important nodes and community interaction spots.
- Design and program parks and open space to maximize their potential, recognizing the limits of parkland supply and changing demographics.
- Promote the use of native plants which are drought tolerant, provides shade and help in soil erosion management in city landscaping, public streets and outdoor open spaces.
- Encourage retention of trees outside of development footprint immediately prior to and during development and redevelopment.
- To develop the resources and structures required to implement the above mentioned Strategy



Bamboo spp Ficus spp Markhamia spp Maesopsis eminii Erythrina abyssinica
Recommended planting along rivers, streams & lakes



Brachychiton acerifolius Senna spectabilis Delonix regia Jacaranda mimosefolia Araucaria heterophylla
Recommended planting for public gardens



Syzigium sp Prunus Africana Manguier Tuja orientaris Azadiracta indica
Recommended planting along the road



Cedrela Serrata Greville Robusta Alnus Acuminata Mimosa Scabrella Calliandra Calothyrsus Moringa oleifera
Recommended planting for forestry

Fig.7.26 Planting recommendation for different landscape areas

Source - Urban & Peri-urban Forest management in Kigali, Practical Tool on Agroforestry, Rwanda Environmental management Authority Kigali, 2010

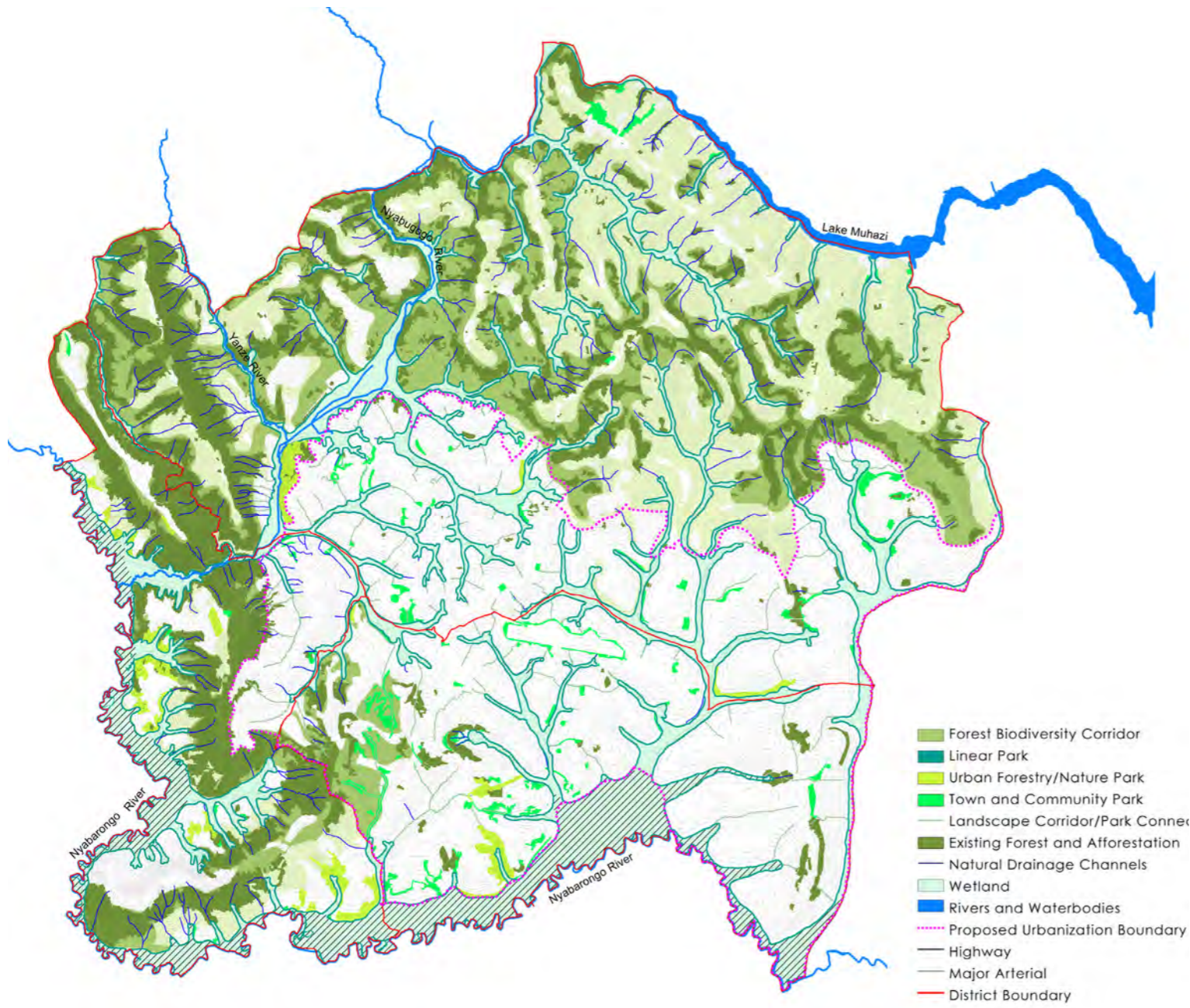


Fig.7.27 Proposed Landscape Network Plan

7.2.6 INTEGRATE NATURAL LANDSCAPES WITH THE URBAN LANDSCAPES

LANDSCAPE NETWORK PLAN

Kigali exists today because of the natural system that underlines it. The rolling hills, wetlands, rivers and hillside forests have been source of the life, providing recreational, agricultural substance and general livelihood for the centuries. Apart from the numerous environmental benefits, natural landscapes provide scenic views, educational and lot of active and passive recreation opportunities. Hence, strategy to conserve natural landscape can be associated with the parks and open space plan in the city where natural and manmade landscapes can be integrated through the series of landscape corridors and park connectors.

The aim of the Landscape Network Plan is to integrate the conserved natural landscapes in Kigali like wetlands, forests, rivers and natural drains with the city parks. This can be done through landscape framework which allows landscape connectivity and biodiversity flow without compromising developmental needs of the city.

LANDSCAPE NETWORK MANAGEMENT STRATEGIES:

The key management strategies for Landscape network plan are explained below and illustrated in the map 7.16:

- Preserve and protect natural landform and features: refer conservation and management strategies for the landscape areas established in the previous section.
- Design buffers for the wetland, river and lake established by the Organic low as linear park to limit growth, protect existing biodiversity and agricultural tradition.
- Incorporate public access and permissible recreation into restoration

and preservation efforts.

- Develop these buffers as riparian corridors by promoting native species plantation
- Identify potential connecting corridors between these natural areas and conserve them. For example – unique terrain of Kigali allows wetlands and waterways connection to the uplands through natural drainage valleys. These natural drains have high conservation potential and to be developed as landscape corridors allowing stormwater discharge, biodiversity flow and recreation and development connection to the natural areas.
- Promote creation of continuous public trails adjacent to riparian corridors, green belts and landscape corridors to allow continuous system trail connection.
- Promote these conserved landscapes as a thematic passive recreation areas relating to their ecological values and assets.
- Promote natural resource protection to foster green jobs opportunities and training programs.

7.3 Proposed Green and Blue Plan

7.3.1 STRATEGIES AND ATTRACTIONS

The Green and Blue Plan proposes a city wide park network banking on the various natural wetlands and the undulating terrain. It creates distinctive tourist destinations with the thematic landscape developments unique to each district. These attractions will be appealing to both domestic and international visitors and will also develop large recreational spaces in the city. The key themes and strategies for each districts are broadly described bellow;

Gasabo- The Land of Origins
 Kicukiro- The Golden Park
 Nyarugenge - The Adventure Gateway

GASABO - THE LAND OF ORIGINS

Proposed Character- laid back relaxed environment.

Mostly Gasabo district is dominated by small undulating steep mountains with valleys occupied by wetlands and waterways. The existing land use is forestry and agriculture on the northern side and residential and industrial development along the southern side of the district. Hence, the tourism focus for the district can be more nature based & agrotourism.

Nature based tourism Attractions

1. Heritage tree park @ Rutunga
2. Agro tourism valley of Nuduba, Rutunga & Bumbogo
3. Agrotourism resort
4. Mount Jali ridge park
5. Eco energy farms @ Gihogwe

Parks & Recreation Attractions

1. Water park & resort @ lake Muhazi
2. Horticultural parks
3. Valley of flowers & wetland park
4. Golf course @ Remera



Fig.7.29 Valley of Flowers - Uttaranchal, India



Fig.7.30 Agrotourism farm & resort



Fig.7.31 Heritage tree park



Fig.7.32 Theme Park

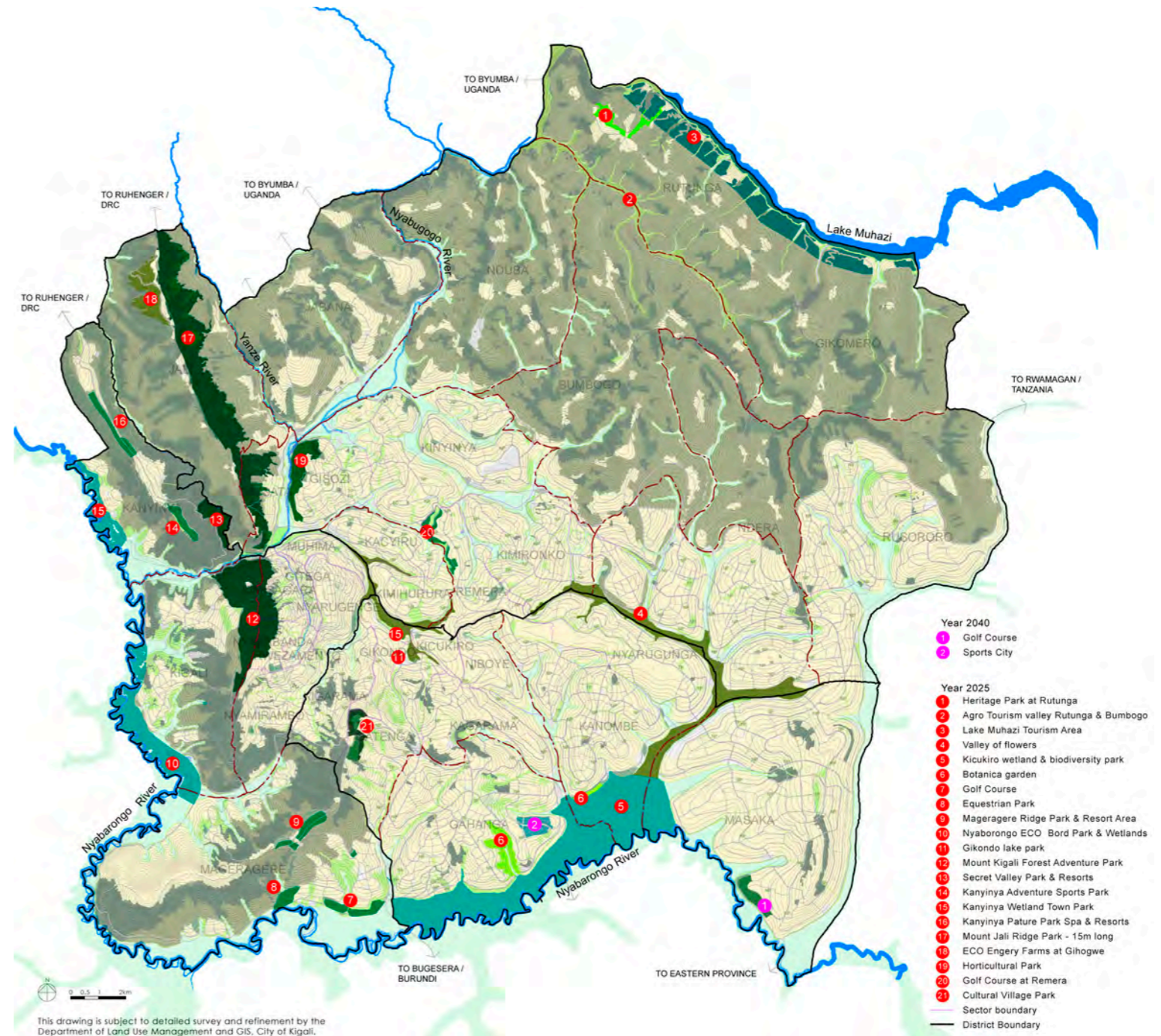


Fig.7.28 Proposed Green & Blue Attraction Plan



Fig.7.33 Equestrian Park,Golf Course and sports city



Fig.7.34 Lake park, amusement park & botanical garden



Fig.7.35 Seckret valley park, nature park wetland park



Fig.7.36 Forest adventure parks

KICUKIRO - THE GOLDEN PARKS

Proposed Character- Urban busy environment.

The Kicukiro district is relatively less steep compared to other two districts and except wetlands and waterways most of the land is developable. Hence, looking at the development opportunity, tourism focus for this area can be more of urban parks and thematic recreational areas.

Nature based tourism attractions

- 1. Kicukiro Wetland & biodiversity parks

Parks & recreation attractions

- 1. Valley of flowers & wetland park
- 2. Equestrian park
- 3. Sports city
- 4. Golf course & resort
- 5. Gikondo Lake park
- 6. Botanical garden
- 7. Amusement park

NYARUGENGE - GATEWAY TO THE ADVENTURE

Character- Adventurous landscapes with scenic viewing sites.

The Nyarugenge district is comprised of north south steep ridges. The Nyabarongo river corridor along the western edge of the district is identified as the biodiversity conservation corridor at the national level, as it receives large number of migratory birds every year.

The proposed landuse for the district is mostly agriculture along wetlands and forested areas. The buildable areas are proposed with the small clustered village developments with CBD on the eastern edge of the district. Hence, the tourism focus for this area can be adventure and nature based along the steep hills and

wetlands, parks and recreation based along the CBD.

Nature based tourism attractions

- 1. Nyabarongo eco bird park & wetlands
- 2. Secret valley park
- 3. Kinyinya wetland town park
- 4. Nyarugenge district center wetland park
- 5. CBD Wetland Park @ Muhima

Parks & recreation attractions

- 1. Kinyinya adventure sports park
- 2. Mount Kigali adventure forest park
- 3. Kinyinya nature park, spa& resorts
- 4. Mageragere ridge park & resort area

These parks and destinations are planned on the regional scale attracting people from the rest of the country. They build Kigali's unique identity as an adventure and tourist friendly city.

CITY PARKS/ATTRACTIONS

These parks and attractions act as the city's breather spaces which include active sports related activities and public areas.

- Wetland Parks
- Hill / Mountain Ridge Parks
- City Squares & Plazas
- Tourists / Arts Markets
- Museums & Heritage / Historic Sites
- Stadiums & Sports Clubs

The proposed landscape attraction plan is presented in Fig.7.28

7.3.2 PROPOSED GREEN AND BLUE PLAN 2040

The Green and Blue Network Plan indicates seamless network of natural and urban landscape areas (Refer to Fig.7.37). The plan features following variety of parks and public spaces:

TOWN PARKS

Town parks are the regional destination for locals as well as the visitors. The facilities are mostly associated with the major recreation, education, leisure activities and may have natural or unique features. The town plaza near town parks attracts festivities, local celebrations and public gatherings.

LOCAL PARKS

The local parks cater to the neighborhood scale. They range in sizes and are programmed for active and passive recreation. They are located near residential developments to promote the community environment and provide typical park amenities for local population.

URBAN PARKS

Urban parks are the large thematic parks like botanical garden, horticulture parks, lake park, biodiversity park etc. They are the focal point of the community and support the identity of the place.

VALLEY OF FLOWERS

The proposed valley of flowers will be the icon for the Kigali City. The existing wetland valley will have lush plantation of Roses and Alstromeria flowers along its buffer and peripheral areas. The parks will feature flower gardens, green house exhibits, commercial flower fields with the gift shops and florist shops.



Fig.7.38 Sports stadium



Fig.7.39 Town park / plaza



Fig.7.40 Local parks



Fig.7.41 Valley of flowers



Fig.7.37 Proposed Green and Blue plan-Year X

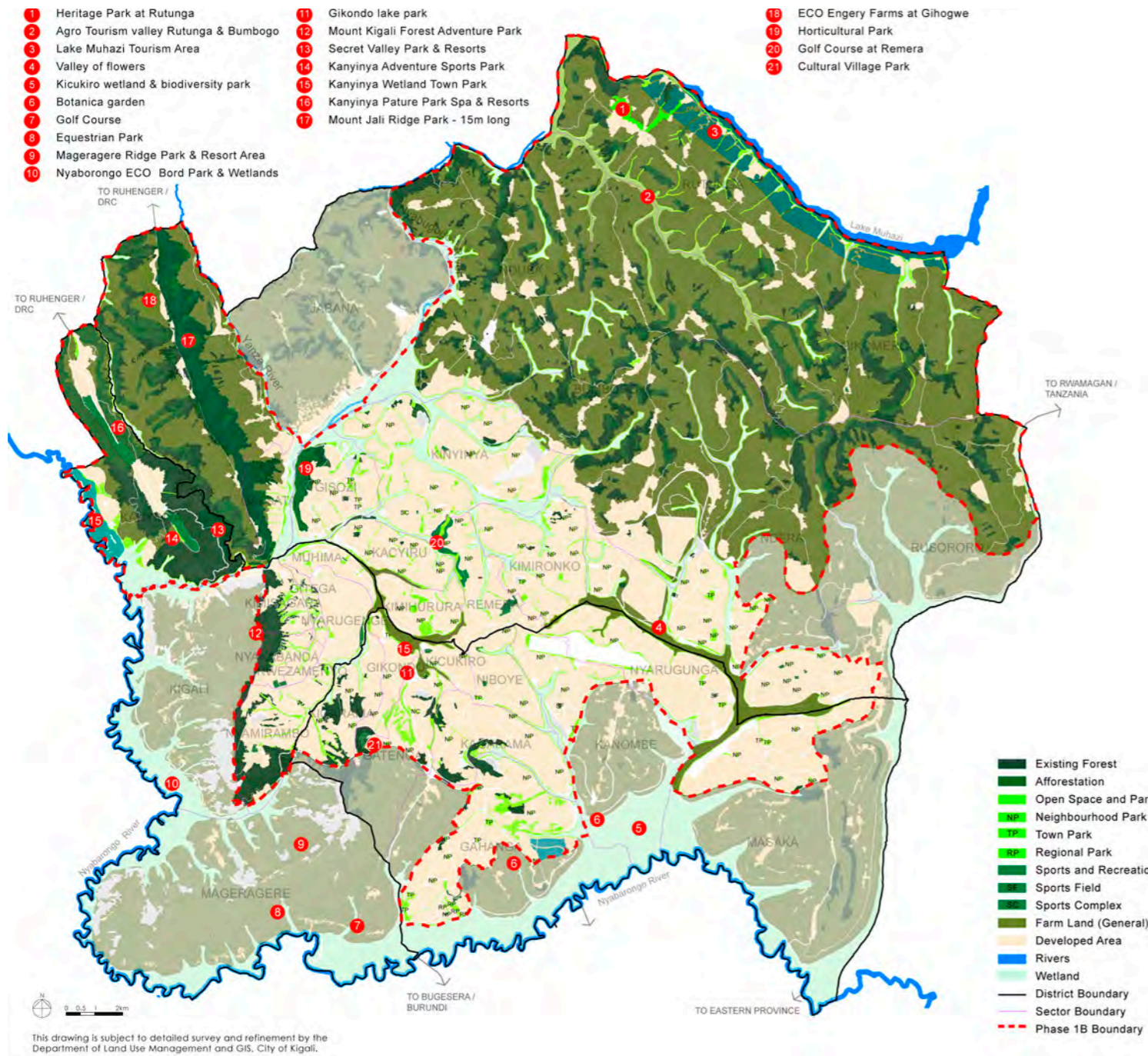


Fig.7.46 Proposed Green and Blue plan-2025



Fig.7.42 Heritage park



Fig.7.43 Nature park



Fig.7.44 Wetland park



Fig.7.45 Park connector

NATURE PARKS

The large drainage channels within towns, the unbuildable slopes and forest patches in the city are converted into nature parks.

WETLAND PARK

The wetland parks are developed around the existing wetlands and proposed wetland buffers. It collects and recycles surface runoff coming from the surrounding areas. It features indigenous plantation and allows passive recreation use.

PARK CONNECTOR NETWORK

All the above open green spaces are connected through green connector network like green strips, bridges, green fingers etc and ensure a seamless pedestrian network throughout the city.

7.3.3 PROPOSED GREEN AND BLUE PLAN 2025

Following the final vision plan for the 2040, the year 2025 green and blue plan targets development in key areas.

- The agro tourism parks in the North near Lake Muhazi play an important role in introducing value add forestry and plantation.
- The proposed adventure and nature parks near the Nyarugenge CBD attract residential development.
- The Wetland/Nature and Bio diversity park near the newly proposed Gahanga regional centre attract investments and corporate giants into the city.
- The first phase of valley of flowers along the highway and airport invite major developments along the proposed corridor.

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8

CITY OF ENDEARING CHARACTER AND UNIQUE LOCAL IDENTITY

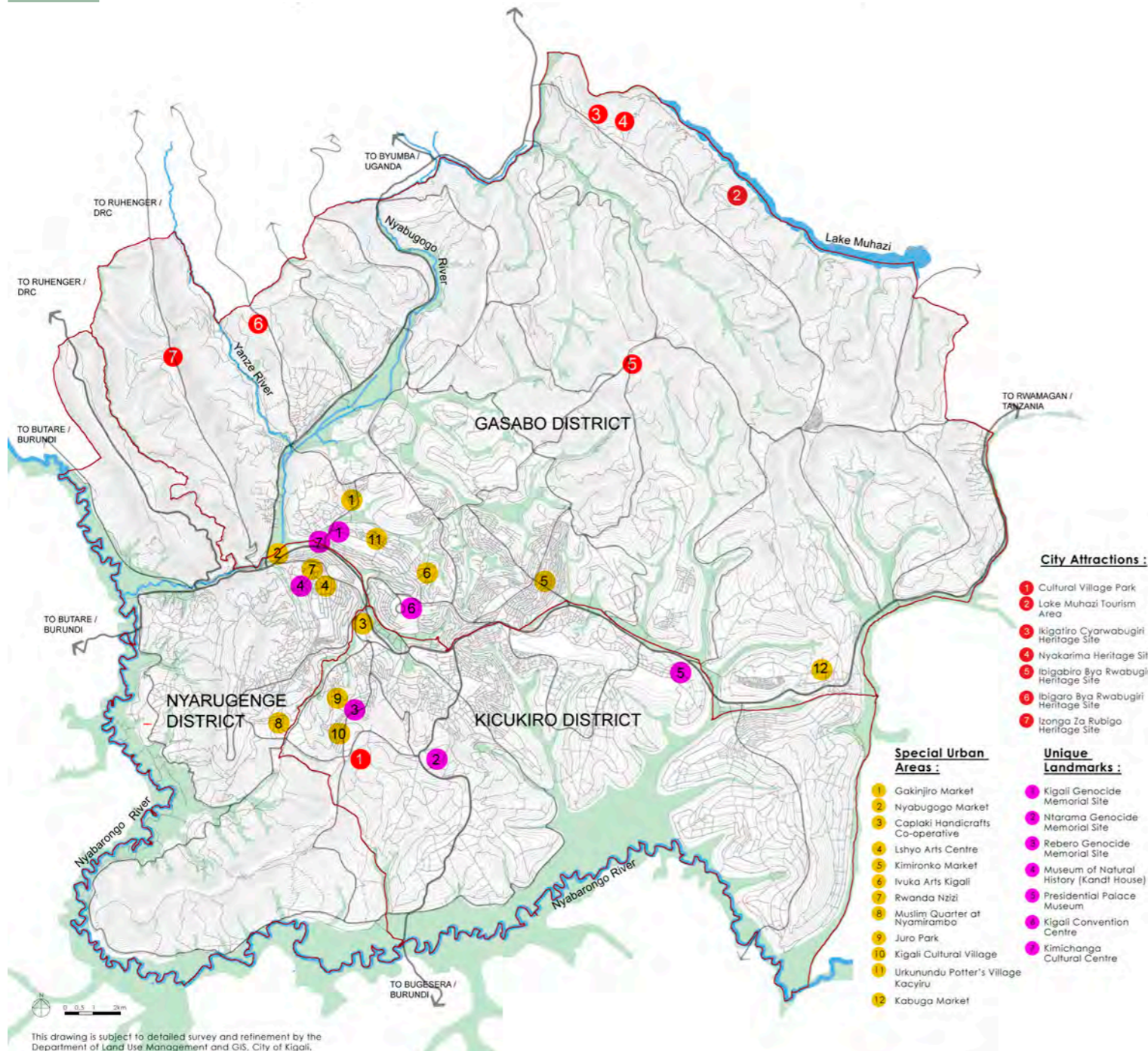


Fig.8.5 Existing Identity Features

8.1 Kigali's Special Character

The interaction of landscape, built form, history, people and their local culture together gives a place a distinct identity. The continuance of the local character gives the people a sense of belonging while enhancing community life. This distinctness is attractive to tourists as well as investors, providing the city a competitive edge by virtue of its unique identity.

Livable and memorable cities with a unique sense of place are created through conservation of streets and neighborhoods built at human scale; public areas that support positive community interaction; key landmarks that hold strong value to the community; and special city attractions that are identifiable to the particular City. The existing assets such as Kigali's local heritage & culture; landmark buildings such as museums, memorials and religious sites; special commercial areas such as existing local markets etc, contributes to Kigali's special character today. These are the potential areas for enhancing the local character and enriching the sense of place.

These unique assets need to be retained and further enhanced to make Kigali uniquely identifiable in the region. Existing features with high tourism potential as well as new tourism features also need to be identified to make Kigali special and attractive destination. Hence, to have an endearing character and unique local identity, Kigali City should focus on developing:

- A Tourism Development Strategy
- Local Identity Development Strategy

8.2 Tourism Development Strategy for Kigali City

Sustainable Tourism Development Masterplan for Rwanda¹, has placed high expectation in tourism contribution to local economy. It is envisioned to be a key leader in Eco tourism and conference hub regionally. Rwanda also has many rich natural resources that are unique to the world and would push the country forward to achieve the development objective. Kigali, is centrally located in the heart of Rwanda, and it is the main gateway to explore the country.

Kigali itself is blessed with natural assets such as hills and wetlands, which have immense environmental importance as well as tourism potential. Besides all these natural assets, the unique culture and lifestyle draws travelers from afar.

It has been acknowledged that to improve the tourism satisfaction in Kigali, the city needs to focus on:

- Improving road network to serve the sparse located attractions with transport and tourism supportive services and provisions to meet the demand of international tourists.
- Implementation of planning legislation, better organized or promoted attractions, and well trained manpower and technical skills.

As developing, challenges and opportunities go hand in hand. More diverse and well managed tourism programs should be provided in order to extend tourist stay and increase tourist spending. By establishing

¹ RDB, UNWTO

more urban, cultural and nature attractions, the target for tourist stay should increase from current 2 days to 4-5 days. At the same time, the unique identity and significant natural and culture legacy should be well preserved through proper urban design and development strategies to minimize negative impact to local residents.

A holistic tourism development strategy is proposed based on the vision of Kigali master plan. It encompasses development objectives in conservation, regeneration, economic stimulation, service provision and strategic promotion of these assets through clear direction. The master plan identifies key tourism development corridors taking into account the natural, heritage and social assets and integrating it with the proposed transportation, infrastructure and environment management strategies. However, these proposed strategies are still conceptual; the city with RDB will have to conduct detailed feasibility studies to develop a comprehensive Tourism Strategy and Master Plan.

8.2.1 PROPOSED KEY TOURISM DEVELOPMENT CORRIDOR FOR KIGALI

Kigali master plan has mapped out a forward looking urban development strategy with key emphasis on the existing city center, transit oriented development and limiting urban development to less than 35% of the available land. The concept focused on new developments in green field areas, while intensifying the inner city area surrounding CBD through regeneration. Due to the hilly terrain in Gasabo district and parts of Nyarugenge District, the master plan emphasizes more extensive development to the center and south of Kigali. In the hilly areas, due to terrain constraints, the master

plan focuses more on rural development, agriculture and environment protection strategies.

Kigali is the first destination to Rwanda. To further strengthen the master plan concept, Kigali tourism development should focus on providing diversified tourism products that are well served by roads instead of dispersed independent development. The clustering of tourism products will make it easier for service providers to organize, manage and regulate. The collected effort will result in improved service quality and achieve a better tourism satisfaction.

In light of this concept of creating tourism clusters in Kigali, four major tourism development corridors are proposed, with each of them focusing on a distinct market segment. (refer to Fig.8.6)

1.URBAN CULTURE CORRIDOR:

Spanning over key areas in the city center, the Urban Culture Corridor is not only an opportunity to showcase the new city image, but also a chance to highlight the rich Rwandan culture. It is usually the first destination for visitors before making the trip to the National Parks outside the city. It is also the place where locals meet and interact with the visitors. It is a place for first impressions, and a place where different cultures and behaviors fuse.

Therefore, Urban Culture Corridor will focus on developing tourism products that can represent the rich Rwandan culture and history. It should also function as a key transportation node for regional commute. As the city grows, the status of this transit node may need to switch to other locations in order to mitigate traffic pressure.

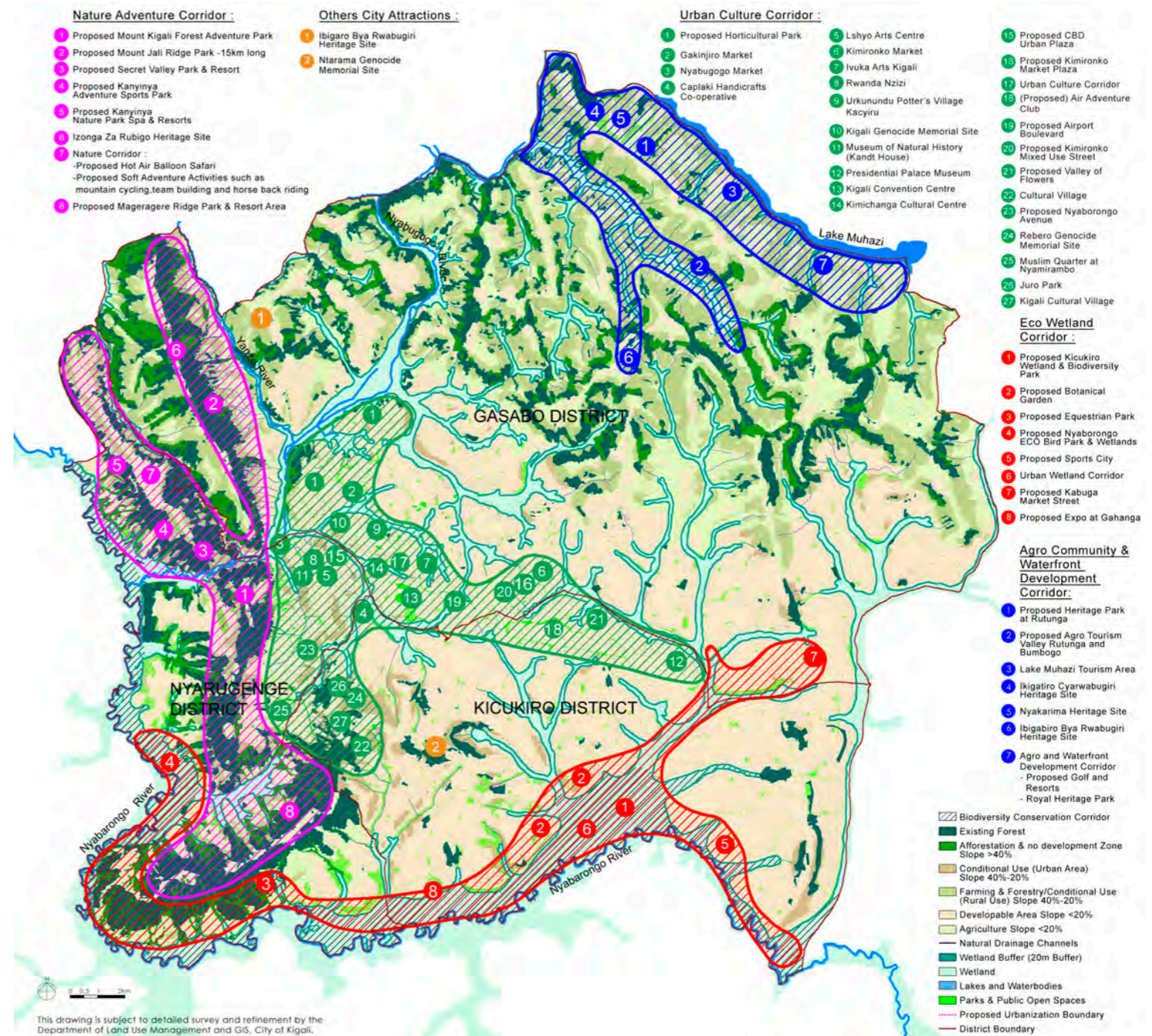


Fig.8.6 Kigali Tourism Development Strategy

Table 8.1 Proposed Tourism Development Corridor

Urban Culture Corridor

KEY ATTRACTIONS	MARKET SEGMENT	ACCOMMODATION
KIGALI GENOCIDE MEMORIAL SITE	BUSINESS TOURIST	STAR HOTELS
GAKINJIRO, KIMIRONKO MARKET	HOLIDAY TOURIST	ECONOMY HOTELS
PROPOSED HORTICULTURAL PARK, FLOWER VALLEY	FIRST TIME VISITORS	
URKUNUNDU POTTER'S VILLAGE KACYIRU	TRANSIT VISITORS	
KIMICHANGA CULTURAL CENTER		
CBD PLAZA & CONVENTION CENTER		
GISIMENTI ENTERTAINMENT DISTRICT		
PROPOSED AIR ADVENTURE CLUB		

Nature Adventure Corridor

KEY ATTRACTIONS	MARKET SEGMENT	ACCOMMODATION
PROPOSED KANYINYA ADVENTURE SPORTS PARK	ECO TRAVELS & NATURE TOURIST	STAR HOTELS
PROPOSED KANYINYA GOLF RESORTS AND SPA	ACTIVITY AND ADVENTURE TOURIST	INTEGRATED RESORT
PROPOSED SECRET VALLEY PARK & RESORT	RESORT VISITOR	CONDOTEL
PROPOSED HOT AIR BALLOON SAFARI	FAMILIES	
PROPOSED SOFT ADVENTURE ACTIVITIES	BUSINESS TRAVELERS	

Eco Wetland Corridor

KEY ATTRACTIONS	MARKET SEGMENT	ACCOMMODATION
PROPOSED KICUKIRO WETLAND & BIODIVERSITY PARK	ECO TRAVELS AND NATURE TOURIST	BOUTIQUE HOTELS
PROPOSED FLOWER VALLEY	LOCAL RESIDENTS	RESORTS
PROPOSED BOTANIC GARDEN	LEISURE TOURIST	CONDOTEL
PROPOSED HOTEL CLUSTERS	FAMILIES	ECONOMY HOTELS

Agro Community and Waterfront Development Corridor

KEY ATTRACTIONS	MARKET SEGMENT	ACCOMMODATION
COMMUNITY ATTRACTION/ HERITAGE	ECO TRAVELS AND NATURE TOURIST	RESORT & SPA
GOLF & RESORT	ACTIVITY AND ADVENTURE TOURIST	BED & BREAKFAST
BOATING, FISHING, BIRD WATCHING	RESORT VISITOR	HOLIDAY LODGES
	BUSINESS TRAVELERS	

Key attractions in the Urban Cultural Corridor could include the Kigali Convention Center, Kigali Genocide Memorial Site, Kimichanga Cultural Center, and Market streets, to name a few. The character of this area will be more urban with colorful and vibrant streets, pedestrian walkways, and public open spaces. With the relocation of the airport to Bugesera, the current airport could function as an air base for air adventures tourism industry conducting local flights with adventure programs such as sky diving, flight training, micro-light flight tours etc.

Star hotels, “value for money” economy hotels will have presence along this corridor facilitated by different dining and shopping opportunities. The urban and culture corridor is meant to set the image of “quality service” and “unique tourism experience” to travelers.

2.NATURE ADVENTURE CORRIDOR:

The Nature Adventure Corridor is located to the west of Nyarugenge district. It is a hilly area with good connectivity to the city through major highway and arterial roads. The large supply of lush green and interesting terrain makes it the best destination for nature adventure tourism. Along this corridor, travelers can find the most exciting action themed adventure parks that are perfect for group expedition, physical training, and exceptional cultural experiences. Integrated golf resorts are proposed in order to cater to the needs of upper scale & business market segment.

Nature adventure corridor will be complemented with activities such as air adventure and hot air balloon safari. It offers a safe and well managed environment for human to explore the

nature. The authenticity of nature setting so close to the city is a unique feature for tourists and visitors. Adventure programs such as bicycle tours, horseback riding, fruit picking, hiking etc will be incorporated within the Nature Adventure Corridor.

3.ECO-WETLAND CORRIDOR

The Eco-Wetland Corridor refers to the south periphery of Kigali. The site covers a large area of natural wetland, and functions as one of the main features in the city's green network. It is the backyard garden for Kigali, and will bring about a good mix of both aesthetic and economic value to the city.

Well served by public transport, it is a good place for a weekend getaway for local residents and eco-tourism lovers to experience the unique wetlands of Kigali City. A botanic garden is also proposed which besides being a showcase of Rwanda flora will also be an attractive destination for hosting live performance and culture shows.

The bio-intensive method of introducing floral farming will reduce environmental degradation as well as protect the wetland zones. The lucrative export industry of floriculture can be a new value added agro-industry that also supports tourism by transforming the area into a recreational destination. Besides being a valued employment generator, the Flower Valley will create a lively visual treat to urban dwellers and visitors and make a lasting impression. The corridor will also have many wetland corridor parks and cycling routes connecting many local residential neighborhoods.

4.AGRO COMMUNITY AND WATERFRONT DEVELOPMENT CORRIDOR

Located on the north of Kigali and surrounded by the rolling hills of Gasabo district, the agro and community themed development is a true escape from the bustling city life. Accessed by the scenic drive through the hills, the journey of commute itself becomes part of the adventure.

Community based tourism enables the tourist to discover local habitats and wildlife, and celebrates and respects traditional cultures, rituals and wisdom. The community will be aware of the commercial and social value placed on their natural and cultural heritage through tourism, and this will foster community based conservation of these resources.

The clustering of community tourism, offers a “staged authenticity” that helps to preserve the social values. The themed establishment is closely associated with the authentic regions that interest tourists. It can also offer a genuine impression to tourists of the social establishment of the region. Villagers are able to seek employment in tourism industry closed to their homes and keep their usual occupation, normally as farmers, at the same time. The key focus of the community tourism area will be the Royal Heritage Parks, which is at close proximity to Lake Muhazi.

Lake Muhazi waterfront is a designated area for tourism development. Approved projects include Lake Muhazi Golf and County Resort, the Seeds of Peach Center, and other resort development. Muhazi shorefront is also the main access to Akagera National Park. It provides travelers

a variety of lake activities such as boating, fishing and bird watching. It will be a place to retreat from the busy urban lifestyle to enjoy the tranquility of the lake and nature.

8.3 Local Identity Development Strategy

The essential qualities needed to create distinct character and identity for places in the city are:

- **CONTEXTUAL:** Development should respond sensitively to the local, heritage, social, cultural and environmental context. This will help to create places which blend well with the surrounding context.
- **CHARACTER:** Places in the city having distinct character are memorable and appreciable.
- **VARIETY:** More choice of places of different uses in the city are appreciated by all and helps to create an attractive city.
- **CONNECTIVITY:** Places providing good seamless connections between various uses facilitate more civic and social bond.
- **INNOVATIVE:** Creativity in city space design can turn a mundane place into a memorable and cherished part of the city.

A distinct urban character can therefore be achieved through development of specific heritage conservation and urban design strategies. The key approach to develop areas with distinct local character are as below:

- Identify key heritage buildings and precincts in the city for conservation.
- Retain and reinforce the existing built fabric of key identified areas as Special Precincts.
- Recognize and allow existing activities which give the identified areas its special

character and sense of place.

- Retain existing landmarks and develop new urban landmarks in the City.
- Develop more public spaces for social gatherings.
- Retain the unique landscape and terrain and optimize it as special attractions.
- Develop new urban attractions.
- Develop Urban Design plans for key areas in the city.

The natural, cultural, heritage and key built features in the city are proposed to be enhanced by providing them with roles that will make them identifiable attractions in the city. These features will become the key attractions in the city for tourists as well as locals. Along with being entertainment and recreational destinations, the local character of the city also needs to be maintained and developed to create a sense of belonging for the residents.

To showcase City's identity and character and highlight as well as develop the local character of places, the city needs to focus on developing:

- **SPECIAL PRECINCTS** comprising of heritage and urban precincts.
- **UNIQUE LANDMARKS** comprising of Heritage buildings, cultural/ religious buildings and/ or other urban icons.
- **DISTINCTIVE STREETSCAPES** comprising of streets with special character.
- **ATTRACTIVE PUBLIC PLACES** comprising of special urban plazas.
- **SPECIAL CITY ATTRACTIONS** comprising of regional recreational and tourism destinations.

8.3.1 SPECIAL PRECINCTS

Areas with potential heritage value and unique urban character are proposed to be developed as special precincts with

special guidelines. Such areas are mainly categorized as:

- Heritage Precincts
- Special Urban Precincts

HERITAGE PRECINCTS

Heritage plays an important role in creating a sense of identity. It creates a link to the past providing lessons, and in connecting tangible and intangible narratives of places. Heritage forges a common understanding and bond of shared experiences. The built and physical heritage in Kigali represents the collective memory of the people. If erased this will create a vacuum that will be a loss to the society as a whole.

The fast pace of change in the city threatens the old builtup areas as these are being replaced by more financially profitable structures. Similarly, there is a threat to the natural environment heritage and the cultural heritage. Urban Design and Heritage Conservation Strategy play a key role in ensuring that developments respond better to the surrounding context, particularly in heritage areas. This is especially true in today's context where heritage and old parts of the city comes in conflict with development pressures.

Special heritage precincts with strong architectural and urban character need to be identified. These precincts could be areas that are heritage districts, cultural areas, religious areas, markets, or traditional settlements.

Some of the areas proposed as Heritage Precincts include the Urukundu potter's village at Kacyiru, Muslim quarter at Nyamirambo, etc. The heritage significance may range from important local feature to a streetscape or facade representing a



Fig.8.7 Rwanda's Vernacular Architecture



Fig.8.8 Natural Landscape



Fig.8.9 Kigali Genocide Memorial



Fig.8.10 Urukundu Potters Village at Kacyiru



Fig.8.11 Paroisse Regina Pacis Remera



Fig.8.12 Kigali Urban Streetscapes



Fig.8.13 Identity Features : Attractive Public Spaces



Fig.8.14 Proposed Identity Features : Vibrant Streetscape



Fig.8.16 Proposed Identity Features : Special Urban Precincts



Fig.8.15 Proposed Identity Features : City Attractions - Flower Valley



Fig.8.17 Identity Features : City Attractions



Fig.8.18 Proposed Identity Features : Heritage

period in history. A detailed heritage study is recommended to identify more of such potential areas to be retained as Heritage Precincts that reflect local character and special identity of the City. Heritage is not limited to the historic built form, monuments and other physical artefacts and can extend to the non-physical elements such as community traditions, performing arts, rituals, and festive events which is unique and not replicated elsewhere. Every effort should be made to preserve them so that they represent Kigali in terms of city image. Cultural heritage is community based; it is not solely inherited tradition, but can also be contemporary urban or rural practices. It is recommended to foster this intangible heritage by recognizing them as unique communities which represent the unique characters of the city. Areas identifiable with such communities can be defined as heritage precincts.

Further recommendation for heritage in Kigali are as below:

- Identification & classification of heritage assets as per categories.
- Development of heritage regulations & policies.
- Development of proper incentives and benefits for owners of such heritage districts.
- Provision of infrastructure and guidelines to support heritage assets.
- Establishment of heritage management body.
- Implementation of government initiated heritage pilot projects.

SPECIAL URBAN PRECINCTS

Kigali is planned to have hierarchy of multiple centres around the City and along the proposed transit corridors. These nodes

shall have high quality developments, which are compact, walkable, and mixed use in character. These centres are proposed to be transit oriented developments well integrated with the transportation station. These urban centres should be developed to have a distinctive urban character. Nyabugogo Market Precinct, Kimironko Market Precinct, Gakinjoro Market Precinct, etc are some of the urban areas proposed to be developed as special urban precincts. Similarly, the new regional and town centres are also recommended to be developed as urban precincts with special character.

Some of the strategies for the special urban precincts are:

- Creation of seamless transportation experience through urban design strategies that promote better integration of developments and improved pedestrian connections.
- Provision of development guidelines to promote better street edge character and more compact development.
- Promotion of mixed use development for more variety of uses and vibrant urban character.
- Development of pedestrian friendly environment and attractive features with retail at street level to create lively urban environment.
- Provision of organized car parking that is well integrated with the development to reduce traffic congestion.

8.3.2 UNIQUE LANDMARK

A landmark gives a strong urban character and an immediate recognition to the City. Landmarks enhances City's skyline and helps to distinguish one city from the other. Landmarks also help to create sequential experience while traversing the city.

Landmarks are focal points and node in this sequence which gives a sense of arrival to the place. Landmarks could be heritage buildings, monuments, civic and cultural buildings, or other special iconic urban buildings. Kigali has some of such iconic landmarks and local features which help to orient the visitor's better in the city. These landmarks include Genocide Memorials, Museums, Kigali Convention Centre, etc.

While the existing landmarks in the City need to be enhances, it is also important to introduce new land marks in the City. The new landmarks will help create distinct City identity especially for new urban areas in the city and provide the reference points. An exciting urban skyline can be achieved for Kigali City through introduction of unique and recognizable landmarks on the undulating terrain complementing its foreground of wetlands and backdrop of hills. At the moment, the proposed landmark feature include Kimicanga Cultural Centre and more of these landmark sites will be identified at detail planning stage.

Some of the strategies for developing landmarks are:

- Identification of strategic locations for potential landmarks.
- Promote State-of-the-Art development in these sites through international design competitions.

8.3.3 VIBRANT STREETSAPES

An excitement in a City-life is demonstrated by the walkability of the City. Variety of street scales and character, from grand to intimate will create a better sense of orientation across the city. New boulevards, shaded shopping streets, seamless

pedestrian networks, and vibrant heritage streets all provide character and variety in experiencing the city. Such streetscapes help in creating a more human city.

Nyaburongo Avenue, Airport Boulevard, Kimironko Market Street, Kabuga Market Street and Valley of Flowers are some of the potential areas identified as distinctive streetscapes that will enhance the City's identity.

Some of the key steps to creating better streets for Kigali are:

- Improve design of streets to become social spaces for communities than just corridors for movement.
- Prioritize on improving the pedestrian experience as opposed to private vehicle.
- Add human scale features and visual richness in local streets.
- Allow activity generating uses with friendly street edge in Streets around transit nodes.
- Introduction of street planting and landscaping plans.

8.3.4 ATTRACTIVE PUBLIC PLACES

Kigali has many natural assets like wetlands and forests, however lacks urban public open spaces in the City. New public places and urban open spaces such as urban plazas and squares provide not only relief spaces in the urban areas but also improves the experience of the city. These imaginative new urban places create a more livable city. CBD and Kimironko Market Plaza are some of the potential urban plazas identified as urban open space that can be developed to create a distinct urban identity.

Some strategies to create distinctive landscapes are:

- Identification of sites for attractive public places.
- Development of variety of attractive & distinctive urban parks and plazas with unique features and activities .
- Requiring private developers to provide for iconic public spaces.
- Promotion of public art in public spaces.

8.3.5 CITY ATTRACTIONS

Currently, Kigali has limited regional tourist attraction within the City. There are proposals for Cultural Village near Juro Park and a large tourism area proposed near Lake Muhazi. The Lake Muhazi Tourism Area is recommended to include water based theme parks in the tourism programme as a new recreational destination.

New additional attractions will continually refresh the identity of the City and will make the City an exciting destination for the locals as well as regional visitors. The Tourism Corridors have been proposed by the Tourism Strategy. This has identified the key tourism attractions for the various areas of Kigali. Amongst these some are new City attractions. Some of the city attractions proposed are the Botanical Garden, Wetland - Biodiversity Park, Eco-Bird Park, Horticulture Park, Forest Adventure Parks etc optimizing the natural landscape. Some of these parks are proposed to be developed as integrated resort parks. Other attractions include the heritage precincts with variety of cultural activities attached. Some of the key strategies to develop these attractions are:

- Safeguard land for regional attractions.
- Create variety of attractive destinations that makes the City distinct.
- Facilitate private sector / international investors to develop such destinations.

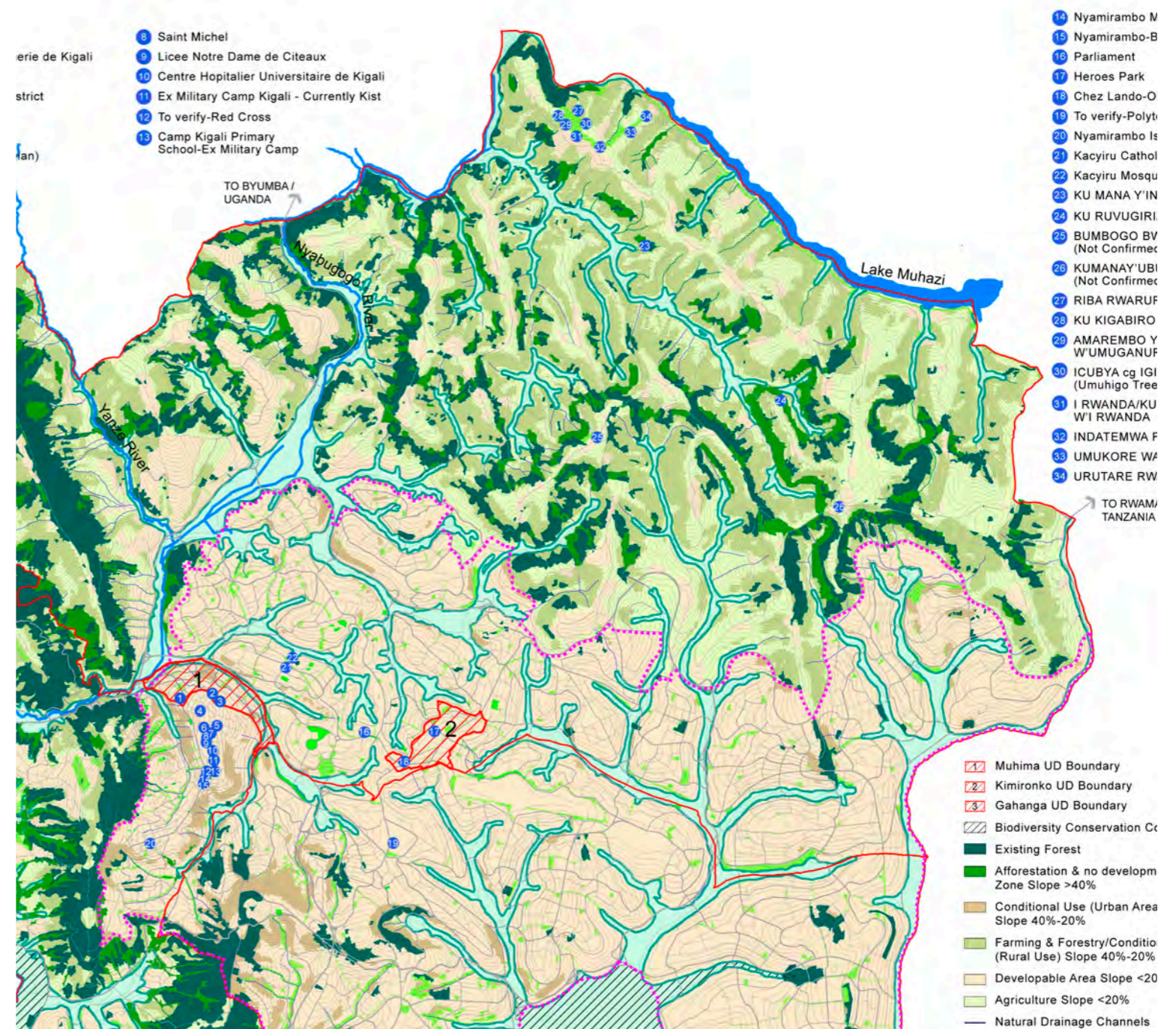


Fig.8.19 Kigali Heritage Assets and Urban Design Areas

9

CITY OF SUSTAINABLE RESOURCE MANAGEMENT

Table 9.1 Projected Water Demand for Year 2025 and Year X

LAND USE	YEAR 2025			YEAR 2040		
	TOWNSHIP	RURAL	INDUSTRIAL	TOWNSHIP	RURAL	INDUSTRIAL
	(M3/D)	(M3/D)	(M3/D)	(M3/D)	(M3/D)	(M3/D)
SP1	57,600	-	-	57,600	-	-
NY1	6,652	-	-	9,600	-	-
NY2	2,160	-	-	20,400	-	-
NY3	25,915	-	-	36,000	-	-
NY4	-	-	-	9,600	-	-
NY5	2,160	-	-	16,800	-	-
G1	22,800	-	-	22,800	-	-
G2	24,000	-	-	24,000	-	-
G3	21,600	-	-	21,600	-	-
G4	42,000	-	-	42,000	-	-
G5	10,800	-	-	10,800	-	-
G6	10,440	-	-	28,800	-	-
G7	5,640	-	-	16,800	-	-
G8	-	-	-	12,000	-	-
K1	21,600	-	-	21,600	-	-
K2	-	-	-	9,600	-	-
K3	42,000	-	-	42,000	-	-
K4	38,400	-	-	38,400	-	-
K5	-	-	-	18,000	-	-
K6	10,800	-	-	10,800	-	-
K7	15,600	-	-	15,600	-	-
K8	-	-	-	10,800	-	-
K9	-	-	-	14,400	-	-
K10	-	-	-	26,400	-	-
K11	-	-	-	42,000	-	-
I1	-	-	-	-	-	4,537
I2	-	-	8,911	-	-	8,911
I3	-	-	-	-	-	10,107
I4	-	-	-	-	-	5,733
RURAL	-	-	-	-	14,400	-
TOTAL	360,167	-	8,911	578,400	14,400	29,289
GRAND TOTAL	369,078			622,089		

9.1 WATER SUPPLY

9.1.1 KEY ISSUES

Key issues that need to be addressed by the City are:

- UNCOORDINATED PLANNING BETWEEN FUTURE LAND USE AND INFRASTRUCTURE:** Without proper planning, the existing infrastructure would not be able to meet the growing water demand. The City has to work closely with the service provider to determine the growth centre and the projected water demand. Sufficient land should be set aside for the construction and expansion of the water treatment plants and service reservoirs.
- SHORTAGE OF WATER SUPPLY:** The current supply is still lacking behind the actual demand. The 80 lpcd city wide goal set by the MININFRA was due to the limited supply. In the long run, as the City population and standard of living rise due to the urbanization, this goal has to be reviewed. The City also has to utilise the current resources more efficiently and identify new ones for long term planning.

Table 9.2 Water Demand Unit Rate

LAND USE	WATER DEMAND UNIT RATE
RURAL AREA	80 LPCD
TOWNSHIP	120 LPCD
INDUSTRIAL	10 M ³ /HA.D

Table 9.3 Water Demand Unit Rate Comparison

CITY	SINGAPORE	CAPE TOWN	AMSTERDAM	MELBOURNE	KIGALI
WATER DEMAND (LPCD)	155	225	147	142	120

- DIFFICULTY IN EXPANDING THE WATER NETWORK:** The undulating terrain of Rwanda poses a challenge in laying and expanding the existing water pipe network to cover the entire City. It is more economically viable to consider local water supply sources for rural areas that are inaccessible to the existing network.

9.1.2 WATER DEMAND ESTIMATION

The average water supply rate from EWSA to the customer is 45 lpcd. In reality, the actual water consumption for the customer in the urban area and commercial building can reach as high as 200 lpcd while the residents without access to the piped water use only 15 – 25 lpcd. This report would adopt the water demand unit rate shown in Table 9.2 to project the water demand for Year 2025 and Year X.

The water demand for rural areas is proposed to be in line with City-wide goal to supply 80 lpcd of potable water to the residents. The water demand for the urban areas is significantly higher to cater to the City projected growth in the future. In the

long run, as the City develops, standard of living is expected to rise significantly especially in the urban areas. However the proposed water demand of 120 lpcd is still relatively lower than the average water consumption of other urban cities such as Singapore, Cape Town, Amsterdam and Melbourne (refer to Table 9.3 for the comparison). This relatively lower rate is adopted based on the assumption that substantial water demand management strategies would be implemented as the City is being developed.

For planning purpose, the water demand for the industrial areas is proposed to be 10 m³/ha.d as a general guide.

The planning horizon for water supply is split into two following the land use plan, year 2025 and Year X. Based on the water demand unit rate listed in Table 9.12 the estimated water demand for Year 2025 and Year X is shown in Table 9.31.

9.1.3 PLANNING APPROACH

In Year 2025 and Year X, the City of Kigali would need to supply 369,078 and 622,089 m³/d of potable water to its residents. This is significantly higher than the current potable water supply of 59,000 m³/d from the existing water treatment plants. The existing water treatment capacity, potential water resource, planned water supply projects and water distribution system would be reviewed to provide the most cost effective and sustainable solutions for the City water supply system.

EXISTING WATER TREATMENT CAPACITY

Table 9.4 shows the summary of individual water treatment plant capacity and the water supply deficit that the City would be facing by Year 2025 and Year X. The deficit is derived based on the ultimate design capacity of these plants.

POTENTIAL WATER RESOURCE

To overcome the water supply deficit, the existing WTPs have to be expanded and new water resources must be identified to augment the water supply.

Besides the plan to upgrade Nyabarongo WTP from 25,000 m³/d to 40,000 m³/d, another new water resource that is currently under planning is to abstract spring water from Mutobo, Muzanse District near the northern boundary of Rwanda. The project is being planned by EWSA. It is expected to supply 120,000 m³/day of water for the City of Kigali and the surroundings upon completion in 2017. The water quality is better than the surface water and will require minimum treatment. Even with the planned projects, the water supply will not be sufficient to meet the future demand.

City of Kigali has an extensive network of river and quite a few big lakes surrounding it. To date, only water from Yanze River, Nyabarongo River and Lake Mugesera is abstracted for treatment to supply to the City. Another lake closest to the City, Lake Muhazi, has the potential of being a new water resource for the City.

As there is limited information on the existing water resource in Rwanda, an estimation of the volumes of the lake serves

as a guide to how much raw water could be abstracted for treatment. Table 9.5 provides some basic data of Lake Muhazi, Lake Mugesera and Nyabarongo River which could be considered in planning for water abstraction from them.

WATER DISTRIBUTION SYSTEM

Most of the water supply within the City would be distributed through the expansion of the existing water supply network. The planning of the water distribution network expansion is based on the following factors: Planning considerations for the future water distribution system are:

- **TOPOGRAPHY** – to consider expansion of network in areas where the elevation is not significantly higher than the existing network i.e. where pumping is still reasonable;
- **COVERAGE OF EXISTING NETWORK** – in areas too remote from the existing network or cut off by extremely high grounds, it may not be feasible or economically viable to expand the network there
- **WATER DEMAND DISTRIBUTION** – the expansion of the existing water supply network should focus on areas of high future demands. In rural areas where the water demand is relatively insignificant and scattered it would not be economically viable to expand the network there

WATER DEMAND MANAGEMENT

Besides augmenting the water supply, it is advisable to manage the water demand from the household level to township level.

At the household level, installing water saving devices shall be encouraged to reduce the water use (refer to Fig.9.1) while at the township level, the City should be looking at using alternative water sources such as rainwater harvesting (refer to Fig.9.2) or treated effluent from STP for non-potable use.

These strategies, if implemented properly, would be able to reduce the dependence on the potable water by 10 – 20%. Refer to Table 9.6 to compare how other cities in the world are managing their water usage.



Fig.9.1 Water Saving Devices
Source: Envirogadget, Plumbing4home, Ecobuilder



Fig.9.2 Rainwater Harvesting Tank
Source: The Innovation Diaries

Table 9.4 Water Supply vs Projected Water Demand

WATER TREATMENT PLANT (WTP)	RAW WATER SOURCE	CURRENT CAPACITY (M ³ /D)	ULTIMATE DESIGN CAPACITY (M ³ /D)	WATER DEMAND	
				2025	2040
KIMISAGARA	YANZE RIVER	22,000	22,000	369,078	622,089
NYABARONGO	NYABARONGO RIVER	25,000	40,000		
KARENJE	LAKE MUGESERA	12,000	12,000		
Total		59,000	74,000		
Deficit				-295,078	-548,089

Table 9.5 Basic Data of Lake Muhazi, Lake Mugesera and Nyabarongo River

POTENTIAL WATER RESOURCES	BASIC DATA
NYABARONGO RIVER	UPSTREAM, SURFACE AREA: 2,700KM ² , ANNUAL RAINFALL: 1,500MM DOWNSTREAM, SURFACE AREA: 4,450KM ² , ANNUAL RAINFALL: 1,200MM AVERAGE DEPTH: 2 - 2.5M, MAX. DEPTH: 4.6M
LAKE MUHAZI	MAX. LENGTH: 37 KM, MAX. WIDTH: 0.6 KM SURFACE AREA: 33 KM ² , AVERAGE DEPTH: 10 M MAX. DEPTH: 14 M, WATER VOLUME: 330 MILLION M ³ SURFACE ELEVATION: 1,443 M
Lake Mugesera	SURFACE AREA: 42 KM ² , AVERAGE DEPTH: 4 M MAX. DEPTH: 4 M, WATER VOLUME: 168 MILLION M ³

Source: Wikipedia

Table 9.6 Water Demand Management Comparison

WATER RECYCLING	30% OF SINGAPORE WATER SUPPLY COMES FROM TREATED WASTE WATER (NEWATER)
	TEL AVIV RECYLES AND REUSES 100% OF ITS SEWAGE FOR NON POTABLE USE.
	CALIFORNIA STATE HAS A LAW THAT ALLOW THE USE OF TREATED WASTE WATER FOR TOILET FLUSHING AND IN-BUILDING PIPING
RAINWATER HARVESTING	NEW ZEALAND'S RURAL POPULATION, WHO DOES NOT HAVE ACCESS TO THE MUNICIPAL WATER SUPPLY NETWORK, DEPENDS ON RAINWATER HARVESTING FOR BOTH POTABLE AND NON POTABLE USES
	MUMBAI HAS REGULATION THAT ENCOURAGES ALL NEW DEVELOPMENTS TO HARVEST RAIN WATER
	HOUSEHOLD IN MELBOURNE TYPICALLY HAS A RAINWATER HARVESTING TANK THAT IS USED FOR NON POTABLE USE
WATER SAVING DEVICE	SINGAPORE: 18% WATER DEMAND REDUCTION
	TOKYO: 20% WATER DEMAND REDUCTION

Source: Wikipedia

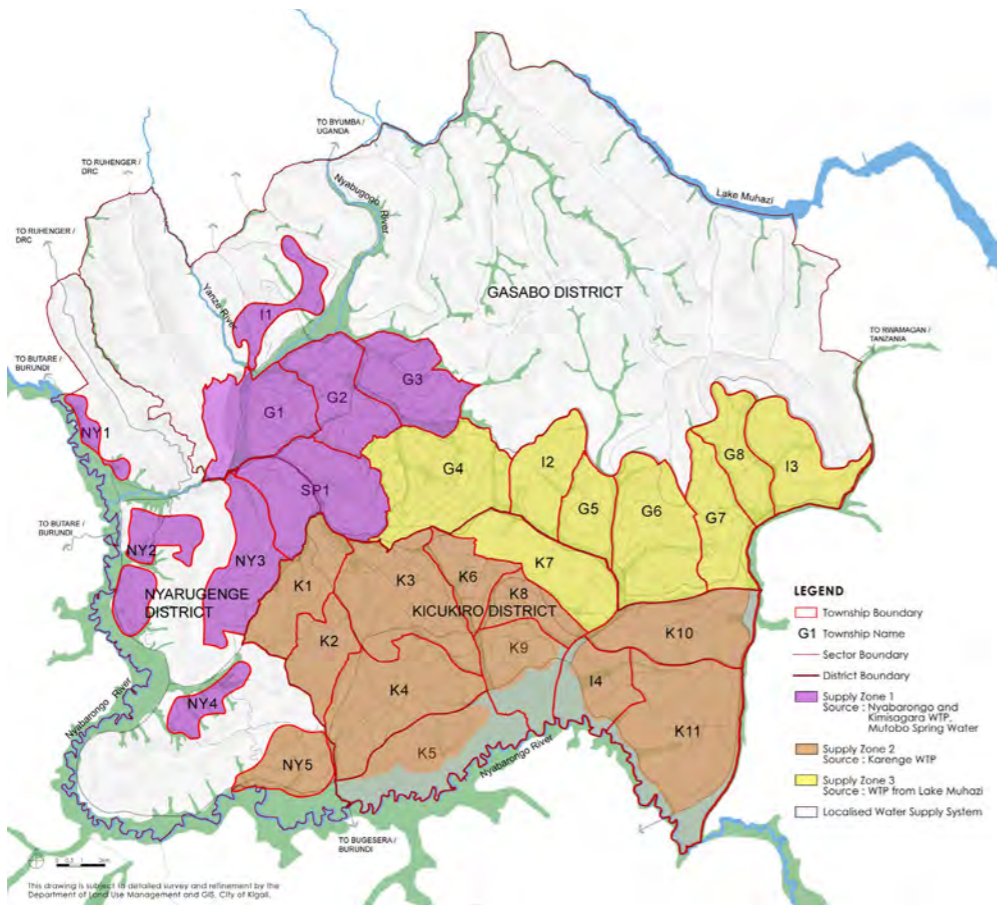


Fig.9.3 Proposed Water Supply Zoning

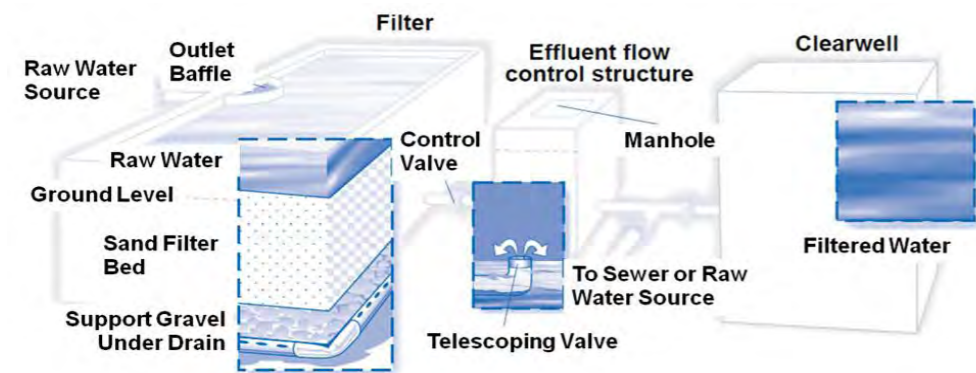


Fig.9.4 Slow Sand Filtration Diagram
Source: On Tap Volume 4, Issue 3 [1995]

9.1.4 PROPOSED WATER SUPPLY PLAN

Based on preliminary assessment of the existing water resources (refer to Table 9.5), Table 9.7 lists down potential water resources to be explored by Year 2025 and Year X. During the implementation stage, detailed hydrological and yield study need to be carried out for each Lake and River.

WATER SUPPLY DISTRIBUTION SYSTEM

Water supply distribution system for the proposed townships and industrial area would be expanded from the existing water supply network. These areas should have 100% access to piped water. There would be three water supply service zones based on their proximity to the water treatment plant (refer to Fig.9.3).

In 2025, the majority of the demand would come from Nyarugenge District and townships along the expressway that divides Gasabo and Kicukiro District. Water audit and maintenance program need to

be carried out on the existing network to ensure reliable supply for the future townships and industrial areas.

Currently, East Gasabo and Kicukiro are not entirely connected to the existing water supply network due to low demand. New developments are expected in these areas by 2025, hence the City has to focus on constructing new water supply infrastructure in these areas and connecting them to the existing water supply network.

In the rural area, it is recommended to utilise the local sources such as spring water or groundwater because of the scattered development and low water demand. Alternatively small scale WTP such as slow sand filtration plant could be considered (refer to Fig.9.4).

SLOW SAND FILTRATION SYSTEM

Slow Sand Filtration system is proposed for rural areas based on the following considerations:

- **LOW CAPITAL, OPERATIONAL AND MAINTENANCE COST** – It does not require sophisticated technology to build and can be constructed using locally available materials. Filtration process does not require electricity and chemicals hence lowering the operation cost.
- **SIMPLE OPERATION AND MAINTENANCE PROCESS** – It does not require technically skilled operator to operate and maintain the filters..
- **GOOD QUALITY OF TREATED WATER** – The combined physical and biological treatment process can remove turbidity, odour, colour and pathogen as efficient as other systems at a much lower cost.
- **LAND SPACE REQUIREMENT** – The drawback of slow sand filtration system is that it requires a lot of space due to its slow filtration rate. It is suitable for rural areas where water demands are not high and land is easily available.

Table 9.7 Projected Water Supply Augmentation

WATER RESOURCE	YEAR 2025			YEAR 2040
	EXISTING SUPPLY (M ³ /D)	PLANNED SUPPLY (M ³ /D)	PROPOSED SUPPLY (M ³ /D)	PROPOSED SUPPLY (M ³ /D)
YANZE RIVER	22,000	-	-	-
NYABARONGO RIVER	25,000	15,000 (ADDITIONAL)	60,000 (ADDITIONAL)	-
LAKE MUHAZI	-	-	50,000	100,000 (ADDITIONAL)
LAKE MUGESERA	12,000	-	96,000 (ADDITIONAL)	142,000 (ADDITIONAL)
MUTOBO SPRING	-	120,000	-	-
TOTAL	59,000	135,000	206,000	242,000
GRAND TOTAL		400,000		642,000

9.2 Sewerage

9.2.1 KEY ISSUES

Key issues that need to be addressed by the City are:

- SELECTION OF AN APPROPRIATE SITE FOR THE CENTRALISED STP:** The site that is currently being considered by the City is susceptible to flood. It would cause several issues to the STP operation such as overflowing of sewage into the surroundings and damage to the pumps. The City may need to consider another site or prepare mitigation measures to keep the STP running smoothly in the event of flood.
- DIRECT DISCHARGE OF SEWAGE INTO THE EXISTING WATER BODIES:** It will not only contaminate the water quality in water bodies but also pose a threat to public health. The City needs to progressively phase out septic tanks and pit latrines in the urban areas and provide adequate STP and sewer connections to curb the problem of direct sewage discharge.
- CONTAMINATION OF GROUND WATER BY PIT LATRINE:** As the sewage infiltrates the soil, it will need time to be treated by the organisms and cations in the soil. Most of the contamination cases usually occur at the areas with high water table or near the water bodies when the sewage has shorter retention time in the soil. The use of pit latrines at these areas needs to be prohibited in the future and be replaced with more environmental friendly system.

9.2.2 SEWAGE FLOW ESTIMATION

The sewage flow is estimated based on

the assumption that 80% of the water consumption would be collected as waste water by the sewerage network. Based on the projected water demand (refer to Table 9.3), the sewage flow for Year 2025 and Year X is shown in Table 9.8.

9.2.3 PLANNING APPROACH

Sewerage network planning is to be in line with Waste Water Master Plan as much as possible. The master plan was done for City

of Kigali by Electrogaz (EWSA former name). It was completed in March 2008. The study areas covered by the Master Plan only include Muhima, Nyarugenge, Kacyiru, Kimihurura, Kigarama, Kimironko, Remera and Narugunga (refer to Fig.9.5).

Several key points from the Master Plan such as construction of centralised Gitikinyoni STP and construction of sewerage network would be incorporated in the sewerage planning.

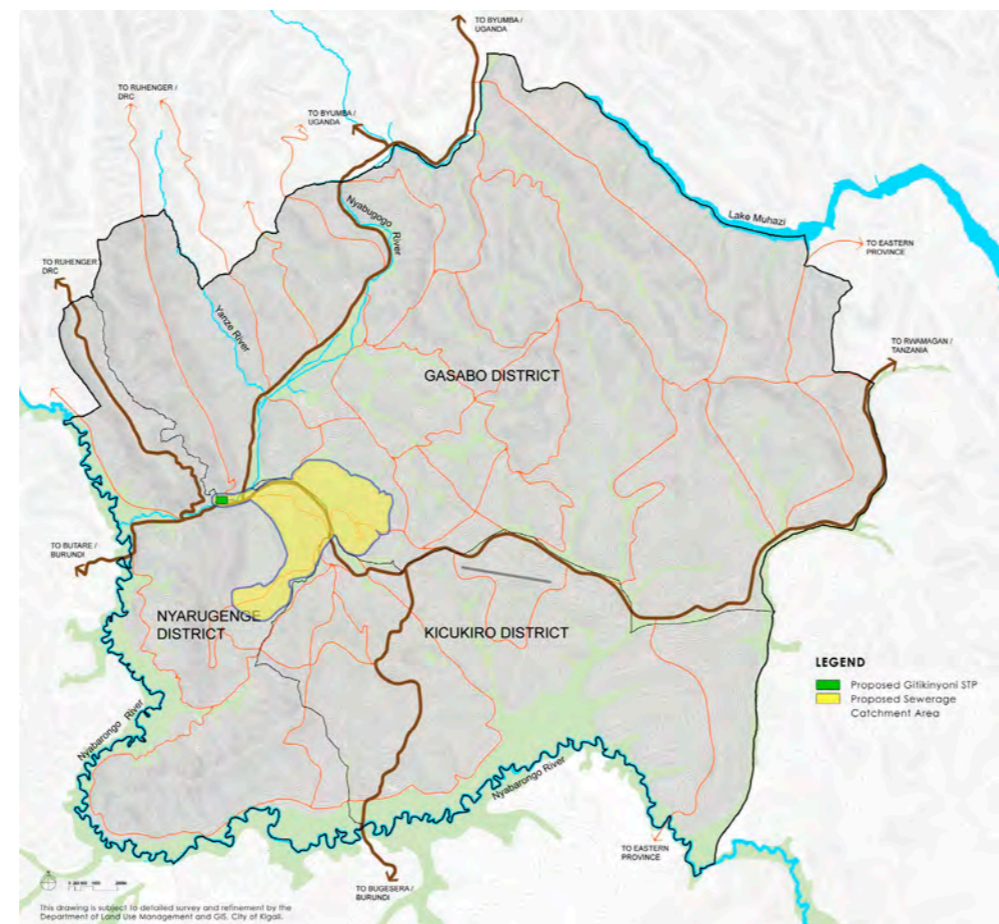


Fig.9.5 Proposed Location and Catchment Area of Gitikinyoni STP

Table 9.8 Sewage Flow Estimation for Year 2025 and Year X

LAND USE	YEAR 2025			YEAR 2040 / (YEAR X)		
	TOWNSHIP	RURAL	INDUSTRIAL	TOWNSHIP	RURAL	INDUSTRIAL
	(M ³ /D)	(M ³ /D)	(M ³ /D)	(M ³ /D)	(M ³ /D)	(M ³ /D)
SP1	46,080	-	-	46,080	-	-
NY1	5,322	-	-	7,680	-	-
NY2	1,728	-	-	16,320	-	-
NY3	20,732	-	-	28,800	-	-
NY4	-	-	-	7,680	-	-
NY5	1,728	-	-	13,440	-	-
G1	18,240	-	-	18,240	-	-
G2	19,200	-	-	19,200	-	-
G3	17,280	-	-	17,280	-	-
G4	33,600	-	-	33,600	-	-
G5	8,640	-	-	8,640	-	-
G6	8,352	-	-	23,040	-	-
G7	4,512	-	-	13,440	-	-
G8	-	-	-	9,600	-	-
K1	17,280	-	-	17,280	-	-
K2	-	-	-	7,680	-	-
K3	33,600	-	-	33,600	-	-
K4	30,720	-	-	30,720	-	-
K5	-	-	-	14,400	-	-
K6	8,640	-	-	8,640	-	-
K7	12,480	-	-	12,480	-	-
K8	-	-	-	8,640	-	-
K9	-	-	-	11,520	-	-
K10	-	-	-	21,120	-	-
K11	-	-	-	33,600	-	-
I1	-	-	-	-	-	3,630
I2	-	-	7,129	-	-	7,129
I3	-	-	-	-	-	8,086
I4	-	-	-	-	-	4,586
RURAL	-	-	-	-	11,520	-
TOTAL	288,134	-	7,129	462,720	11,520	23,431
GRAND TOTAL	295,263			497,671		

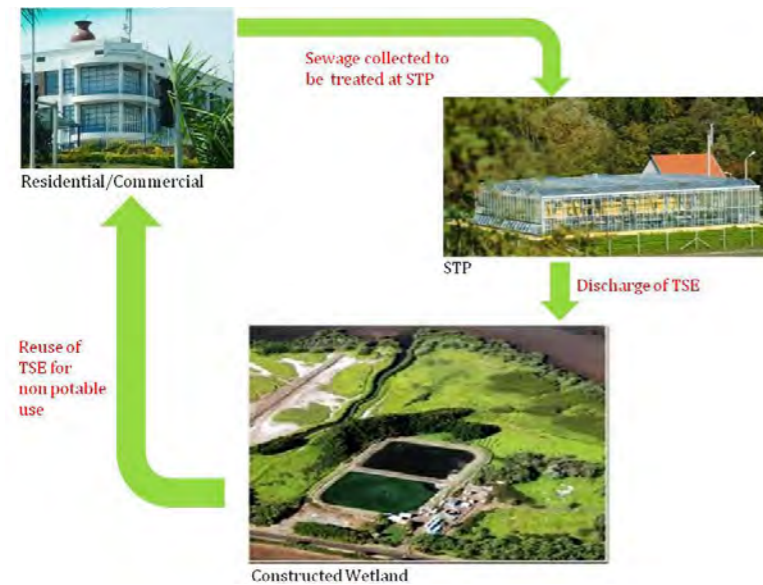


Fig.9.7 Sewage Flow Diagram

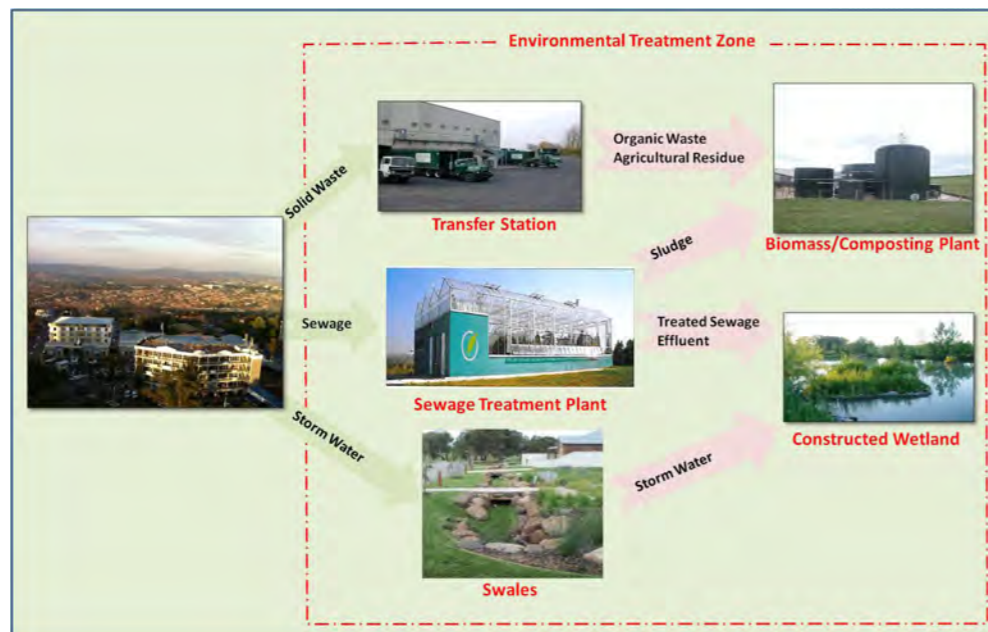


Fig.9.8 ETZ Process Flow Diagram

PHASING OUT OF PIT LATRINES

The use of pit latrines has to be phased out gradually by 2025. For areas with water scarcity problem, it should be replaced with more sustainable system such as ventilated pit latrines and Eco-San.

SEPARATION OF SEWAGE FROM STORM WATER

Sewage has to be separated from storm water because it would create health issue to the residents and would end up contaminating the receiving water bodies. Sewerage network should be connected to the individual housings to collect the sewage and convey it to the designated STP for treatment.

SEWAGE TREATMENT PLANT

At the moment, there is no sewage treatment plant for the City. The Waste Water Master Plan had proposed to construct an STP to treat the sewage from the future SP1 and NY3 Townships.

The STP is proposed to be constructed at



Fig.9.6 Proposed Gitikinyoni STP

the Nyabugogo river bed along the road of Kigali-Gitarama at Gitikinyoni (refer to Fig.9.6). It is currently a low lying area and located next to an existing wetland. The STP is designed to treat sewage flow of 27,000 m³/d by 2020 with physico-chemical treatment method.

For the remaining townships in the City of Kigali, decentralised STP would be proposed based on the following considerations:

- **EXISTING TOPOGRAPHY** – the City has an undulating topography. The numerous hills and mountains that separate the proposed townships make it uneconomical to collect all the sewage and channel to a centralized STP as extensive pumping will be required.
- **DEVELOPMENT DENSITY** – rural areas are quite scattered and not as dense as the development at the City centre. To connect all the scattered development together requires extensive sewerage network that passes through undeveloped land. Construction cost will be very high and not favourable.

Decentralised STP would be proposed for the township and industrial area. The number of STP within each township would depend on the terrain, land use and estimated sewage flow. In general, each township would be served by at least one STP. Treated sewage effluent would be further refined in the constructed wetland before final discharge into the receiving water bodies (refer to Fig.9.7).

Rural area would be encouraged to use on-site treatment such as septic tanks and Eco-San.

ENVIRONMENTAL TREATMENT ZONE

Each decentralised STP would be housed inside an Environmental Treatment Zone (ETZ). ETZ is the integrated waste management concept adapted from the Kigali City Master Plan (KCMP) report. The concept of ETZ is to isolate and treat all the unwanted waste in the same remote location so as to minimize contact between the residents and waste. It would have an STP, a constructed wetland and a solid waste management facility (refer to Fig.9.8).

Every ETZ does not necessarily have to include all the above mentioned elements. However STP and constructed wetland are the basic elements which will be present within each ETZ. Decision on what solid waste facility, if any, to be included in each ETZ will depend on the actual type of waste generated by the area contributing to it.

The planning considerations for the ETZ locations are:

- **LOW LYING AREA WITH GENTLE SLOPE** – for the sewerage network to flow to the STP by gravity.
- **PROXIMITY TO EXISTING WATER BODIES** – to discharge the excess treated sewage effluent from the STP after further treatment in the constructed wetland.
- **ACCESS FOR OPERATION AND MAINTENANCE** – it shall be located where vehicular access is possible.
- **ISOLATED** – preferably not within residential or commercial development with enough open space and greenery for buffer.

9.2.4 PROPOSED SEWERAGE PLAN

Each township shall be served by 1 – 2 decentralised ETZ. All the ETZ are proposed next to the existing rivers or wetland for final discharge. Refer to Fig.9.9 for the proposed location of the ETZ.

The ETZ construction would be split based on two time frame, year 2025 and Year X. Some township such as G6, G7 are expected to grow faster than the others by 2025, therefore the ETZ need to be constructed earlier. As the population grow gradually, the proposed facilities within the ETZ, such as STP and constructed wetland, can be constructed in phases. However sufficient land areas need to be reserved to cater for future demands.

To get a clearer idea of how the various components within an ETZ could be arranged, township G4 is selected as an example. It is projected to generate the highest sewage flow generation in Gasabo District.

The sewerage catchment area is divided by the ridge at the centre, therefore two ETZ would be proposed for G4. The blow up configuration of the ETZ to the east is shown in Fig.9.10. Solid waste facility shall be located near the main road for waste collection vehicle access. STP and Constructed wetland shall be located the low lying area with gentle slope. Proximity to the natural wetland or waterbodies is preferable for final discharge.

No ETZ is proposed for the industrial areas. Industrial waste water characteristic depends on the type of the industry. It is not advisable to mix and treat all the waste water in one STP. It is proposed that every future industrial user to construct and operate its own onsite industrial waste water treatment plant within its plot of land.

Simple and low cost onsite sewage treatment system such as septic tanks, and Ecosan would be proposed for rural areas.

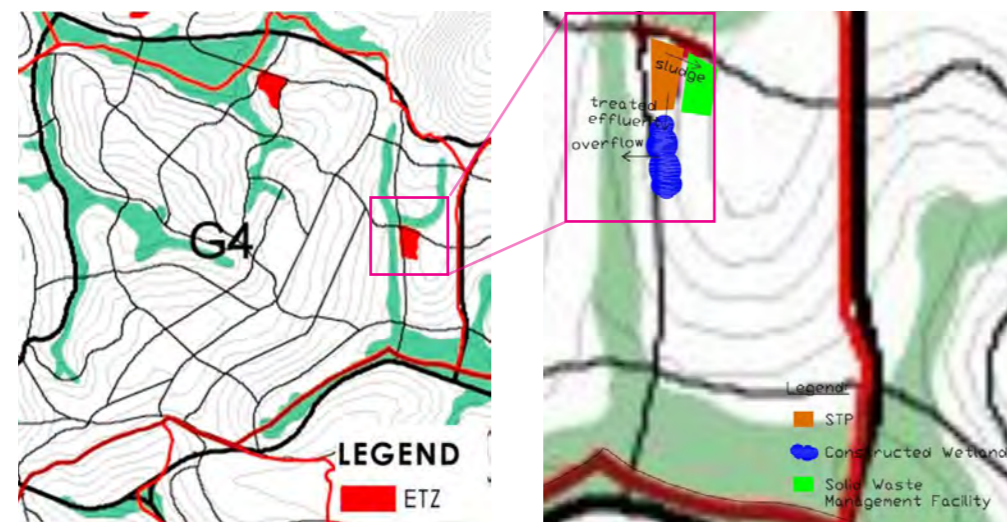


Fig.9.10 Typical ETZ Configuration

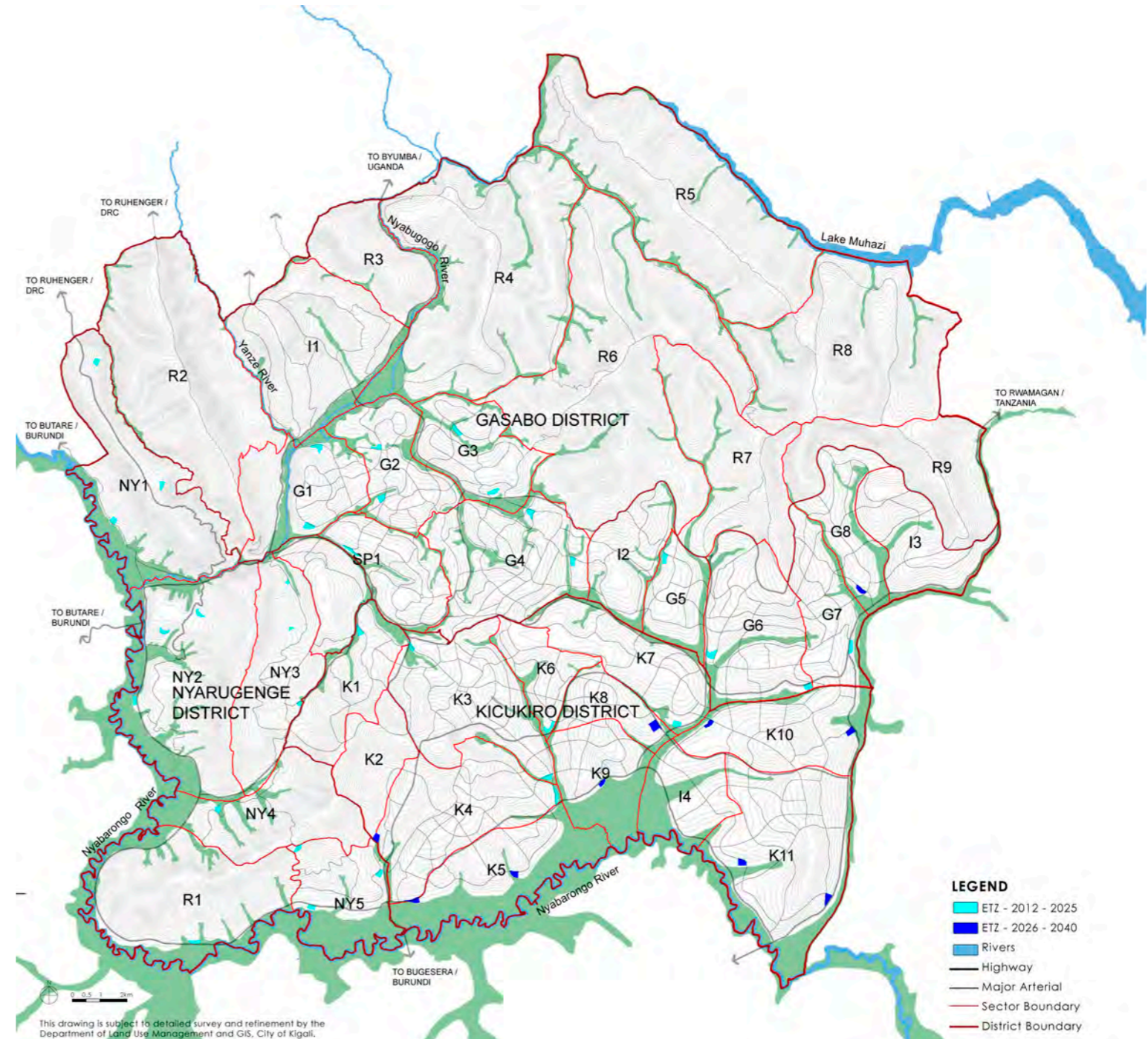


Fig.9.9 Proposed ETZ for Year 2025 and Year X

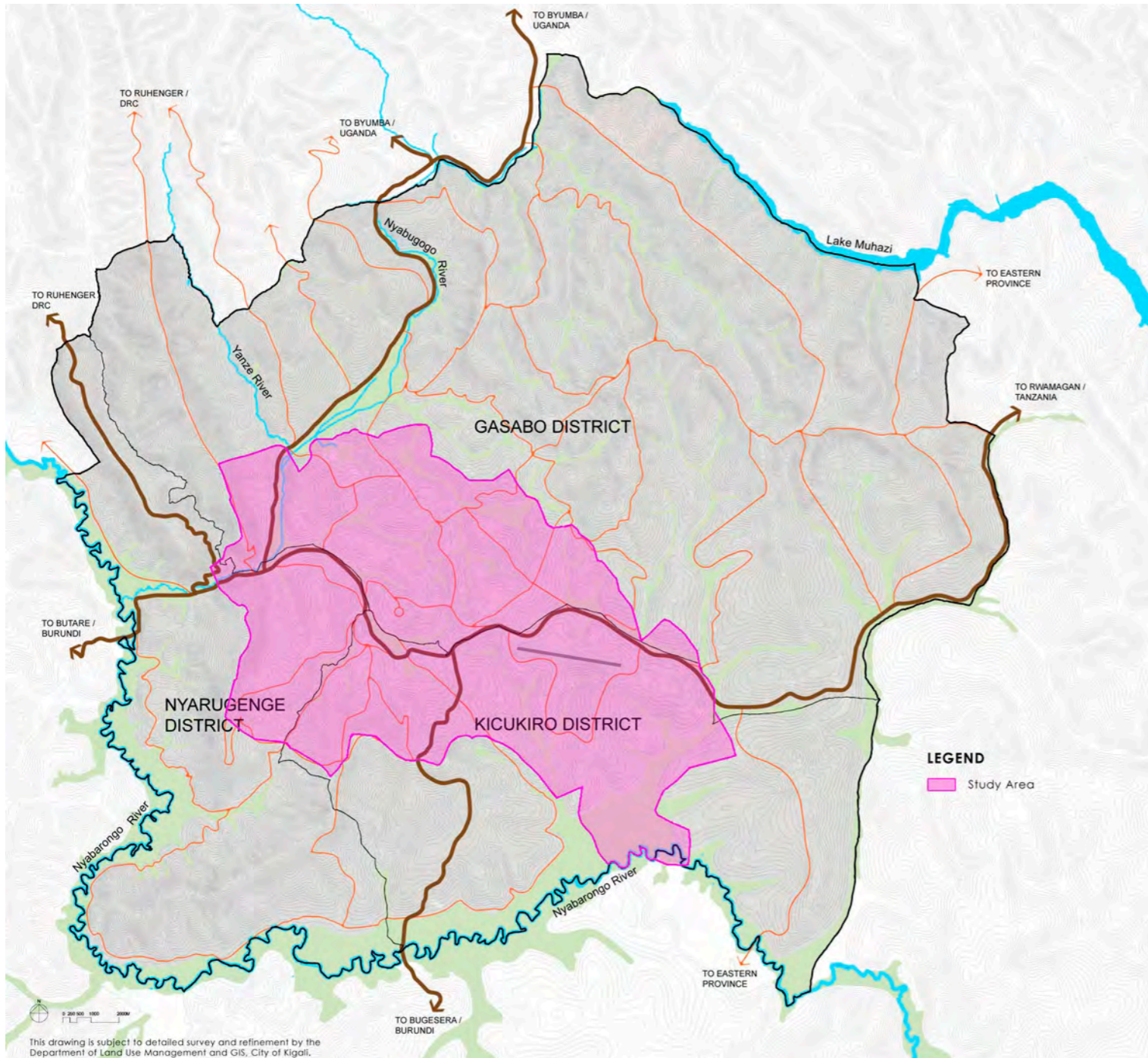


Fig.9.11 Study Area of Waste Water Master Plan

9.3 Storm Water Drainage

9.3.1 KEY ISSUES

Key issues that need to be addressed by the City are:

- **LACK OF SEPARATION BETWEEN STORM WATER AND WASTE WATER FLOW:** It is affecting the water quality in the public drains and eventually the receiving water bodies. To resolve this issue, close coordination with the implementation of the sanitation policy and proper sewage treatment system is necessary.
- **LACK OF STORM WATER MANAGEMENT:** Storm water should be seen as a resource to be valued and not to be got rid of. The City has a considerable amount of rainfall annually. with proper storm water management, it could be harvested for non-potable use such as landscape irrigation and general area washing. It would also help to reduce flood risks.
- **EROSION AT THE AREAS WITH STEEP SLOPES:** Gikondo Industrial Area and Nyamirambo area on the eastern slopes of Mount Kigali are some of the examples of such problematic areas. The eroded soil would eventually end up in the water courses and water bodies, thus reducing the drainage capacity and polluting the water environment. Earth control measures such as afforestation, soil terracing, contour farming, etc should be implemented to minimise soil erosion.

9.3.2 PLANNING APPROACH

The planning approach for storm water management is to minimize flood risk through on-site retention, improve the

quality of water to be discharged into the existing water bodies and to integrate the storm water infrastructure into the urban setting. The concept to develop storm water management as part of Sustainable Urban Development has been adopted in Australia, Singapore, UK, etc.

Storm water runoff is higher and faster at urban areas because there are many impervious surfaces that do not allow water infiltration to the ground. Storm water runoff picks up and carries pollutants along its flow path. It would eventually go to the water bodies at the downstream and compromise the water quality. There is also a possibility of flash flood and soil erosion during the heavy storm event if the runoff is too fast.

To create a sustainable storm water management for the City of Kigali, it has to be planned based on the following criteria:

- Removal of pollutant at source;
- Slow down of storm water runoff;
- Storm water retention ;
- Storm water reuse;
- Beautification of the existing and future waterways.

The City has an existing Storm Water Master Plan which was completed in March 2008 (refer to Fig.9.11 for the master plan coverage). It has proposed measures to improve the storm water management of the City of Kigali such as separation of sewage from storm water, rehabilitations and clean-up of the existing drainage network, formulation of storm water management policy, etc. These proposed measures are in line with the planning approach of this Conceptual Plan Report.

9.3.3 PROPOSED STORM WATER MANAGEMENT

The following sustainable storm water management features shall be proposed for the City of Kigali, wherever applicable.

VEGETATED SWALES

Vegetated swale is an open-channel drainage ways used to convey storm water runoff that can be used as replacement for the conventional drainage system (refer to Fig.9.12). It has both conveyance and pre-treatment function to remove soil particles and gross pollutants from the storm water runoff. It will not only beautify the surrounding landscape, it will also aid in the spreading and slowing of velocities of runoff.

Vegetated swale is usually installed at a gentler slope (1% to 4%) to maintain its conveyance function and prevent ponding during low flows. It is the most suitable to be installed within the development plot, recreational parks, car parks, etc. It can also be used to replace the road side drain for local street with gentler slope.

BIORETENTION SWALE

Bioretention swale is a vegetated swale with additional bio-treatment system at the base (refer to Fig.9.13). In addition to the conveyance and sediment removal function, it provides further treatment by allowing the runoff to percolate through the filter. The cleansed water would be collected by the perforated pipe at the drainage layer and conveyed to the water bodies at the downstream. Similar to vegetated swales, it can be installed within the development plot, recreational parks, car parks, etc.

BIORETENTION BASIN

Bioretention basin is a landscaped depressions or a shallow vegetated basin that is designed to slow down and treat the storm water runoff on-site (refer to Fig.9.14). It lets the runoff percolates through the filtration media. It does not have conveyance functions like swale. It can be installed at various scale and shapes such as planter box, roof top, car parks, etc. It is recommended to be installed at the upstream before main drains or constructed wetland.

CONSTRUCTED WETLAND

Constructed wetland is a shallow and extensively vegetated water bodies (refer to Fig.9.15). It is usually constructed at the downstream to further treat the pre-treated runoff from swales, rain gardens or public drains. It is designed to remove finer and dissolved particles. It consists of three treatment zones:

- Inlet zone (sedimentation basin), to let the larger to medium size pollutants settle down. It also acts as energy dissipaters and prevents scouring.
- Macrophyte zone (shallow heavily vegetated pond), to remove the fine particles.
- High flow bypass channel, to discharge the excess runoff and protect the macrophyte zone during heavy storm event.

The constructed wetlands can be proposed in the urban settings or within the ETZ zone. Constructed wetland within the ETZ can be designed to receive discharge from both

the surrounding contributing catchment and the treated effluent from the STP. The wetlands can be constructed on different scales according to the design capacity.

The final product of the constructed wetland can be slowly released to the water bodies or reused for non-potable use such as irrigation.

MAINTENANCE AND OPERATION

Vegetation plays an important role in every sustainable storm water management features. The selected plants should have fibrous root system to keep the soil porous, good nutrient removal capabilities and ability to withstand dry and wet environment.

Maintenance of these features will be concerned with:

- Weed removal;
- Removal of debris;
- Maintenance of the features profile;
- Maintenance of the vegetation by irrigation, mowing, pruning;
- Cleaning of the inlet and outlet to prevent clogging;
- Flushing of the perforated pipe.



Fig.9.12 Vegetated Swale
Source: ABC Water Guideline

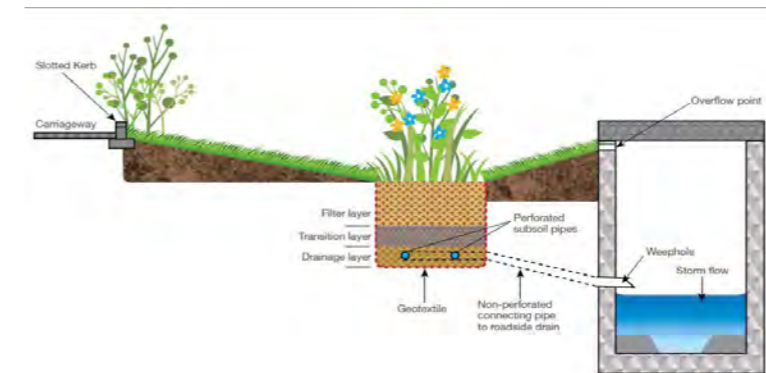


Fig.9.13 Bioretention Swales
Source: ABC Water Guideline

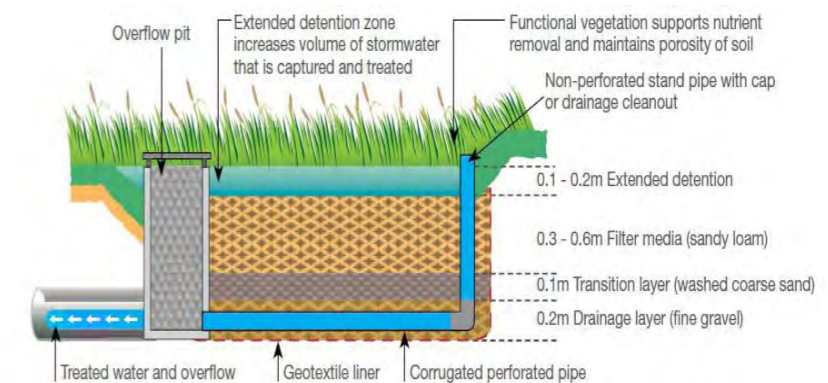


Fig.9.14 Bioretention Basin
Source: ABC Water Guideline

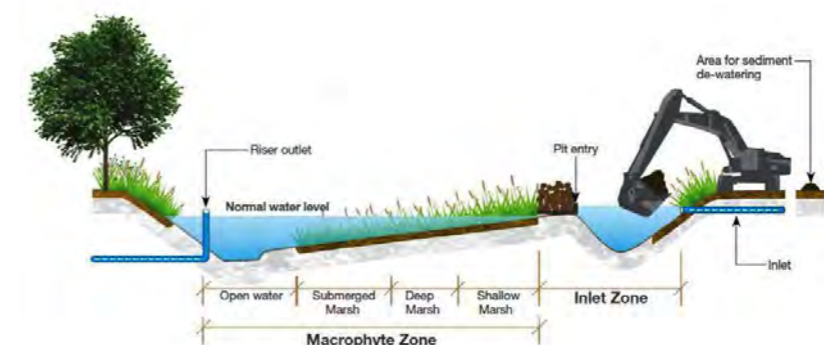


Fig.9.15 Constructed Wetland
Source: ABC Water Guideline

Table 9.10 Projected Power Demand for Year 2025 and Year X

PLANNING AREA	MAX DEMAND 2025 (MW)	MAX DEMAND 2025 (MVA)	MAX DEMAND 2040 (YRX) (MW)	MAX DEMAND, 2040(YRX)(MVA)
SP1	78.8	92.7	106.0	124.7
SP2	42.8	50.3	57.6	67.7
NY1	9.1	10.7	17.7	20.8
NY2	3.0	3.5	37.5	44.2
NY3	35.4	41.7	66.2	77.9
NY4			17.7	20.8
NY5	3.0	3.5	30.9	36.4
G1	31.2	36.7	42.0	49.4
G2	32.8	38.6	44.2	52.0
G3	29.5	34.7	39.7	46.8
G4	57.4	67.6	77.3	90.9
G5	14.8	17.4	19.9	23.4
G6	14.3	16.8	53.0	62.4
G7	7.7	9.1	30.9	36.4
G8	-	-	22.1	26.0
KT1	29.5	34.7	39.7	46.8
KT2	-	-	17.7	20.8
KT3	57.4	67.6	77.3	90.9
KT4	52.5	61.8	70.7	83.1
KT5	-	-	33.1	39.0
KT6	14.8	17.4	19.9	23.4
KT7	21.3	25.1	28.7	33.8
KT8	-	-	19.9	23.4
KT9	-	-	26.5	31.2
KT10	-	-	48.6	57.2
KT11	-	-	77.3	90.9
I1	9.9	11.6	13.3	15.7
I2	20.3	23.9	27.4	32.2
I3	23.1	27.2	31.1	36.6
I4	12.6	14.9	17.0	20.0
RURAL	-	-	-	-
TOTAL	601.2	707.3	1,210.7	1,424.4

9.4 Power Supply

9.4.1 KEY ISSUES

Some of the key issues to be addressed by the City are as follows:

- **LOW ACCESS TO ELECTRICITY IN THE RURAL AREA:** Alternative energy sources should be considered for areas that are not close to the national grid.
- **LACK OF UTILITY RESERVE ALONG PUBLIC ROAD AND LAND SPACE FOR POWER INFRASTRUCTURE:** Due to uncoordinated planning between land use and infrastructure, there is often insufficient space to lay power cables within the road reserve and/or no suitable plots to build electrical substations. In most cases, additional cost is incurred to acquire land for the construction of substations and/or divert the existing utility services to provide space for new power cables. Sufficient land and utility reserves need to be set aside while planning for future growth and land use.

Table 9.9 Spatial Load Forecast

YEAR	WATT, MAX DEMAND PER CAPITA	POPULATION (MILLION)	MAXIMUM DEMAND, MW
2012	126.84	1.22	154.74
2015	134.6	1.51	203.25
2018	142.84	1.86	265.69
2021	151.58	2.26	342.58
2024	160.86	2.72	437.55
2027	170.71	3.22	549.68
2030	181.16	3.7	670.28
2033	192.25	4.16	799.74
2036	204.01	4.58	934.38
2039	216.5	4.96	1,073.84

9.4.2 PROJECTED LOAD DEMAND

SPATIAL LOAD FORECAST

In order to plan efficient operation and economic capital expansion of an electric power system, the system owner must be able to anticipate the need for power delivery – how much power must be delivered, and where and when it will be needed. Such information is provided by a spatial load forecast, a prediction of future electric demand that includes location (where) as one of its chief elements, in addition to magnitude (how much) and temporal (when) characteristics.

The spatial load forecast for the Kigali City is approximately 1,074 MW in the year Year X based on population of 5 million. The projected power demand for the development at 3-year interval starting from 2012 to 2039 is as shown in Table 9.9. This number will continue to increase as future areas are developed in the city.

The projected load demand is based on following assumptions:

- The electrification rate is 100% for Kigali City (current coverage area of electricity supply is estimated at 60%.)
- The kWh per capita per year is 500 kWh or 126.84 watt per capita and load factor of 0.45. According to the data given by EWSA on the power consumption for year 2011, the estimated electricity consumption for Kigali city is 405 kWh per capita per year (peak).
- The yearly increase of maximum demand per person is 2% as a result of higher earnings and high standard of living (attributing to the usage of more electronic products).

Based on Table 9.9, the growth rate for the City is about 10% for the first 15 years and slowing down to 5 % in year Year X. The projected load demand for the City is shown in Table 9.10.

9.4.3 PLANNING APPROACH

The physical process of electricity supply consists of three stages (refer to Fig.9.16, they are:

- power generation,
- transmission, and
- distribution.

POWER GENERATION

Electricity is generated at power stations from various natural resources such as coal, natural gas, hydro, solar, geothermal and wind. Generation can be likened to a manufacturing process where raw materials are transformed into a finished product. The power stations produce electricity in large quantities where economies of scale can be achieved.

There are currently 4 power plants in or near the Kigali city, namely Gikondo diesel plant, Jabana diesel plant, Jabana HFO, and Kigali solar power plant (Jali). These power plants supply a limited power supply to the Kigali city, while most of the power is supplied from the power plant at the remote area of Rwanda.

POWER TRANSMISSION

The electricity transmission network refers to the pylons, wires and substations that make up the national grid. Power stations are located at or close to the fuel resource which is often a considerable distance from where the major demand for electricity is located. Large quantities of electricity are therefore transported over the transmission network to major substations located in key areas. Supply may also come from power stations in other states via interconnectors which link the transmission systems.

Transmission can be likened to the bulk transport of goods and products. Just as container loads are broken down into smaller quantities for wholesale and then retail distribution, the output from power stations is transmitted from major substations to local substations where it is further divided for distribution.

High voltages are needed for the economic transport of large quantities of electricity but these voltages are far too high for customers to use. The transmission voltages are reduced in several stages, initially in substations, by transformers. The substations also contain switchgear which controls the flow of electricity between substations and into the distribution network.

As the bulk supply of electricity is divided into smaller quantities, the voltage can be lowered. The result is a large network of power lines, all operating at different voltages according to how much electricity they have to carry, bringing electricity closer and closer to where customers want to use it and then delivering it literally to their door at an appropriate supply voltage. The existing transmission line available at the Kigali City is 110kV and 70kV (AC) line. The sub-transmission line consisted of 30kV line.

POWER DISTRIBUTION

Local substations supply the distribution system which is a network of high voltage (HV) and low voltage (LV) feeders. These feeders could be overhead power lines or underground cables.

Distribution transformers reduce high voltage to low voltage for use within

households, shops, businesses, factories, hospitals, schools, etc. Some customers with large commercial or industrial premises may be supplied at high voltage.

Overhead power lines are a widely used and economic way of transmitting and distributing electricity. However, they are vulnerable to a variety of environmental and third party influences such as storms, lightning strikes, vandalism, and vehicle accidents.

Underground cables are considerably more expensive than overhead lines and are often installed for aesthetic or safety reasons (eg, avoiding the need to have overhead power lines close to multi-storey buildings in city streets). They are more complicated in construction but are also protected from most of the problems encountered by overhead power lines.

The central business district and commercial centers of major cities will have the highest reliability because of the greater use of underground distribution, both high and low voltage, and the relatively shorter lengths of these lines, reducing their exposure to environmental problems.

For urban/suburban residential and commercial areas in cities and major towns will have a mixture of underground cables and overhead power lines. These areas are usually supplied from an interconnected network with at least one alternative source of supply.

Areas outside the CBD and urban/suburban areas such as rural regions and associated small towns are usually supplied by overhead lines with limited or no interconnections to alternative sources of supply.

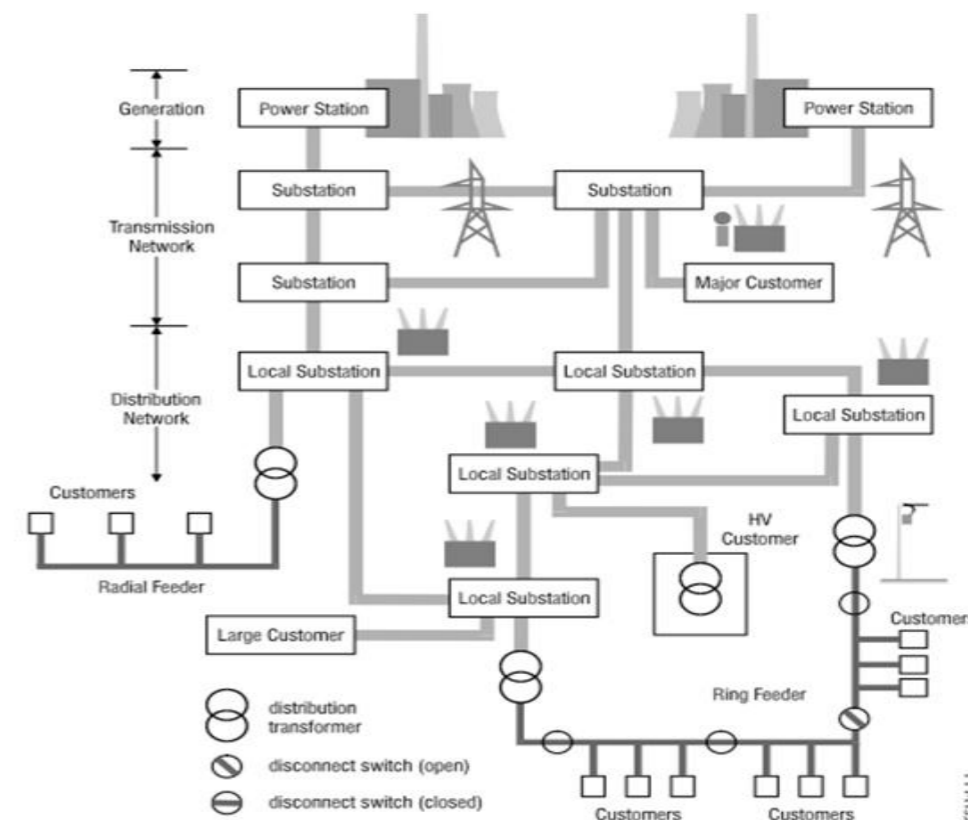


Fig.9.16 Power Supply Stages

The major distribution line for the Kigali city is lower voltage at 3 phase 4 wires 380V or single phase 2 wires 220V. For large customer, they can intake 15kV medium voltage line.

9.4.4 PROPOSED POWER SUPPLY PLAN

As the projected load demand for the city is more than 647 MW or 760 MVA, it is proposed to increase the grid one higher level to 220kV. Currently, the existing grid system at Rwanda is AC 110kV, 70kV, 30kV and 15kV.

At year Year X, 4 numbers of 220kV/

110kV substations are proposed for the development, which each substation shall install 3 numbers 150 MVA transformers (refer to Table 9.11 and Fig.9.17).

Space need to be reserved for the future overhead power line and pylon. The maximum distance between pylon, minimum distance beneath the cables, and buffer are indicated in Table 9.12.

Existing transmission line would be upgraded and merged into the new network in stages. The substations can be built first and space can be reserved for future expansion of outdoor switchgear and

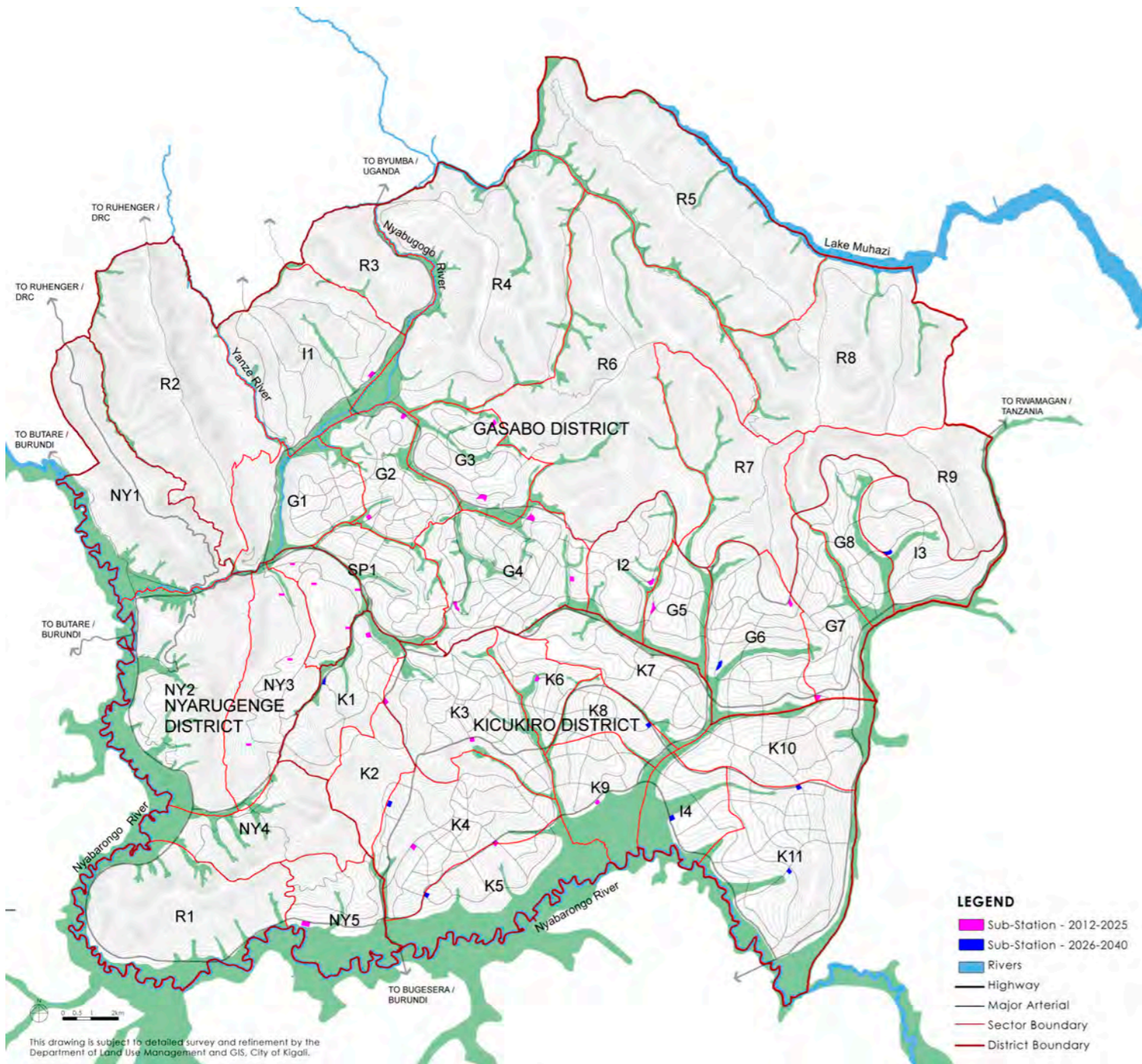


Fig.9.17 Proposed Substation Location for Year 2025 and Year X

transformers. In short, the service provider can initially install the 2 transformers and only install the third one when demand increases.

POWER GENERATION PROPOSAL

1424 MVA is the indicative maximum demand of the City at year Year X. The service provider need to consider the excess demand (normally 15% higher than maximum demand) and the transmission losses along the power line, which is normally between 25% to 30% depending on the distance from power plant to City.

The current power plants capacity is about 85MW including power supply import from the neighboring country. The EWSA plans to generate additional 1000MW from

year 2011 to 2017 from various sources such as hydropower (232MW), geothermal (310MW), methane (300MW) and peat (200MW).

For additional power requirement, the service provider could consider other power plant such as natural gas power plant, wind, solar,etc.

ALTERNATIVE POWER SUPPLY

In Kigali, where most of the electrical power comes from the burning of imported diesel fuel outside the Sub-Area, alternative renewable energy sources are important for sustainable & independent development within the Sub Area (township). While some of the new technologies may seem to be more expensive than fossil fuel electrical

Table 9.11 Proposed Number of Substations

SUBSTATION TYPE	TRANSFORMER (2 TO 3 NUMBERS), MVA	LAND SIZE (WITH OUTDOOR SWITCHGEAR)	QUANTITY
220kV / 110kV	120, 150, 180	150M x 150M	4
110kV / 70kV	50, 63, 80	150M x 150M	18
110kV / 30kV	30, 40, 50	150M x 150M	14
70kV / 30kV	20, 30, 40	100M x 100M	33
30kV / 15 kV	10, 15	50M x 50M	138

Table 9.12 Space to be Reserved for Future Installation

CIRCUIT VOLTAGE	MAXIMUM DISTANCE BETWEEN PYLON (M)	MINIMUM DISTANCE BENEATH THE CABLES (M)	BUFFER REQUIRED (M)
220kV AC	375	11	45
110kV AC	250	8.5	45
70kV AC	250	8.5	30
30kV AC	250	8	30

generation, fossil fuels have “external” costs that are not computed into up-front costs (such as environmental, political & health costs). These hidden costs have important implications for long term national security and environmental sustainability as well as medical costs. Their hidden costs should be calculated into decisions about energy supply.

In addition, there is important economic development potential for Rwanda by emphasizing green technologies. By using these technologies abundantly and developing prototypes, Rwanda can position itself as a leader in this arena and potentially develop a clean energy industry that can provide technology to the whole Central/East Africa region. The range of new / green energy technologies is growing exponentially. Solar photovoltaic (PV) can be mounted to roof tops or banked together in generation plants within each township. PVs can be used as roof shelters, park shade structures, window shades and even facades.



Other renewable sources to be utilized within the township include: biogas & biomass generators from wet organic waste in the sewer system and dry organics (from such sources as market & produce processing waste) respectively. Gravity water flow from hilltop storage tanks in the township will generate electricity while reducing water pressure to appropriate levels.

PHOTOVOLTAIC

Photovoltaic (PV) cells should be incorporated where feasible into individual buildings, including civic buildings. Although not as cost effective (at this time) as fossil fuel generation, it is expected that with the increased development in the City and the problems associated with electrical generation, PV's would provide a reliable source. This film PVs can be applied to any exterior surface exposed to direct sunlight. As a matter of thumb, household energy needs can be met by reserving 9 m² unit on a north or near north facing roof along with architectural design guidelines which



will make the incorporation of solar energy more cost effective.

ELECTRICAL POWER “SMART” GRID

The state of the art in electrical power distribution flow is moving from the hierarchical large central power plant grid to a network grid for decentralized power generation sources. The integration of multiple renewable energy sources is changing the way distribution is achieved. The diversity of sources such as solar photovoltaic, wind, hydro and biofuels that may contribute inconsistent peaks in generation from different locations requires a “smart” grid to balance loads from many sources and distribute them to where they are needed. Hydrogen generation is even being tested as an energy storage medium to offset the highs and lows of wind power generation. This kind of power grid will allow anyone to contribute it and be reimbursed through reverse metering.



REDUCING DEMAND: ELECTRICAL ENERGY EFFICIENCY

Because of the rapidly increasing demand and cost for electrical power in Kigali, new development in the township must be energy efficient and lighten the new loads within the Sub Area. Multiple small savings at the individual building and residential units in aggregate can make a very large difference in energy consumption and the sizing of the electrical distribution system.

Proper building design in solar orientation, materials, shading configurations and passive cooling strategies will make mechanical cooling largely unnecessary. As more residents move to automated washing and drying of clothing, laundromats should be conveniently located in the neighborhoods for centralized services utilizing high efficiency washers and dryers.

“EnergyStar” or similarly efficiency rated equipment and appliances are to be used throughout new developments, including especially water heaters (which may also be solar) and refrigerators.



Lamps for light fixtures should be LED or compact fluorescent where ever possible. Alternative briquette, gas, oil or solar cookers will greatly reduce electrical demand.

Thermal mass, radiant barriers, thermal insulation and vented skin technologies also serve to reduce requirements for cooling. Where some mechanical cooling is still desirable, low energy consumption techniques such as evaporative cooling, night time recharge, geothermal exchange, domestic water chill beam and other forms of radiant cooling are recommended.



Fig.9.18 Alternative Power Sources (Left to Right : Solar; Bio-gas; Hydrogen; Geothermal; Wind)

10 WAY FORWARD



Fig.10.1 Stakeholders Meetings

10.1 Way Forward

The proposed Kigali City Master Plan sets the direction for the development of Kigali City for the next 30 years. This Report presented the Conceptual Plan for the City of Kigali highlighting the broad level land uses, zoning and implementation method.

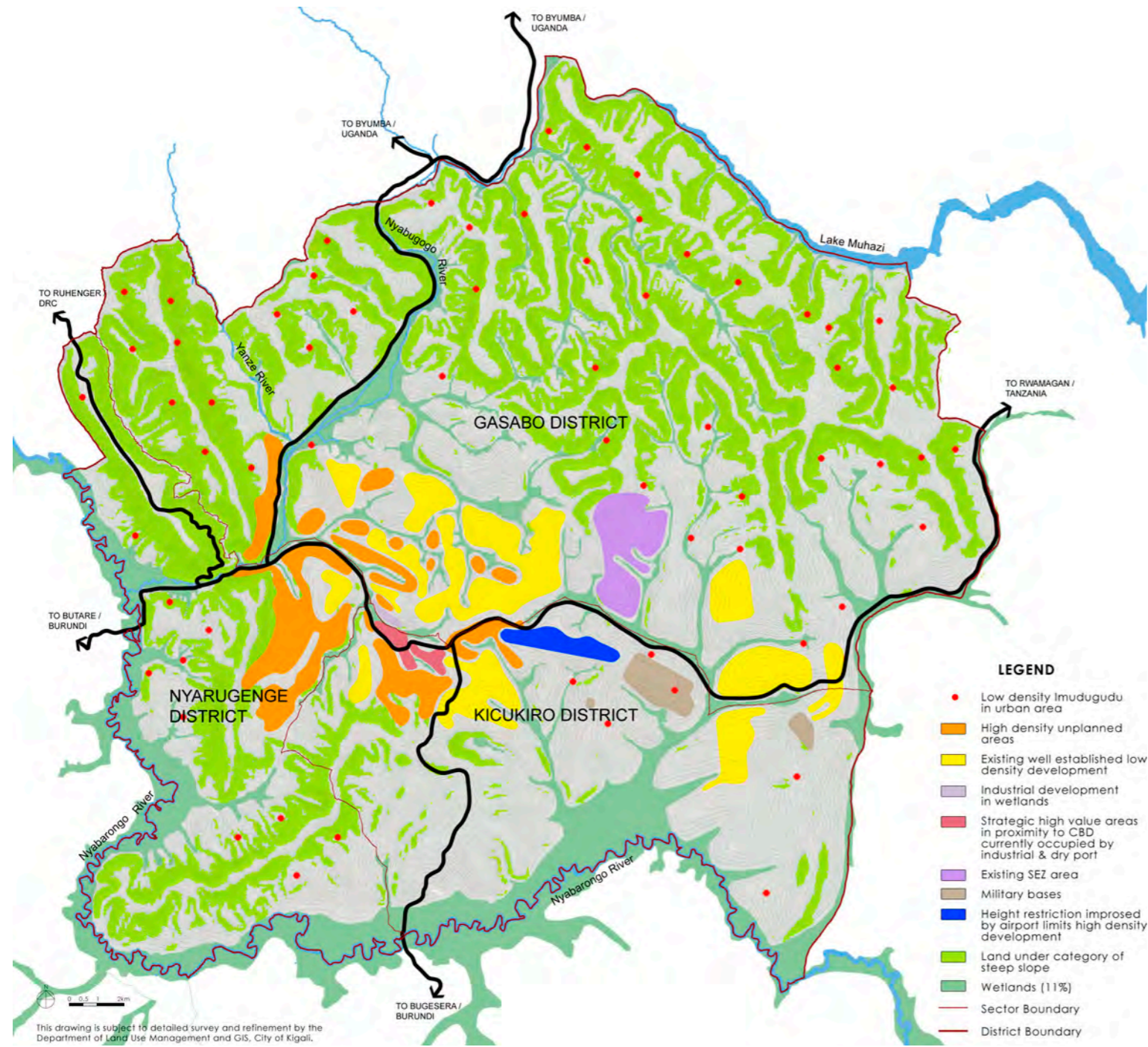
The subsequent phases will include the following key tasks:

- Feedback will be gathered from the City and Stakeholders.
- Detailed Master Plans will be prepared for Gasabo and Kicukiro Districts. The detailed land use plan will include rationalization as per cadastral information; and provision of facilities such as neighborhood centre, primary and secondary schools, local parks, etc at

- the neighborhood level (in Task Order 4).
- The development control guidelines and the zoning plans for the city and the districts will be prepared as per the detailed land use plans (in Task Order 4).
- Urban Design proposals for Gahanga & Kimironko - Gisimenti Corridor will be prepared highlighting the urban design guidelines (in Task Order 5).
- The detailed implementation strategies will be recommended with key actions required and the detailed scopes of Priority Projects (in Task Order 6).

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APPENDIX 1: KIGALI CITY CONTEXT



Constraints Map of Kigali City

DEVELOPMENT CONSTRAINTS AND OPPORTUNITIES

Kigali's key physical constraints and opportunities are identified based on the existing context analysis. The key objective of identifying the Kigali's development constraints and opportunities are to understand the site constraints that are required to be respected as given site conditions, and to optimize the potentials offered by the site which shall be considered for the new city Master Plan.

KEY DEVELOPMENT CONSTRAINTS

More than half of the City's land area is constrained by natural limitations. Other physical constraints include some of the existing site uses and the recently approved projects especially around the urban areas.

DEVELOPMENT CONSTRAINTS IMPOSED BY ENVIRONMENTALLY SENSITIVE AREAS

- 19% of the Kigali is occupied by the wetlands and these environmentally sensitive areas require to be respected. Large areas of these wetlands are spread along the southern and western boundaries of the City along the Nyabugogo river. As per the organic law, all wetlands and natural water bodies need to be provided with 20m buffer which is restrained from development.
- The City is also constrained with geographical terrains largely in Gasabo and Nyarugenge districts. Around 31% of City's land falls under the "Steep Slope" Category, which is the land with a slope of more than 20%. This further leaves just about one-third of land available for development. These steep slope areas are environmentally sensitive and needs to be restrained from urban development.

DEVELOPMENT CONSTRAINTS IMPOSED BY EXISTING AND APPROVED DEVELOPMENTS

- Currently, 7% of the City's land is taken up by unplanned developments without proper access to roads, infrastructure services and public facilities. While it is essential to either improve or redevelop these urban areas, some of it may remain as constraints due to limited City resources. A different urban strategy will be required to improve the living conditions within these unplanned areas.
- Further to this, around 1% of the city area is occupied by good class single family housing mostly around the prime areas in proximity to the city core which potentially could accommodate much higher densities. These houses will require to be retained due to its well established high end neighborhood character.
- Other strategic high value areas in Gikondo are also occupied by pollutive industries and the dry port. These will need to be relocated in the long term to rationalize the use of such prime land in close proximity to the City centre.
- While the City is growing fast with number of new development projects; most of the approved residential projects such as Cyaruzinge, Nyagahanga, Gisozi, Kinyinya, Gaciliru and Rukatsa including the industrial development project at Kigali SEZ are proposed in the strategic areas along east west corridor but with very low densities. Hence, these proposals constrain the optimal development potential of these sites.
- The current airport at Kanombe constrains the air space of the urban area around it due to the height restriction imposed.
- Special uses such as military land also restrict the new development in that area.

KEY DEVELOPMENT OPPORTUNITIES

The City is blessed with a scenic nature scape and a pleasant salubrious climate. Sizeable areas of land are free of development and available especially in the Gasabo and Kicukiro districts for the urban expansion.

AMPLE STRATEGIC AREAS FOR NEW DEVELOPMENT

- A total of 266 sq km or 36% of City's land is developable in the City of Kigali out of which 17% is currently occupied by the existing urban developments. Around 153 Ha of virgin land along the north and south of the EW corridor is available for new urban developments.

OPPORTUNITIES FOR URBAN REDEVELOPMENT

- 67 Ha of land is currently occupied by unplanned settlements and low density urban areas and have the potential to be redeveloped as the comprehensive high density urban areas for housing and commercial developments with integrated public facilities and infrastructure services.

REVITALIZATION OF CENTRAL BUSINESS DISTRICT

The tri-nodal existing CBD constitutes of Nyarugenge and Muhima (Commercial zone), Kacyiru (Administrative zone) and Kimihurura (Diplomatic zone) can be further strengthened and fortified as the premier business district of Rwanda.

OPPORTUNITIES FOR NEW EMPLOYMENT NODES

- Approved international railway lines connecting Kigali to Dar- Es - Salaam and Musongati provide greater opportunities for logistic and industrial activities in Kigali City. The rail line is planned to be

extended further to the north towards Uganda in future.

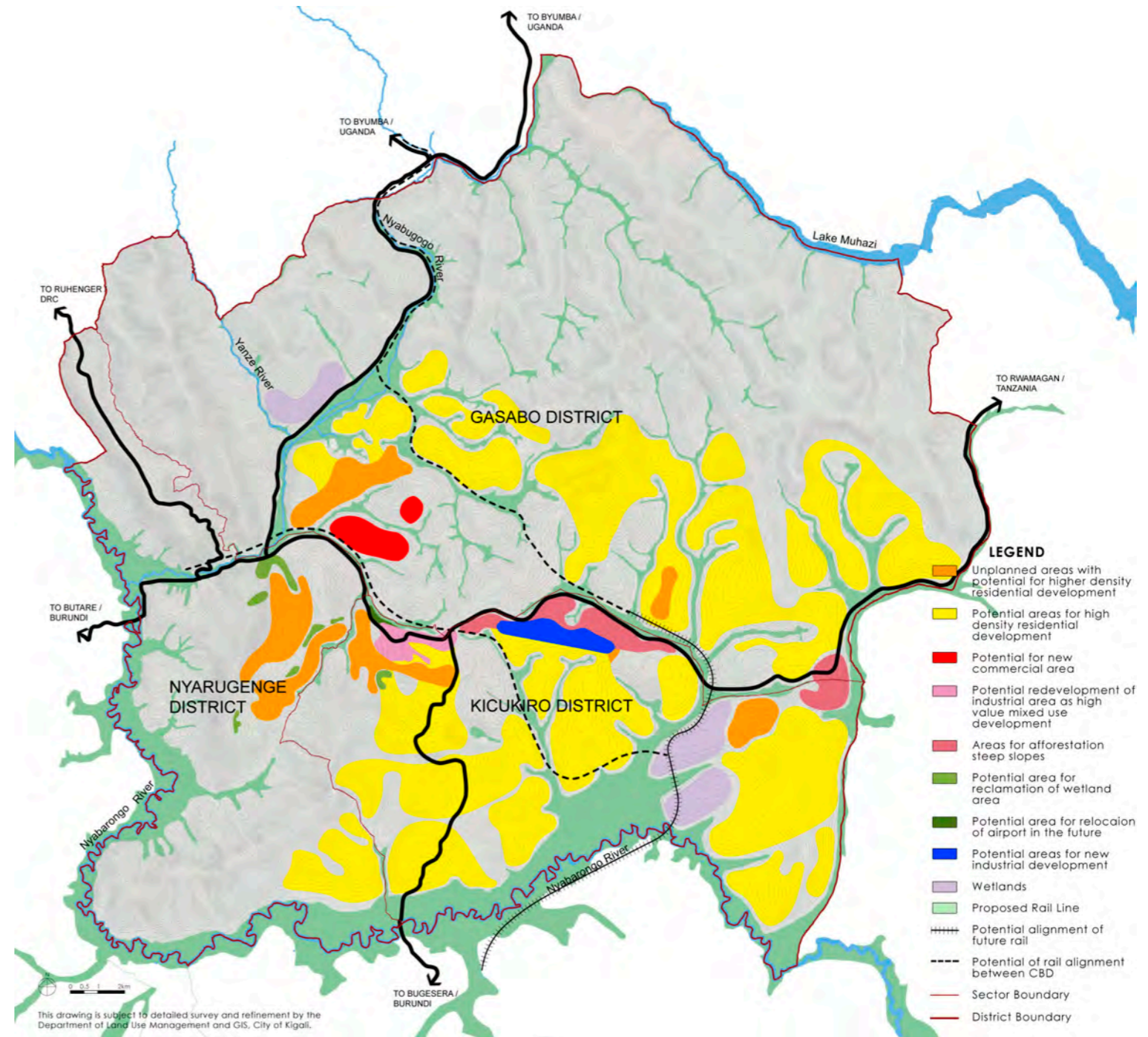
- There are some existing scattered industrial development around Gatsata along the Kigali- Gatuna Road in the northern part of Gasabo. Hence, the scattered industries could potentially be consolidated and safeguarded as expanded employment node with variety of industrial and logistics development.
- The approved rail line passes through Masaka, connects to the Kigali SEZ and are also proposed to connect to the upcoming international airport at Bugesera south of Kigali which further increases the opportunities for air cargo. This provides the opportunities for developing logistics for perishable goods around Masaka.
- The current mixed use pattern along the EW road provides opportunities to develop this corridor as a high density mixed use development corridor.

POSSIBILITIES OF REGIONAL PASSENGER RAIL

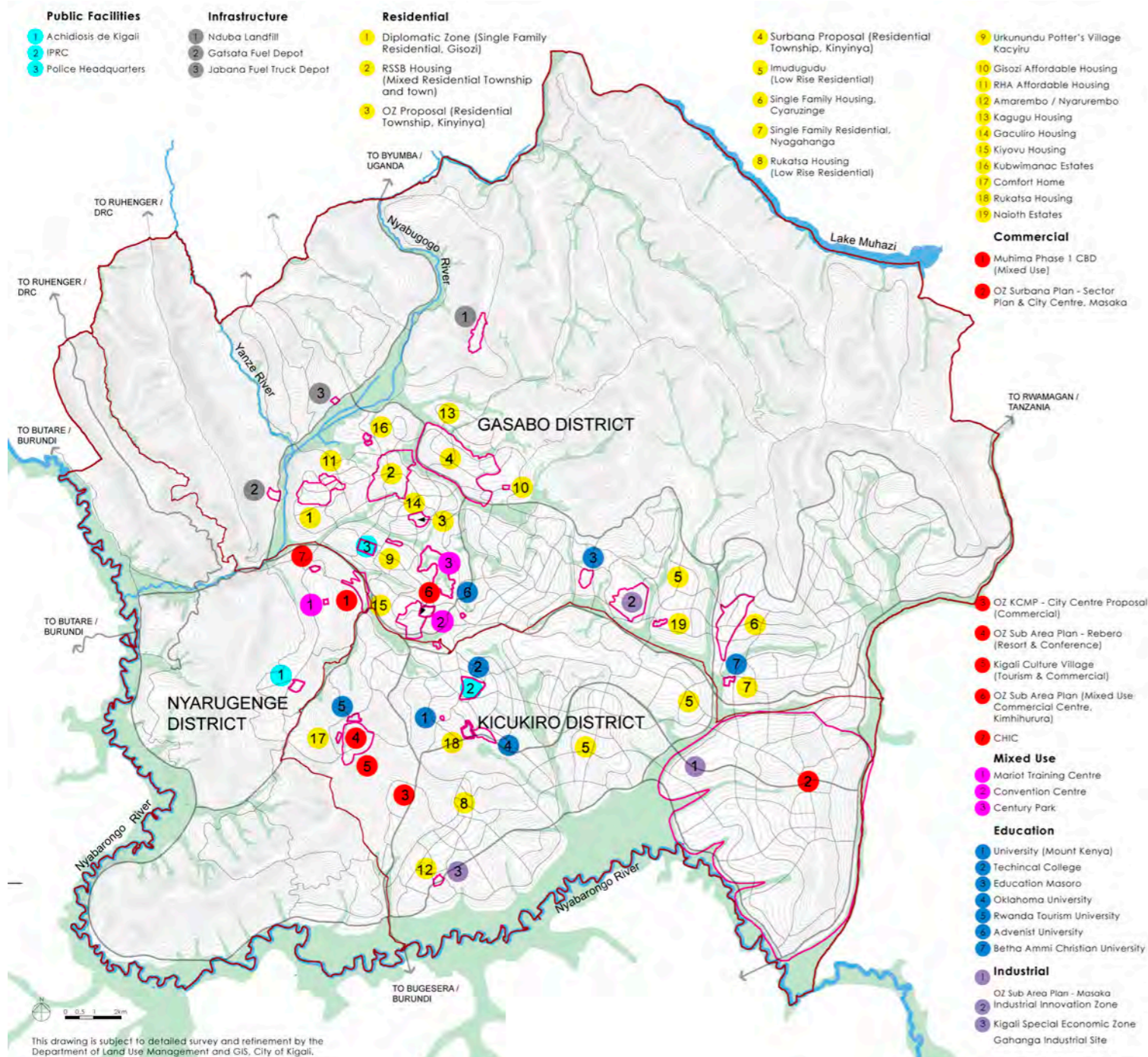
- There is a possibility of extending the upcoming freight rail to a passenger rail connecting the CBD.

IMMENSE POTENTIAL FOR RECREATION AND TOURISM

- Hilly areas in Nyarugenge & Gasabo are potential for recreation & unique urban agriculture. The steep slope areas also offer potential opportunities for afforestation and expansion of green areas for the dense urban developments.
- Large wetland in the south could be transform into an attractive wetland park. The redevelopment opportunities also offer potentials for restoration of former wetlands.



Opportunities Map of Kigali City



Approved Projects in Kigali City

APPROVED PROJECTS

Some of the approved projects by the City of Kigali, include large scale residential developments in Kinyinya, Gisozi and parts of Ndera and Gahanga; few commercial developments in Gatenga and Gahanga; and some development of facilities in Ndera, Kicukiro, Gatenga and Kagarama. The adjacent figure shows the complete list of approved projects in the City. The table below lists few of the Residential Developments.

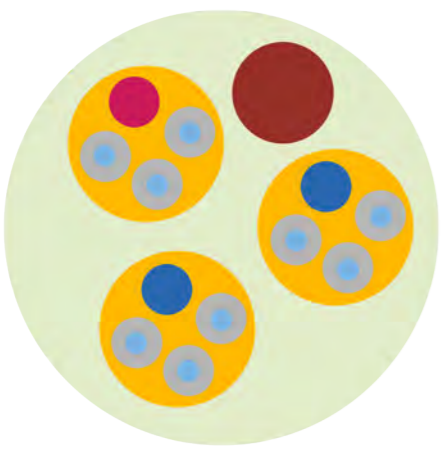
Approved Residential Development








RESIDENTIAL DEVELOPMENT	HOUSING TYPE & UNITS
EMERALD INVESTMENTS, GISOZI DIPLOMATIC ZONE	600 APARTMENT UNITS 200 VILLAS
GACULIRO	1000 VILLAS 1600 APARTMENT UNITS
CO.CVAM ESTATE, CYARUZINGE	1025 VILLAS
NYAGAHANGA	VILLAS 10000 UNITS ?
REAL CONTRACTORS, KINYINYA	300 APARTMENT UNITS
IDEM, KIYOVU	120 VILLAS
IDEM, KAGUGU	54 APARTMENT UNITS
KIGALI TOP MOUNTAIN, KAGUGU	60 VILLAS
DN INTERNATIONAL, RUSORORO	150 UNITS
OLIVE PROPERTIES, GACULIRO	36 APARTMENT UNITS
UJENGE RW LTD, KAGUGU	172 APARTMENT UNITS
PYGMA GROUP, KAGARAMA	64 APARTMENT UNITS
KICUKIRO-RUKATSA HOUSING	120 APARTMENT UNITS

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APPENDIX 2 : PLANNING REQUIREMENTS & STANDARDS

PROPOSED HIERARCHY OF PLANNING AREA



URBAN AREA HIERARCHY		POPULATION	CORRESPONDING COMMERCIAL CENTRE	
	CITY	5 MILLION		INTERNATIONAL CBD
	TOWN	150,000-200,000	 	REGIONAL CENTRE FRINGE CENTRE/ TOWN CENTRE
	NEIGHBORHOOD	15,000-20,000		NEIGHBORHOOD CENTRE

PROPOSED POPULATION DISTRIBUTION IN TOWNSHIPS

TOWNSHIP	AREA (HA)*	POPULATION
SP1	1819	4,80,000
N1	2465	80,000
N2	3031	1,70,000
N3	1676	3,00,000
N4	1615	80,000
N5	1246	1,40,000
G1	1453	1,90,000
G2	1216	200,000
G3	1249	1,80,000
G4	2051	3,50,000
G5	719	90,000
G6	1834	2,40,000
G7	1090	1,40,000
G8	834	1,00,000

* Note: Township size includes nature areas and non buildable slopes

TOWNSHIP	AREA (HA)*	POPULATION
K1	1130	1,80,000
K2	825	80,000
K3	1993	3,50,000
K4	1985	3,20,000
K5	1684	1,50,000
K6	682	90,000
K7	1384	1,30,000
K8	621	90,000
K9	1157	1,20,000
K10	1525	2,20,000
K11	2768	3,50,000
Rural Area	-	1,80,000
Total	-	5,000,000

PROPOSED BROAD LAND USE REQUIREMENTS FOR KIGALI CITY YEAR X

		% OF URBAN EXISTING	% OF URBAN 2025	% OF URBAN YEAR X
PROTECTED FOREST / WETLAND/ WATERBODY		33%	75%	60%
AGRICULTURE		50%		
URBANIZED AREA (%)		17%	25%	40%
AREA		731.27	731.27	731.27
POPULATION		1.2 MILLION	2.9 MILLION	5 MILLION
GROSS DENSITY		1670 P/KM ²	3950 P/KM ²	6850 P/KM ²
GROSS URBAN DENSITY		11000 P/KM ²	15850 P/KM ²	17000 P/KM ²
URBANIZED AREA	RESIDENTIAL	9%	75 KM ² (41 %)	150 KM ² (51%)
	INDUSTRIAL	0.4%	24 KM ² (12.5 %)	30 KM ² (10%)
	COMMERCIAL + MIXED USE	0.4%	3 KM ² (1.5 %)	6 KM ² (2%)
	TRANSPORTATION, INFRASTRUC- TURE & UTILITIES	3.1%	44 KM ² (24 %)	50 KM ² (20%)
	SPECIAL USE	1.6%	7 KM ² (4 %)	6 KM ² (2%)
	URBAN RECREATIONAL OPEN SPACES	0.2%	18 KM ² (10 %)	29 KM ² (10%)
	PUBLIC FACILITIES	1.6%	11 KM ² (6 %)	15 KM ² (5%)
	TOTAL BUILT-UP AREA	119 KM ²	182 KM ²	294 KM ² (100%)
Note: Residential Area is recommended to be secured for 5 Mil Population				

PUBLIC FACILITIES STANDARDS

		SOUTH AFRICA (CAPE TOWN)	SINGAPORE	PROPOSED FOR KIGALI
COMMERCIAL	NEIGHBOURHOOD CENTRE	5 MIN WALK TO LOCAL MARKET; 1 PER 5000 POPULATION, 0.2 - 4 HA	1 PER 13,000 - 20,000 POPULATION, 1.7 HA SITE	1 PER NEIGHBOURHOOD; 1.2 HA SITE.
	TOWN CENTRE	DATA NOT AVAILABLE	1 PER TOWN, 17-25 HA SITE	1 PER TOWNSHIP; 12.0 HA SITE.
	REGIONAL CENTRE	DATA NOT AVAILABLE	1 PER 0.5 MILLION, CATCHMENT RADIUS - 5 KM , 57 HA SITE	1 PER 0.5 MILLION, 50 HA SITE.
EDUCATIONAL FACILITIES	PRIMARY SCHOOL	1 PER 5500 POPULATION, MAX WALKING DIST. 2.25 KM. MIN 2.8 HA SITE. (INCLUSIVE OF FIELD)	1 PER 13,400 POPULATION. 1.8 HA SITE	1 PER NEIGHBOURHOOD (15,000-20000 POPULATION). 1.5 HA SITE.
	SECONDARY SCHOOL	1 PER 12500 POPULATION, MAX DRIVING TIME. 15 MINS MIN 2.8 HA SITE, (INCLUSIVE OF FIELD)	1 PER 19,150 POPULATION. 3.0 HA SITE	1 PER 20,000 - 25,000 POPULATION. 2.4 HA SITE.
	PRIMARY + SECONDARY SCHOOL (COMBINED)	DATA NOT AVAILABLE	DATA NOT AVAILABLE	2.8 HA SITE. (BASED ON EXISTING SCHOOL SITES)
	VOCATIONAL / ICT INSTITUTE	1 PER 100,000 POPULATION, 1 HA SITE	1 PER TOWN. 5.0 HA SITE	1 PER TOWNSHIP. 5.0 HA SITE.
	HIGHER EDUCATION INSTITUTE	1 PER 1 MIL POPULATION, 8 HA SITE	1 PER 500,000 POPULATION. 6.0 HA SITE	1 PER 500,000 POPULATION. 6.0 HA SITE
SOCIO-CULTURAL FACILITIES	COMMUNITY HALL*	1 PER 10,000-60000 POP; MAX TRAVEL TIME 30 MINS; 0.5 HA SITE.	1 PER 40,000 POPULATION. 0.4 HA SITE	1 PER 5,000 POPULATION. 0.5 HA SITE.
	REGIONAL LIBRARY	1 PER 40000- 70000 POPULATION, MIN SIZE 0.03 HA	1 PER 65,000 POPULATION. 0.4 HA SITE	1 PER 500,000 POPULATION. 0.5 HA SITE.
	RELIGIOUS FACILITY	1 PER 3000 - 6000 POPULATION; 0.15 - 1 HA SITE, DISTANCE OF 2 KM	1 PER 25,000 POPULATION. 0.2 -0.45 HA SITE	1 PER NEIGHBOURHOOD (15,000- 20000 POPULATION). 0.5 HA SITE.
	CEMETERIES	1 PER 100,000 PEOPLE 15.6 HA OVER 30 YEARS (2000 GRAVES PER HA)	DATA NOT AVAILABLE	1 PER TOWNSHIP 20 HA OVER 20 YEARS
	MUSEUMS/ CULTURAL CENTRE ETC.	1 PER 50000 (SMALL MUSEUM, SITE & PURPOSE SPECIFIC) 1 PER 50000 (PERFORMING ARTS CENTRE, SITE & PURPOSE SPECIFIC)	DATA NOT AVAILABLE	1 PER TOWNSHIP. 1.5 HA SITE.
HEALTH FACILITIES	HEALTH CLINIC *	0.2 HA PER 5000-20000 POPULATION 0.5 HA PER 30000-50000 POPULATION 1 HA PER 60000-70000 POPULATION	SERVED BY PRIVATE PRACTITIONERS AS PART OF COMMERCIAL FACILITIES	1 PER NEIGHBOURHOOD (15,000-20000 POPULATION). 0.5 HA SITE.
	POLYCLINIC	1.5 HA PER 60000 - 120000 POPULATION MAX VEHICULAR TRAVEL TIME OF 30 MINS	1 FOR MINIMUM POPULATION OF 150,000 (EXCLUDING PRIVATELY OPERATED CLINICS). 0.5 HA SITE FOR 150,000 - 200,000 POPULATION	1 PER TOWNSHIP. 5.0 HA SITE. MAX TRAVEL TIME OF 30 MINS.
	REGIONAL HOSPITAL	DISTRICT HOSPITAL: 450000 POPULATION; 5 HA SITE REGIONAL HOSPITAL: 1 MILLION POPULATION; 7 HA SITE TEACHING(SPECIALIST) HOSPITAL: 4.5 MILLION POPULATION; 35 HA SITE	4.5 BEDS PER 1,000 POPULATION. 5.0 HA SITE	1 PER 500,000 POPULATION. 5.0 HA SITE
PARKS & OPEN SPACES	NEIGHBORHOOD PARK	0.4 HA PER 1000 POPULATION, 20 MIN WALKING DISTANCE	DATA NOT AVAILABLE	1 PER NEIGHBOURHOOD (15,000-20000 POPULATION). 1.0 HA SITE
	TOWN PARK	(DISTRICT /REGIONAL PARK) 0.2 HA PER 1000 POPULATION; 20MIN BY PUBLIC TRANSIT	1 PER TOWN. 10 HA SITE	1 PER TOWNSHIP. 6.0 HA SITE
	SPORTS FIELD	0.56HA PER 1 000 PEOPLE (+ ADDITIONAL 0.3/0.4HA PER 1 000 IN METROPOLITAN AREAS FOR HIGHER ORDER FACILITIES) 1 PER 60000 POPULATION, GROUPING OF FIELDS AND/OR SPORT FACILITIES, 1.5- 2.5 HA	1 PER 125,000 POPULATION. 3.0 HA SITE	1 PER TOWNSHIP . 1.5 HA SITE. (NEAR TO SCHOOLS OR COMMUNITY CENTRES OR COMBINE WITH PARKS.)

		SOUTH AFRICA (CAPE TOWN)	SINGAPORE	PROPOSED FOR KIGALI
SPORTS & RECREATION	SPORTS CENTRE (WITH SWIMMING POOL AND STADIUM)	SPORT STADIA , 1 PER 300,000 POPULATION (WITH TRACKS & 3000 SEATS) REGIONAL SPORTS ARENAS 1 PER 250000-500000, 0.5 HA (INDOOR SPORTS HALLS MAY HOST NON SPORTING EVENTS) INTERNATIONAL SPORTS COMPLEX, 10 PER 1.5 MILLION, 3 HA SITE	1 PER 125,000 POPULATION	1 FOR EVERY 500,000 POPULATION. 6.0 HA SITE.
CIVIC FACILITIES	FIRE STATION	1 PER MIN POPULATION OF 100000, 0.3 HA SUBURBAN STATION, 1.2 HA REGIONAL STATION	1 TO COVER 5 - 8 MINS RESPONSE TIME. 0.4 - 0.6 HA SITE	5 MINUTES RESPONSE TIME. 0.5 HA SITE.
	GOVERNMENT/ MUNICIPAL OFFICES	DISTRICT OFFICE - 40000 - 140000 POPULATION, TRAVEL TIME 30 MIN MUNICIPAL OFFICE - 1 PER SUB REGION/ 500000 POP., 0.3 - 1 HA SITE	DATA NOT AVAILABLE	1 SECTOR OFFICE PER SECTOR. 1 DISTRICT OFFICE PER DISTRICT.
*(as part of neighborhood centre)				

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