



Umwaka wa 63
Igazeti ya Leta n° Idasanzwe
Bis yo ku wa 25/09/2024

Year 63
Official Gazette n° Special Bis of
25/09/2024

63^{ème} Année
Journal Officiel n° Spécial Bis du
25/09/2024

Ibirimo/Summary/Sommaire

page/urup

Iteka rya Minisitiri/ Ministerial Order/ Arrêté Ministériel

Iteka rya Minisitiri n° 004/24/10/TC ryo ku wa 22/08/2024 rishyiraho igishushanyo mbonera cy'imikoreshereze n'imitunganyirize by'ubutaka cy'Akarere ka Muhanga.....	2
Ministerial Order n° 004/24/10/TC of 22/08/2024 establishing land use and development master plan of Muhanga District.....	2
Arrêté Ministériel n° 004/24/10/TC du 22/08/2024 établissant le schéma directeur d'utilisation et d'aménagement des terres du District de Muhanga.....	2

ITEKA RYA MINISITIRI N° 004/24/10/TC RYO KU WA 22/08/2024 RISHYIRAHU IGISHUSHANYO MBONERA CY'IMIKORESHEREZE N'IMITUNGANYIRIZE BY'UBUTAKA CY'AKARERE KA MUHANGA <u>ISHAKIRO</u> <u>Ingingo ya mbere:</u> Ishyirwaho <u>Ingingo ya 2:</u> Ibigize igishushanyo mbonera <u>Ingingo ya 3:</u> Itangazwa <u>Ingingo ya 4:</u> Igihe igishushanyo mbonera kimara <u>Ingingo ya 5:</u> Ivugururwa <u>Ingingo ya 6:</u> Ingingo y'ururimi <u>Ingingo ya 7:</u> Gutangira gukurikizwa	MINISTERIAL ORDER N° 004/24/10/TC OF 22/08/2024 ESTABLISHING LAND USE AND DEVELOPMENT MASTER PLAN OF MUHANGA DISTRICT <u>TABLE OF CONTENTS</u> <u>Article One:</u> Establishment <u>Article 2:</u> Composition <u>Article 3:</u> Publication <u>Article 4:</u> Period of validity <u>Article 5:</u> Revision <u>Article 6:</u> Language provision <u>Article 7:</u> Entry into force	ARRÊTÉ MINISTÉRIEL N° 004/24/10/TC DU 22/08/2024 ÉTABLISSANT LE SHEMA DIRECTEUR D'UTILISATION ET D'AMÉNAGEMENT DES TERRES DU DISTRICT DE MUHANGA <u>TABLE DES MATIÈRES</u> <u>Article premier:</u> Établissement <u>Article 2:</u> Composition <u>Article 3 :</u> Publication <u>Article 4:</u> Période de validité <u>Article 5:</u> Révision <u>Article 6:</u> Disposition linguistique <u>Article 7:</u> Entrée en vigueur
--	--	---

ITEKA RYA MINISITIRI N° 004/24/10/TC RYO KU WA 22/08/2024 RISHYIRAHO IGISHUSHANYO MBONERA CY'IMIKORESHEREZE N'IMITUNGANYIRIZE BY'UBUTAKA CY'AKARERE KA MUHANGA Minisitiri w'Imari n'Igenamigambi; Ashingiye ku Itegeko Nshinga rya Repubulika y'u Rwanda; Ashingiye ku Itegeko n° 27/2021 ryo ku wa 10/06/2021 rigenga ubutaka, cyane cyane mu ngingo yaryo ya 59; Inama y'Abaminisitiri yateranye ku wa 11/09/2023 imaze kubisuzuma no kubyemeza; ATEGETSE: <u>Ingingo ya mbere: Ishyirwaho</u> Hashyizweho igishushanyo mbonera cy'imikoreshereze n'imitunganyirize by'ubutaka cy'Akarere ka Muhanga.	MINISTERIAL ORDER N° 004/24/10/TC OF 22/08/2024 ESTABLISHING LAND USE AND DEVELOPMENT MASTER PLAN OF MUHANGA DISTRICT The Minister of Finance and Economic Planning; Pursuant to the Constitution of the Republic of Rwanda; Pursuant to Law n° 27/2021 of 10/06/2021 governing land, especially in Article 59; After consideration and approval by the Cabinet, in its meeting of 11/09/2023; ORDERS: <u>Article One: Establishment</u> The land use and development master plan of Muhanga District is established.	ARRÊTÉ MINISTÉRIEL N° 004/24/10/TC DU 22/08/2024 ÉTABLISSANT LE SCHEMA DIRECTEUR D'UTILISATION ET D'AMÉNAGEMENT DES TERRES DU DISTRICT DE MUHANGA Le Ministre des Finances et de la Planification Économique; Vu la Constitution de la République du Rwanda; Vu la Loi n° 27/2021 du 10/06/2021 portant régime foncier, spécialement en son article 59; Après examen et adoption par le Conseil des Ministres, en sa séance du 11/09/2023; ARRÊTE: <u>Article premier: Établissement</u> Il est établi le schéma directeur d'utilisation et d'aménagement des terres du District de Muhanga.
---	---	--

<u>Ingingo ya 2: Ibigize igishushanyo mbonera</u> Igishushanyo mbonera cy'imikoreshereze n'imitunganyirize by'ubutaka cy'Akarere ka Muhanga, kigizwe n'ibi bikurikira: (a) raporo rusange y'igishushanyo mbonera cy'imikoreshereze n'imitunganyirize y'ubutaka cy'Akarere; (b) amakuru ndangahantu y'igishushanyo mbonera; (c) amabwiriza agenga ishyirwa mu bikorwa ryacyo.	<u>Article 2: Composition</u> The District land use and development master plan of Muhanga District is composed of the following: (a) the main report of the District land use and development master plan; (b) zoning plan; (c) zoning regulations.	<u>Article 2: Composition</u> Le schéma directeur d'utilisation et d'aménagement des terres du District de Muhanga est composé de ce qui suit: (a) le rapport général du schéma directeur d'utilisation et d'aménagement des terres du District; (b) le plan de zonage; (c) le règlement de zonage.
<u>Ingingo ya 3: Itangazwa</u> (1) Raporo rusange y'igishushanyo mbonera cy'imikoreshereze n'imitunganyirize y'ubutaka cy'Akarere ka Muhanga iri ku mugereka w'iri teka. (2) Amakuru ndangahantu y'igishushanyo mbonera cy'akarere ka Muhanga n'amabwiriza agenga ishyirwa mu bikorwa ryacyo bitangazwa ku rubuga rw'ikoranabuhanga rwagenwe n'urwego rufite imicungire	<u>Article 3: Publication</u> (1) The main report of the land use and development master plan of Muhanga District is annexed to this Order. (2) The zoning plan and zoning regulations of the land use and development master plan of Muhanga District are published on the website designated by the organ in charge of land use management.	<u>Article 3: Publication</u> (1) Le rapport général du schéma directeur d'utilisation et d'aménagement des terres du District de Muhanga est annexé au présent arrêté. (2) Le plan de zonage et le règlement de zonage du schéma directeur d'utilisation et d'aménagement des terres du District de Muhanga sont publiés sur le site web désigné par l'organe ayant l'utilisation et la gestion des terres dans ses attributions.

n'imikoreshereze by'ubutaka mu nshingano. <u>Ingingo ya 4: Igihe igishushanyo mbonera kimara</u> Igishushanyo mbonera cy'imikoreshereze n'imitunganyirize by'ubutaka cy'Akarere ka Muhanga gikurikizwa kugeza mu 2050. <u>Ingingo ya 5: Ivugururwa</u> (1) Igishushanyo mbonera cy'imikoreshereze n'imitunganyirize by'ubutaka cy'Akarere ka Muhanga gishobora kuvugururwa cyose nyuma y'imyaka icumi cyangwa ikindi gihe bibaye ngombwa uhereye ku muni gishyiriweho. (2) Ivugururwa ry'igishushanyo mbonera cy'imikoreshereze n'imitunganyirize by'ubutaka cy'Akarere ka Muhanga rishobora kandi gukorwa rireba agace gato igihe bibaye ngombwa bitabangamiye iterambere ry'utundi duce kandi hakurikijwe amategeko abigenga. <u>Ingingo ya 6: Ingingo y'ururimi</u> Iri teka ryateguwe mu rurimi rw'Ikinyarwanda.	<u>Article 4: Period of validity</u> The land use and development master plan of Muhanga District is implemented until 2050. <u>Article 5: Revision</u> (1) The land use and development master plan of Muhanga District may be comprehensively reviewed after ten years or whenever considered necessary from the date of its establishment. (2) The revision of land use and development master plan of Muhanga District may also be done on a specific area, when considered necessary, without compromising the development of other areas in accordance with relevant laws. <u>Article 6: Language provision</u> This Order was drafted in Ikinyarwanda.	<u>Article 4: Période de validité</u> Le schéma directeur d'utilisation et d'aménagement des terres du District de Muhanga est mis en œuvre jusqu'en 2050. <u>Article 5: Révision</u> (1) Le schéma directeur d'utilisation et d'aménagement des terres du District de Muhanga peut être entièrement révisé après dix ans ou chaque fois que cela est jugé nécessaire à partir du jour de son établissement. (2) La révision du schéma directeur d'utilisation et d'aménagement des terres du District de Muhanga peut également être effectuée sur une zone spécifique, en cas de besoin, sans compromettre le développement des autres zones conformément à la législation en la matière. <u>Article 6: Disposition linguistique</u> Le présent arrêté a été rédigé en Ikinyarwanda.
---	---	--

<u>Ingingo ya 7: Gutangira gukurikizwa</u> Iri teka ritangira gukurikizwa ku muni ritangarijweho mu Igazeti ya Leta ya Repubulika y'u Rwanda. Agaciro karyo gahera ku wa 11/09/2023.	<u>Article 7: Entry into force</u> This Order comes into force on the date of its publication in the Official Gazette of the Republic of Rwanda. It takes effect as of 11/09/2023.	<u>Article 7: Entrée en vigueur</u> Le présent arrêté entre en vigueur le jour de sa publication au Journal Officiel de la République du Rwanda. Il prend ses effets à partir du 11/09/2023.
---	---	---

Kigali, 22/08/2024

(sé)

MURANGWA Yusuf

Minisitiri w’Imari n’Igenamigambi
Minister of Finance and Economic Planning
Ministre des Finances et de la Planification Économique

Bibonywe kandi bishyizweho Ikirango cya Repubulika:

Seen and sealed with the Seal of the Republic:

Vu et scellé du Sceau de la République:

(sé)

Dr UGIRASHEBUJA Emmanuel

Minisitiri w’Ubutabera akaba n’Intumwa Nkuru ya Leta
Minister of Justice and Attorney General
Ministre de la Justice et Garde des Sceaux

UMUGEREKA W'ITEKA RYA MINISITIRI N° 004/24/10/TC RYO KU WA 22/08/2024 RISHYIRAHU IGISHUSHANYO MBONERA CY'IMIKORESHEREZE N'IMITUNGANYIRIZE BY'UBUTAKA CY'AKARERE KA MUHANGA	ANNEX TO MINISTERIAL ORDER N° 004/24/10/TC OF 22/08/2024 ESTABLISHING LAND USE AND DEVELOPMENT MASTER PLAN OF MUHANGA DISTRICT	ANNEXE À L'ARRÊTÉ MINISTÉRIEL N° 004/24/10/TC DU 22/08/2024 ÉTABLISSANT LE SCHÉMA DIRECTEUR D'UTILISATION ET D'AMÉNAGEMENT DES TERRES DU DISTRICT DE MUHANGA
IGISHUSHANYO MBONERA CY'IMIKORESHEREZE N'IMITUNGANYIRIZE BY'UBUTAKA CY'AKARERE KA MUHANGA	LAND USE AND DEVELOPMENT MASTER PLAN OF MUHANGA DISTRICT	SCHÉMA DIRECTEUR D'UTILISATION ET D'AMÉNAGEMENT DES TERRES DU DISTRICT DE MUHANGA



MUHANGA

District Land Use Plan 2023-2050



2023

Report Title	Muhanga District Land Use Plan 2023 – 2050
Project title	Muhanga District Land Use Plan Report
Owner	Muhanga District
District Council Approval	26 th May, 2022
Cabinet's Approval	11 th September, 2023

CONTENTS

Contents	ii
List of Figures	v
List of Tables	vii
List of Acronyms	viii
Executive Summary	xi
1 Introduction	1
1.1 Background of Muhanga DLUP	1
1.2 Objective and Scope	3
1.2.1 Objective	3
1.2.2 Scope	3
1.3 Muhanga District Description	3
1.3.1 Geographical Location	3
1.3.2 Hydrography	4
1.3.3 Soil and Erosion	6
1.3.4 Topography	9
1.1.2 Flora and Fauna	13
1.1.3 Profiling	14
2 Regulatory and Policy Framework	41
2.1 Laws	41
2.2 Policies	42
2.3 Guidelines	43
3 Methodology	44
3.1 Consultation meetings	44
3.1.1 Consultation with national stakeholders	45
3.1.2 Consultation with the local authority	46
3.1.3 Consultation with the community	47
3.2 Data Collection	48
3.2.1 Spatial data collection	48
3.2.2 Non-spatial data collection	51
3.3 Data Analysis	51
3.4 Muhanga DLUP Report Compilation	53
4 Muhanga Land Use and Development Planning	55

4.1	Visioning and Economic Specialization	55
4.1.1	Vision of Muhanga District	55
4.1.2	Muhanga District Economic Specialization.....	55
4.2	Population, Urbanization, Settlement and Housing (PUSH)	57
4.2.1	Population	57
4.2.2	Urbanization, Settlement and Housing	61
4.3	Transportation	81
4.3.1	Land Transportation.....	82
4.3.2	Roads network in Muhanga District	83
4.4	Public Facilities	84
4.4.1	Education	84
4.4.2	Healthcare Services.....	89
4.5	Public Utilities.....	91
4.5.1	Energy	91
4.5.2	Water and Sanitation.....	93
4.6	Agriculture and Livestock.....	94
4.6.1	Agriculture	94
4.6.2	Livestock.....	98
4.7	Environmental and Natural Resources	100
4.7.1	Forestry	101
4.7.2	Swamplands	106
4.7.3	Water bodies	108
4.7.4	Mining.....	109
4.7.5	Green Urbanization.....	111
4.7.6	Waste management	113
4.7.7	Stormwater Management	115
4.8	Tourism and Conservation	117
4.8.1	Tourism Development for Muhanga District.....	119
4.8.2	Planned tourism zones in Muhanga District land uses Master plan	125
4.9	Economic Development	126
4.9.1	Employment opportunities.....	126
4.9.2	Trade and Logistics.....	127
4.9.3	Industrialization	128

4.10	Muhanga Land Use Balance Sheet.....	130
4.10.1	Muhanga Satellite City (Main Urban Area).....	130
4.10.2	Remera Rurban Center.....	141
4.10.3	Rural Settlement Sites.....	149
4.10.4	Parts of Muhanga District outside the settlement boundaries.....	153
4.10.5	Muhanga District Land Use Balance Sheet	156
5	Implementation Strategies	163
5.1	Existing Laws Enforcement	163
5.2	Legal and Institutional Framework	163
5.3	Phasing Plan	164
5.4	Land Readjustment (detailed physical plans).....	164
6	DLUP Compliance and monitoring.....	166
6.1	DLUP Compliance	166
7	References	168

LIST OF MAPS

Map 1: The location of Muhanga District.....	4
Map 2: Muhanga hydrography.....	6
Map 3: Muhanga soil characteristics.	8
Map 4: Muhanga Topography	12
Map 5: Muhanga Hill Shade	12
Map 6: Muhanga District slope adjusted to elevation.....	12
Map 7: Muhanga District slope.....	12
Map 8: Distribution of trade centers in Muhanga District.	30
Map 9: Muhanga District urbanization hierarchy	66
Map 10: Delimitation of Muhanga satellite city.	68
Map 11: Delimitation of Remera rurban center	70
Map 12: Railway and Road transportation network according to NLUDMP 2020-2050.....	82
Map 13: Muhanga District Road Network.....	83
Map 14: Distribution of education facilities in Muhanga District	89
Map 15: Distribution of Healthcare facilities in Muhanga District	90
Map 16: Distribution of forest in Muhanga District	104
Map 17: Area with slope above 55% in Muhanga District.....	105
Map 18: Muhanga Satellite City Existing Land Cover	132
Map 19: Muhanga Satellite City land use zoning plan by 2050	136
Map 20: Remera Rurban Center Existing Land Cover	144
Map 21: Remera rurban center land use zoning plan by 2050.....	145
Map 22: Muhanga District existing rural built-up distribution.....	151
Map 23: Distribution of existing land uses inside rural settlement sites.....	153
Map 24: Distribution of existing land cover outside settlement boundaries.....	155
Map 25: Muhanga District existing land uses.....	156
Map 26: Muhanga District land use zoning plan by 2035	157

LIST OF FIGURES

Figure 1: Top five products for Muhanga District (Source: SMEs product cluster MINICOM / 2011	18
Figure 2: Distribution (%) of resident population aged 16 years and above in private households of Muhanga by economic activity status (2012)	28
Figure 3: Planning steps used during elaboration and review of Muhanga DLUP	45
Figure 4: Consultative meetings at Muhanga District.....	47
Figure 5: Fieldwork and survey.	50
Figure 6 : Distribution (count and %) of the population of Muhanga District by residence Source: NISR 2022 & NLUDMP 2020-2050 guidelines, adapted by NLA, 2023.	60
Figure 7: Urbanization hierarchy by 2050.	63
Figure 8: Spatial allocation of main urban areas - Source: NLUDMP 2020-2050	64
Figure 9: Spatial distribution of Muhanga District's rural settlements sites.	74
Figure 10: Dwelling units needed in Rwanda by 2050	77
Figure 11: Housing Type A+	78
Figure 12: Housing Type A	79
Figure 13: Housing Type B.....	79
Figure 14: Housing Type D	80
Figure 15: Agricultural suitability in Rwanda	98
Figure 16: Proportion of forest allocation.....	103
Figure 17: The proportion of steep slope above 55% and suitable slope.....	104
Figure 18: Proportion of land to be afforested on slopes over 55%.....	106
Figure 19: Allocation of forests in Muhanga on slope above 55%.....	106
Figure 20: Landfill in Muhanga satellite city.....	113
Figure 21: Tourism sites in Muhanga District	120
Figure 22: Hotel reserved land.....	125
Figure 23: Muhanga city existing land use distribution (Source: LUDP 2009).....	131
Figure 24: Muhanga Satellite City – Existing Land Cover.....	133
Figure 25: Allocation of residential zones in Muhanga satellite city.....	137
Figure 26: Muhanga Satellite City Planned Land Use Balance Sheet	141
Figure 27: Remera rurban center existing land use distribution	143
Figure 28: Remera rurban center planned land use balance sheet	148
Figure 29: Rural area vs. urban area ratio in Muhanga District.....	149
Figure 30: Existing portion of land against built-up outside of urban boundaries.....	150
Figure 31: Proportion of existing land use within rural settlement areas.....	152
Figure 32: Proportion of existing land cover outside settlement areas	154

LIST OF TABLES

Table 1: Summary statistics of forest cover in Southern Province	14
Table 2: Muhanga District total population with density per Sector unit in 2022 (Source: NISR, 2022)	16
Table 3: Potentialities of Muhanga District	17
Table 4: Potential sectors in Muhanga District	23
Table 5: Main Economic Activities in Muhanga by Industry Group (EICV4 and EICV5).....	27
Table 6: Private companies by major sectors (Source: Establishment Census, NISR, 2011).....	29
Table 7: Muhanga District SWOT analysis	40
Table 8: Muhanga District existing population per administrative Sector (2012&2022)-Source: NISR (2012&2022) adapted by NLA, 2023	58
Table 9: Muhanga District Population Projection – 2050-Source: NISR 2022, NLUDMP 2020-2050 guidelines, adapted by NLA, 2023.....	59
Table 10: Number of rural settlement sites in Muhanga District.....	72
Table 11: Muhanga rural settlement sites per Sector and area covered	73
Table 12: Muhanga DLUP alignment with NLUDMP 2020-2050 settlement parameters	73
Table 13: Matching Housing types and Settlement types according to NLUDMP 2020-2050	78
Table 14: Muhanga projected population in relation to households	80
Table 15: Total Muhanga estimated housing stock 2021-2050	81
Table 16: Road classification in Muhanga satellite city	84
Table 17: number of Nursery schools needed Source: NLUDMP 2020-2050	86
Table 18: number of Primary schools needed-Source: NLUDMP 2020-2050	87
Table 19: number of Secondary schools needed-Source: NLUDMP 2020-2050	88
Table 20: Summary of current potential energy contribution in Rwanda (Source: Energy Sector Strategic Plan, MININFRA 2018)	92
Table 21: Muhanga Main Crops and associated production (Source: Local Economic Development (Led) Strategy 2017-2023).....	96
Table 22: Environmental SWOT analysis for Muhanga District.....	101
Table 23: Allocation of forests in Muhanga District	103
Table 24: The proportion of locations with steep slopes above 55%.....	104
Table 25: Afforestation status in the locations with slopes above 55%.....	105
Table 26: Tourism segment by 2050.....	119
Table 27: Land size of tourism areas for 2050.....	119
Table 28: Muhanga tourist attraction sites	124
Table 29: Existing Land Use Distribution in Muhanga City (Source: LUDP 2009)	131
Table 30: Rational distribution of existing land cover in Muhanga satellite city	133
Table 31: Muhanga Satellite City Planned Land Use Balance Sheet	140
Table 32: Remera rurban center existing land use balance sheet.....	142
Table 33: Remera rurban center planned land use balance sheet.....	147
Table 34: Muhanga District existing rural built-up balance sheet	149
Table 35: Existing land use within updated rural settlement sites	152
Table 36: Existing land cover outside settlement areas	154
Table 37: Muhanga District existing land uses	157
Table 38: Muhanga District land use zoning – balance sheet.....	162

LIST OF ACRONYMS

BPMIS:	Building Permitting Management Information system
BRT:	Bus Rapid Transit
CCP:	Continuous Compliant Planning (CCP)
DDS:	District Development Strategy
DHS:	Demographic and Health Survey,
DLUP:	District Land Use Plan
DRC:	Democratic Republic of Congo
DU:	Dwelling Unit
EDPRS:	Economic Development and Poverty Reduction Strategy
EIA:	Environmental Impact Assessment
ENR:	Environment and natural resources
GDP:	Gross Domestic Product
GDP:	Gross Domestic Product
GGCRS:	Green Growth and Climate Resilient Strategy
GGGI:	Global Green Growth Institute
GIS:	Geographic Information System
GoR:	Government of Rwanda
GPS:	Geographic Positioning System
HH:	House Hold
HIC:	Higher Income Country
ICT:	Information Communication and Technology

IDP:	Integrated Development Programme
LED:	Local Economic Development
LUCA:	Land Use Category
LUDP:	Local Urban Development Plan
MCC:	Milk Collection Center
MDGs:	Millennium Development Goals
NLA:	National Land Authority
NLUDMP 2020-2050:	National Land Use and Development Master Plan
NSTI:	National Strategic Transformation
PHC:	Rwanda Population and Housing Census
PUSH:	Population Urbanization Settlement and Housing
RAB:	Rwanda Agriculture Board
RDB:	Rwanda Development Board
REMA:	Rwanda Environment Management Authority
RHA:	Rwanda Housing Authority
RTDA:	Rwanda Transport Development Agency
SDGs:	Sustainable Development Goals
SME:	Small and Medium Enterprise
SUDS:	Sustainable Urban Drainage Systems
TTC:	Teacher Training College
TVET:	Technical and Vocational Education and Training

UMIC:	Upper Middle-Income Country
UR:	University of Rwanda
WASAC:	Water and Sanitation Corporation

EXECUTIVE SUMMARY

Muhanga DLUP cluster is a top priority guiding district development, ensuring efficient land use management in accordance with Vision 2050 and NLUDMP 2020-2050.

It is a District spatial plan that is structured around the following thematic areas:

- Visioning and economic specialization.
- Population, Urbanization, Settlements, and Housing (PUSH).
- Spatial Economy (Employment, manufacturing, industry, mining).
- Agriculture.
- Environment and Natural Resources (land, forestry, water resource, mining resource, climate change, environment).
- Tourism and Conservation.
- Transportation.
- Infrastructure - Public Utilities (Water, Energy, ICT)
- Public Services (Health, Education, Public Administration, Religious, Recreational facilities, etc)
- Implementation, Compliance, and Monitoring strategy and guidelines.

All these thematic areas were analysed in the light of the current situation to formulate the Planning perspectives.

The first version of Muhanga DLUP was approved in 2013 to guide land use planning across the district while implementing the NLUDMP 2010 - 2020, Vision 2020 and EDPRS II. In line with Vision 2050, the NLUDMP 2020-2050 was revised and approved by Cabinet in July 2020, which proposed the revision of all DLUP clusters across the country to support its implementation in two horizon phases. Consequently, Muhanga DLUP, which includes land use plans for the urban areas - Muhanga satellite city and Remera urban center - and the rural areas, mainly comprising the entire Imidugudu complex, agricultural areas, forests and infrastructure in the district, was revised to support the implementation of the first horizon of the NLUDMP 2020-2050 up to 2035 and later 2025.

Considering the 12 sectors that make up the district, Muhanga DLUP was developed taking into account the geographical location, topography, hydrography, soil, vegetation, population and demography as well as their specialisation and economic opportunities. The central location of Muhanga District has been taken as a base to make it a regional trade and mining processing hub due to its soil rich in various minerals. The hydrography of the district consists

of various streams that impound the entire Nyabarongo River watershed from West to North and East. Muhanga District also has a rugged topography with a succession of high mountains and V-shaped valleys that influence the high rate of erosion. The district has some natural and dominant planted vegetation in all sectors that favour faunal diversity and have been considered in the preparation of the DLUP.

Development of Muhanga DLUP was framed by several laws, strategies, policies, guidelines, and directive documents to support the framework of this plan. Various stakeholders were consulted, including the involved institutions at the national level, local authorities, and communities, as well as non-governmental groups, to ensure that the plan is inclusive of their participation. In addition to this consultation, both spatial and statistical data were collected and analysed on field to produce the spatial map of the existing land use and development plan of the district and to assist in the report.

It is estimated that the population of Muhanga District, which was 319,141 in 2012, reached 414,883 in 2022, rising to 510,625 in 2032 and about 550,000 in 2035. The NLUDMP 2020-2050 estimates that the population of Muhanga District in 2050 will be about 1,026,500 people, of which 80.5% will live in urban areas and the remaining 22.2% in rural areas, especially in the planned rural settlement areas. Based on this population projection, a needs assessment was carried out to plan for future demand and allocation of land and to balance the different land uses.

Muhanga DLUP has been developed based on the recommendations of the NLUDMP 2020-2050, where the district has low urbanisation and includes only Muhanga town in Nyamabuye sector and part of Shyogwe sector and other small centers in rural areas. The number of urban dwellers in Muhanga District was 87,253 in 2022, while the rural population was 271,181. However, the NLUDMP 2020-2050 proposes to develop Muhanga town into one of the three satellite cities to support Kigali City in the areas of trade, logistics and industry and to control urbanisation, especially in the central part of the country. Following Muhanga satellite city, the structure expands to include Remera rurban center in Kiyumba sector and 135 rural settlement sites made up of residences outside the urban areas. It is estimated that in 2035, Muhanga District inhabitants will be 454,575 in the urban areas and 129,628 in the rural areas.

In Muhanga satellite city, NLUDMP 2020-2050 recommends that 10% of houses will fall into category A+, 35% category A, 35% category B, 10% category C and another 10% category D. In Remera rurban center, NLUDMP 2020-2050 recommends that 52% will fall in category A+,

45% category A, 2% category B and 1% category C. However, in Muhanga rural settlements, 50% of the houses will be category A+ and another 50% will be category A. Here, A+ is the most common type of detached or semi-detached houses, which are one or two floors high and have a plot area of 500 m² for two households. If built in the countryside, it has a gross density of 40 dwelling units (floor) per hectare and in a whole neighbourhood a gross density of 24 DU/Ha. A is based on the same 500 m² plot, but groups four dwelling units in two floors and has a net density of 80 dwelling units per hectare and a gross density of 40 DU/Ha. B represents a typical apartment building with up to 12 dwelling units in 3-4 floor. The net density is 120 with a plot size of 1000 m². This type is the cheapest among apartment buildings, as it does not require an elevator and can be installed almost anywhere. C stands for a typical multi-family high-rise building with up to 9 floors. The net density is 180 with a lot size of 2000 square meters. This type is the cheapest of the multi-family buildings and can fit almost anywhere. Its gross density is also reasonable at 63DU/Ha. D: is the largest structure in the apartment repertoire, which is up to 22 stories high. The net density can reach 300DU/Ha on plots of 3000 sqm. It is ideal for flat topographies, but can also be built on a hillside lot, but is usually limited by visual considerations. This structure is expensive, mainly because of maintenance, and therefore is not considered for affordable housing.

Transportation in Muhanga District is entirely by land; there is no air or water transportation. Muhanga District is connected to neighbouring districts by roads that branch off from Muhanga city. According to the NLUDMP 2020-2050, Muhanga will be connected to both Kigali and other districts to the south via a network of expressways that will pass through Muhanga satellite city, and this type of connection will link Muhanga to Karongi district to the west. However, Muhanga will be connected to the northern province and the west through an arterial road network.

The plan for public facilities in Muhanga District according to the DLUP includes 493.81 hectares for educational and research facilities, 33.08 hectares for Healthcare facilities, 42.77 hectares for the maintenance of existing religious facilities, 2 hectares for cultural or memorial sites, and 36.60 hectares for cemeteries. Besides public facilities, 80.40 hectares are allocated for utilities in Muhanga District. However, agriculture accounts for the largest share of the area, occupying 31,589 hectares, followed by forests with an area of 16,672 hectares.

Muhanga District capital improvement projects are the basis for implementing the DLUP in compliance with the phased plan for each land use zone with the support of the legal and

institutional framework to strengthen the laws. The implementation of the DLUP in Muhanga will be done in different clusters through the elaboration of detailed physical plans by the district under the supervision of NLA in the zones to be developed, such as residential zones. Land use planning and zoning regulations will play a vital role in the implementation of the DLUP. Frequent evaluations and monitoring will be conducted to assess whether implementation complies with NLUDMP 2020-2050.

1 INTRODUCTION

1.1 BACKGROUND OF MUHANGA DLUP

Aligned with the Government of Rwanda’s Vision 2050, there exists an ambitious objective to propel urbanization forward while concurrently augmenting the average annual growth rates of the gross domestic product (GDP) and the GDP per capita. The realization of this vision promises Rwandan citizens a heightened quality of life, characterized by robust social protection measures, enhanced healthcare services, effective disaster risk reduction strategies, and bolstered food security initiatives. Integral to this vision is the strategic development of urban infrastructure, harmonized with efforts aimed at biodiversity conservation, thereby mitigating citizens’ vulnerability to the adverse impacts of climate change.

Aligned with Rwanda’s aspirations to elevate the economy to an upper middle-income status by 2035, targeting a GDP per Capita of \$4,035, and ultimately transitioning to a high-income economy by 2050, characterized by a GDP per Capita of \$12,476, fostering food security, and nurturing a knowledge-based economy, underscores the imperative for optimal land utilization.

The land in a district, accumulates various uses and sectors respecting the nature of local potentialities, nature of the soil, topography, climates, populations, and many others. The District land use encompasses the allocation of land across the whole district surface to different uses around diverse thematic areas to manage the effective use of resources and guide future development as well as to promote more social, economic, and environmental outcomes. Muhanga District approved the first version of the District Land Use Plan in 2013, and in the same year approved the Muhanga District LUDP. These tools have steered land use planning across the district while implementing NLUDMP 2010-2020, Vision 2020 and EDPRS II.

Since 2018, the Government of Rwanda has been engaged in the revision and updating of the NLUDMP 2010-2020 under which the evaluation and assessment on its implementation conducted in 2016-2017 indicated some bottlenecks that raised the urgent need to revise it. The newly revised and updated NLUDMP 2020-2050, which was approved by the Cabinet in July 2020, has the overall objective of finding solutions to the identified problems and generating specific guidelines for implementation and, mainly, designing a new and updated spatial structure for the nation. All settlements: urban, rural, large or small, are part of the national spatial puzzle, including Kigali, the satellite cities and the network of secondary cities.

In accordance with the NLUDMP 2020-2050 guidelines, each sector, which has a spatial dimension and a land allocation requirement for sectoral activities, is recommended to update its master plan and strategies following the NLUDMP 2020-2050 guidelines. All land requirements are explicitly aligned with the national plan on the one hand and based on quantitative programmes for its operations on the other. The sector development strategies will have two levels. The NLUDMP 2020-2050 still proposes the DLUP cluster, a new concept of DLUP cluster is strongly recommended. This concept has the advantage of integrated compliance through the simultaneous preparation of a set of plans at district and Kigali City level. The DLUP cluster includes urban and rural zoning plans. It details at the same time the district level zones by integrating urban land use zoning (cities and rural centers) and rural zoning which mainly includes the whole Imidugudu complex, agricultural zones, forests and infrastructure in the district.

The DLUP cluster should be consistent with green principles and climate resilience strategies to become a District Green Land Use Plan (DGLUP). The development of any master plan in the district should be in the form of a set of local urban and rural plans brought together to form an integrated district plan. The product will be a detailed zoning map of the district with zoning regulations, useful for cadastral surveying, building permit systems and for subsequent detailed local physical planning. Through law enforcement and intelligent permitting services, this type of planning will play an important role in eliminating sprawl, thereby increasing consolidation.

Statutory phasing of the implementation of each land use plan will be mandatory for Muhanga District and essential for all other districts. The key idea of phasing is tiling, which prevents random or distant development settlements. Each new phase should be geometrically linked to the previous one. A five-year phase is recommended for all district land use plans and the Kigali City Master Plan.

It is therefore in this perspective that the preparation and revision of Muhanga DLUP was undertaken from June 2021. The revision of Muhanga DLUP was done within the framework of alignment and compliance with the NLUDMP 2020- 2050, Vision 2050, NST1, and the DDS.

1.2 OBJECTIVE AND SCOPE

1.2.1 Objective

The DLUP aims to allocate land to different uses for the concerned district by clustering all thematic areas, to manage the efficient use of resources and guide future development in line with the NLUDMP 2020-2050, thereby promoting social, economic and environmental benefits. The DLUP emerged with the 2035 target, which is to be revised for the 2050 target, to facilitate the implementation of the NLUDMP 2020-2050 in two manageable phases. It gives details in terms of land allocation with specifications and potentialities of the districts, in comparison with the NLUDMP 2020-2050 which gives general guidelines to facilitate the planning balance of land use at national level.

1.2.2 Scope

The scope of this review and update of Muhanga DLUP focused on the whole district, consisting of both urban and rural components. Muhanga DLUP covers all thematic areas. Taking all these coverage areas together, land has been allocated to different uses while zoning to feed each sector depending on its land demands and developing an effective land use balance sheet to guide the way forward to the 2050 view in line with the NLUDMP 2020-2050.

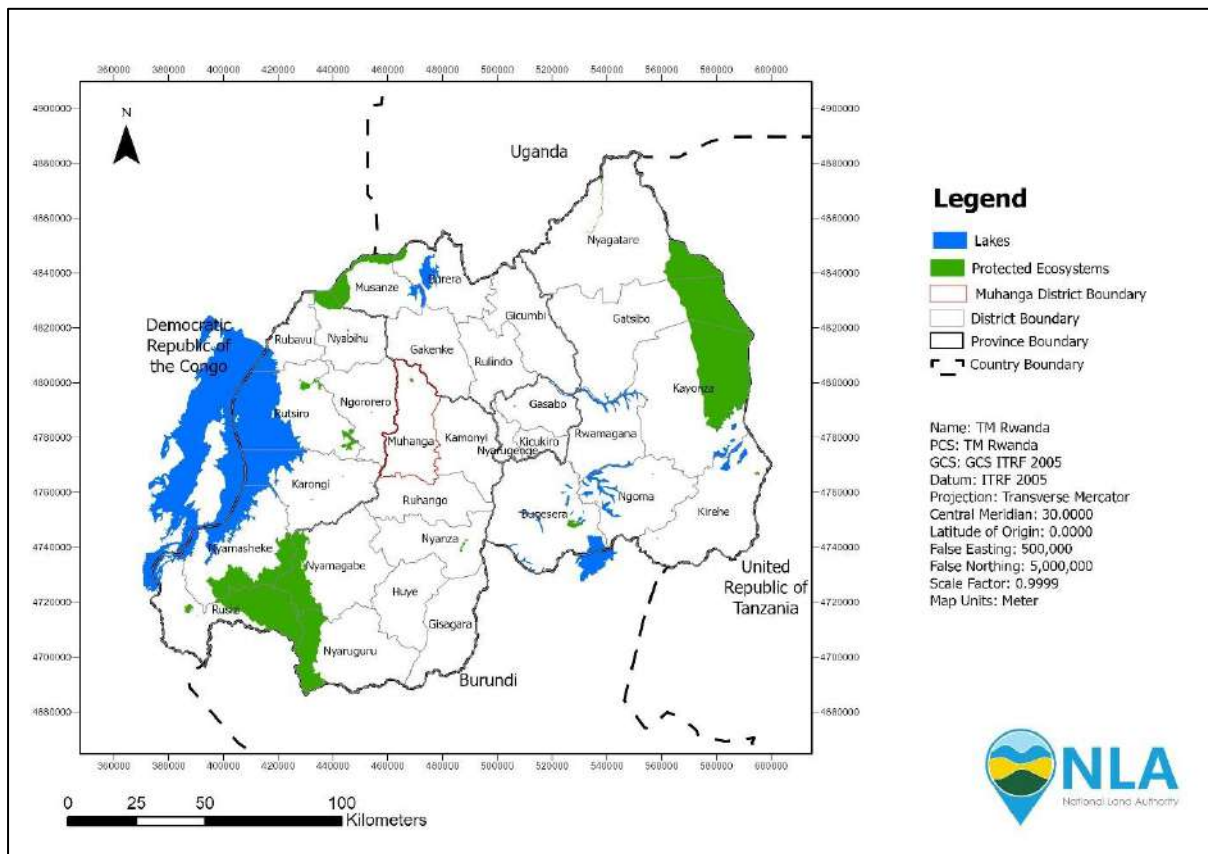
1.3 MUHANGA DISTRICT DESCRIPTION

Muhanga is one of the eight districts of the Southern Province established by the organic law n° 29/2005 of 23/12/2005 on the administrative entities of the Republic of Rwanda. It is subdivided into 12 sectors: Muhanga, Cyeza, Kibangu, Kiyumba, Mushishiro, Kabacuzi, Nyabinoni, Nyamabuye, Nyarusange, Rongi, Rugendabari, and Shyogwe, as well as 63 cells and 331 villages (Imidugudu) occupying an area of 647.7 Km². The section also briefly outlines the characteristics of Muhanga District in terms of geographical location, hydrography, soil, topography, vegetation, population and demography, specialization, and economic opportunities.

1.3.1 Geographical Location

Muhanga District is referred to as being in the central part of the country, joining the west, south, north and the city of Kigali towards the east. Muhanga is located in the Southern Province and shares its borders with two districts in the Southern Province, namely Kamonyi

in the east and Ruhango in the south. Besides, Muhanga District shares its borders with the Western Province with Karongi and Ngororero Districts in West, and with the Northern Province with Gakenke District in North. The main urban area of Muhanga District, Muhanga Satellite City, is located in the south-eastern part of the district and shares borders with Ruhango District along Shyogwe, Nyamabuye and Muhanga Sectors, and this city also adjoins the border of Kamonyi District along Shyogwe and Cyeza Sectors. The remaining areas, from the south-west to the central and northern parts of the district, are considered rural, with a succession of unevenly distributed settlement centers.



Map 1: The location of Muhanga District

1.3.2 Hydrography

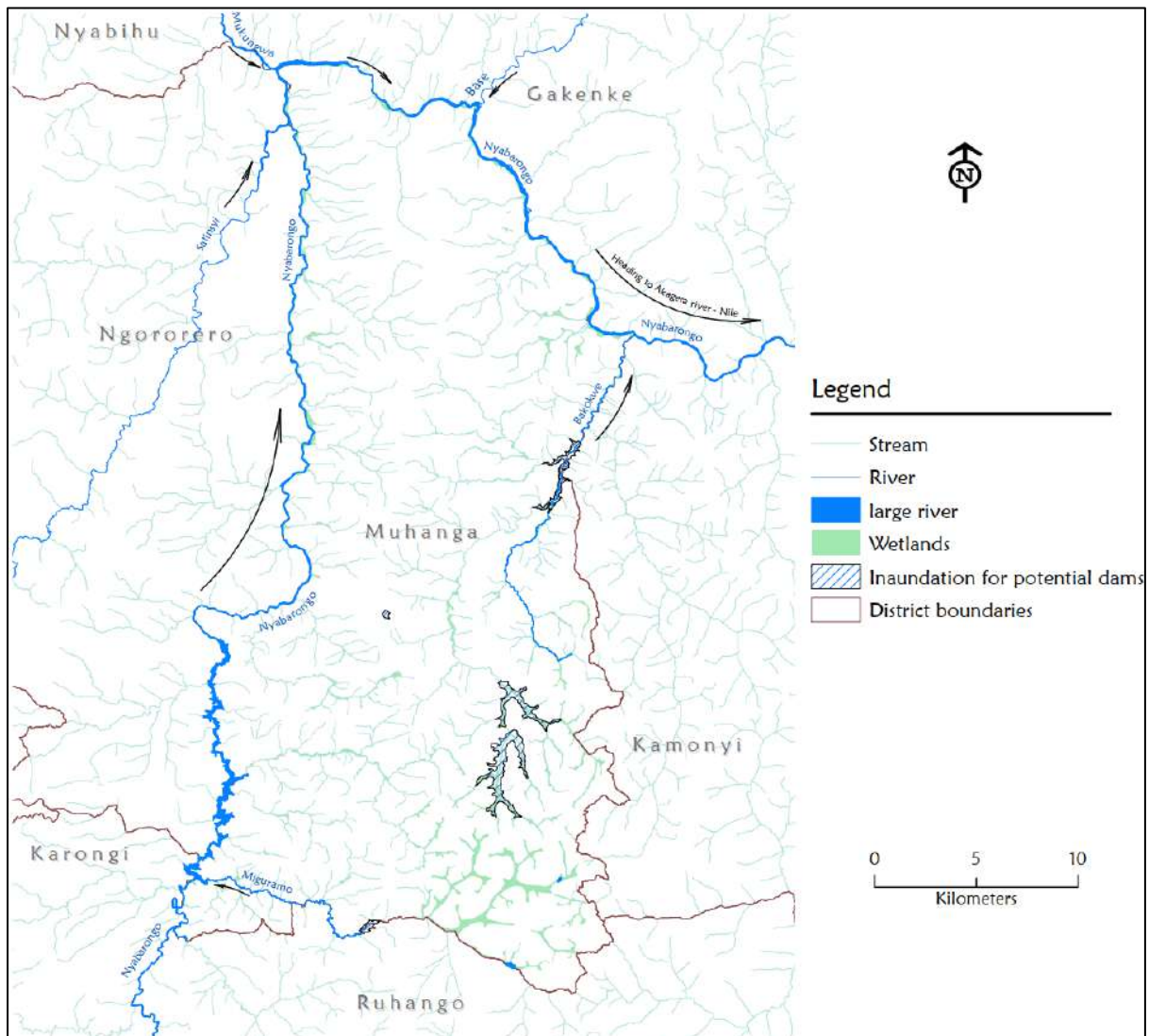
Hydrography deals with the measurement and description of the physical characteristics of oceans, seas, coastal areas, lakes and rivers, and the prediction of their evolution over time. Its primary purpose is to ensure the safety of navigation and to support all other maritime activities, including economic development, security and defense, scientific research and environmental protection. In view of this significance, Muhanga is a district which doesn't have a lake or large water bodies like the ocean or the sea. Instead, the district has a rich distribution of rivers of different categories led by Nyabarongo river. This Nyabarongo forms the hydrographic belt of

the district that crosses six Sectors and collects more than 90% of the runoff/small rivers alone; its tributaries are Miguramo, Muhanga, Ururumanza, Sagarara, Kiryango, Akabebya, Mukunguri and flow eastwards to Akanyaru. Nyabarongo river flows from the southwest, crossing the border of Muhanga District from west to north, as well as turning east across the border to the north after catching Satinsyi river from the west in Ngororero District, and Mukungwa from the north. It serves as an accumulation of all the rivers in the whole district, as they all flow into it.

This pattern of drainage in Muhanga District, generally consisting of a rich distribution of rivers, is mainly influenced by the nature of the topography of the district. Since Muhanga is a district with a succession of mountains and valleys, this has influenced the distribution of water flow in the overland rivers. Considering the mountain ranges from the south of the district to the north, the flow of the rivers is divided into two distinct parts. One part of the rivers on the western side of these mountains flows westwards into Nyabarongo directly and the other part of the rivers flows eastwards with Bakokwe flowing into Nyabarongo as well between Muhanga, Kamonyi and Gakenke districts. In terms of social life in Muhanga District, this pattern of river and water drainage favours the population especially in the farming context. For example, some Swamplands are openly used for agriculture, especially for rice, as in the south-eastern part, in Rugiramigozi. Thus, they use a water drainage irrigation system to feed these Swamplands to grow rice as well as other crops. This system is also applied to other rivers such as alongside Nyabarongo river. In addition to agriculture, the rivers are also a source of energy for a community in Muhanga District as well as for the country as a whole. Some of the rivers in Muhanga are used to generate electricity for the local community, but the major project is the Nyabarongo power plant in Mushishiro sector, bordering Ngororero district, which produces a large megawatt of electricity and is connected to the national grid.

Land use planning in Muhanga District does not affect the pattern of rivers, although this river distribution system may contribute to the allocation of land to specific uses such as agriculture or other activities. In terms of DLUP, consideration of rivers and their buffer zones is a key aspect to include since, for example, no settlement should be planned in a river or wetland buffer zone. Similarly, in the situation of flooding or severe overflow that may pose a hazard to the community, the DLUP considers sensitive disaster-prone areas and allocates land use with this concern at the forefront. As such, no settlements or other related infrastructure or activities should be allocated in these flood-prone or other high-risk areas. It is in this respect that the DLUP becomes a powerful tool to accumulate the hydrographic pattern in Muhanga

District and consider the challenges or benefits that should be associated with this hydrography, and then look at the allocation of land to different uses with respect to these aspects.



Map 2: Muhanga hydrography

1.3.3 Soil and Erosion

1.3.3.1 Soil in Muhanga District

Soil in Muhanga generally consists of humic Kaoli soils derived from granitic rocks. However, soil characteristics vary from one ecological type to another, which is observed from a variety of soils depending on altitude (high and low hills or lower slopes). According to the Food and Agriculture Organisation of the United Nations (FAO), the main soil categories in Muhanga District are Haplic Acrisols, Humic Alisols, Humic Cambisols, Humic Luvisols, Dystric Leptosols, Humic Ferrasols, Haplic Pheozems, Vertical Luvisols, Umbic Gleysols, Terric Histosols and Ferric Lixisols. In addition, the district has lateritic and granitic soils distributed

over most of its territory. The swamps and lowlands are characterised by silt-rich clay soils with local alluvial and colluvial deposits.

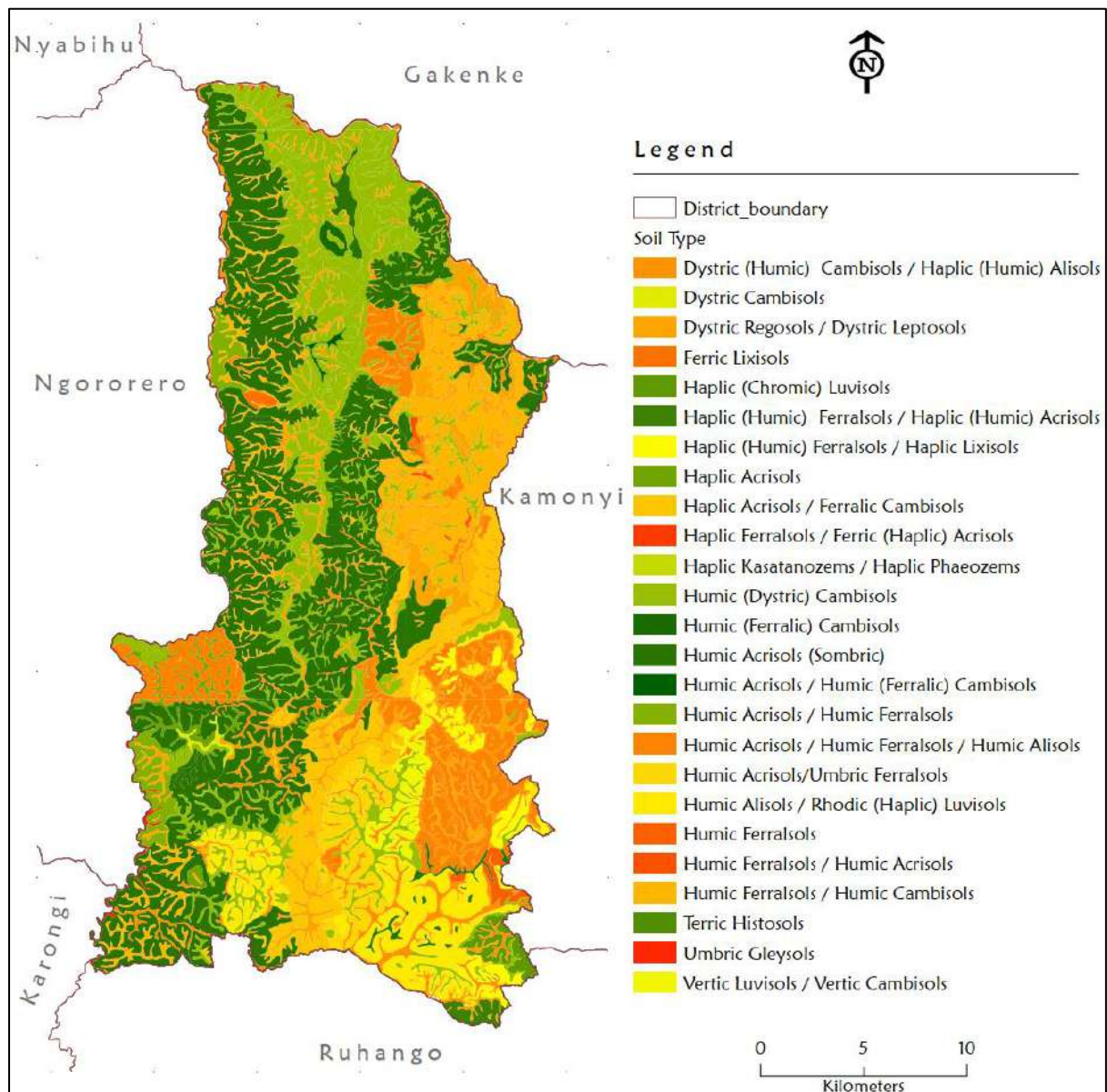
Soil performs a range of functions and services that influence the living conditions of the population. Socially, the soil in Muhanga is mainly used for agriculture especially in Swamplands and uplands, mining activities, human settlements and forestry plantations. The economy of Muhanga District is therefore based on agriculture (coffee, rice, cassava, vegetables and cereals) and mining. Although the soil acidity is high, due to the presence of minerals in the district, some parts of the district are not conducive to agricultural practices due to their high pH levels. Thus, the steeply sloping soil encourages people to leave it for forest, including Eucalyptus and Pinus, as well as for large banana crops with the combination of avocado, sweet potato, cassava, etc.

In general, soil is a basic resource when developing a land use plan based on soil type. Not all soils are suitable for agriculture and for building houses, roads and factories but have characteristics that may limit their use. Not all soils are suitable for building houses, roads and factories. Soils have characteristics that may limit their use. For example, some soils are rocky. This makes cultivation difficult. The focus of a land use planner, engineer, landowner or developer should be to match the land use with the soil type.

The influence of the soil on the development of the Muhanga DLUP needs to be considered, especially for the type of soil and its appropriate use. According to the International Soil Reference and Information Center (ISRIC) and the Food and Agriculture Organization of the United Nations (FAO) soil categories, the use of each soil type should be applied by a planner when developing the DLUP. For example, in Muhanga District, Histosols are mainly suitable for agriculture. Leptosols are suitable for extensive grazing, arable farming and most Leptosols are best kept under forest. Pheozems are fertile and are used for grassland or forest vegetation, irrigated cereal planting and livestock farming. Soils have a wide range of agricultural uses because of their moderate weathering and high base saturation. They are mainly covered by natural swamp vegetation but can also be used for agriculture, dairy and horticulture, rice planting, arable crops and extensive grazing.

Muhanga District has Alisols that contain mainly a substantial amount of unstable minerals. The district also has Ferralols which are characterised by low natural fertility, have good physical properties but are chemically poor and cannot support agricultural activities except for other uses including residential and infrastructure use. The district is also rich in cambisols,

which are characterised by a high content of weather-resistant minerals and can be used for agriculture, subject to the limitations of the land. All soil types need to be used appropriately to ensure high productivity of land use in the future.



Map 3: Muhanga soil characteristics.

1.3.3.2 Erosion in Muhanga District

Water erosion is the main type of erosion found in Muhanga District where water following heavy rains removes the top layer of soil and displaces soil particles, depositing them in lower areas of the landscape. This is mostly due to heavy rainfall, altitude and soil depletion due to over-farming and limited use of manure and mineral fertilisers. The average annual rainfall in Muhanga is about 1207mm of rainfall per year and it is located in the high mountains of the Cong Nile with the peak above 2000m. This results in the movement of eroded soil from the

steep slopes including Budaha-Ndiza and Buberuka hills to the Muhanga rivers such as the Akanayaru and Nyabarongo with its tributaries Miguramo, Muhanga, Ururumanza, Sagarara, Kiryango, Base, Akabebya, Mukunguri.

The movement of soil eroded by water from the top to the bottom of the landscape leads to the loss of the top layer which is mainly fertile and vulnerable for the agricultural activities of the Muhanga communities. Soil infertility results in low agricultural productivity, leading to high food prices. Heavy water runoff and flooding leads to the destruction of roads and buildings which are mainly the basic infrastructure of the community. Contamination of the eroded soil by river water, especially the Nyabugogo River, decreases the quality of the water by changing its chemical content and reducing its oxygen level, which causes illness in the society. Areas vulnerable to water erosion in Muhanga should be considered and planned for all uses that act as erosion prevention measures, including forestry, agriculture by condition and livestock, as well as for protection if they are at a high level proven by the risk analysis assessment.

In Muhanga District, the conversion of the natural ecosystem into a planned land use, especially in the mining sites during the DLUP implementation phase, disturbs the stability of the soil particles and even changes its texture. Developing the Muhanga District Land Use Plan without preserving natural land use or incorporating other compensatory measures will be the key to severe erosion in the future.

1.3.4 Topography

1.3.4.1 Muhanga District elevation

Elevation representing the vertical distance of a point or level that may be a feature or phenomenon on or affixed to the surface of the Earth, measured from sea level. The elevation of Muhanga District varies from highest to low with high mountain ridge ranges and successive "V" shaped valleys. One part of Muhanga District is in the country's "central plateau" with a hilly topography. With moderate and low-lying terrain, this part of the district is among the best areas of the national Central Plateau. The other part of the district is in the high mountains with peaks exceeding 2000 meters (Saruheshyi, Kanyarira, Mukingi, and Samba). It also contains some peaks forming part of the Budaha-Ndiza-Buberuka region.

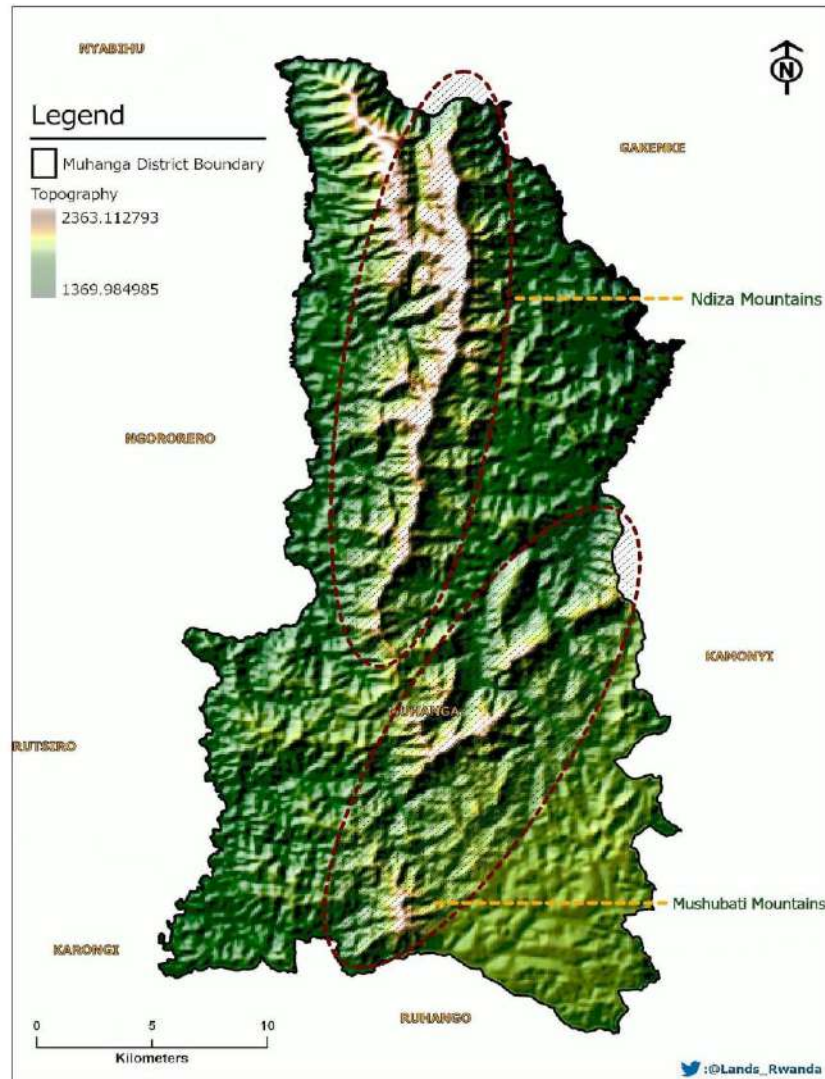
With regard to the livelihoods of the society in Muhanga District, this type of elevation sometimes favours them in the development of their subsistence livelihoods, such as construction and agriculture, especially in the low-lying flat part of the district which is located

in the south-east. The landscape of this area is very suitable for infrastructure development as well as for agriculture due to extremely minimal soil erosion and ease of mechanisation. This part contains some Swamplands such as Rugiramigozi which is more used for the development of rice and maize farming.

However, the south-western part to the central and northern part of Muhanga District is marked by a complicated topography that makes the area less suitable for farming and dwellings. People tend to build their residential houses on top of the hills, since that is usually better than another location. This situation has led to a scattered distribution of settlements and other related activities. The high elevation in these areas favours the cultivation of certain crops such as Irish potatoes, wheat, etc. However, this topography does not favour mechanisation, and it does not seem possible to use machinery in agriculture, which has meant limiting the development of agricultural production. On the other hand, this topography favours severe soil erosion, where the fertile soil gets moved from the tops of the mountains to the plains in the rivers, and this influences the low agricultural productivity. In addition, the problem of scattered settlement promotes poor land and resource management and influences the problems of land fragmentation. Nevertheless, this topography should be good and potential for hiking, and can be developed in the sense of a tourist attraction that can contribute to the development of social life.

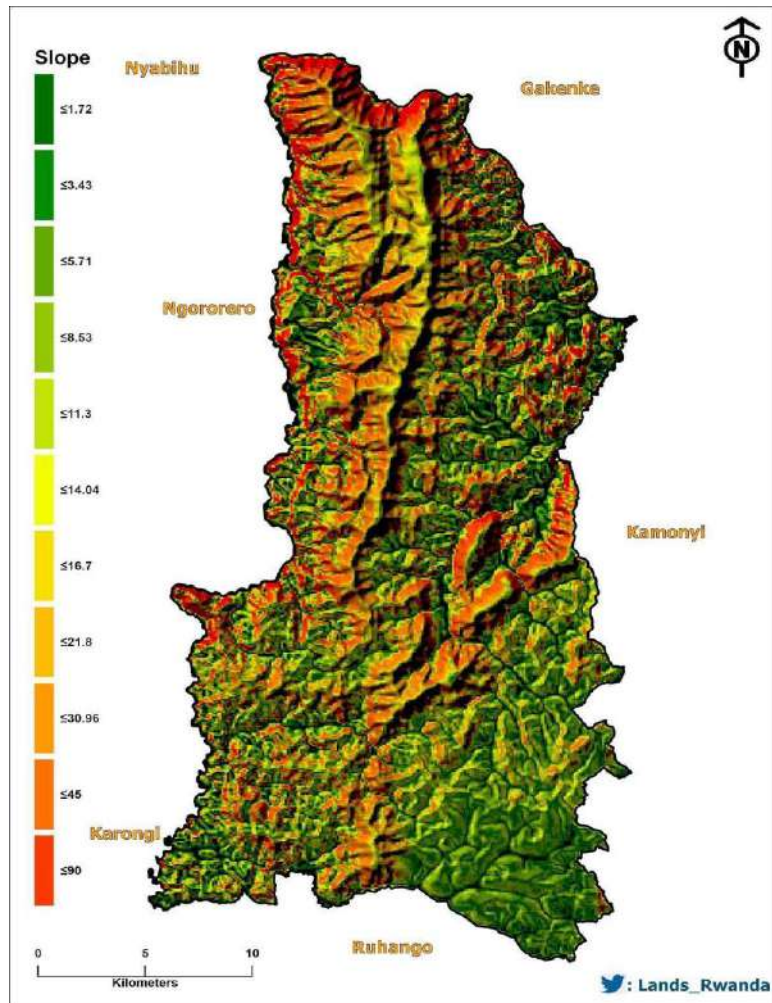
Overall, this type of elevation in Muhanga District, on the one hand, creates an obstacle to good land use planning, as it is not easy to find a good location for a large settlement to support Muhanga satellite city. As a result of this nature of the topography, coupled with the scattered residential livelihoods, many unremarkable settlements have subsequently emerged as rural settlement sites closer to each other during the development of the DLUP. A further issue is that where other districts have more than one rural center, the topography of Muhanga has made it difficult to identify good locations for development in urban areas that support Muhanga satellite city. Only one location - Remera center - proved to be a suitable area for development.

Muhanga DLUP is a solution to manage land allocation in the whole of Muhanga District, taking into account its topography and association potentials. The DLUP is only one solution to facilitate the development of this district in a well-planned manner, where resources are to be managed efficiently, and guide future development with due regard to the most desired social and economic livelihoods, as well as good environmental outcomes.



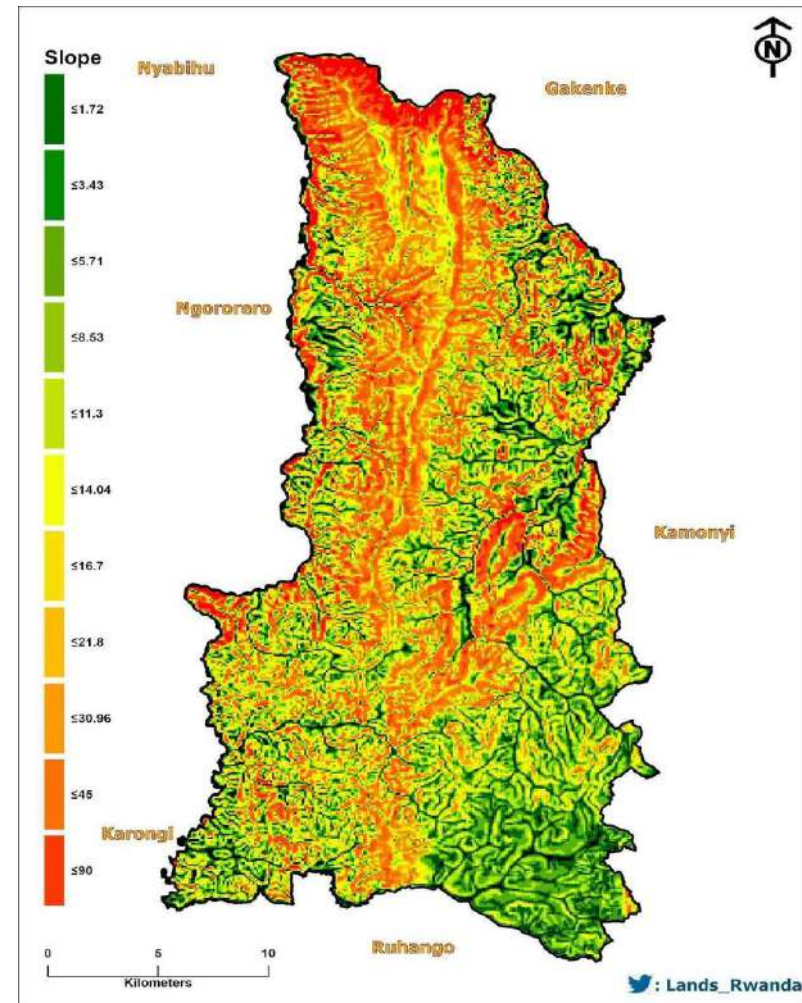
Map 4: Muhanga Topography

1.1.1.1 Muhanga District Slope



Map 6: Muhanga District slope adjusted to elevation.

Map 5: Muhanga Hill Shade



Map 7: Muhanga District slope

Muhanga is one of the Districts in Rwanda that is characterised by the steepest and most contested slope based on its high topography and successive lowlands. The slope in Muhanga District is usually ranging from 1.72 to 90% increment according to GIS analysis. The Southeastern part of the district, especially in Muhanga, Shyogwe, Nyamabuye and Cyeza Sectors, where Muhanga satellite city is located, is the area with a lowland plateau and characterized by a very low slope. While the western, central, and northern parts are more dominated by high altitude mountains and some very low-lying Swamplands along the Nyabarongo rivers and form the high steep slope. Based on rugged mountains, the slope is very high especially in the northern part towards Amasangano area where the Nyabarongo, Satinsyi and Mukungwa rivers converge by the side of Nyabinoni sector. Ndiza Mountains range between Kabacuzi and Rugendabari in the central part of the district, in a northerly direction between Kiyumba, Kibangu, Rongi and Nyabinoni sectors form the longest and highest terrain in the district. It forms the steepest slope on their downward sides in the eastern and western parts.

1.1.2 Flora and Fauna

1.1.2.1 Flora

According to the forest cover mapping report (MoE, 2019), Forest cover in Southern Province is about 177,537ha forests corresponding to 29.8% of the total province land. The results show that Muhanga is the third highest forested with 17,120 ha of forest cover (i.e. 10% of the total southern province land), as it is presented in the table below:

District	Total District land without water (Ha)	Total forest cover (Ha)	% Forest cover
GISAGARA	67,920	9,021	13.3
HUYE	58,153	14,688	25.3
KAMONYI	65,553	9,016	13.8
MUHANGA	64,772	17,120	26.4
NYAMAGABE	109,036	54,018	49.5
NYANZA	67,215	8,949	13.3

NYARUGURU	101,027	55,759	55.2
RUHANGO	62,678	8,965	14.3
Total	596,355	177,537	29.8

Table 1: Summary statistics of forest cover in Southern Province

Muhanga District Natural plants or ecosystems have disappeared, leaving room for crops and artificial forests. The crops consist of large banana plantation with the combination of avocado, sweet potatoes, cassava, etc. Most of the current artificial forests consists of Eucalyptus, Pinus and few grevilleas especially on the line's conservation tillage. The main use is the construction of houses, firewood and the construction of bridges. This imposes the rehabilitation of damaged natural forests and agroforestry. However, the District has a natural forest of around 150 ha called Busaga in Ndiza Mountain.

1.1.2.2 Fauna

The wildlife of Rwanda comprising its flora and fauna, in prehistoric times, consisted of montane forest in one third the territory of present-day Rwanda. Although Rwanda is a small country, it has a remarkable variety of ecosystems and of flora and fauna. Its location at the heart of the Albertine Rift eco-region in the western arm of the Africa. The Albertine Rift is considered to have the highest species richness in Africa. It is considered a biodiversity hotspot containing more endemic mammals, birds, butterflies, fish and amphibians than anywhere else in Africa. Habitats supporting such an array of biodiversity are very varied.

Wildlife no longer exists in Muhanga District for a long time except for some birds, small mammals and reptiles encountered in the less frequented places. Thus, from the wildlife point of view, only domestic animals i.e. cattle, goats, sheep, pigs, rabbits, chickens and cats exist in the district.

1.1.3 Profiling

1.1.3.1 Muhanga District Population

The PHC5 2022 have enumerated 358,433 residents in Muhanga District, which represent 11.9% of the total population of the Southern Province (3,002,699 residents). The population of Muhanga District is predominantly female, 184,818 females, corresponding to 51.6 % of the total population. The Sectors of Shyogwe, Nyamabuye are the most densely populated Sectors

with over 50 thousand residents each. The less densely populated Sectors are Rongi and Kabacuzi. According to the PHC5, the number of out-migrations is more than the number of in-migration. The increasing number of rural population is migrating to other cities in search of a better life. This has affected the development of Muhanga.

According to the PHC5, Muhanga's population is young, with 41% of the resident population under 17 years of age. The average household size in Muhanga is 3.8 persons. Muhanga District is predominantly rural with 75.7% of its population living in rural areas. Nine out of 12 Sectors in Muhanga District are entirely rural, namely Kabacuzi, Kibangu, Kiyumba, Muhanga, Mushishiro, Nyabinoni, Nyarusange, Rongi and Rugendabari. Muhanga Satellite City Masterplan was approved by the District Council where 3 Sectors were selected as urban administrative boundaries, which are Cyeza, Nyamabuye and Shyogwe Sectors. There are several urban boundaries used by different authorities for Muhanga City. According to the PHC5, a total of three Sectors, nine Cells and 41 Cillages come under the urban boundary of Muhanga City, with an urban population of 87,252.

However, the following table shows the distribution of the population in Muhanga District according to the Sector unit, as the result of the 2022 population census.

SECTORS	POPULATION 2022	DENSITY (Inhab/Sqkm)
Cyeza	34,540	604
Kabacuzi	28,192	374
Kibangu	20,326	424
Kiyumba	23,364	392
Muhanga	28,700	463
Mushishiro	21,071	397
Nyabinoni	16,253	412
Nyamabuye	59,961	2026
Nyarusange	28,308	458

Rongi	29,389	361
Rugendabari	17,363	407
Shyogwe	50,966	1419
TOTAL	358,433	555

Table 2: Muhanga District total population with density per Sector unit in 2022 (Source: NISR, 2022)

1.1.3.2 Potentialities of Muhanga District

1.1.3.2.1 General overview

Following the site visits and the focus group discussions, the consulting team put together the list of ranked potentialities, along with justifications and strategies. Local economic development potentialities were assessed using the following criteria and indicators:

- Business growth (business growth per year)
- Job creation (jobs created per year)
- Income increase (income increase per year)
- Tax revenue increase (tax revenue increase per year)
- Youth employment (jobs created for youth)
- Women's economic empowerment (jobs created for women)
- Economic transformation (i.e., new businesses in mechanized agriculture, industrial sector, ICT and / or service sector)
- Response to local market demand for products Potential for exports (export increase per product per year)
- Environmental sustainability (i.e., environmental impact and use of natural resources).

The value of the potentiality as indicated in the table of potentialities, is appreciated based on its socio-economic benefits that could be brought by investment in the potentiality.

Potentialities	Prioritized values
Increased production	- Sufficient local/ national demand - Production has potential multiplier effects.
Export earnings	- High international demand

	- Product has priority in National Export Strategy - Tax revenue increase (through formalization)
Economic Diversification	- Tax revenue increase (through formalization) - Added value (bringing product closer to end line) - Environmental sustainability - Strong links to employment creation - Potential product in harmony with national strategies
Employment creation	- Increase in formal sector wage employment - Low skilled, labour-intensive employment - Increased employment of women

Table 3: Potentialities of Muhanga District

1.1.3.2.2 The potentialities assessment and strategies

1.1.3.2.2.1 Potentialities

The presence of a large town in Muhanga offers numerous opportunities for the development of services and manufactured goods, as indicated by the SME cluster chart. However, the dominance of the agricultural sector within Muhanga indicates that agribusiness development will have a considerable impact on LED. Furthermore, the presence of numerous mineral deposits offers opportunities to rapidly diversify Muhanga economic base. These and other potentialities are examined in greater detail in the district briefing and report.

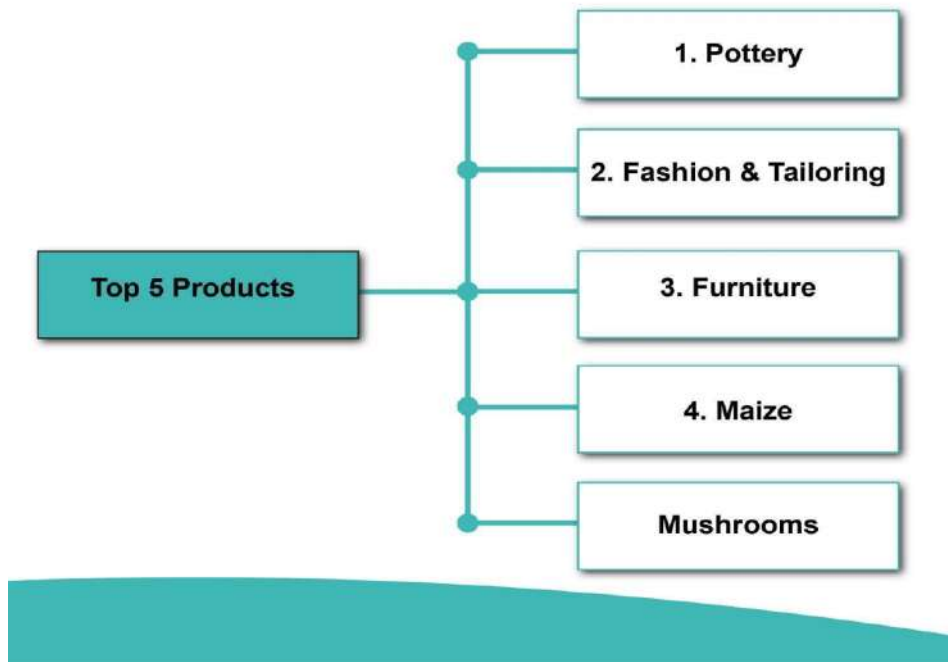


Figure 1: Top five products for Muhanga District (Source: SMEs product cluster MINICOM / 2011)

Potentiality	Area/Product	Strategy	Potential Returns	Feasibility/Capacity	Skills needed	Sectors
	Agribusiness					
1. High soil fertility	Pineapple, Coffee, Sericulture, Irish potato, Wheat, Fruits, Maize...	-Build producer cooperatives capacity for post-harvest storage, erosion control and water management, -Provide improved inputs to producer cooperatives.	-labour intensive job creation -reduction in postharvest losses and improvement of productivity	-Existing Support from District and sector technicians -Producer's cooperatives and organizations -Unskilled farmers and technicians	-Agricultural scientists - Agribusiness specialists -Post harvest handling -Food processing -Business logistics	Kabacuzi, Kiyumba Rongi, Nyabinoni, Muhanga, Nyarusange Kabacuzi, Mushishiro
2. Large land for livestock	High potential of livestock	-Provide insemination support to producer cooperatives -Facilitate veterinary access for producer cooperatives -Initiate animal insurance scheme -Supply technical support to animal producers; -Initiate animal insurance scheme.	-increased livestock production -Established tradition of livestock in Muhanga -Presence of modern slaughter in Muhanga Town	-Established habit of livestock husbandry -Presence of veterinary public servants -Lack of modern techniques in animal husbandry -High demand in animal products	-Animal Husbandry -Veterinary Science	All Sectors

	Mining					
3. Mines and quarries	Clay, Cassiterite, Coltan, stones and sand	-Rehabilitate roads in Ndiza -Develop strategy to professionalize mining sector and attract private investment	-Boost off-farm employment -Formalizing sector will increase tax revenues	Lack of mining technicians -High international demand for Coltan and Cassiterite -Artisanal Mining operations currently active	-Mining specialists -Ecologists -Safety specialists	Cyeza, Kabacuzi, Kibangu, Kiyumba, Muhanga, Mushishiro, Nyamabuye, Nyarusange, Nyabinoni, Rongi, Rugendabari
	Modernising mining extraction and initiate minerals processing	-Extraction of Cassiterite and Coltan in 11 of 12 Sectors; -Road network improvement in Ndiza -Promotion of investment in mining activities -Attract foreign investors - Promotion of local mineral processing	-Boost off-farm employment -local mineral processing for added value and creating employment	-Abundance of minerals in Ndiza -High international demand of those minerals - -Need of local mineral processing for added value and creating employment - -Lack of tradition of mineral processing		Cyeza, Kabacuzi, Kibangu, Kiyumba, Muhanga, Mushishiro, Nyamabuye, Nyarusange, Nyabinoni, Rongi, Rugendabari
4. Human capital	Industry					
	Availability of Site for Craft	-Develop strategy for establishing Agakiriro site -Partner with	-Boost off-farm employment -	-Existing handicraft cooperatives - Insufficiency of	Vocational Trainers - Business logistics	Kabacuzi, Rongi, Kibangu, Rugendabari, Nyabinoni

	Industry /AGAKIRIRO	TVETs to ensure flow of skilled labour	Revenue diversification	Skilled Teachers and trainers		
5. Suitable rivers for hydroelectricity	Energy					
	Existence of Nyabarongo along 7 Sectors for hydropower	-Conduct feasibility study for Hydroelectric plant and microbarrages	-Additional plants could boost local electrification and improve the business environment	Scarcity of skilled technicians in barrage construction - Scarcity of skilled technicians in electricity Micro-barrage currently being constructed	-Electrical Engineers Environmental Scientists	Nyarusange, Mushishiro, Rugendabari, Kibangu, Rongi, Nyabinoni, Kiyumba
6. Big number of local investors	Commerce					
	Commerce -	Local investors sensitization - Identification of economic potentially attractive activities - Audio-visual advertising of those activities - Commitment of District to invest in those activities	The creation of job new employment opportunities Reduction of youth unemployment to alleviate poverty Increasing income levels Broadening the tax and revenue base of municipalities The	Large number of local businessmen/women but working individually Favourable environment for investment. - central location of Muhanga in the Country, existence of crossed national paved roads toward North,	- Custom of individual investment - Low capacity in entrepreneurs' hip and project management - Insufficient number of BDC, BDSs Experienced Businessmen / Women	Muhanga, Nyamabuye, Mushishiro, Cyeza, Nyamabuye

		- Access to finance facilitation Involvement of local BDS, BDC, cooperatives and MFI; Road network improvement in Ndiza	development of human sources.	South, East and West, existence of touristic sites, high demand in tourism related services (Tourism sites, Hostels, Regional Stadium, Commerce, Restaurants, Mineral Water ...); Potential non-local investors		
7. Abundance of clean water sources	Industry	Public advocacy - Promotion of private initiatives - Promote and support local water management committees Road network improvement in Ndiza	-Can provide clean water to nearby districts	Abundance of clean water springs and rivers in Ndiza - Potential of adduction water supply - Low rate of water access rate in Muhanga (67%) Full Access rate to water is one of Vision 2020 objectives	Lack of water supply skilled technicians	Nyabinoni, Rongi, Kibangu, Kiyumba, Rugendabari, Kabacuzi (Ndiza)
8. Large area with forest	Bekeeping	Harvest all old forests - Replace Pinus and	Forestry and Wood industry promotion	Abundance of hillside lands for afforestation - Abundance of old	District and Sector Agriculture staff	Kabacuzi, Rongi, Kibangu, Rugendabari, Nyabinoni

		Cyprus by friendly Eucalyptus species - Promote and support nurseries development at Cell and Umudugudu level; Renew old forests - Modern beekeeping technics - Train beekeepers - Processing units	(plantation and apiculture), Increased of Honey production	forest to be harvested and replaced - High need of hillside protection against erosion, Large forests - High demand	- Presence of afforestation public projects	
9. Abundance of white clay quality stones and sand		Modern beekeeping technics - Train beekeepers - Processing units. - Train young people in clay modern processing - Promote investment in clay exploitation Advertise quality stones clay and sand s of Muhanga District - Road network improvement	Reduced import of clay product Job creation Tax revenue increase	-Abundance of very good clay, stones and sand in South and west Muhanga District - Abundance of labour - Local experience in clay processing - High demand in clay products	Lack of clay modern processing technicians - One stone exploitation exists near Muhanga Town and cold train some apprentices	All sectors, mainly Shyogwe

Table 4: Potential sectors in Muhanga District

1.1.3.2.2.2 Existing potentialities in Muganga district

The following are latent socio-economic potentialities within Muganga district.

- (i) Progressive and radical terracing;
- (ii) Modernization of agriculture;
- (iii) Agri-business Promotion;
- (iv) Promotion of cooperatives;
- (v) Artificial insemination and distribution of bulls;
- (vi) Modernization of aquaculture;
- (vii) Development of small livestock;
- (viii) Beekeeping and fish promotion of cooperatives;
- (ix) Milk and hides processing;
- (x) Enhance cooperative capacity guarantee fund of micro-projects that generate income;
- (xi) Modernization of artisan;
- (xii) Organize artisans into cooperatives;
- (xiii) Creation of craft centers;
- (xiv) Guaranty funds for artisans to produce low material and intermediate products such as bamboo and sisal agave;
- (xv) Strengthening of trading centers;
- (xvi) Construction of markets;
- (xvii) Organization of the PSF at all levels;
- (xviii) Awareness to the savings and credit;
- (xix) Development of the agricultural industry;
- (xx) Technical school of mines;
- (xxi) Electrification of the trading centers;
- (xxii) Marketing and development of tourist sites;
- (xxiii) Hotel investment;
- (xxiv) Promotion of work type HIMO for job;
- (xxv) Promotion of non-agricultural activities (crafts, industry and services);
- (xxvi) Rehabilitation and routine maintenance of roads;
- (xxvii) Construction/rehabilitation of bridges;
- (xxviii) Construction of micro - solar energy and biogas;
- (xxix) Development of alternative energy sources;

- (xxx) Public offices subscription to electricity;
- (xxxi) Construction of TV centers;
- (xxxii) Connections to the Internet public offices and schools;
- (xxxiii) Construction of modern ovens of brick and tile;
- (xxxiv) Creation of companies or cooperatives of operators of mines;
- (xxxv) Establishment of technical school of mines and geology;
- (xxxvi) Development/rehabilitation and maintenance of water infrastructure.

1.1.3.2.2.3 Proposed Strategies

The key strategies for supporting District economic development relate primarily to infrastructure improvement and the development of key skills and capacities of the local population in order to capitalize on identified potentialities. The strategies identified include land use management, improvement of roads and transport infrastructure, improved electrification, enhancement of technical and vocational schools (TVETs), and further expansion of ICT infrastructure.

1.1.3.3 Employment

In Muhanga, agriculture stands as the predominant sector, encompassing 70% of employment opportunities as per the 2017 EICV5 data. Additionally, significant employment sectors include wholesale and retail trade, constituting 9% of the workforce, followed by construction (5%), and household enterprises (3%). Over the period of 2014 to 2017, total employment in Muhanga experienced growth from approximately 181,883 to 207,556 jobs. The surge in employment was primarily attributed to agriculture, witnessing an increase from 117,000 jobs in 2014 to 146,000 jobs in 2017, marking a noteworthy 25% escalation over the three-year span. Subsequently, there were notable job increases in transportation and storage (3,708), arts, entertainment, and recreation (2,574), construction (891), and household enterprises (751). The construction sector witnessed a 10% uptick in employment between 2014 and 2017, attributed to the availability of cost-effective building materials and heightened urbanization. Despite wholesale trade ranking as the second-largest sector, it experienced a marginal 8% decline in employment, dropping from 20,000 jobs in 2014 to 18,000 in 2017."

ISIC Industry Group	EICV4	%	EICV5	%	Sector Job growth	%
Agriculture, forestry and fishing	117,044	64.35	146,194	70.44	29,150	25%
Mining and quarrying	6,149	3.38	3,973	1.91	-2,176	-35%
Manufacturing	4,973	2.73	1,740	0.84	-3,233	-65%
Electricity, gas, steam and air condition	307	0.17	182	0.09	-125	-41%
Water supply, sewage, waste management	424	0.23			-424	-100%
Construction	9,332	5.13	10,223	4.93	891	10%
Wholesale and retail trade	20,097	11.05	18,489	8.91	-1,608	-8%
Transportation and storage	1,838	1.01	5,544	2.67	3,706	202%
Accommodation and food service activities	1,509	0.83	1,049	0.51	-460	-30%
Information and communication	178	0.1	205	0.1	27	15%
Financial and insurance activities	752	0.41	982	0.47	230	31%
Real estate activities	178	0.1			-178	-100%
Professional, scientific and technical	2,559	1.41	421	0.2	-2,138	-84%
Administrative and support services	2,068	1.14	1,445	0.7	-623	-30%

Public administration and defence	2,60	1.43	1,010	50.49	-1,595	-61%
Education	2,475	1.36	3,424	1.65	949	38%
Human health and social work activities	821	0.45	1,480	0.71	659	80%
Arts, entertainment and recreation	162	0.09	2,736	1.32	2,574	1589%
Other service activities	1,751	0.96	1,186	0.57	-565	-32%
Activities of HH as employers	6,337	3.48	7,088	3.41	751	12
Activities of extraterritorial organisations	324	0.18	185	0.09	-139	-43%
Total	181,883	100	207,556	100	25,673	14%

Table 5: Main Economic Activities in Muhanga by Industry Group (EICV4 and EICV5)

There are several employment centers within Muhanga District, with a higher concentration of businesses established in Muhanga City. A large portion of economic activities and administrative offices are in Nyamabuye Sector. Commercial activities in Muhanga City include banks, hotels, and logistics facilities. One of the most prominent businesses in Muhanga City is the American robotics company, Zipline. Zipline provides on demand access to blood and other essential medical products by drone. This service is aligned to the Smart Rwanda Master Plan 2020 and should be promoted.

Outside Muhanga City, there are several trade centers and sector offices. They can be found in Nyabinoni, Ruhango, Nkondo, Remera, Rutongo, Musasa, Bereshi, Daha, Meru, Misizi and Kinini. Additionally, there are mining activities distributed throughout Muhanga District, and creates a fair number of jobs. Further details on the mining sector can be found in the subsequent section. A considerable proportion of Muhanga population live in Muhanga but commute daily to work in Kigali. Muhanga must address this trend if it is to be economically

competitive and self-sustaining. Eight new modern markets are planned in Muhanga District as part of the strategy. They will be in Mbuye, Buringa, Kivumu, Cyakabiri, Misizi, Rwambariro and Bukiro. This is in line with the National Roadmap for Green Secondary City Development, where Muhanga has been identified to become a potential commercial and financial services hub.

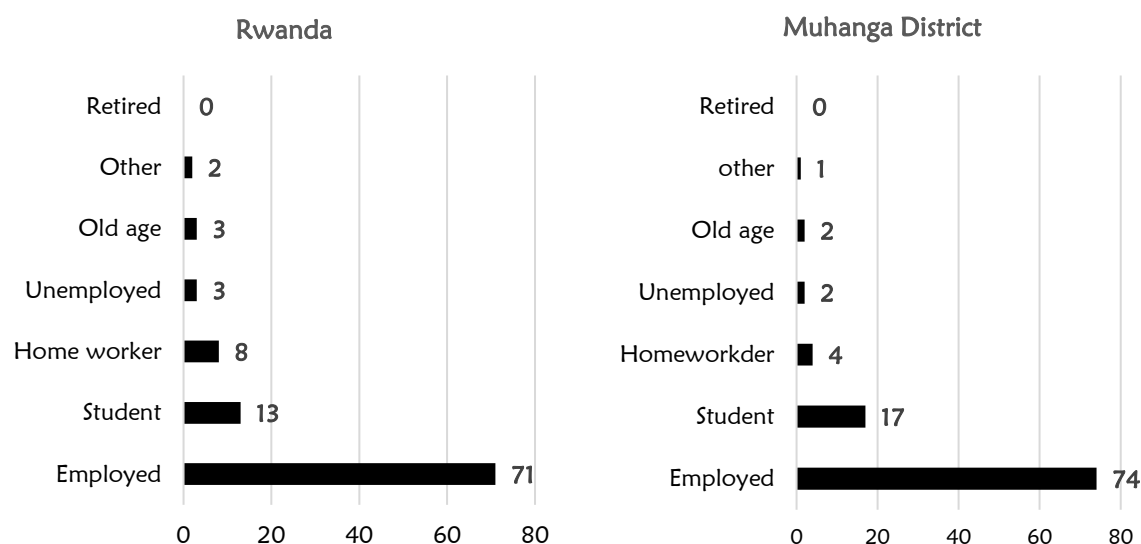


Figure 2: Distribution (%) of resident population aged 16 years and above in private households of Muhanga by economic activity status (2012)

1.1.3.4 Commerce

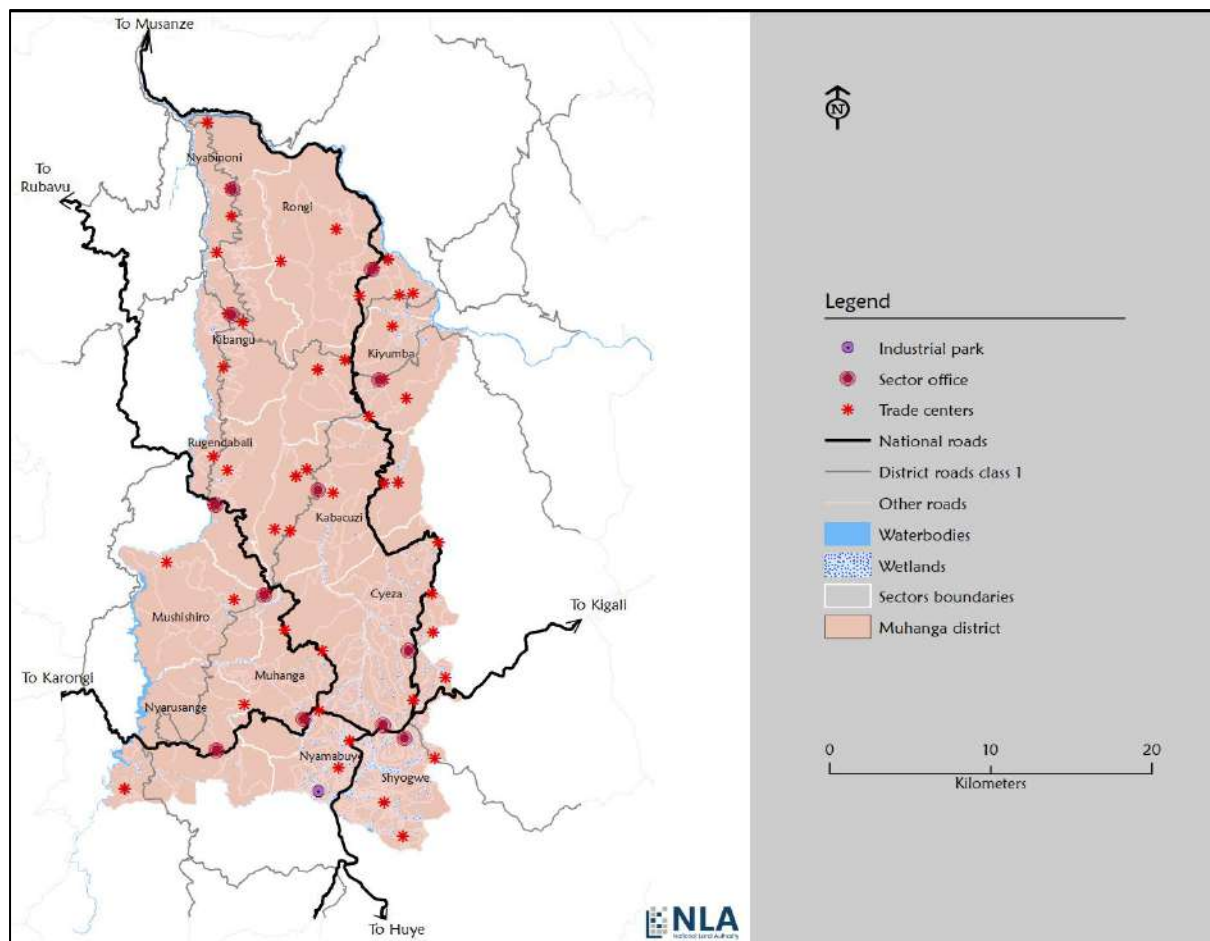
In investment, the district established the Muhanga Investment Association / Group known as SIMSA which is made up of 325 businessmen, with an initial capital of 500,000,000 Rwf and 100,000,000 Rwf worth of share capital.

Indicator	Muhanga District	Rwanda
Number of private Companies	4509	118,716
Wholesale and retail trade, repair of motor vehicles and motors.	2878	64,620
Accommodation and food services	1055	33,281
Other service activities	181	6,433
Professional, scientific and technical activities	186	5,503

Manufacturing	108	4,548
Financial and insurance activities	28	932
Administrative and support service activities	25	733
Agriculture, forestry and fishing	6	663
All other (ICT, education, transportation, electricity, construction, etc.)	42	2,003

Table 6: Private companies by major sectors (Source: Establishment Census, NISR, 2011)

Mining also plays a pivotal role for the development of this district because there are deposits of Colombo Tantalite associated with Cassiterite in 15 out of 19 Sectors of Muhanga District, namely Cyeza, Kabacuzi, Kibangu, Kiyumba, Muhanga, Mushishiro, and Nyarusange. Besides generating foreign currency through export, the mining activity can create many jobs and contributes to the rapid transformation of local economy as this can be observed in Ruli Sector where mining activities have been active for the last 5 years. To be really at the forefront of economic transformation of the district, there is need to build capacity of operators in this sector, attract more investment and organize the activity to make it more profitable to local population and hence to District.



Map 8: Distribution of trade centers in Muhanga District.

1.1.3.5 SWOT Analysis

SWOT stands for Strengths, Weaknesses, Opportunities and Threats. A SWOT analysis is therefore a technique for assessing these four aspects for any development. In the context of the DLUP, SWOT analysis is used as a tool to assess the strengths, weaknesses, opportunities, and threats for the district concerned in terms of land use planning based on the potential of the areas. In developing of Muhanga DLUP, the analysis of each sector was done by examining the benefits, as well as the barriers of that sector and the associated zones that are suitable for it. The table below highlights the strengths, weaknesses, opportunities, and threats that were analysed for each sector in Muhanga District during the district land use plan.

Sector	Strengths / Weaknesses / Opportunities / Threats
Agriculture	Strengths: (i) Land for agriculture and livestock; (ii) High productivity of Banana, maize, beans and sweet potatoes; (iii) Honey production / bee keeping; (iv) Regional / International markets (Kigali City, Kamonyi, Ngororero, Karongi, Ruhango, Bugesera Districts, International gates: DRC, Republic of Burundi, etc.) Weaknesses: (i) Low use of fertilizers and improved seeds; (ii) Low investments in Agro processing sector; (iii) Fragile soil that is prone to landslides; (iv) Sloppy areas exposed to erosion and other related disasters. Opportunities: (i) External investors in coffee sector; (ii) International markets for coffee and fruits; (iii) Appropriate crops to the region: coffee, pineapple, banana, maize, beans, cassava, etc.;

	(iv) Sectors of Cyeza, Shyogwe, Nyamabuye and a part of Muhanga sector has large areas of marshlands that are a potential for growing varieties of water tolerant crops; (v) Girinka program, to improve the well- being of local communities; (vi) Agriculture policy; (vii) Existence of VUP. Threats: (i) Fluctuations of prices for agricultural products such as Maize at international markets; (ii) Climate change and irregular seasons; (iii) High mountain with steep slope area of Ndiza zone; Nyabinoni, Mushishiro, Rongi, Kabacuzi, Kibangu, Kiyumba Sectors (beyond 2000 m) are severally affected by land degradation & soil erosion; (iv) Reduction of productive land capacity; (v) Loss of plant & biodiversity; (vi) Damage waterways. for example, sedimentation and changes in the quantity, quality & timing of water flow.
Private sector Development & Youth Employment	Strengths: (i) Modern Markets in Muhanga Urban Center; (ii) New centers for business, hand crafts (Agakiro); (iii) Potential minerals and quarrying activities; (iv) Abundant international and national transportation agencies (passengers, goods and products for export; (v) Graduated students are supported to start up doing business as well financial motivation (promote businesses for job creation) and more youth to attend TVET; (vi) Existence of NGOs or actors in socio-economic projects. Weaknesses: (i) Weak awareness of use of IT and tele-centers by local communities; (ii) Inactive Public Private Partnership (PPP) initiatives; (iii) Migration Movements of private business developers from Muhanga to Kigali Capital City; (iv) High cost of transport of imported raw materials and products;

	(v) Low purchasing power in the community; (vi) Lack of markets for the finished products; (vii) No immediate alternatives to implemented Government policies; (viii) Poor access to capital and high interest rate; (ix) Lack of support for informal businesses; (x) High interest rate Opportunities: (i) No barrier to national and regional travels; (ii) Industrial Park development through attracting local and foreign investors; (iii) Exploiting the Strategic position of the district by creating linkages with other districts; (iv) Harnessing unexploited resources (sand, clay soil, mining in 11 out 12 sectors in Muhanga); (v) Skilled population with advanced entrepreneurial mind-sets; (vi) Agro-processing Threats: (i) Regional and international competition which hinders poorly produced products,
Transport	Strengths: (i) Availability of tarmac Roads within Muhanga Urban Center i.e. National Road being 131Km and District class 1&2 ranging between 254Km; (ii) Improved feeder roads; (iii) Sector and Cells are all accessible with established District roads; (iv) Road Muhanga-Ngororero linking Muhanga to North and the road Kigali-Muhanga-Ruhango linking Muhanga and other parts of Southern province and Muhanga-Karongi road linking Muhanga to western Province to promote trade and transport. Weaknesses: (i) Irregular maintenance and rehabilitation of basic infrastructure (roads, bridges); (ii) Inadequate coverage of public transportation means (rural sectors); (iii) Poor district roads that need to be rehabilitated and improved;

	(iv) Mountainous region making it difficult for transport infrastructure development and expensive; (v) Poor drainage systems during the construction of roads Opportunities: (i) Political will for feeder roads development in Muhanga District (connectivity with rural areas); (ii) International roads crossing Muhanga District Threats: (i) Natural calamities destroying basic infrastructure; (ii) Landslide, flooding and subsequent soil erosion leads to damages of infrastructures especially roads.
Energy	Strengths: (i) Availability of on grid electricity and other sources of energy (biogas & gas, mobisol/solar power, etc.); (ii) Presence of a hydroelectric plant on the Nyabarongo River. Weaknesses: (i) Low percentage of households with access to electricity Opportunities: (i) Conducive environment to alternate other sources of energy; (ii) Potential for installation of micro-hydroelectric powers. Threats: (i) Natural calamities destroying basic infrastructure; (ii) High consumption of biomass
Water and Sanitation	Strengths: (i) Access to water supply with management committees; (ii) Availability of drinking water treatment plant in the district; (iii) Enough water sources in the district that can be captured and supplied to all Sectors, cells and villages Weaknesses: (i) Irregular maintenance and rehabilitation of basic infrastructure (water pipes); (ii) Low percentage of households with access to water;

	(iii) Funds/resource are limited; (iv) Lack of Hygiene and sanitation infrastructure (landfill, faecal sludge treatment plants...). Opportunities: (i) Political will for water extension in Muhanga District (connectivity to rural areas); (ii) Promote integrated water resources management and resilience. Threats: (i) Natural calamities destroying the infrastructure; (ii) Gradual deterioration of the environment due to improper sanitation in rural areas.
Urbanization and Rural Settlements	Strengths: (i) Existing IDP model villages program providing access to basic infrastructure, services and supports for livelihood projects; (ii) National informal settlement strategy, informal settlement studies and ongoing elaboration of physical plan availability of local building materials; (iii) It's a satellite city; (iv) Availability of NLUDMP 2020-2050; (v) Availability of City Master plan, Availability of local urban development plan for the district; (vi) The District Land Use Plan (DLUP) 2013-2018; (vii) Increasing number of people living in urban areas; (viii) Increased number of households living in planned rural settlement sites, Weaknesses: (i) Lack and insufficient staff in District One Stop Center; (ii) Poor extraction /exploration of construction materials; (iii) Poor district structure with insufficient staff in urbanization and settlement sector; (iv) Environmental degradation; (v) Limited financial capacities for the local population to implement the MUHANGA Satellite City town master plan; (vi) Lack of expertise for local people and awareness about master plan;

	(vii) The big number of households living in scattered areas, mainly in agricultural lands; (viii) Settlements and other infrastructures built without considering environment and climate risks among others. Opportunities: (i) "IDP Model" initiative to be implemented in all sectors; (ii) Relocation of houses from high-risk zones; (iii) Promotion of renewable energy technologies for cooking and lighting in the imidugudu sites; (iv) Efficient use of water & promote Rainwater harvesting in HH Threats: (i) Increasing population due to urban - rural migration; (ii) Informal settlements arising (urban Sprawl); (iii) Lack of basic infrastructure in rural areas; (iv) Population living in High-Risk zones; (v) Steep slope; (vi) Population capacity for self-resettlement and / or self-relocation to planned settlements
ICT	Strengths (i) IT service supply (4G) and telecommunication facilities; (ii) Availability of fibre optic; (iii) It has facilitated Doing Business in construction permitting services Weaknesses: (i) Small coverage of IT system (Internet) and telecommunication facilities in rural areas (Iminara); (ii) It's expensive Opportunities: (i) Good and fast service delivery; (ii) Capacity building avenues Threats: (i) Unemployment; (ii) Internet cut off or Congestion could lead to slow public services

Environment and Natural Resources	Strengths: (i) Greened policies i.e. DDPs; (ii) Minerals available, White Clay, Cassiterite, Wolfram, Coltan, stones and sand; (iii) Water harvesting techniques have started to be implemented in planned settlements Weaknesses: (i) Techniques for measuring pollution are limited. Opportunities: (i) Strong political commitment to providing guidance to the population and considering environmental issues in development programs; (ii) Potential Source for green jobs; (iii) Availability of policies that need to be enforced for better management of the Environment Threats: (i) There is a lot of stress on the environment and natural resources and climate change will add to these pressures; (ii) High mountains with steep slopes leading to land degradation and soil erosion; (iii) Water pollution from surrounding Mining and Quarries
Financial Sector Development	Strengths: Financial institutions enabling access to finance (banks, insurance companies, SACCOs, Cooperatives, Micro-finance, etc.) Weaknesses: (i) Lack of guarantees for financial accessibility by local community; (ii) Inadequacy of the enterprises that generate jobs and income; (iii) Lack of education of the local population (neither read nor write); (iv) Banking Culture non-existent (cheque, interest rates); (v) Lack of widespread ethics. Opportunities: (i) Constitution of solidarity guarantees across associations;

	(ii) Mobile money. Threats: Regional and international competition
Social Protection	Strengths: Available services to support graduation from extreme poverty and reduced malnutrition. i.e. Girinka, VUP caseworker's mechanism, household profiling, milk support, income generating activities, FARG etc. Weaknesses: There is a lack of data on the availability of complementary services that support livelihood development. Threats: Natural calamities interrupting economic activities and retarding development
Health	Strengths: Availability of standard Healthcare facilities (Kabgayi Hospital, Health Centres and Health posts.) Weaknesses: (i) Shortage of skilled workforce; (ii) Difficult access to health care Opportunities: Each cell has at least a health infrastructure, Threats: The lack of access to adequate quantities of water can greatly contribute to the incidence of diseases and the spread of waterborne diseases
Education	Strengths: (i) Annual organized school competition in all schools & other competitions such as Umurenge Kagame Cup that boosts LED; (ii) Commitment of a big number of youths to join TVET Weaknesses:

	(i) Low rate of TVET attendance due to mind-set, poverty and other local community issues; (ii) Poor Quality of TVET Trainings from some training centres; (iii) Poor investment motivation from private sector Opportunities Availability of skilled labour force in the EAC region and DRC who can be used to TVET Threats: Natural calamities destroying basic facilities
Governance and Decentralization	Strengths: (i) Existence of decentralized administrative structures and organized; (ii) Functional Home-Grown Solutions (HGSs) include Umuganda, Abunzi, Imihigo, Ubudehe, Itorero & Ingando, Umushyikirano, Umwihherero, and Girinka; (iii) Optimistic attitudes and behaviours of the population active population and working spirit. Weaknesses: (i) Lack of professional expertise in the staff acting in the justice sector in general and staff acting in the judicial system in particular; (ii) Vulnerable people face many barriers to access formals Justice Institutions (distance, language, costs etc.) Opportunities: (i) Capable institutions to spur good governance and a justice system for transformational governance and sustainable national development Threats: (i) Emerging of cybercrime, low cyber security coordination and common understanding for information security; (ii) Reduced access to justice especially for vulnerable persons greatly undermines the rule of law and deepens dissatisfaction of the overall performance of the judiciary
Sport and Culture	Strengths: (i) Sport facilities (Muhanga Modern Stadium.);

	(ii) Muhanga is having interesting tourist sites related to the history of Rwanda, at the time of the monarchy such as Rucuncu, Kanziga. Weaknesses: Lack of complex fields for sports and lack of sports equipment (recreational Hub) Opportunities: (i) The regular international sport and cultural competitions; (ii) Being close to Kigali, it would also benefit from opportunities to accommodate large events, sport and cultural related activities Threats: Social media and Internet games affecting the physical facilities.
PFM	Strengths: (i) Available budget law for all institutions (District, Sector, Non- Budget Agencies / NBAs); (ii) Availability of action plan Weaknesses: Low competence on the budget reporting Opportunities: (i) National Budget law is disseminated at the local level and NBAs; (ii) IFMIS program is disseminated in all level. Threats: Insufficient budget capacity in manipulating IFMIS program.

Table 7: Muhanga District SWOT analysis

2 REGULATORY AND POLICY FRAMEWORK

Several laws, strategies, policies, guidelines, and directives documents prepared by GoR regulate land use, development, planning and management in Rwanda, such as follows.

2.1 LAWS

- **Presidential Order n° 038/01 of 20/05/2022 establishing NLUDMP 2020-2050**

The Presidential Order n° 038/01 dated 20/05/2022, which establishes the NLUDMP 2020-2050, delineates a planning horizon spanning the next three decades. The Order outlines the revision process, ensuring alignment with other plans, and assigns responsible institutions for implementation, emphasizing the pivotal role of all sectors. With the NLUDMP 2020-2050 gazetted, the focus now shifts to effectively implementing it through DLUPs and other tools, ensuring strict adherence to alignment principles between NLUDMP 2020-2050 and DLUPs. It is against this backdrop, that Muhanga District revised its Land Use Plan, ensuring compliance with the directives set forth in NLUDMP 2020-2050;

- **Law n° 27/2021 dated 10/06/2021 governing land in Rwanda**

Law n° 27/2021 dated 10/06/2021 governing land in Rwanda, which regulates land affairs, contains detailed provisions concerning land use management and development, as well as the institutional framework and procedures governing the initiation, development, adoption, and establishment of land use and development plans at the district level. This legislation specifically governs land occupancy and construction activities on areas designated for human habitation. Moreover, it encompasses the planning of plots and site development to facilitate the realization of national, City of Kigali, and district land use master plans.

Muhanga DLUP was revised taking into consideration other laws related to land management and utilization such as:

- Law n°10/2012 of 02/05/2012 governing urban planning and building in Rwanda. Urban planning should strive for the gradual and adaptable advancement of urban centers within the context of economic and social development policies, incorporating rural planning and environmental preservation objectives;

- Law n°20/2011 of 21/06/2011 governing human habitation in Rwanda. This law governs land occupation and construction on lands reserved for human habitation;
- Ministerial Order n° 04/Cab.M/015 of 18/05/2015 determining urban planning and building in Rwanda;
- Ministerial Order N° 005/MoE/22 of 15/02/2022 determining modalities of change of land use.
- Land use plans zoning regulations edition 1, November 2022.

2.2 POLICIES

- National Land Policy, June 2019, MoE

The revised Land policy of June 2019 focuses on the efficient utilization and management of land to support the national transformation goals without compromising the benefits of future generations. To achieve this objective, the policy outlines actions organized into three core pillars: land use planning, surveying, and mapping; land use management; and land administration. These pillars encompass eight thematic areas:

- (i) Land use planning, surveying, and mapping;
 - (ii) Integration of land utilization across various Sectors;
 - (iii) Effective land use management;
 - (iv) Facilitation of private sector investment in land;
 - (v) Land registration procedures;
 - (vi) Administration of land lease fees, real property taxes, and land markets;
 - (vii) Ensuring land rights security and managing land disputes;
 - (viii) Institutional framework and coordination mechanisms within the land sub-sector.
- National Urbanization Policy, December 2015, MININFRA;
 - National Human Settlement Policy in Rwanda, May 2009, MININFRA;
 - National Housing Policy, March 2015, RHA.
 - Ministerial Instructions n°001 of 23/04/2018 determining the management and use of the lands allocated for agriculture and livestock.
 - Ministerial Instructions relating to the implementation of the National Grouped Settlement Program in Rural Areas (27 May 2009).

2.3 GUIDELINES

Numerous land use planning guidelines established in previous years remain pertinent and continue to inform current practices. While we can mention a few examples, it's important to note that the list includes:

- Urban Planning and Building Codes (June 2019, MININFRA);
- Land Use Planning Guidelines (December 2017, NLA);
- Land Readjustment guidelines (October 2021, NLA).

3 METHODOLOGY

3.1 CONSULTATION MEETINGS

Muhanga DLUP was developed through a collaborative effort between the district administration and the assistance provided by NLA. Staff members from both parties cooperated closely throughout the entire process, facilitating the seamless exchange of necessary data between NLA and Muhanga District.

As the collaboration between the NLA and Muhanga District teams progressed, the initial step involved the NLA presenting the cabinet approved NLUDMP 2020-2050 to District Authorities. This served to raise awareness among district leaders, staff, and stakeholders. Furthermore, it marked the commencement of the elaboration and revision of Muhanga DLUP.

Similar to other planning activities, the process commenced with situational and deskwork analyses, involving the active participation of staff members from both parties. Together, they identified available data, determined methodologies, scheduled consultative meetings, and planned investigations. This included various steps such as data collection through land surveys and physical analyses, ensuring compliance with boundaries for urban, rural, and rural settlement sites. Additionally, efforts were made towards disseminating information to enhance public awareness, as well as developing draft reports and undertaking other necessary tasks. Throughout each phase, the team collaborated closely, ensuring cohesive progress.

After completing the fieldwork, Muhanga District team, consisting of personnel from One Stop Center with diverse expertise, convened with the NLA team at the Kigali/NLA Head Office for a three-week period to develop the report. Subsequently, validation meetings were arranged for the District Council and focal persons from partner institutions to review both interim and final reports. During these meetings, the District Council, executive committee, and stakeholders offered feedback and acknowledged the progress made, leading to the final approval of Muhanga DLUP 2023-2050.

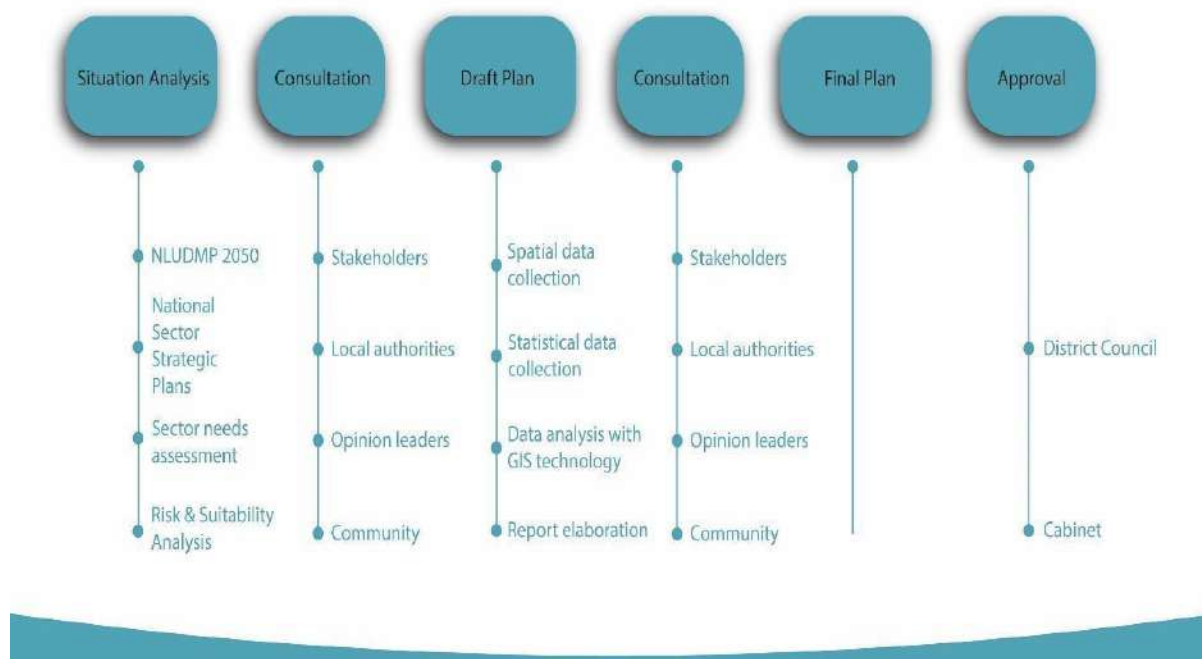


Figure 3: Planning steps used during elaboration and review of Muhanga DLUP

3.1.1 Consultation with national stakeholders.

Institutional consultation aims to make the different governmental and non-governmental institutions involved in the project aware of the need to participate in its development and implementation. The collaboration of the different institutions plays an important role in the success of the projects as they need each other in terms of planning, development and implementation. In the case of the District Land Use Plan, various institutions work together in accordance with their mandates, with the NLA as the lead institution, to support the overall land use and development project. During the elaboration of the district land use plan, all sectors have to work together and all need land to sustain their current and future projects that revolve around their mandates. In this case, they all have to maximise their demands for land, which may raise land conflicts in their interests.

However, the District Land Use Plan was put in place with the aim of providing the best land use balance for the different sectors, as all are interdependent during development. The DLUP is a solution to efficiently allocate land to different sectors, to effectively manage the use of available resources by different institutions, to guide the future development of communities, and to promote more desirable social, economic and environmental outcomes.

During Muhanga DLUP, the various institutions involved in the project and consulted by NLA are: RHA, RTDA, NISR, LODA, REMA, RWB, RWFA, FONERWA, WASAC, REG, RAB,

and various ministries such as MINEDUC, MINISANTE, MINAGRI, MINISPORT, etc. These institutions and ministries, depending on their mandates, have to achieve their objectives in the district concerned, so it is necessary to find the best balance on land use to guide them. They also provided data on their current and future projects that they intend to initiate. Thus, the consultations on the preparation, development and implementation of the district land use plan helped them to understand the efficient use of land and not to hamper the projects and future prospects of other sectors. These consultations also helped them to understand their role in the planning, elaboration and implementation of the district land use plan.

Therefore, the outcome of these institutional consultation meetings on Muhanga District Land Use Plan goes in the direction of an inclusive planning where no sector is lagging behind the 2035 target. In addition, all sectoral institutions participated together in finding the best land balance that supports better management of the limited land available and efficient use of the available resources.

3.1.2 Consultation with the local authority

At the local level, the District Land Use Plan is developed through the combined efforts of the concerned district, its sectors, cells and villages. The district takes the lead in the District Land Use Plan, then the villages, cells and sectors act as the closest authority to the community as well as to opinion leaders. The DLUP consultation with local authorities aims to improve their understanding about the benefits of the project in terms of enhanced land management and economic development. This type of consultation aims to engage them as well as be a weapon to build their ownership in the project, as it concerns their territories and benefits them and their communities.

The local authorities are the main implementers and regular supervisors of the District Land Use Plan implementation. Consequently, raising their awareness of the project is essential for its success. Furthermore, in the planning process, the local authorities are the ones who really know the terrain and provide real and accurate information for good planning and development. They are aware of the potential areas and understand the appropriate development sectors to allocate in each part of the locality.

In the case of Muhanga District, the local authorities are the ones who guided as to which locations are suitable for agriculture, mining, tourism, forestry, etc. and helped in making good land allocations in an efficient manner. The local authorities really know their people in regard

to their efforts and weaknesses. Thus, this information has also helped in planning, elaboration and implementation of Muhanga District Land Use Plan. Ultimately, it is 100% beneficial for the local authorities to participate as they are the first to mobilise the community on the project in the planning phase to make the project more participatory, and in the implementation phase to make the project more successful.

Various consultative meetings were held at Muhanga District level, bringing together different stakeholders in the district, including representatives of sectors, cells, villages, religious figures, civil society organizations, security bodies and private sector operators. NLA, as the coordinating institution for this mission, and the district organization aimed to ensure a participatory approach, including discussion and agreement on priority areas and implementation strategy.

The result of the consultation meetings with local authorities in Muhanga District is that they develop awareness of the project and understand their responsibilities, from planning to implementation. With a high level of involvement of local authorities, people become much more conscious of Muhanga DLUP and get involved to facilitate in its implementation.



Figure 4: Consultative meetings at Muhanga District

3.1.3 Consultation with the community

The community is the prime user of the land for diverse activities to feed itself and sustain its life in numerous ways. Given the high population growth in almost all parts of the country and the limited skills in land use planning and management, the population poses the issue of land fragmentation, whereby land is split into extremely small pieces. It leads to growing land conflicts as well as poor production and management. However, the District Land Use Plan has emerged as a solution to facilitate better land management and efficient use of available land resources. The community would not be able to use and manage well its land resources without

a clear guidance for the local authority and a proper planning framework. With the District Land Use Plan, land conflicts are eradicated, and people are given the opportunity to work and develop their land. In this way, people deserve to know and understand the plan to develop their land according to the national vision. During the development of Muhanga District Land Use Plan, community consultation meetings were conducted in each sector to raise awareness of the project and its objective. These consultations were also intended to engage the population by helping to clarify their current land issues, assisting in effective data collection and allocation of land to the most suitable areas. In addition, this is the best way to make people understand the purpose of the plan for their future perspectives and their contributions.

From the consultation meetings, the community learned about their responsibilities during the development of the DLUP and reflected on their involvement in the implementation. The community was given the opportunity to guide the technical team in collecting data from the field and to help them integrate their insights so that no further developments would be left behind. Through the consultation meetings, the community has been engaged in Muhanga DLUP planning activities by contributing their ideas that have guided the planning process, and has become aware of the structure of DLUP in line with the NLUDMP 2020-2050, and has understood how it will be implemented. As a result, the technical team developing Muhanga DLUP benefited from the support of the community by gathering their ideas on what to incorporate into the planning and by participating in the data collection. Thus, the outcome of Muhanga DLUP has been a participatory plan, which encompasses all people and sectors, and has also improved the understanding of their responsibilities during implementation.

3.2 DATA COLLECTION

3.2.1 Spatial data collection

Spatial data includes geographic information about the earth and its features. A pair of latitude and longitude coordinates defines a specific location on the earth (Haining 1993). Development of the DLUP requires the collection of spatial or geographical data for all areas considered in the land use zoning. The spatial data involved in the elaboration of the Muhanga DLUP covers existing infrastructure such as roads, electricity, water supply, educational and Healthcare facilities, markets, administrative offices, mining sites and concessions, etc. In addition to this infrastructure, it was necessary to collect data on the location of potential settlements and to delineate their boundaries, from urban to rural areas, so that settlements might be differentiated

from other land uses. Spatial data collection was also necessary to mark areas that were likely to be protected and conserved, such as tourist sites, as well as disaster-prone areas, such as steep slopes or Swamplands.

The focus of spatial data collection was to support the development of Muhanga DLUP with accurate data and a clear understanding of the terrain, and was used to allocate land uses. Spatial data collection was carried out using tools such as Garmin GPS, DGPS, Earth collector, SW Maps and so on, during the fieldwork. Besides, the collateral methodology was used to collect some spatial data available to the institutions involved in the DLUP. During this collateral spatial data collection, existing and proposed data for each sector was gathered to manage the current situation, and subsequently plan based on the present status and track the future planning of each sector.

3.2.1.1 Field work and Study

Based on the analysis made from the desk review on existing condition features and selected priority areas, the NLA team jointly with the District One-Stop Center team conducted a field land survey and physical analysis within the priority sites both urban, rurban and rural settlements sites. Regarding Muhanga City and rurban area the following sites were visited: Nyamabuye, Shyogwe, Cyeza, Muhanga sectors as well as Kiyumba sector where Remera rurban is located. Regarding rural settlements the following sites were visited, all 246 sites were visited with the emphasis Geographic Positioning System (GPS) coordinates were taken especially to clearly identify the boundary consistencies and zoning. Primary data was collected by face-to-face conversations with local communities especially in the areas visited as well as direct observations. Data were analysed and interpreted using the Geographic Information System (GIS) as well as new satellite images.



Figure 5: Fieldwork and survey.

3.2.1.2 Collateral spatial data collection

The most common method of collecting spatial data is using Global Positioning System (GPS) receivers. The users take the GPS tools and go to the field to collect geographical or location data. However, for collateral spatial data collection, institutions, groups or individuals collaborate with other partners who provide them with the final data for the project purposes. Institutions collaborate with each other and share data in carrying out the projects assigned to them. Regarding the elaboration of the DLUP, the NLA needs to involve institutional partners from different sectors that need land for their plans. The institutions provide available spatial data related to their projects so that they can be included in the DLUP. For instance, Muhanga is a district with various natural resources and potentials such as mining, trade, forestry, agriculture, etc., where all corresponding spatial data are collected and analysed. Therefore, all sectoral institutions in Rwanda need to situate their projects in the light of the current situation and prospects. To this end, they provide the available data for their projects to support planning to accumulate each sector in a balanced way according to their land demands.

During the elaboration of Muhanga DLUP, data was needed and collected, including forestry from RWFA, the water supply system and associated future projects from WASAC, electricity data from REG, transport data from RTDA, rural settlement boundaries and urban master plans from RHA, Swamplands and their buffer zones from REMA, rivers and other water bodies from RWB and many others. The accumulation of these spatial data and projects provides a basis for data collection on the ground and provides detailed information for zoning and subsequent implementation support.

The collection of collateral data has to take place at the offices of the concerned institutions, at their headquarters or at their zone offices in the concerned districts. Using the template and checklist designed to collect the necessary data, the partner institutions prepare to capture and provide their collateral data to NLA for inclusion in the plan to facilitate land allocation according to their demands. This avoids land conflicts between different sectors, facilitates efficient use of resources and ensures future development.

3.2.2 Non-spatial data collection

Non-spatial data (such as attribute or characteristic data) consists of information that is independent of any geometric considerations. It includes data that is not demonstrated with location-based and geographic location. Basically, non-spatial data accumulate statistical and quantitative data that provide information about features or phenomena in the form of definitions, explanations and can be displayed in graphs, tables, but not maps. When elaborating the DLUP, non-spatial data are needed to support the analysis and compilation of the report since the land use plan is composed of various data. Statistical data on the neighbourhood regarding the economy, environment and livelihoods are needed and considered for the preparation of Muhanga DLUP.

The non-spatial data that was collected and used during the elaboration of Muhanga DLUP includes demographic statistics that account for the current and projected status, allocation of economic data across Muhanga such as people' income generation, economic activities that support the society's livelihoods, trade in terms of movement of goods and services, security data and its organs, religious statistical data, and its movements, etc. These data were essential to support the elaboration of Muhanga DLUP where each situation was considered to guide the development of all sectors.

In Muhanga District, non-spatial data was collected in terms of fieldwork by visiting each situation on site, and some was also collected in a collateral way by consulting different offices for institutions, local authorities, and non-governmental groups. This data helps to fill in gaps in spatial data and provides information for decision-making in effective planning. The data has also contributed to the awareness of the importance of efforts in specific sectors.

3.3 DATA ANALYSIS

Data analysis encompasses the process of reviewing, cleaning, transforming, and modelling data with the goal of discovering useful information, drawing conclusions, and supporting

decision making. Land use plan data analysis involves the process of systematically applying spatial and non-spatial data on infrastructure, zoning, and other features to describe, illustrate, summarize, and interpret the data and create maps, tables, or charts. During the elaboration of the DLUP, technical staff move to the field to collect data and eventually come up with spatial and non-spatial data that are finally analysed in the office for the generation of land use zoning layers and the compilation of tabulations and graphs that present data in the report.

The significance of data analysis in the elaboration of Muhanga DLUP lies mainly upon processing data collected from the field and presenting them in terms of maps, tables or graphs in order to support decision making in planning and land use. Data analysis in developing Muhanga DLUP has helped to identify the suitable areas for different land uses, zoning the settlements into convenient locations considering many aspects and bringing other land uses in different areas. Through data analysis, the urban and rural settlement areas were mapped out and the associated land use zones were planned. Severe slope zones of more than 55% were identified using the data analysis in Muhanga District, where forest plantations will be allocated, and then the disaster-prone areas were identified. The analysis of spatial and non-spatial data in Muhanga District helped in effective land use allocation as well as effective planning of land use balance of different thematic areas.

In Muhanga DLUP data analysis, geospatial technology, especially GIS software, was used to acquire data from the field and manipulate it in the office to get a clear representation. With regard to GIS software, the technical team used ArcGIS 10.8 version, as well as ArcGIS pro, to create the shapefiles and associated maps for zoning, for example, taking into account the Existing situation and the planned land use plans. GIS further helped in creating tabular data by referring to the attribute tables of the geospatial data. These tabulated data were later analysed using Excel and SPSS to ensure a good and accurate representation in the report. In addition to GIS technology, SPSS and other tools, some design software such as Adobe Illustrator and Adobe Photoshop were also used to create some diagrams and other design to make the report clearer and more attractive to the audience to optimize the data analysis and presentation for Muhanga DLUP.

The results of Muhanga DLUP data analysis represent the distinct land use planning layers for the current and planned land use allocations. The result includes the maps, tables, and graphs that describe the land use planning outcomes in Muhanga District. Therefore, Muhanga DLUP data analysis findings were used to generate the report and are intended to be used separately

as maps, tables, and graphs to support the presentation of the land use plan to end users and implementers.

3.4 MUHANGA DLUP REPORT COMPILATION

The Muhanga DLUP report represents a document that brings together all land use planning related concepts, data, and other information that illustrates how land use is allocated, supports effective use of resources on the land, and guides future development at the district level. The DLUP report serves to document the current status and projected situation with respect to land use in the district. During the development of the DLUP, data collected both in collateral and on-site was compiled into a single document that represents the district master plan. This document consists of text, maps, tables, diagrams, and other outlines that describe the district in concern given the background of all the issues. The DLUP report describes the district in terms of location, topography, soils, hydrography, climate, and other physical features, and later in terms of opportunities and constraints. In addition to these characteristics, the DLUP report also shows the planning situation of the district considering PUSH (population, urbanization, settlement and housing), spatial economy (mining, trade, industrialization, etc.), tourism and conservation, infrastructure and services, and environment.

Elaboration of Muhanga DLUP report was done since the beginning of data collection, but it was extensively done after the substantial field work in the office that the report could be improved. For two weeks, NLA staff, in collaboration with district staff, met at the NLA office to develop the report. A rigorous internal validation was conducted, and they provided input to improve the structure and quality of the report. The retreat with the district and relevant stakeholders was held in Musanze district to harmonize the report and collect comments from various partners. The outcome of the retreat was constructive comments, gathering of various data to fill the gaps, and the good structure of the report.

Muhanga DLUP report is structured in such a way that it starts with the introduction, then continues with the legal and policy framework, methodology, Muhanga land use and development plan, implementation strategies, compliance and monitoring, conclusions and recommendations, and annexes. In the introduction, Muhanga DLUP covers the background of Muhanga land use and related planning, objective and scope, description of Muhanga District including location, hydrography, soil and erosion, topography, fauna and flora, and SWOT analysis. The regulatory and policy framework in this report includes the laws, policies, and

guidelines related to land use planning and associated implementations. The methodological section of the report describes the methods and techniques used in the preparation of Muhanga DLUP, including consultation meetings, data collection, data analysis, and compilation of the report. The following section summarizes the vision and economic specialization of the Muhanga Land Use and Development Plan, and addresses all of its thematic areas, considering the current status and future prospects for each sector. In the implementation strategies section, the report covers enforcement of existing laws, legal and institutional framework, phased plan, capital improvement projects, land readjustment for detailed physical plans, and zoning regulations.

4 MUHANGA LAND USE AND DEVELOPMENT PLANNING

4.1 VISIONING AND ECONOMIC SPECIALIZATION

4.1.1 Vision of Muhanga District

Primarily, the vision of Muhanga District is aligned to the country's target of being classified as a middle-income country where annual economic growth (GDP) is expected to be at least 11.5% with a per capita income of USD 1240 by 2050. The district's vision is also aligned to Vision 2050, the same direction of the NLUDMP 2020-2050 as well as the new NST1. With this focus according to the Muhanga DDS, the district is very committed to protect the environment and fight against the effects of climate change that will be achieved to support the attainment of a sustainable species.

In this regard, Muhanga District has a vision to become a green satellite city with significant role in mining, quarrying, and trading. This vision will be achieved through the implementation of government policies, service delivery and support to sectors to deliver quality services, especially regarding the implementation of the land use plan.

With Muhanga DLUP, the formulated objectives are specific, measurable, appropriate, realistic & achievable, and time bound (SMART). These include; (i) The productivity in mining will be expanded by 12% with improved professional methods and value addition; (ii) The productivity in quarry will be expanded by 12% with improved professional methods and value addition; (iii) Six modern commercial malls for regional shopping businesses will be developed; (iv) Develop value chain in agriculture and livestock by 30% of increased productivity; (v) Extend road infrastructure network by 60% (10% each year) and keep them well maintained at 100%; (vi) Extend water supply networks by 60% (10% each year) and keep them well maintained at 100%; (vii) Extend energy supply networks by 60 % (10% each year) and keep them well-maintained at 100%; (viii) Develop soft infrastructure (Equipment and skills for IT, Modern Markets, Waste Management, BDCs, Selling Points, SMEs, Cooperatives, Tourisms, etc.) and promote financial inclusion.

4.1.2 Muhanga District Economic Specialization

The economic specialization of Muhanga District is based on mining activities, logistics and industrialization, and aims to establish itself as the commercial hub of the region throughout the country. With this specialization, the development of Muhanga DLUP has been elaborated,

considering all aspects that support the vision of the district and rely on it to better support the district in achieving sustainable development. For the district development and for the growth of the country's economy, this specialization plays an essential role in attracting investors for production activities and promoting employment in the community. Consequently, a DLUP has been prepared in Muhanga District to support the allocation of land to all sectors that promote economic transformation implementation strategies.

Muhanga is a district in which mining plays a major role. This sector, which strengthens the district's economy, was expanded and planned during the development of the DLUP. The Mining Sector Perspective Plan in Muhanga District was drawn up with a view to developing in line with environmental protection. This DLUP guides the development of the mining sector for a long-term period, more precisely up to 2035, without affecting the other sectors.

Regarding trade and logistics, which have developed immensely in Muhanga District, especially in the city that serves other regions across the country due to its strategic location, DLUP was developed with commerce development in consideration. In fact, this was one of the factors that led Muhanga to be upgraded from a secondary to a satellite city during the development of the NLUDMP 2020-2050. Given the development of trade in Muhanga and the category of the city in terms of supporting urbanization in Rwanda, Muhanga DLUP proposed a significant land area for trade and commercial sector with significant categories of commercial zones that will support this vibrant development. It is in this regard that industrialization in Muhanga sector also given the ability to have special economic zone for general industries and a significant portion of light industries in Muhanga satellite city and Remera urban center.

4.2 POPULATION, URBANIZATION, SETTLEMENT AND HOUSING (PUSH)

4.2.1 Population

4.2.1.1 Existing population in Muhanga District

According to the RPHC5, the population of Muhanga District increased from 319,141 2012 to **358,433** in 2022. The population is predominantly rural, where **84.1 %** of the total population live in rural areas in 2012 as compared to 75.7 % in 2022. Additionally, the female population is slightly higher than the male population, with females representing **52.1%** of the total population in 2012, compared to **51.6%** in 2022 and people aged (0-17 years) represented **45.2 %** of the total population in 2012 as compared to **41.3%** of the total population in 2022 and this reflecting a decrease in fertility rate over ten-years period. Private households were estimated at **75,207** as compared to **93,241** in 2022. The population density in Muhanga District increased from **493** inhabitants per square kilometer in 2012 to **555** inhabitants per square kilometer in 2022. This indicates that the district has become more densely populated over the ten-year period.

Sector Name	Type of Sector: Urban; Rural	2012 Census			Households per Sector year 2022	2022 Census			Households per Sector year 2022
		Counts				Counts			
		Male	Female	Total	Numbers	Male	Female	Total	Numbers
Cyeza	Rural	14,132	16,077	30,209	7,156	16,410	18,130	34,540	8,985
Kabacuzi	Rural	11,918	13,522	25,440	6,110	13,427	14,765	28,192	7,334
Kibangu	Rural	9,375	10,653	20,028	4,673	9,612	10,714	20,326	5,288

Kiyumba	Rural+Urban	10,212	11,554	21,766	5,488	11,009	12,355	23,364	6,078
Muhanga	Rural	12,123	13,696	25,819	5,986	13,742	14,958	28,700	7,466
Mushishiro	Rural+Urban	9,397	10,803	20,200	4,888	9,909	11,162	21,071	5,481
Nyabinoni	Rural+Urban	7,765	9,015	16,780	4,047	7,640	8,613	16,253	4,228
Nyamabuye	Rural	21,643	23,002	44,645	10,966	28,810	31,151	59,961	15,598
Nyarusange	Rural	11,997	13,715	25,712	6,054	13,585	14,723	28,308	7,364
Rongi	Rural	12,684	14,167	26,851	6,646	13,894	15,495	29,389	7,645
Rugendabari	Rural	7,926	8,994	16,920	4,015	8,170	9,193	17,363	4,517
Shyogwe	Rural	23,611	21,160	44,771	9,178	27,407	23,559	50,966	13,258
Total		152,783	166,358	319,141	75,207	173,615	184,818	358,433	93,241

Table 8: Muhanga District existing population per administrative Sector (2012&2022)-Source: NISR (2012&2022) adapted by NLA, 2023

4.2.1.2 Projected population

According to the NLUDMP 2020-2050 projection, the total population of Muhanga District is estimated to reach **584,203** inhabitants by 2035 and **1,026,500** inhabitants by the year 2050. Of this, **454,575** inhabitants are expected to live in urban areas by 2035 and **826,500** inhabitants are expected to live in urban areas. This is based on the assumptions that the population projection for cities, will be distributed based on recommended hierarchy and economic potentials of each city, for rurban, the document specifies the rurban population and the number of rurban settlements within each District, and the geographical distribution of the rural population is based on the assumption that it will distribute proportionally to the future agricultural lands in LUCA (Land Use Categories).In the LUCA A, population will grow by **41%** due to the availability of prime lands. LUCA B remains static, and the massive change in LUCA C, where the population decreases more than a million, to **17.6%** of its current population. This result indicates two main movements: first, a very profound movement of farmers from C to A searching for new agriculture

opportunities. Secondly, C also appears as the primary source of urbanisation, either in situ or by migrating to cities in A and B. From the above explanations, Muhanga is a satellite city categorised in LUCA B.

Sector name	type of the sector	Pop 2022	HHs 2022	Pop 2035	HHs 2035	Pop 2050	HHs 2050
Cyeza	Rural & Urban	34,540	8,985	102,956	25,739	183,004	45,751
Kabacuzi	Rural	28,192	7,334	13,476	3,369	20,792	5,198
Kibangu	Rural	20,326	5,288	9,716	2,429	14,991	3,748
Kiyumba	Rural & Urban	23,364	6,078	25,743	6,436	43,731	10,933
Muhanga	Rural & Urban	28,700	7,466	75,515	18,879	133,523	33,381
Mushishiro	Rural	21,071	5,481	10,072	2,518	15,540	3,885
Nyabinoni	Rural	16,253	4,228	7,769	1,942	11,987	2,997
Nyamabuye	Rural & Urban	59,961	15,598	144,510	36,127	262,407	65,602
Nyarusange	Rural	28,308	7,364	13,532	3,383	20,878	5,219
Rongi	Rural	29,389	7,645	14,048	3,512	21,675	5,419
Rugendabari	Rural	17,363	4,517	8,300	2,075	12,805	3,201
Shyogwe	Rural & Urban	50,966	13,258	158,566	39,641	285,167	71,292
Total		358,433	93,241	584,203	146,051	1,026,500	256,625

Table 9: Muhanga District Population Projection – 2050-Source: NISR 2022, NLUDMP 2020-2050 guidelines, adapted by NLA, 2023

In summarizing the presented table depicting the projected population of Muhanga District according to the NLUDMP 2020-2050 guidelines, it is noteworthy to observe that the subsequent figure illustrates the anticipated population distribution based on residence. Notably, the rural population

constituted 84.1 % of the overall population in 2012, followed by a decrease of 75.7 % in 2022. Further projections indicate a gradual decrease to 22.2 % by the year 2035, ultimately reaching 19.5 % by 2050.

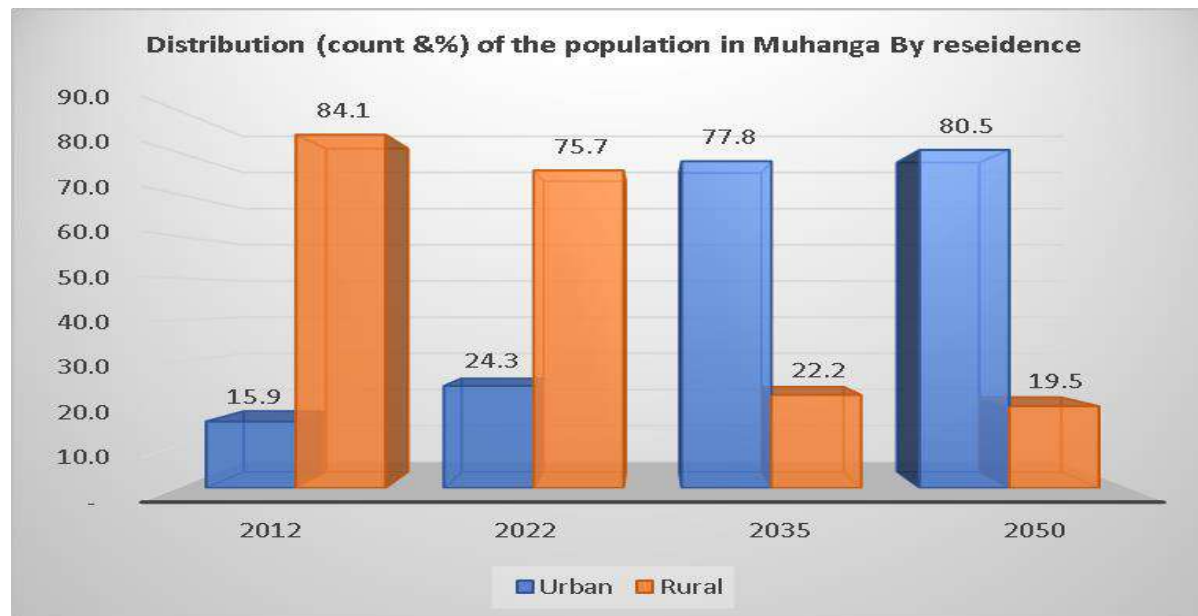


Figure 6 : Distribution (count and %) of the population of Muhanga District by residence Source: NISR 2022 & NLUDMP 2020-2050 guidelines, adapted by NLA, 2023.

4.2.2 Urbanization, Settlement and Housing

According to Population census (NISR 2022), Rwanda has a population of about 13.2 million and a high population growth rate of 2.3%, making it one of Africa's fastest-growing populations and this has severe implications in terms of demand on its natural resources including, land, water, forest, housing, health, education, jobs etc. Rwanda's urbanization rate remains significantly low despite its level of increasing at a high rate. Between 2012 and 2022, Rwanda's urban population grew almost twice as fast as the rural population, even though fertility levels within urban areas have generally been declining. High natural population growth in towns due to improved health and internal migration (mainly rural to urban) are by far the most significant causes of urban expansion, especially as persistent rural poverty causes migration to urban areas of people hoping to improve their livelihoods. While the majority of Rwanda's population still lives and works in rural areas, the process of urbanization is well underway as Kigali and several major Rwandan satellite and secondary cities are expanding rapidly and contributing to the country's socio-economic growth.

Between 2012 and 2022, Rwanda's urban population increased from 1.7 million to 3.7 million- by almost 2 million people or 132 percent-at an average rate of 6.7 percent per year. Therefore, even at a slower pace of 4.5%, Rwanda's urban population can reach the government target of 15-16M or about 70% level of urbanization in 2050. Migration is the key factor that affects the rate of urbanisation, the higher the rural-urban migration, the higher the increase in the urbanisation rate. The lower the rural-urban migration the lower the development of urbanisation rate. Rwanda's urbanisation has been characterised by primacy syndrome which is a problematic typology in the urbanisation system. Primacy is whereby a stratum of small cities and numbers of weak cities of intermediate sizes are dominated by one vast city. The presence of a primate city in a country indicates an imbalance in development – a progressive core, and a lagging periphery, a situation which contradicts decentralization. If a country strives for decentralization, it must eliminate the primate city syndrome.

Primate cities in the developing world were mostly a relic of their colonial history when European colonizers concentrated all economic, transportation, and trade actively in one place, leaving the infrastructure in place after decolonization. NLUDMP 2020-2050 identifies a primate city system in Rwanda, with 1.3 million people living in the City of Kigali. The city includes 40% of the country's urban population, while the remaining 60% live in small towns. The city of Kigali accounted for 40 percent of the country's total GDP and 61 percent of total

non- agricultural GDP. The NLUDMP 2020-2050s' target for Kigali is to steer it from being a primate city and plan other outlets for the potential migration, by distributing more magnets in the country. As a result, the migration pressure on Kigali will decrease, and the size of the town will exceed 3.8M. A primate city and a Capital are not synonyms. In many countries, the Capital is the country's most important city, but not necessarily a primate city. As a capital, it will continue to be the country's most important city, a center of government, commerce, science, culture, and the place for headquarters of locals as well as important international businesses.

To overcome the issue of primacy syndrome in the urbanisation system in Rwanda, NLUDMP 2020-2050 brings to the table an additional mode of urbanization for Rwanda: “In-Situ Urbanization,” which is a process in which people become urbanized where they are. It transforms clusters of rural settlements into urban centers within the original rural environment. In-situ Urbanization is the right solution for both urban and agricultural systems. However, implementation requires vigorous governmental promotion and investments in rural agglomerations. On the other hand, it reduces the costly movements of poor farmers to cities. It prevents social and economic pressures in existing towns. The only chance to achieve a 70% urbanization rate, as Vision 2050 requires, is by encouraging in situ urbanization and prioritizing investments in the rural system to form real clusters of settlements.

NLUDMP 2020-2050 encourages Kigali and other cities to initiate large urban renewal projects and re-examine the use of steeper slopes within the existing boundaries. The renewal approach leads to inward retrofitting, more consolidation, and less affordable housing for waves of migrants. Urban renewal will replace sprawl, which is caused by the ease and less expensive development in vacant areas. New development in urban as well as in rural areas must imply two complementary concepts: Agglomeration and Consolidation. Agglomeration is suitable for services and the economy. Agglomeration and economies of scale can emerge only if spatial consolidation is achieved. Concentration and Consolidation are the antonyms of sprawl, and it is one of the main objectives of this plan. The hierarchy of settlements is one of the most important considerations while planning a spatial master plan. Kigali’s master plan and six secondary city programs give only an indication of the implicit assumptions about this critical issue. The superposition of plans shows that there is a gap between the ideas and the target of the urbanization level (14.7M). Kigali (3.8M) + 6 secondary cities (2.4M) are together 6.2M. A solution for the rest of the 8.5M is needed to fill the gap. Unfortunately, this issue has passed under the radar of national policymaking until now. NLUDMP 2020-2050 deals with this issue

and presents five variants of the hierarchy, followed by a spatial structure. The hierarchy has five ranks: Kigali is on top, the second rank includes 3 Satellite cities, then the group of 8 Secondary cities, 16 District towns, and finally, 73 Rurban Centres/emerging centers, including the small agglomerations of small emerging towns in the rural areas.

4.2.2.1 The Structure of urban development plan

The spatial plan proposes urban population in each rank, accumulating to 15.40M, which is an urbanization rate of 70%. In terms of centralization, Kigali and its satellites agglomerate to a central core of 6.4M, or 41.1%, which is reasonable centrality.

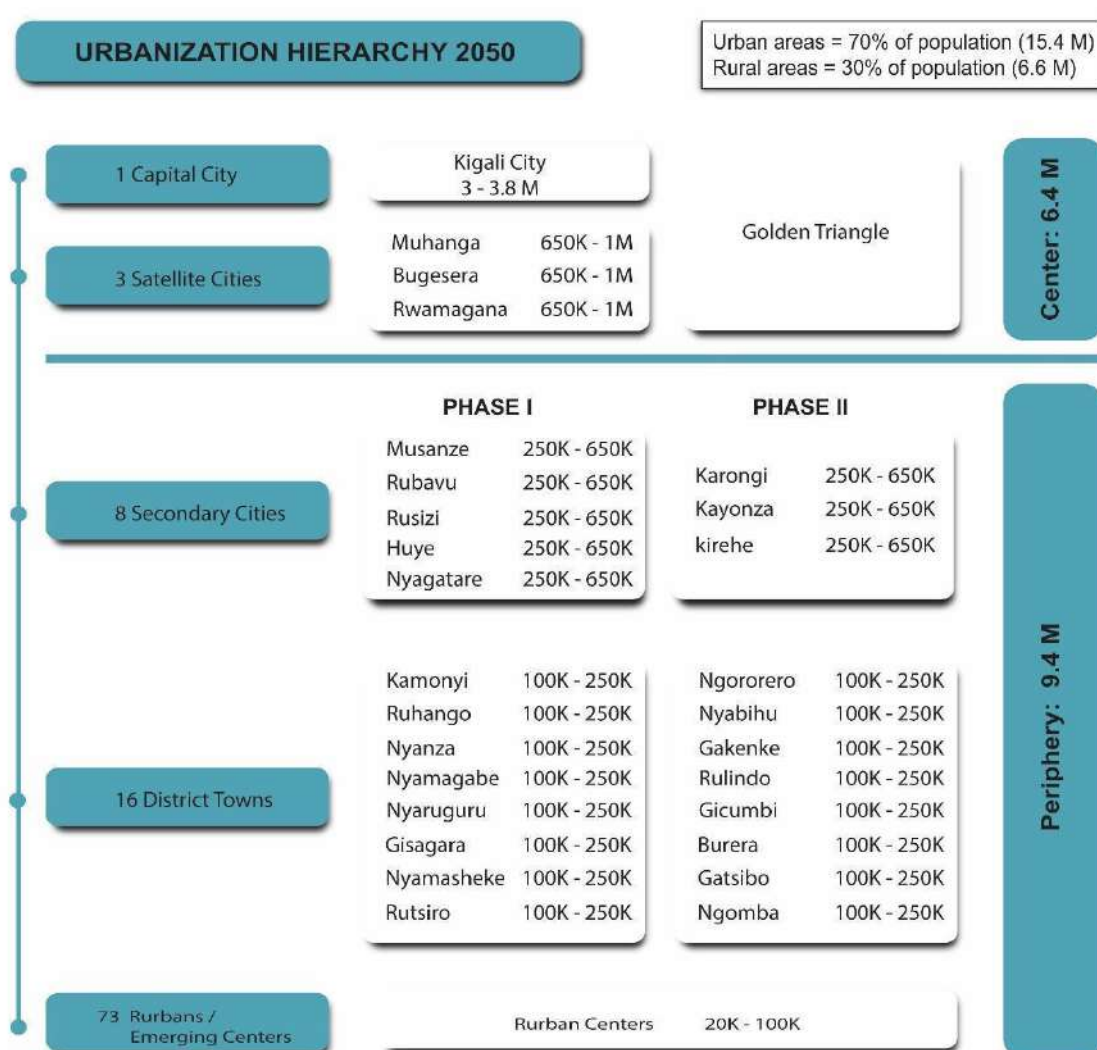


Figure 7: Urbanization hierarchy by 2050.

The spatial plan will guide the future settlement structure by the following principles: It is optimizing centralization by preventing extreme Agglomerations. Three cities (Rwamagana, Muhanga, and Bugesera) play the role of Satellites. When combined with Kigali, they become

a triangle, agglomerating 6.4M people. It controls the Primacy of Kigali. The superiority of Kigali must be limited if the Government desires the decentralization of the country. It supports In-Situ urbanization and controls migration. Intra Migration is a generator of Urbanization. If a particular structure of Urbanization is desired, then managed Migration will be used to accomplish it.

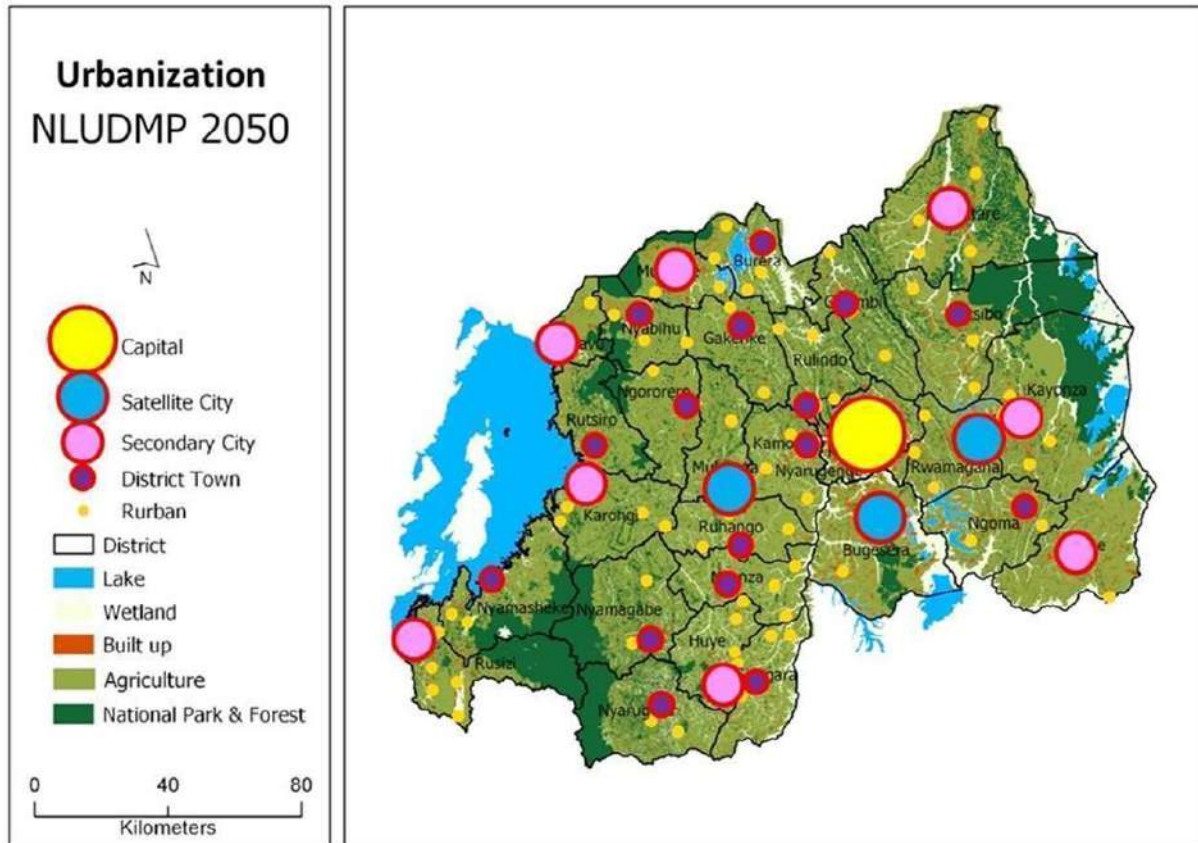


Figure 8: Spatial allocation of main urban areas - Source: NLUDMP 2020-2050

Nine targets according to NLUDMP 2020-2050 must be achieved to achieve Rwanda desired urbanization as follows:

- It assists in stopping the negative migration from satellite and secondary cities by developing economic opportunities and other pull factors.
- The primary source of growth of secondary cities should be the surrounding villages.
- If the first two processes are provided, the redundant large-scale migration from rural areas to Kigali will diminish.
- The internal migration of farmers towards the eastern province for attractive agriculture opportunities is very positive.

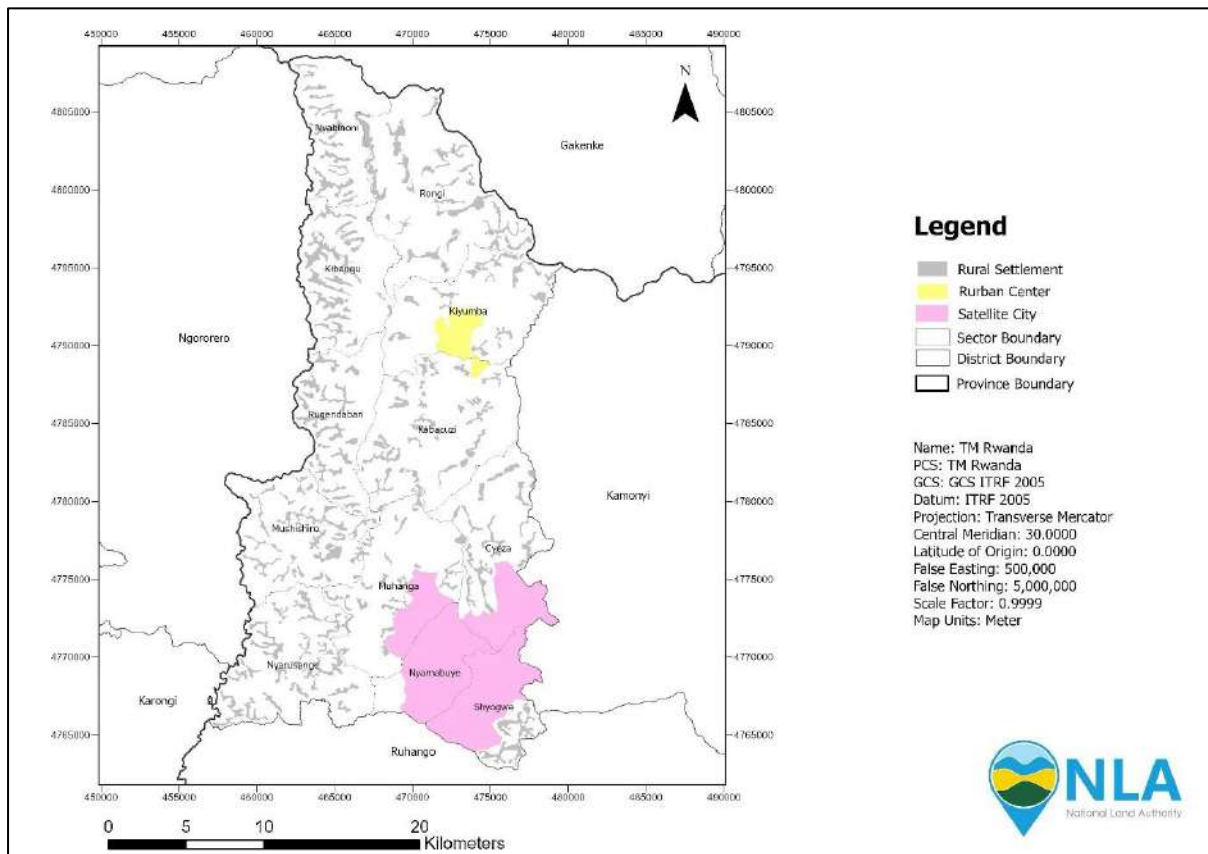
- Migration from Kigali to places in the outskirts of Kigali, a movement that creates suburbanization, must be stopped and replaced by migration to economically based growth poles.
- It is supporting the peripheral border cities. Eight existing towns, which are located on an external belt near the borders, are suggested to grow fast and to be regarded as Peripheral Growth Poles of 250k-650 K, or secondary cities. They will make use of their location as international border towns and optimize commerce beyond their specific location advantages and specialization. A belt of highways will connect the belt towns. The development of these eight cities will happen in two phases – five in the first phase and three in the second.
- It is maximizing feasibility in developing Satellite and Secondary cities. By focusing on existing towns with good potential, and by setting reasonable population targets, the probability of implementation is increased meaningfully.
- It is preventing sprawl by minimizing Rurban Population. This objective of reducing the population in small and weak emerging towns is based on stopping rurban sprawl of tiny townships and directing urbanization towards healthy cities with several hundred thousand inhabitants. As the rurban phenomenon cannot be eliminated, the plan suggests a maximum of 1.8M for this segment and a freeze policy at 73 Rurbans settlements.
- Supporting efficient geometry for the sake of the transportation network. The mechanism to achieve a planned decentralization is a practical and high-level service level of transportation. Decentralization is based on economic interaction between distant poles. Cooperation can be realized only by a network of expressways.

4.2.2.2 Urbanization and Settlement Hierarchy

Based on the NLUDMP 2020-2050, the following are the key directions for Muhanga District:

- NLUDMP 2020-2050 positions Muhanga as one of the three Satellite cities considering its proximity to Kigali City.
- Urban Population for Muhanga District is targeted to be 440,000 by 2035 and 800,000 by 2050.
- Considering the targeted density of 9000 people/Sqkm, the land demand is estimated as 49 km² by 2035 and 89 Sqkm by 2050.
- Besides Muhanga City as the primary city, NLUDMP 2020-2050 identifies Remera as the Rurban Settlement in the Muhanga District.

- Rural Population for Muhanga District is targeted as 200,000 with an estimated land requirement of 38 Sqkm by 2050.
- Based on employment targets, Muhanga District is indicated to require 228 Ha of the Industrial Park by 2035 and 685 Ha by 2050.
- Additionally, the Kampala-Kigali-Tanzania Railway line is recommended to be extended to Muhanga, Rubavu, and Goma.



Map 9: Muhanga District urbanization hierarchy

Muhanga District main urban area (Muhanga satellite city) is currently composed of four Sectors namely, Nyamabuye, Shyogwe, Cyeza, and Muhanga. Currently, the city already has its tool, the master plan that guides its implementation with clear zoning regulations and guidelines. These Sectors were composing the urban area of Muhanga but some areas among these Sectors mentioned were outside the masterplan; some cells are considered to be within urban areas whereas others are not. The total area covered by the urban area is about 76 sqkm.

4.2.2.2.1 Total settlement area

The NLUDMP 2020-2050 calculates the total settlement area in three different ways as follows: In the Integrated NLUDMP 2020-2050 and Land Use Balance sheet report, the Land

requirement in the cities is calculated solely based on population density (10,000 for capital, 9,000 for satellite cities, 8,000 for secondary cities, and 7,000 for District towns). Rurban settlement size is 5,850 people /km², and rural land requirement is 0.64 hectares / household. In the PUSH report, the total settlement area is dependent on the amount of housing in terms of dwelling units. This amount varies based on settlement hierarchy. The net area consists of only the lot, while the Gross area includes roads, infrastructure, and services according to the report. It is reasonable to assume that different housing types have different gross-area demands. The total settlement area is then calculated based on the gross area and proposes that residential should always constitute 40% of a settlement regardless of whether it is a city, rurban or rural settlement. The remaining 60% is to be used for services, industry, and other built areas. In the Integrated NLUDMP 2020-2050 and Land Use balance, sheet report it is proposed that one calculates the service level needs by multiplying the housing by a factor of 2.0, regardless of the settlement hierarchy.

4.2.2.3 Urban Settlement in Muhanga District

Muhanga District represents one potential support for the urbanisation hierarchy in Rwanda, as it comprises Muhanga satellite city, which was proposed by the NLUDMP 2020-2050 as a trade and mining processing hub. Muhanga was previously a secondary city, but due to its location in relation to Kigali City, and the NLUDMP 2020-2050's concept of backing up Kigali, the Rwanda Golden Triangle was proposed and upgraded Muhanga to a satellite city with Bugesera as the logistics and airport city and Rwamagana as the agricultural hub. Muhanga District itself, owing to various factors such as topography, has an urbanisation hierarchy consisting of only two urban areas. There is Muhanga satellite city, which plays an important role in supporting the boom in Kigali and serves as the central urban area of the country. Behind this satellite city, there is Remera rurban center that serves an important role in supporting urbanization and trade in the central and northern parts of Muhanga District. Besides all this, there are about 135 rural settlement sites that have been integrated into the urbanisation hierarchy to support the harmonisation of rural settlements.

4.2.2.3.1 Muhanga Satellite City

Muhanga Satellite City Master Plan 2050 has been prepared based on discussions with the Government, and existing initiatives such as District Development Strategies and previous Master Plans. The Master Plan provides a long-term strategic growth direction for Muhanga District and urban land use distribution for Muhanga City. Muhanga District is positioned to

become the Mining, Logistics & Regional Trade Centre of Rwanda, and a Smart and Green Secondary City. In line with this vision, the Master Plan presents the respective goals, objectives, strategies, and key projects/proposals to achieve this vision.

To achieve the vision, five key goals have been identified for Muhanga:

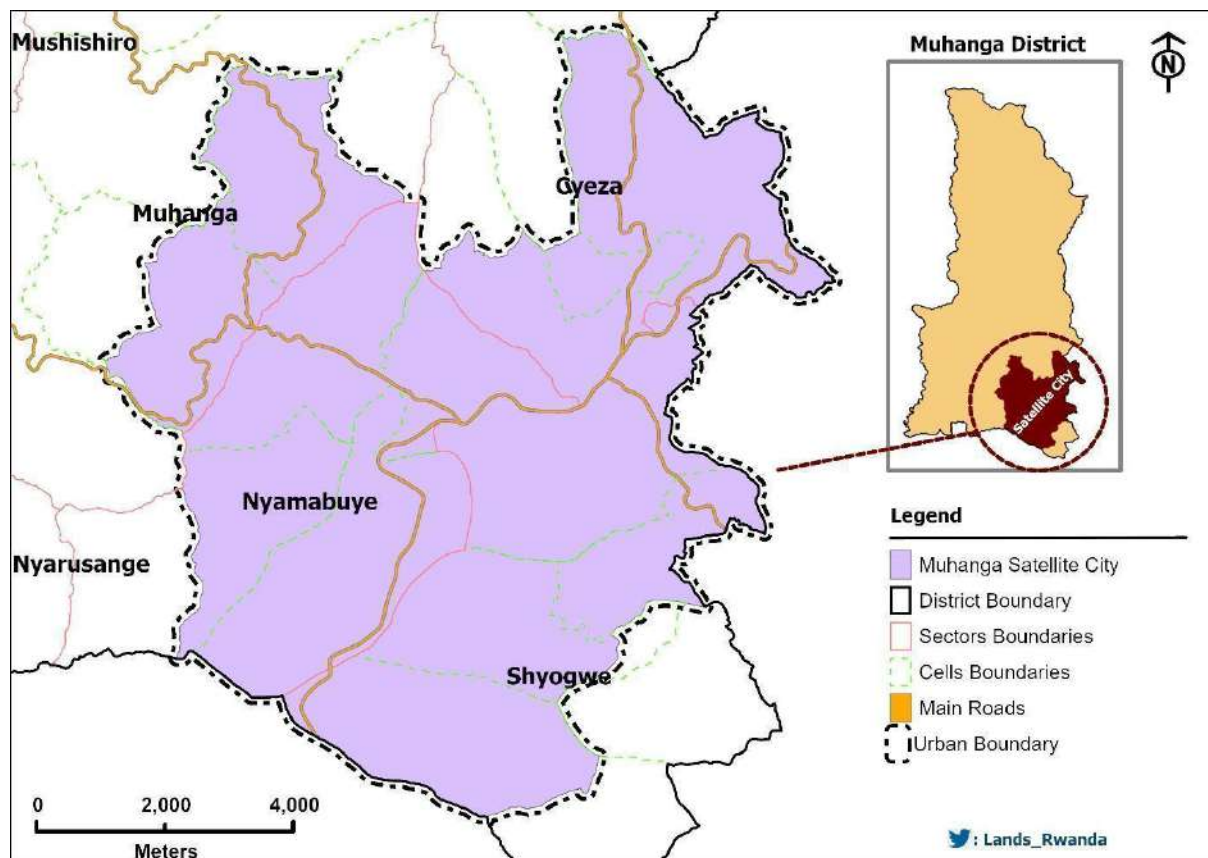
Goal 1: Diverse Economic Opportunities

Goal 2: Inclusive Urban Growth

Goal 3: Seamless Connectivity and Integrated Logistics

Goal 4: Sustainable Infrastructure

Goal 5: Green Growth, Nature and Tourism



Map 10: Delimitation of Muhanga satellite city.

The size of Muhanga satellite city is much larger than other satellite cities (Nyamata/ Bugesera and Rwamagana) means that the density of population in Muhanga satellite city is higher than other satellite cities or secondary cities, Muhanga satellite city is the second largest population in Rwanda. Population of Muhanga satellite city are mainly engaged in non-agricultural pursuits like manufacturing, trade and commerce, services and professions, there are a higher concentration of high skilled and knowledge-based work. There are also more opportunities for high skilled work.

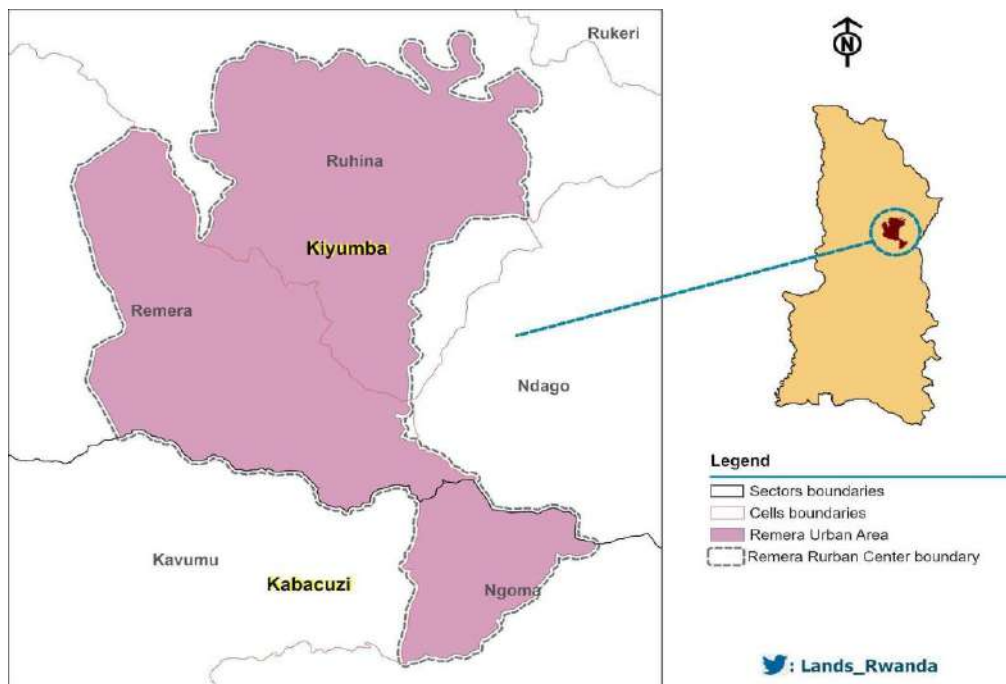
In Muhanga urban there are many economic, social, religious and even sporting activities. The important activities that are found in Muhanga urban area include construction activities, medical services, public utilities, transport , tourist and hotel , and banking and financial services. The satellite city of Muhanga is the closest to Kigali, which places it in a strong position to absorb migrants from Kigali.

Muhanga District is located at only 50km from Kigali city, among the areas that supply the city of Kigali with food especially vegetables, fruits and meat of small livestock .The satellite city of Muhanga is located in the center of the country and has the advantage of being at the cross-roads of major highways connecting the major cities of the country. This strategic position provides opportunities to develop trade at the national level. This position is an advantage for the promotion of the private sector and possibility of expanding urbanization for the development of socio-economic infrastructures to meet urban standards.

4.2.2.3.2 Remera Rurban Settlement

Rurban centers are emerging centers of linkage between rural and urban. The following factors were considered while selecting rurban settlements taking into consideration the district council guidance as follows: (i) Emerging existing potential trading centers; (ii) High pressure of growing residential settlements; (iii) Geographic location; (iv) Existing and developing infrastructures such as roads, waters, electricity, healthcare facilities, employment opportunities, education facilities, etc... NLU DMP 2020-2050 has identified Remera as the Rurban Settlement in Muhanga District. Remera rurban is where the existing trade center is located and large built-up areas can be observed. Additionally, Remera provides vocational-level institutes (Nyabikenke, Kiyumba). Remera rurban is on the national road of Cyakabiri-Nyabikenke-Ndusu and it is where Nyabikenke hospital is located.

However, Remera trading center faces enormous challenges that hinder its development that include; (i) steep topography characterized by hills and mountains; (ii) Outdated infrastructures; (iii) Limited land for extension of Remera center; (iv) Lack of bus station; (v) Scattered settlements development; (vi) Lack of job-creating opportunities for the youth; (vii) Poor sanitation; (viii) High population growth which is not corresponding to available land.



Map 11: Delimitation of Remera rurban center

Rurban settlements are new layer types of urban settings on the hierarchy of urbanization in Rwanda that will play a key role in contributing to achieving the country's urbanization rate desired by 2050 whereby 8.4 M (52.69%) on a coverage area of 897 Sqkm and 15.4M (70%) on a coverage area of 1447 Sqkm as a long-term goal to be achieved by vision 2050. Rurban will also be the linkage between District major towns and rural settlement sites well developed with all desired infrastructures for the wellbeing of local communities. Therefore, the above-mentioned rurban will be settled by 24,657 population on an average land surface area of 4.2 Sqkm.

4.2.2.3.3 Rural Settlements

4.2.2.3.3.1 Rural development plan

According to RPHC5, rural population of Rwanda was 9,545,149 inhabitants, representing 72.1% of the total population and residing in 13,661 rural settlement sites. The rural area landscape is characterised by too many settlement sites and scattered homesteads. Transformation of rural settlement structure is needed in Rwanda. The following actions were proposed:

- Urgent actions are needed to consolidate and freeze the rural settlement sites sprawl. Rural settlement will feed urban areas. Therefore, the 2050 projected population of 6.6M (30%) will be clustered into about 3000 settlement sites. An average of 1 or 2 settlement sites(s)

per cell is required. All total rural settlement gross boundaries should not exceed 124 km² by 2050 from about 1500 km² of 2019. Housing density in rural settlement sites will increase considerably.

- The Imidugudu system will be restructured into organized clusters, and this process will need to be undertaken continuously throughout the next 30 years.
 - Progressive elimination of the village as an administrative entity is suggested to remain with the Umutugudu as a social and economic entity.
 - High density housing models are much recommended in rural areas, including exploiting the underground. Decrease the size of rural residence from 615 Sqkm to 300 Sqkm and the dwelling models of 4x1 and 8x1 (and other high-density models) to be promoted. Dwelling models that utilize less than 300 Sqkm are also encouraged.
 - Avoid any new housing and utility development out of settlement boundaries
 - Mind-set change on the use of land in Rwanda for all levels (emphasis on young generation)
- **New development must imply for agglomeration and consolidation principles:**
 - i. The number of HHs per rural settlements must grow by three to four times, from 172 today to 550HH.
 - ii. Each rural settlement site at Cell level will have public and social amenities such as sports, recreational and leisure spaces, school and ECD, community health post, roads, market, cowsheds, etc. The specific location for these social facilities will be determined by detailed site plan;
 - iii. The arable land per rural settlement will be around 420 Ha on average;
 - iv. Individual farming in small holdings of around 0.4Ha will have to stop, and different kinds of economic cooperation will be organized instead to reach 1.5Ha per HH in the future;
 - v. Five production units of 110 HH and about 84 Ha will be established in each settlement;
 - vi. Yields improvements will be achieved dramatically due to the agglomeration of forces and economies of scale.

4.2.2.3.3.2 Muhanga Rural Settlement Consolidation

Muhanga District selected 246 sites for rural settlement in 12 Sectors that make up the district. After analysing and consulting the NLUDMP 2020-2050, the NLA team provided 91 sites

covering 38 km² for rural settlement. In collaboration with a joint team composed of Muhanga District, NLA and RHA, they agreed to maintain 135 rural settlement sites, emerged, reshaped and that will be serviced to settle the 240,000 population for further development while complying with NLUDMP 2020-2050.

Item	Number of sites	Covered area (sqkm)
Rural settlement sites proposed by NLUDMP 2020-2050	91	38
Final rural settlement sites after merging and reshaping (in DLUP)	135	70.37

Table 10: Number of rural settlement sites in Muhanga District

No	Sector	Number of sites after DLUP Elaboration	Current coverage area (Hectares)
1	Cyeza	10	542.03
2	Kabacuzi	18	7622.56
3	Kibangu	11	778.05
4	Kiyumba	10	428.92
5	Muhanga	18	782.16
6	Mushishiro	13	665.2
7	Nyabinoni	13	707.57
8	Nyamabuye	0	0
9	Nyarusange	10	601.4
10	Rongi	13	858.98
11	Rugendabali	16	621.92
12	Shyogwe	3	228.28

Total		135	7037.83
--------------	--	------------	----------------

Table 11: Muhanga rural settlement sites per Sector and area covered

Item	Number	Covered area (Sqkm)	Change (%)	Observation
Rural settlement sites provided by NLUDMP	91	38	• Number: +48% • Area: +85%	NLUDMP provided the number and area of rural residential boundaries, whereas Muhanga DLUP provided the number and area of rural settlement boundaries, which entails the increase. These boundaries encompass areas occupied by other land uses such as residential, commercial, roads, public facilities, agriculture and forests, etc. When considering only areas occupied by settlements, Muhanga DLUP is very aligned with NLUDMP 2020-2050 settlement parameters.
Final Rural settlement sites after revision of the DLUP.	135	70.37		
Rurban Centers provided by NLUDMP	1	4.2	• Number: +0% • Area: +0%	
Rurban Centers after revision of the DLUP.	1	4.2		

Table 12: Muhanga DLUP alignment with NLUDMP 2020-2050 settlement parameters

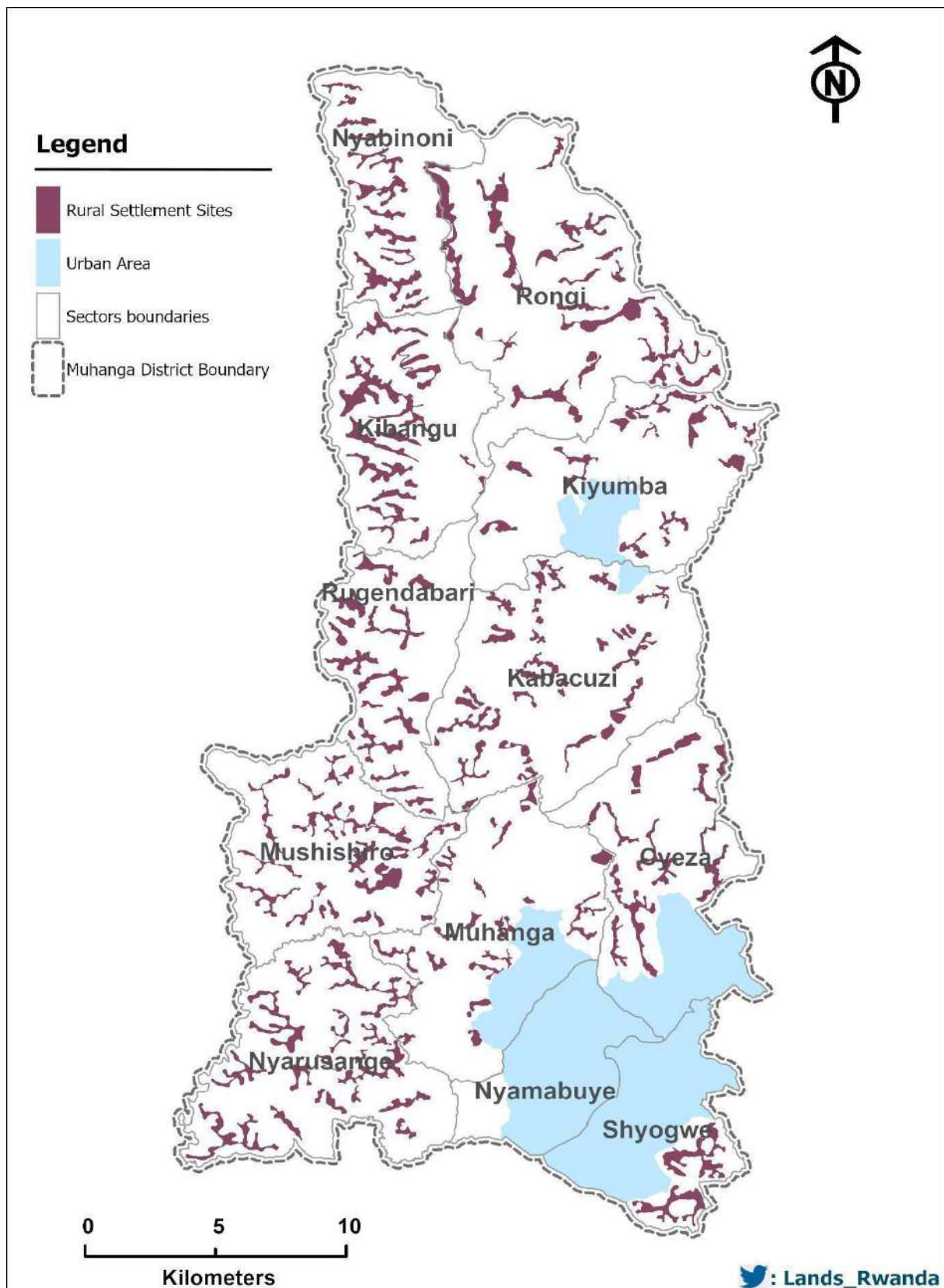


Figure 9: Spatial distribution of Muhanga District's rural settlements sites.

The total area of final delimitation of rural settlement sites in MUHANGA is 75 Sqkm, in this area include: (residential area, social infrastructures, economic activities and Agriculture and forest), when people want to settle in the site where land use provides other activity in the boundary site which is not residential, technical team of District will assess the parcel and people requesting for change of land use, after obtaining the land title complying with residential, she/he will be given construction permit.

4.2.2.3.4 The impact of urbanization

Muhanga satellite city aims to develop:

- ✓ Basic infrastructure and upgrading of informal urban settlements to meet the demands of the urban inhabitants and match the accelerating urbanization;
- ✓ Promoting grouped settlement (Imidugudu); and initiating programs aimed at increasing access to affordable energy, water and sanitation, transport infrastructure and related services for the population;
- ✓ Support economic transformation of the district;
- ✓ Urbanization and rural settlement promoted to accommodate a growing population and facilitate access to socio-economic infrastructure and developing touristic products;
- ✓ The productivity in mining will be expanded by 12% with improved professional methods and value addition;
- ✓ Real estate promotion, construction and maintenance of public buildings;
- ✓ Improvement of informal/peripheral neighbourhoods;
- ✓ Sensitization on the standards of construction and urbanism as well as the protection of the urban environment;
- ✓ Developing a mining processing product industry and exploitation of quarries, promoting private and financial sector development to boost creation of off farm jobs;
- ✓ Increasing agricultural and livestock productivity and production
- ✓ Strengthening technical capacities to increase productivity (in agriculture, industry, handcraft, mining and services such as ICT, tourism...
- ✓ Extend water supply networks by 60% (10% each year) and keep them well maintained at 100%.

The planning of urban areas about urban functions strongly relates to the economic and social aspects of sustainability including demographic issues as well as the inclusion of unregulated settlements and poor people in the planning process. The increasing number of people moving

into urban areas, as well as the structure of the population, must be considered in combination with the dimensioning, location, planning and design of housing and residential areas.

4.2.2.3.5 Limitations of urban development

The critical issues with Muhanga District urban growth and administration are:

- ✓ Insufficient urban pull factors;
- ✓ Weak institutional coordination (Muhanga OSC),
- ✓ Land use disorder and uncontrolled urban sprawl;
- ✓ Increasing degradation of the environment;
- ✓ Informal settlements or informal on urban areas and
- ✓ Lack of integrated resources planning across Sectors of Muhanga District.

4.2.2.4 Housing

An assessment of the current and future housing stock was conducted and found out that the country has today about 2.8M housing units requiring 5.5 (150,000 dwelling units to be constructed annually) to cater for 22.1M inhabitants by 2050. This encounter will start by replacing and upgrading the existing informal rural settlements and identifying existing cities and centers before encroaching the new lands.

The NLUDMP advocates for the development of vertical housing infrastructure, including multi-family apartments, and socio-economic facilities such as industries, schools, Healthcare facilities, public administration offices, and religious buildings, in both urban and rural areas. Given future demographic trends and the substantial housing needs, this approach is strongly recommended to address the demand for housing and optimize land use efficiently.

Encouraging incremental development, the construction process shall be executed in stages with each phase of the building considered as a finished product.

The NLUDMP 2020-2050 proposes five categories of housing to be considered by local-level planning to achieve the desired consolidation and agglomeration.

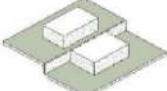
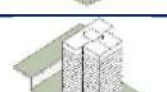
Total 2050		5,500,000 units (2.5M in 2019)
A+		1,656,000 units
1		830,000 Buildings
A		2,175,000 units
1-2		550,000 Buildings
B		1,000,000 units
3-4		11,000 Buildings
C		370,000 units
5-9		40,000 Buildings
D		245,000 units
10-22		11,000 Buildings

Figure 10: Dwelling units needed in Rwanda by 2050

4.2.2.4.1 Planned Housing

The plan involves converting existing low-density housing into higher-density housing. In Muhanga District, housing will occupy 163.57 km², while services will utilize 35-41 km² depending on the computation of service level areas. To accommodate the current and projected population, a total of 256,625 residential units are required.

4.2.2.4.2 Planned housing typologies according NLUDMP 2020-2050

Five housing types are matched with settlement categories, recommending a particular distribution of types for each settlement category. A and A+ will be more frequent in Rurban and rural, while D appears only in Kigali and Growth poles. Type B is dominant in urban areas.

	A+	A	B	C	D	
Kigali city	5%	25%	35%	20%	15%	100%
Satellites	10%	35%	35%	10%	10%	100%
Secondary Cities	19%	40%	30%	7%	4%	100%

District Towns	35%	35%	25%	5%	-	100%
Rurban	52%	45%	2%	1%		100%
Rural settlements sites	50%	50%			-	100%

Table 13: Matching Housing types and Settlement types according to NLUDMP 2020-2050

A+: is the most common type of detached or semi-detached houses, One or two levels high. on a lot of 500 sqm for two households. When built in a sprawl, it has a net density of 40 dwelling units (apartments) per hectare and in terms of a whole neighbourhood gross of 24 DU/Ha.

Housing Types 2050						
	Levels	Max Capacity per building	Lot Ha	DU/Ha NET	Effeciency	DU/Ha Gross
A+	1	1-2	0.05	40	60%	24

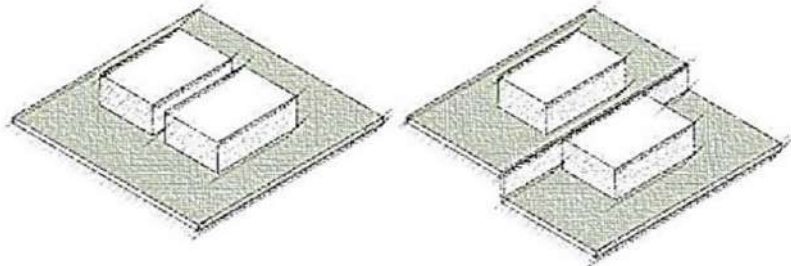


Figure 11: Housing Type A+

A: is based on the same lot of 500 m2 but consolidates four dwellings' units in 2 stories and a net density of 80 dwelling units per hectare and gross density of 40 DU/Ha.

Housing Types 2050						
	Levels	Max Capacity per building	Lot Ha	DU/Ha NET	Effeciency	DU/Ha Gross
A	2	2-4	0.05	80	50%	40

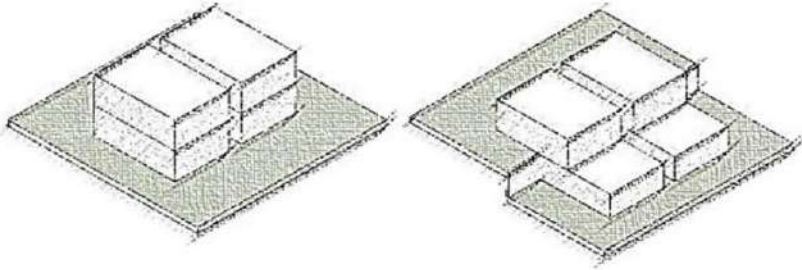


Figure 12: Housing Type A

Both A and A+ can be fitted to suit various topographies including Muhanga District which is highly dominated by hilly and mountainous settings.

B: represents a typical multifamily house of up to 12 DU in 3-4 floors. The net density is 120 on lots of 1000 sqm. This type is the cheapest among the multi-family dwellings, as it does not require an elevator and can be fitted almost everywhere.

Housing Types 2050						
	Levels	Max Capacity per building	Lot Ha	DU/Ha NET	Effeciency	DU/Ha Gross
B	3-4	5-12	0.1	120	40%	48

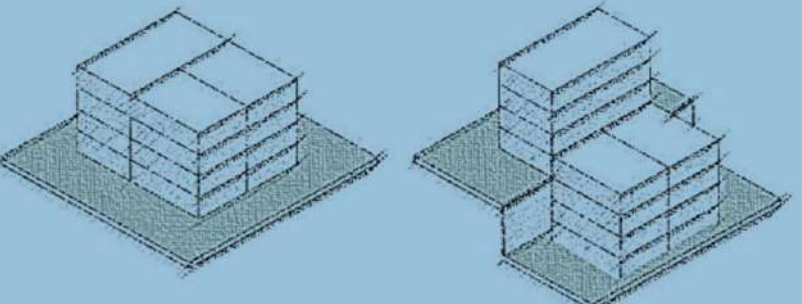


Figure 13: Housing Type B

C: represents a typical multifamily high rise building up to 9 floors. The net density is 180 on lots of 2000sqm. This type is the cheapest among the multi-family houses and fits almost everywhere. Its gross density also reasonable at 63DU/Ha.

D: is the biggest structure in the housing repertoire, rising to 22 floors. The net density can reach 300 DU/Ha on lots of 3000 sqm. It is ideally suited to flat topography but can also be

built on a sloped site but is usually constrained by visual considerations. This structure is expensive, mainly due to maintenance, and therefore it is not feasible for affordable housing.

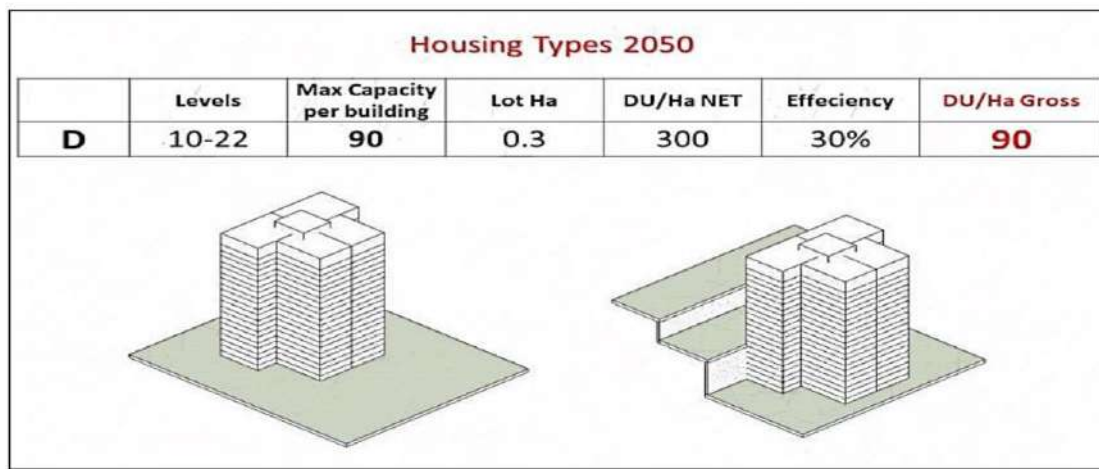


Figure 14: Housing Type D

4.2.2.4.3 Muhanga Housing Stock

To ensure coordination and affordability, the housing stock has been estimated with a mix of different scenarios including population projection, vision 2050, NLUDMP 2020-2050, Muhanga DDS, stakeholder's consultation, analysis of current situation and local Economy of Muhanga District.

MUHANGA DISTRICT	2012	2022	2035	2050
Population projection	319,141	358,433	584,203	1,026,500
Households			146,051	256,625

Table 14: Muhanga projected population in relation to households

By considering Existing situations linked with health measures for family planning, the projected Muhanga District's population will be 584,203 in 2035, corresponded with 146,051 household and 1,026,500 inhabitants by 2050 with 256,625 households. Different housing categories and relevant density have been proposed in order to accommodate various income group, a model of high, medium, low housing was recommended by Master Plan, to allow housing development in Muhanga District and to accommodate the projected number of households.

The size and share for each zone were calculated as indicated in table below:

Residential Type	DU/ha	Total size per ha	Percentage	Total DUs (2035)	Total DUs (2050)
R1B-Residential	40-70	6882	78.80%	115,088	202,221

R1A-Residential	20-30	423	4.80%	7,010	12,318
R1-Residential	15-Oct	156	1.78%	2,600	4,568
R2-Residential	600-100	213	2.42%	3,534	6,210
R3-Residential	60-90	645	7.40%	10,808	18,990
R4-Residential		70	0.80%	1,168	2,053
C1, C3-Commercial		347	4%	5,842	10,265
Total		8736	100%	146,051	256,625

Table 15: Total Muhanga estimated housing stock 2021-2050

The calculation of housing stock recommended in Muhanga District was based on different residential categories, and recommended population projected density. High rising, medium and low rising models have been considered in line with Government vision, NLUDMP 2020-2050, DDS, and local economy of Muhanga District.

4.3 TRANSPORTATION

The movement of people and goods is made possible through various transportation modes. Besides, Trade, as well as tourism activities, might not be optimized without an effective transportation system. There are three main transportation modes in Rwanda, namely air transport, land transport and Inland water transport. Since Rwanda is landlocked, land transportation remains the predominant mode. For regional and international connectivity, Rwanda is linked by road to both Mombasa and Dar-es-Salaam ports at an estimated distance of 1670 km and 1430km, respectively. Rwanda to achieve its socio-economic development objectives, it is paramount to modernize transport infrastructure and services integrated with other sectors development framework. The transport development strategies should aim at reducing travel time to facilitate doing business.

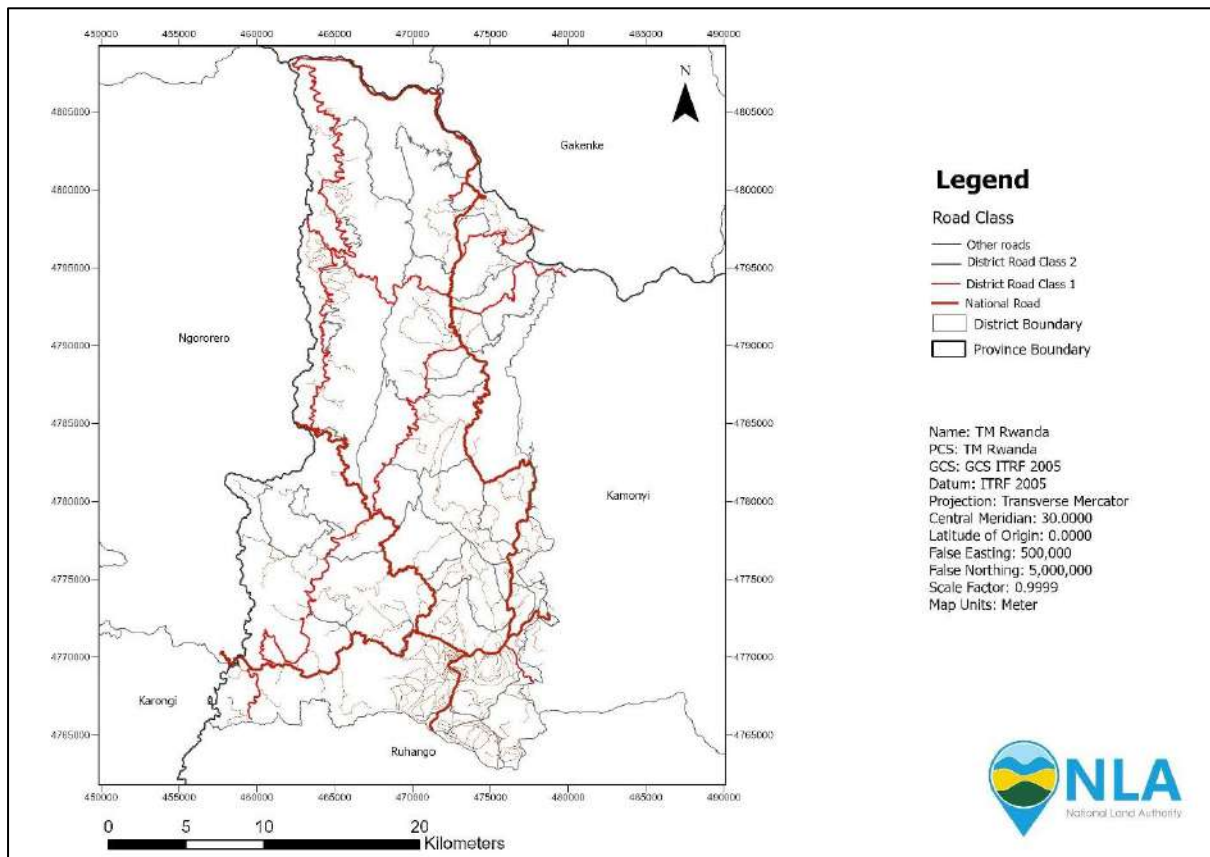
In addition to expanding road infrastructure, there is a need to develop railway and water transport infrastructures as well, to ensure integrated multi-modal transport, resulting in less transport cost, thus making Rwanda industrialization competitive regionally. Rwanda has a very dense road network coverage, which explains the scattered nature of its human habitat and this is very expensive to the government in terms of service provision. The existing road network of 37,896 km (44,669Km including paths) has been analysed, and a new road hierarchy is proposed to achieve the desired vision 2050.

4.3.2 Roads network in Muhanga District

Muhanga is the northern district of the southern province. In accordance with the EICV5 September 2018, indicated that in the southern province, 88.6% of the households regularly use the all-weather roads.

In Muhanga, there are many roads within the urban limit of Muhanga city. The roads can be classified as follows:

- Paved national roads (length=66km);
- 1 unpaved national road (length=65km);
- District roads Class I (total length=141km); (iv)
- District roads Class II (total length=228km);
- Tarmac roads other than national/district road (total length=12.878km);



Map 13: Muhanga District Road Network

4.3.2.1 Roads Network Classification in Muhanga Satellite City

The following road network classifications have been established after different analysis conducted in the table below:

Road Category	Planned Width
National Road and district road class1	15 m from meridian line
District roads class2	12 m from meridian line
Urban roads	6m from meridian line
Unclassified roads	4.5m from meridian line

Table 16: Road classification in Muhanga satellite city

However, the dimensions of the road reserve for urban areas shall be determined in respect of the provisions of the master plan of the city irrespective of the road classification.

4.4 PUBLIC FACILITIES

4.4.1 Education

4.4.1.1 Existing situation

Within Rwanda, Muhanga consistently outperforms the national average in terms of the percentage of children attending primary school and secondary school (NISR, 2012). According to the EICV5 survey, 83% of the people in Muhanga reported to have been to school while 13% reported having never attained any education. Findings from the 2019 Household Survey reveals that 23% of the sampled household heads had no education while 37% did not complete primary education. Those who completed primary studies are 25.7%, which is relatively low respondents who completed secondary school accounted for 3.8% and those who did not completed it accounted for 4.4%. While there are, few respondents who have vocational training (2.6%), those who completed university education account for 2.5% and those who completed masters or doctoral studies account for only (0.2%). This reveals that Muhanga District has few people with higher education qualifications. Therefore, the district has to put more effort and invest in education to improve socioeconomic welfare of communities.

In terms of the education among the workforce, 59% of the workers had no education at all while 25% of the workers attained only primary education. Given that about 59% of workers

have no education, skilling the labour force is key for the development of Muhanga as a secondary city. In terms of educational facilities, there are 131 pre-primary schools, 274 primary schools, 59 secondary schools, 22 TVET, two universities in Muhanga District. Alongside, there are also 60 rooms in primary schools and 51 rooms in secondary Primary for female children. Primary and secondary schools are well distributed across the district with a higher concentration in Muhanga City. Higher education institutions are mostly located in and around the Muhanga urban core. These higher education institutes include Rwanda Institute of Administration, Management, and Kabgayi Catholic Institute. In terms of education, Muhanga faces a number of challenges. The lack of funds hampers the building and upgrading of schools, facilities and infrastructure in Muhanga. Plans are in place for Muhanga to improve access to quality education for its residents. This includes improving the rate of enrolment to school education, increasing the number of qualified teachers, increasing the number of classrooms and introducing ICT based solutions and internet connectivity for classrooms.

4.4.1.2 Planning perspective

The 2050 perceptions ensure access to good quality of education in the initial years of life through increased investments in early childhood development to achieve universal pre-primary enrolment rates by 2050. Access to quality primary education will be confirmed too. All classes will reach middle-income standards for pupil/classroom and pupil/teacher ratios by 2035. Teachers will be empowered and equipped to deliver an education that provides all Rwandans with the capabilities to improve their skills and productivity continually (NLUDMP 2020-2050).

According to NLUDMP 2020-2050, the following standards and parameters have been established for nursery and primary schools:

A. Nursery and Primary Education by 2050:

- Average class size: 35 pupils/class
- Average school size: 840 pupils
- Required size for a nursery school: 0.5Ha
- Required size for a primary school: 1Ha

B. Secondary, Vocational and technical Education by 2050, which will support the reform of quality and quantity.

- Enrolment rate will be 90%
- Average class size: 35 pupils/class

- Average school size: 840 pupils
- Required size for a secondary school: 1.5Ha
- Required size for vocational and technical school: 2Ha

The percentage of children of school age in Muhanga District will be used as a standard at the district level. Thus, 6.89% are in pre-primary, 13.8% in primary and 13.8% in secondary school. Currently, the existing number of classrooms in nursery equals to 456,1398 in primary and 933 in secondary level. These percentages will be applied to the total population year by year, and considering the standard of 840 children per school (NLUDMP 2020-2050), the calculation of schools needed to accommodate all school-age children to implement the Education for all policy.

Determination of number of schools needed

The number of schools is determined by the following formula

$$\text{Ns} = \frac{P1 * S(6-11)}{Qs} \quad \text{Where,}$$

- Ns: Number of Schools are needed
- S (6-11): Percentage of the population who aged 6-11 years group/depends age group
- Qs= Standard number of students for a level school (ECD, Nursery, Primary, Secondary, Tertiary)
- P1: Present total Population

Number of Nursery schools needed

Description	2022	2025	2030	2035	2040	2045	2050
Total Population	358,433	401,233	484,221	584,374	484,221	851,110	1,026,500
Percentage of Babies in Nursery	6.89%	6.89%	6.89%	6.89%	6.89%	6.89%	6.89%
Nursery (3-5]	24696	27645	33363	40263	33363	58642	70726
Children / School [NLUDMP 2020-2050]	840	840	840	840	840	840	840
Planned school	29	33	40	48	40	70	84
Planned Classrooms	706	790	953	1150	953	1675	2021
Required Classrooms	250	334	497	694	497	1219	1565
Required Schools	10	14	21	29	21	51	65

Table 17: number of Nursery schools needed Source: NLUDMP 2020-2050

Educational infrastructures of nursery schools are not enough, and effort should be done to promoting ECDs.

Number of Primary schools needed

Description	2022	2025	2030	2035	2040	2045	2050
Total Population	358,433	401,233	484,221	584,374	484,221	851,110	1,026,500
Percentage of Children in Primary	13.8%	13.8%	13.8%	13.8%	13.8%	13.8%	13.8%
Primary (6-11]	49,464	55,370	66,822	80,644	66,822	117,453	141,657
Children / School (2050)	840	840	840	840	840	840	840
Planned school	59	66	80	96	80	140	169
Planned Classrooms	1413	1582	1909	2304	1909	3356	4047
Required Classrooms	15	184	511	906	511	1958	2649
Required Schools	1	8	21	38	21	82	110

Table 18: number of Primary schools needed-Source: NLUDMP 2020-2050

Conferring to the projected results, this table presents the inadequate of classrooms in primary level from 2022 to 2050 as the population grows, there will be increase of children who join the primary schools which implies that the great demand of constructing new classrooms will be high in order to satisfy the standards of 35 children per classroom and 840 children per school, i.e. 24 classrooms per school (NLUDMP 2020-2050).

Number of Secondary schools needed

Description	2022	2025	2030	2035	2040	2045	2050
Total Population	358,433	401,233	484,221	584,374	484,221	851,110	1,026,500
Percentage of Children in Secondary	13.8%	13.8%	13.8%	13.8%	13.8%	13.8%	13.8%
Secondary(12-17)	49,464	55,370	66,822	80,644	66,822	117,453	141,657
Children / School	840	840	840	840	840	840	840
Planned school	59	66	80	96	80	140	169

Planned Classrooms	1413	1582	1909	2304	1909	3356	4047
Required Classrooms	480	649	976	1371	976	2423	3114
Required Schools	20	27	41	57	41	101	130
TVETs Schools (60%)	12	16	24	34	24	61	78
General Education (40%)	8	11	16	23	16	40	52

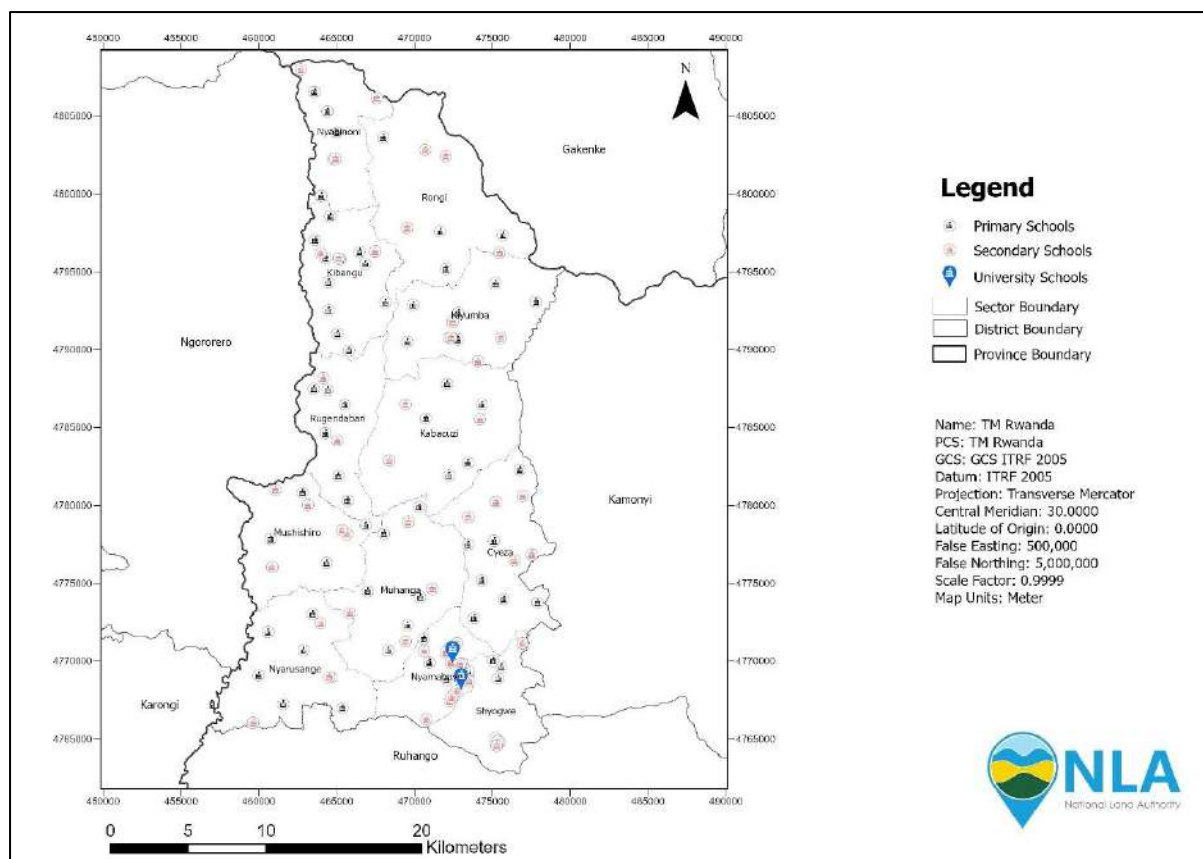
Table 19: number of Secondary schools needed-Source: NLUDMP 2020-2050

Referring to the table above, if the existing schools meet the NLUDMP 2020-2050 standards, i.e. 35 children per class and 840 children per school, there will be construction of few schools. Some programmes may need to be introduced into the secondary education curricula to accommodate land use planning. In particular, given that 60% of children will have to attend TVET and 40% of children will join general education, it is imperative to take this into account in planning, in order to provide employment opportunities for youth.

4.4.1.2.1 Secondary Education

According to NLUDMP 2020-2050, the following standards and parameters have been established for secondary education, which will support to reform the quality and quantity.

- Enrolment rate will be 90 % (39.3% in 2018);
- Average class size: 35 pupils/class;
- Average school size: 840 pupils (381 pupils in 2018);
- Classrooms: 109,576 (17,972 Classrooms in 2018);
- Schools: 4,566 schools (1,728 schools in 2018);
- Required size for a secondary school: 1.5Ha;
- Required size for vocational and technical school: 2Ha.



Map 14: Distribution of education facilities in Muhanga District

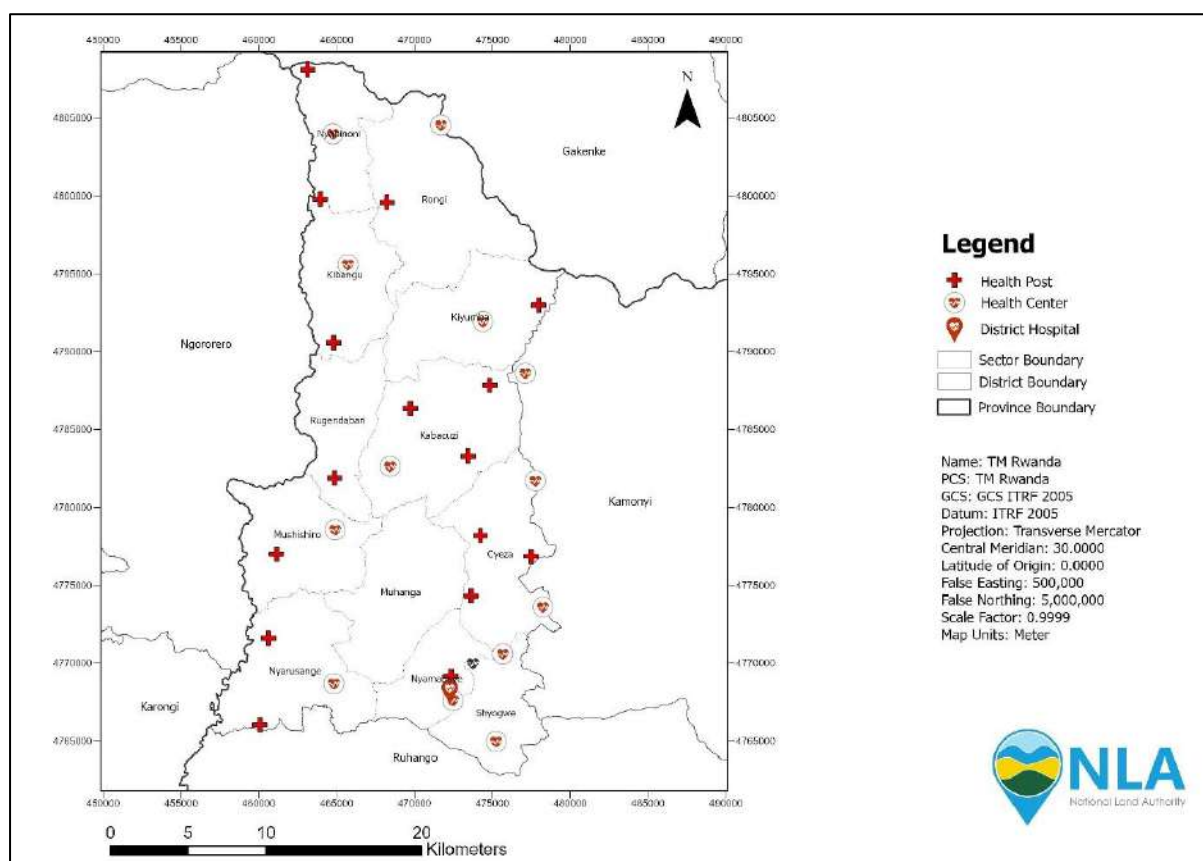
4.4.2 Healthcare Services

4.4.2.1 Existing situation for healthcare services

Muhanga District has a network of healthcare facilities spanning various levels of medical care, strategically dispersed across the district. Two District Hospitals namely Kabgayi and Nyabikenke serve as primary healthcare hospitals each catering to its designated catchment area. Equipped with necessary resources and staffed by experienced medicals professionals, these hospitals deliver secondary medical services including hospitalization, additionally they play a pivotal role in implementing preventive health care measures. 16 healthcare centres (such as Mushishiro, Gasagara, Shyogwe, Nyabikenke, Gishweru, Cyanza, Rusange, Rugendabari, Gitarama, Nyange, Mataba, Ruli, Kivumu, Kivumu, Musambira and Mata healthcare centres) which aim to increase access to crucial primary healthcare services by reducing barriers such as cost, lack of insurance, distance for the patients. There are also 6 clinics such as Ineza Clinique, Umurage medical clinic, Ivuriro Isango, icyizere cy'ubuzima Muhanga, Muhanga Clinic and polyclinique medicale la Providence and 25 healthcare post with aim to serve local population health wise.

Muhanga City is considerably well localised in terms of health care accessibility with almost 90% of its residents are served within 1 km . However, healthcare facilities in Muhanga District are still insufficient considering its population growth and the travelling distance to access these facilities. There is also a shortage of skilled workforce in the health sector in Muhanga. The gap in Healthcare facilities can be bridged by mandating the provision of such facilities in the district.

Regarding health issues, there are a few health centers and hospitals in the sectors that form up the district. The number of patients that Kabgayi hospital receives on daily basis is very big compared to its capacity to attend to them. In addition, the hospital is old, and it needs rehabilitation and the ambulances are very old and yet geographically, some sectors like Nyabinoni, Mushishiro, Rongi, Kabacuzi, Kibangu and Kiyumba are mountainous. This is a threat to expectant mothers or sick people who would be required to be transported from their rural settings or walk long distances.



Map 15: Distribution of Healthcare facilities in Muhanga District

4.4.2.2 NLUDMP 2020-2050 in lines with Health Service

According to National Land uses and Development Master Plan, propose the following health standards structures have: (i) Community health will be organized in clustered rural settlements

sites; (ii) Health posts (0,06ha each): 3000 for future proposed imidugudu (496 in 2019); (iii) Health centers (0.2Ha each): 2 / sector =832 (499 in 2019); (iv) District hospitals (2Ha each): 2 / district = 60 (36 in 2019); (v) Provincial Hospital (3Ha each): 2 per province=8 (4 in 2019); (vi) Referral hospitals (4Ha): 10. (vii) Any new health facility to be built within urban and rural settlement boundaries and vertical construction of buildings should be mandatory.

4.5 PUBLIC UTILITIES

4.5.1 Energy

Energy will continue to be a requirement for household and commercial purposes in the future. Evidence shows a strong correlation between the increase in energy consumption and rise in income levels. Per capita consumption of energy will increase from 1,026 kwh in 2035 to 3,080 kwh in 2050. It is anticipated that there could be a need for about 3,788MW and 13,981 MW of energy capacity in 2035 and 2050, respectively. There will be a high emphasis on an adequate and stable supply of electricity for household and commercial purposes. Energy is central to Rwanda's economic ambitions and development plans. The sector supports all other sectors, including housing and urbanization, manufacturing, agro-processing, mining, tourism and IT. Hence, a well-functioning, efficient energy sector is vital for achieving the country's national goals. Vision 2050 sets out a clear path for Rwanda to achieve upper middle-income status by 2035 and high-income status by 2050. Energy will support the delivery of Vision 2050 by expanding affordable, reliable access to electricity to both citizens and industrial users, ensuring sustainability in biomass supply and securing supplies of petroleum. International experience has shown that economic development is difficult without a well-functioning energy sector, and without minimum levels of capacity and consumption.

The energy sector in Rwanda is made up of three sub-sectors: power, hydrocarbon and new and renewable sources of energy. Amongst the renewable sources of energy are biomass, solar, peat, wind, geothermal and hydropower. Biomass is the most commonly used and dominates both the demand and supply sides of the Rwandan economy.

4.5.1.1 Overview of Rwanda's indigenous energy resources

Resource potential	Summary of current and potential contribution
Hydropower 313-400 MW	Hydropower has generated the bulk of electricity in Rwanda since the 1960s. Its overall potential is estimated at up to 400 MW, and the current installed hydro capacity is 98.5

	MW. As a result of extremely low operational costs however, hydro is still one of the cheapest forms of generation in the long run.
Methane 140-180 MW	Kivuwatt, a 27 MW generation facility, has demonstrated the commercial and technical viability of extracting methane from Lake Kivu. Further utilisation of methane resources is planned, with significant investor interest.
Peat 121-161 MW	A Peat Master Plan was first developed in 1993. Estimates of potential capacity have since been revised downwards from the initial 700 MW to 121 MW-161 MW in 2016. About 77% of the country's peat reserves are near the Akanyaru and Nyabarongo Rivers and the Rwabusoro Plains.
Geothermal (TBD)	Rwanda's geothermal resource is yet to be established. However, studies have identified Karisimbi, Kinigi, Gisenyi and Bugarama as promising areas, with potentially 47.3 MW of generation available from five promising sites. Further studies, exploration and test sites are required to confirm this.
Solar Energy (TBD)	Rwanda's solar radiation varies between 4.3 and 5.2 kWh per m ² per day over all regions. There is high interest from the private sector in on- grid solar power development. However, penetration is limited by the technical capacity of the grid.
Biomass (TBD)	Small-scale power generation using agricultural residues (such as bagasse or rice husks) or biomass briquettes (from compacted waste residues or charcoal dust) is feasible at low levels of capacity.
Wind Energy (TBD)	Commercially viable wind power resources are not expected to be significant based on past resource assessments and modelling work. However, MININFRA will continue to assess the potential for wind to contribute to the overall power generation efforts

Table 20: Summary of current potential energy contribution in Rwanda (Source: Energy Sector Strategic Plan, MININFRA 2018)

4.5.1.2 Future Needs of Energy in Rwanda

There is a correlation between forecasting future energy consumption and GDP annual growth. The current trend of GDP growth of 8% corresponds to an electricity demand growth of 10%, and from the 140MW peak demand at present, we can make a 30-year projection as follows:

$140 \times (1.10)^{30} = 2443 \text{ MW}$ (+15% for peak demand calculation) = 2810 MW (a reasonable projection by 2050). In the case of phenomenal GDP growth, reaching a maximum of 10% that would correspond to an electricity demand growth of 15% (so far, only China has made such high GDP annual growth in the history of humankind). Based on the present 140MW demand, we can make the following 30-year projection:

$140 \times (1.15)^{30} = 9270 \text{ MW}$ (+15% for peak demand calculation) = 10,660 MW (an ambitious projection by 2050). As a big number of people in the district, live in rural areas with an average of 70% living in isolated rural housing patterns in hilly areas. The number of people who have access to both on-grid and off-grid connections is still very low according to statistics. For example, access to on grid energy is (35,8%) and access to off grid energy is (16.6%). This impedes the development and growth of a district since electricity fosters business activities. To strike a balance, there should be two possible ways of accessing electricity using both off grid and on grid connections. Having access to electricity in rural settings would require funding attractiveness from non-government entities because grid and off-grid access to energy would have spillover effects to the existing population in terms of socio-economic activities that add value to the community it is designed to serve.

4.5.2 Water and Sanitation

The Water and Sanitation Corporation (WASAC) is responsible for supplying and managing potable water in the urban areas of Muhanga City. Operations and maintenance of rural water supply systems and schemes in different parts of the district are carried out by cooperatives, organised by the district. The Fifth Integrated Household Living Conditions Survey (EICV 5) (2016/17) assesses the current levels of service in Muhanga City in terms of water supply. Improved water sources refer to protected springs in Muhanga; unprotected springs provide unimproved water sources. Currently, only 83% of the Muhanga population have access to an improved water source, which is lower than the national average of 87%, far from the national target of 100%. In addition, the meantime taken to access an improved water source in Muhanga is 9.7 minutes, which is higher than the national average of 9.6 minutes. As such, 6.6% of households do not use their nearest water source because it either is too far or is not functioning.

4.6 AGRICULTURE AND LIVESTOCK

4.6.1 Agriculture

According to NLUDMP 2020-2050, Agriculture plays a significant role in Rwanda's national planning. One of the Pillars of Rwanda's VISION 2050 is Agriculture nearly 15 times more productive than today, high value, and market-driven. The task for NLUDMP 2020-2050 is to provide the spatial infrastructure needed to realize this goal. Agriculture in Rwanda plays a dual role, in generating income and foreign currency through export of agricultural products (mainly coffee and tea) and in generating food for the local population. Given the size of the country and population, a main question to be asked is whether it is possible to feed the local population (today and in 30 years from now) given the limited arable land. The food needs of the growing population of Rwanda were analysed based on three scenarios regarding agricultural yields' development, to calculate the size of the agricultural land needed for protection within the NLUDMP 2020-2050. In a business-as-usual situation, given the current crops' yields – the farmland in Rwanda will not be sufficient to feed 22.1 million people in 2050.

In a realistic scenario where, within 20 years, 80% of farmers are commercial and the consumption of livestock products rises to 10% of the diet – the farmland in Rwanda is still not sufficient to provide food for a population of 22.1 million people, but for less than half of them. Even if the yields in Rwanda improve to the best practice, the existing farmlands cannot provide food for 22.1 million people due to the topography, the climate and competition over land.

The recommendation is therefore to protect the current agricultural land of 10,949 Km² (41.6%) meaning that for the period of 3 decades to achieve vision 2050, only 12,433 Km² (47.2%) of agriculture land to be reserved to satisfy future generations and to be protected and efficiently utilized and enlarge it as much as possible, given the demand for other land uses and possibly up to 15,000 km² to have room for sustainable food security. The farmers should be not more than 30% of the projected population with less than 10% of agriculture contribution to the GDP and this does not mean reducing the size and value of farmlands, but rather increasing the economic growth of other sectors like Industry and services. The average Land per farmer ratio should be around 1.5 hectares in a consolidated form. In the Eastern, Northern and Southern districts (the LUCA A areas in NLUDMP 2020-2050) agriculture should be developed further, so that cultivated land grows in size, and yields improve dramatically.

However, in the Western districts, where landslides prevail, other economic sectors should be emphasized.

In 2050, the agricultural land / farm (household) ration should be around 0.75 hectares per farm (household). About 8.4% of the workforce will be employed in commercial agriculture. Scattered homestead to be eliminated gradually - consolidate/agglomerate in few settlement sites to decongest agriculture zones and thus allow the use of technology in agriculture. Based on all these recommendations, in 2050 Rwanda will fulfil its vision of a nation that enjoys food security, nutritional health and sustainable agricultural growth from a productive, green and market-led agricultural sector.

4.6.1.1 Existing agricultural environment: The current state of agriculture

MUHANGA is categorized as Land Use Category B (LUCA B): Agricultural suitable lands but scattered. Need for agriculture land use consolidation. A freezing strategy is suggested to stabilize the amount of both agriculture land and forest. Agriculture is by far the most common economic activity with 78 % of the workforce being involved in agricultural activities. Muhanga specializes in a few crops where its production exceeds the national average. These are mainly bananas, cassava and climbing beans.

Crop	Harvest area(ha)		Crop Share %		Crop Production (MT)		Crop yield (kg/ha)	
	Muhanga	Rwanda	Muhanga	Rwanda	Muhanga	Rwanda	Muhanga	Rwanda
Sorghum	-	9,664	0%	1%	-	12,835	1109	1,328
Maize	2,561	210,191	9%	18%	5,420	505,887	2,117	2,407
Wheat	-	9,405	0%	1%	-	14,392	-	1,530
Rice	130	8,507	0%	1%	585	41,787	4500	4,912
Ordinary beans	2223	105,905	8%	13%	1628	64,589	732	610
Climbing beans	4,342	119,226	15%	13%	8,631	189,362	1,988	1,588
Peas	268	20,762	1%	2%	88	16,271	330	784

Groundnuts	-	14,048	0%	2%	-	7,597	-	541
Soybeans	1393	20,346	5%	1%	1059	11,717	760	576
Banana	9,196	169,180	32%	18%	89,825	1,654,151	9,768	9,777
Irish potatoes	160	90,162	1%	8%	1,218	1,432,045	7609	14,119
Sweet potatoes	1,879	52,784	6%	5%	26,817	500,049	14,274	9,474
Taro	291	8,476	1%	1%	1,897	56,027	6,529	6,610
Yam	-	452	0%	0%	-	1,371	6,573	3,030
Cassava	5,665	95,771	20%	9%	104,069	1,306,014	18,372	13,637
Vegetables	573	18,850	2%	0%	4,800	197,149	8,375	10,459
Fruits	307	10,078	1%	0%	3,391	123,789	11,029	12,283

Table 21: Muhanga Main Crops and associated production (Source: Local Economic Development (Led) Strategy 2017-2023)

Farming is the main economic activity in Muhanga, with 78.5% of its population employed in the agriculture sector. Most agriculture workers are independent farmers, and own and cultivate a small size of land. The average size of land cultivated per household in Muhanga is 0.97 ha. Based on the land use data from REMA in 2008, agriculture is the largest land use in Muhanga District, occupying 86.6% of its total land area.

Based on land use data from NLA in 2015, the land use for agriculture remains the predominant land use in Muhanga, but has reduced to 71.4% of the total land area. Soil acidity is high in some areas due to the presence of minerals, making it unsuitable for agriculture. Apart from these areas, Muhanga generally has favourable soil conditions, climate and elevation for agriculture. However, the population density and hilly terrain makes it virtually impossible to

develop extensive farming. Despite the gradual increase in crop production over the years, production levels are still insufficient to obtain a surplus for the market, and farming remains subsistent. Only 10.3% of produce is sold and 16.3% for fruits and vegetables.

The lack of larger plots of land for agriculture has resulted in over-exploitation of small plots of arable land. The use of traditional farming techniques, limited use of fertilisers and lack of erosion control measures, along with others have also contributed to the low production and productivity in Muhanga. Value-added activities include processing of rice, cassava and soybeans, and mixed flour production. However, the processing of agricultural and livestock products in Muhanga remains limited, with small processing units scattered across the district. As of 2012, there are only four units of coffee washing stations, six cereal mills plants, five cassava plants, two banana winery plants and a pineapple juice plant throughout the district. According to the EICV5 study, 10.8% of cultivated land is irrigated. Potential irrigation areas include runoff for small reservoirs and dams, direct river and flood water, lake water, groundwater, and marshlands.

4.6.1.2 Planned Agriculture

It is proposed that the existing 575.5 km² of agricultural land will be preserved. Only 43 km² have high potential according to the NLUIMP 2020-2050. The agricultural sector will have a high focus on productivity, climate resilience and standards, commercial agro-processing, and agribusinesses. The advanced food industry will be developed in the country based on strong linkages between commercial farmers and industries. The agricultural sector will be market-driven, linked to urbanization and trade. In 2050 agriculture in Rwanda will be market-led and high-tech, driven by a few professional farmers with large farms on irrigable lands. Farms will be mechanized and use high-tech inputs in higher volumes. Yields will improve to the optimal international return. According to Muhanga District Land Use Plan 2035, the allocated land for agriculture according to the district land use balance sheet is estimated to be 469 Km² excluding Swamplands and their buffers.

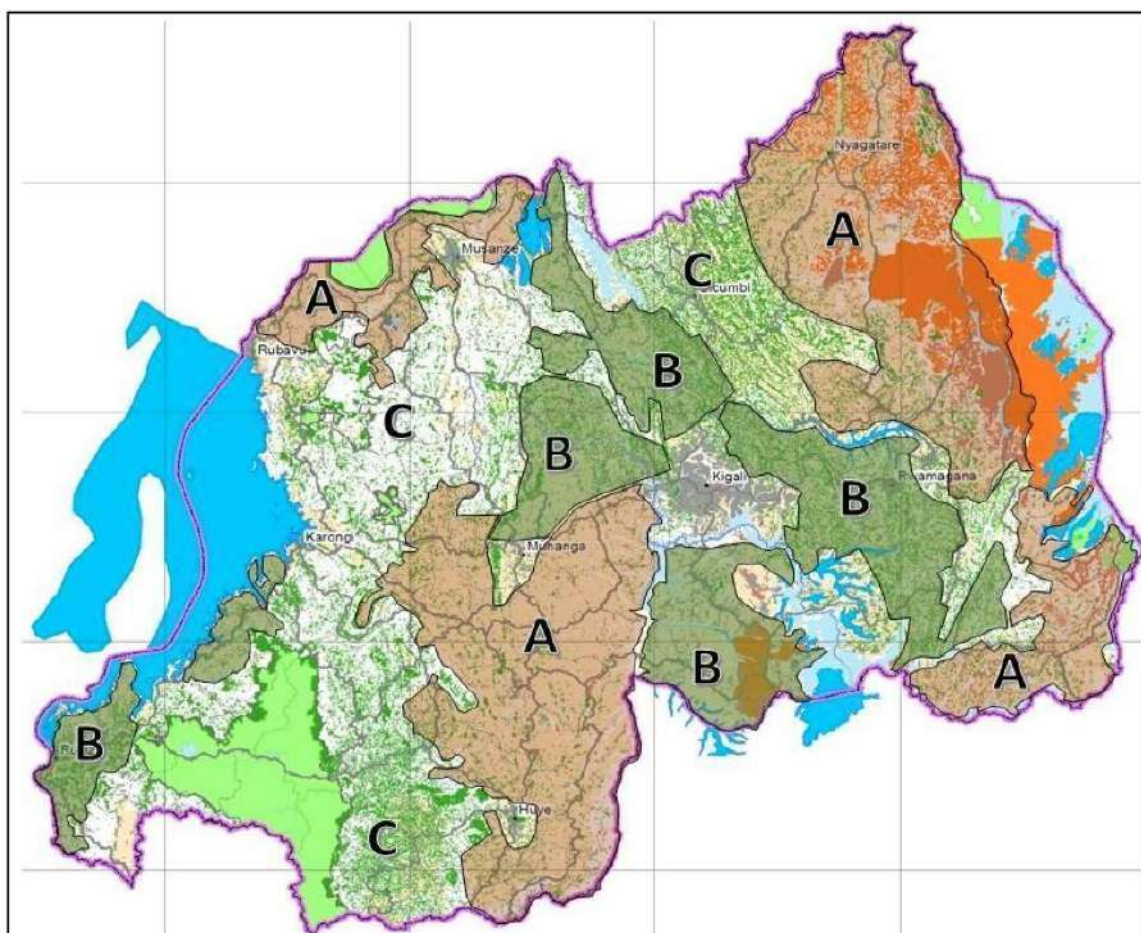


Figure 15: Agricultural suitability in Rwanda

Muhanga District belongs to LUCA C (13,171 km²) is a blend of open landscape elements, including grasslands (1097 km²) and 4,540 km² of different forests. This amount covers almost all-natural woods and 60% of forest plantations. 1554 km² of high slopes is also included. C contains 2.8% of prime agricultural lands, which are small and disjointed, and 974 km² of areas not suitable for commercial use. These lands can still be cultivated in small farms, either subsistence or technically improved. This requires much effort to consolidate agricultural lands for further irrigation and mechanization.

4.6.2 Livestock

According to the NLUDMP 2020-2050, Livestock products are excellent for closing dietary gaps in protein consumption and producing higher value products. However – at a very high cost to the land and other natural resources. The availability of sufficient animal feed is a crucial element in raising livestock yields. This means that agricultural land should be protected to produce feed for farm animals. There are two main options for feeding livestock: (1) Grazing

pastures, (2) Feeding the livestock in intensive farms, mostly grains (wheat, maize, soybean). Livestock productivity will be lower in comparison to intensive feeding, and the land needed is much larger than the area required for growing grains intensively. One option to improve livestock farming is to combine grazing in areas designated conservation (nature reserves and forests) when this dual land use is possible. Feeding livestock grains is intensive. It means that feed will be produced on agricultural land or imported from other countries. High-yield livestock consumes a high amount of feed.

Even under the best scenario, livestock feed may take around 200,000 hectares, about 18% of the currently available agricultural land in Rwanda. The balance sheet advises to use Agriculture land for mostly food production for the local people, and livestock rearing to be based on feed imports (especially raw materials) as much as possible. However, the country will continue to establish animal feed industries, as promoted by NST1 and Vision 2050.

Livestock is not just a source of milk, meats and animal products, but also contributes to income generation and food security. In Muhanga, crop cultivation is usually coupled with the farmer's livestock. According to statistics, 76.9% of households raise livestock. Muhanga has seen the biggest increase in goats (42%) and rabbits (37%). Cattle have a comparatively smaller increase of 16%, but quality, in terms of genetics, have improved. Like agriculture, livestock production levels are insufficient to generate a surplus. Local breeds with low productivity potential and the lack of husbandry in Muhanga are possible causes of low productivity. The biggest challenge that farmers currently face is the feeding of livestock. There is a lack of pasture, which limits the full potential of the livestock market in Muhanga.

Muhanga is also looking at fish farming at existing dams in Rugeramigozi and possibly at future dams to increase food security. A systematic crossbreeding programme has been initiated to produce less vulnerable crossbreds. Artificial insemination of female cows for improved genetics and vaccination of animals against disease are planned to improve the productivity of livestock. Separately, "Girinka Munyarwanda" programme delivered cows to the Muhanga population to alleviate poverty and improve the well-being of the population. As a result, livestock production has gradually increased since 2007.

4.6.2.1 M.C.C (Milk Collection Center)

Muhanga District has one milk collection center (M.C.C) located in Nyamabuye Sector and one Milk Collection Point (M.C.P) located in Horezo IDP model village in Rongi Sector.

4.7 ENVIRONMENTAL AND NATURAL RESOURCES

Rwanda is a natural resources-based economy, and therefore environment and climate change issues are a key priority and cross-cutting area that needs to be enhanced as stated in various medium and long-term national planning and strategic documents. Based on this, the key to planning and implementing the NLUDMP 2020-2050 is to ensure harmonization of land allocation for each sector while at the same time ensuring that there are targeted efforts to the conservation of natural resources and promotion of their sustainable use. The NLUDMP 2020-2050 assessment grouped the environment into three key components, namely: Natural Resources, Biodiversity Protection, and Environmental Quality component Sector. The evaluation gives guidance on critical aspects that need to be considered by various other sectors. It provides policy orientations that need to be undertaken under each of the environmental sub-sector going forward. Protected and conserved areas are fundamental for achieving many of the Sustainable Development Goals, the current land cover (in 2019) includes land for conservation in the form of National parks, protected Swamplands, water bodies and forests which makes up 10,818 Km² (41.07%) of the total Rwandan area. Based on the proposed national land use balance sheet, which is based on a total country area of 26,338sq Km. The environment and natural resources sector have been allocated the second highest land use of 9,925 km² representing 37.7% of the country.

Rwanda's socio-economic development is dependent on the environment and natural resources such as land, water, forest, air, minerals and biodiversity. The Environment and natural resources (ENR) sector contribute significantly to the economic growth of the country. However, the sector faces challenges due to the inefficient use of natural resources as a result of unsustainable investment trends and pressure by other sectors.

Strength	Opportunities
- Wetland to help in managing surface water and pollution - Many planted forests - Favorable weather: No harsh weather conditions or extreme climates - Fertile land	- Existence of a sanitation Master plan - Existence of DDS with greening proposals - Favorable environmental legal and regulatory framework
Weakness	Threats

- Intensive exploitation of natural resources for production of construction materials within the city - Lack of centralised sewerage system - Economy based on exploitation of natural resources - Lack of a dumping site to dispose of waste/poor waste Management - Lack of valorisation of wastes collected within the city	- Steep slopes: Erosion and Landslides - Increase in Surface Water Run-off/ Erosion - High dependence on biomass for cooking - Unsustainable mining practices leading to land degradation and water pollution - Intensive use of chemical fertilisers and pesticides - Bg institutions without proper wastes management systems - Water pollution in Rugeramigozi by wastes from the city
---	---

Table 22: Environmental SWOT analysis for Muhanga District

4.7.1 Forestry

Forests have a significant role to play in Rwanda's national development. They provide 86% of the primary energy source mainly as domestic cooking energy. They hold the base for the country's tourism opportunities, which in 2013 generated USD 294 million and are targeted to increase to over USD 600 million by 2020 (Forest Investment Program for Rwanda, 2017). In addition, forests protect watersheds and downstream Swamplands, supporting agriculture and generate products of the country's export revenues. Further, forests are a vital component of the life-support system and ecological benefits. Under the forest resources, the vision of Rwanda is to achieve and sustain forest cover at 30%. The most recent data on forestry in Rwanda based on the 2019 forest cover informed that the Rwanda forest cover is about 7,246 km² which is equivalent to 30.4% of the dry land. Specifically, 53.5% of the forest cover are plantations, 23.3% is wooded savannah in the East, 18.1% are natural mountain rainforests, and 6.1% are shrubs. In addition, Bamboo stands occupy only 613 hectares and its plantations have mainly grown in the buffer zones of rivers (Rwanda Forest Cover, 2019).

In terms of the forest density and tree cover, about 318,434 hectares are very dense forests (44%), 234,004 hectares are moderately dense (32%), 146,222 hectares are sparse (20%) and only 26,035 hectares are much degraded (4%). Southern and Western Provinces contain 50% of total forests of which 174,199 hectares are in Western Province and 177,537 hectares are in Southern Province. Eastern province takes up to 38% of the total forest land (274,630 hectares).

Northern Province contains only 85,688 hectares and Kigali city remains only with 12,641 hectares (Rwanda Forest Cover, 2019).

4.7.1.1 Existing situation

At district level, the top forested districts are Nyaruguru with 55,759 hectares (55 %) occupied by forests, followed by Rusizi district with 48,255 hectares (53%), Nyamagabe with 54,018 hectares (50%), and Nyamasheke with 45,935 hectares (48%) of forest land. The least forested districts are for Cities and Towns where forests occupy less than 10% of the total district land (Rwanda Forest Cover, 2019). The Muhanga District seems to be forested (26%) even if it is not yet reaching the national recommended target for 30%. Environmentally sensitive areas, including dense forest such as Busaga Forest and moderate forests spread throughout the district where possible. It is still working on forest cover increase and during the last decade, results show that afforestation is about 35.3% against deforestation at 12% over the past ten years from 2009.

4.7.1.2 Planning perspectives

The trend is positive even if there are issues related to forest degradation, deforestation and forest removal. To react to issues, schemes for forest restoration and regeneration, new plantations and buffer zones protection are in place. Additionally, agroforestry, urban forestry and introduction of open spaces are concerned.

Notice: The surface area of forest cover (2019) has decreased with more than 1,300 ha in Muhanga District compared to forest cover in the land use plan for Muhanga District. It is because existing small forests merged to other zoning like residential or agriculture. It is on one hand sound bad to encourage forest removal once Muhanga District has not yet reached the national target for 30%. On the other hand, for the purpose of harmonizing zoning and using district land in a sustainable way, all remaining lands that located in the buffer zones for: Roads; Rivers; Open spaces; Swamplands as well as Steep slopes (>55%) should be for afforestation. The adjacent areas are also encouraged to be reforested and protected to allow for a seamless nature corridor that could enrich the district's biodiversity, while nature areas close to urban area may be programmed as Nature Parks for passive recreation.

District will implement the following measures as recommended by the NLUDMP 2020-2050:

(i) Ensuring that all natural forests should be preserved entirely, and economically maintained and managed; (ii) Ensuring that all forest plantations will be protected, increase the current forest densities, and professionally and financially managed; (iii) Ensuring that all the bare slopes above 55% totalling 26539 hectares of high hills particularly in central to north parts of the district are planted with trees to become part of the forest cover. For economically maintained and managed, cash crops like tea plantations can be developed on those very high slopes.

No	Land Uses	Area in hectare	Percentage
1	Forest	16043.19	24.82
2	Other land uses	48607.00	75.18
Total		64650.00	100.00

Table 23: Allocation of forests in Muhanga District

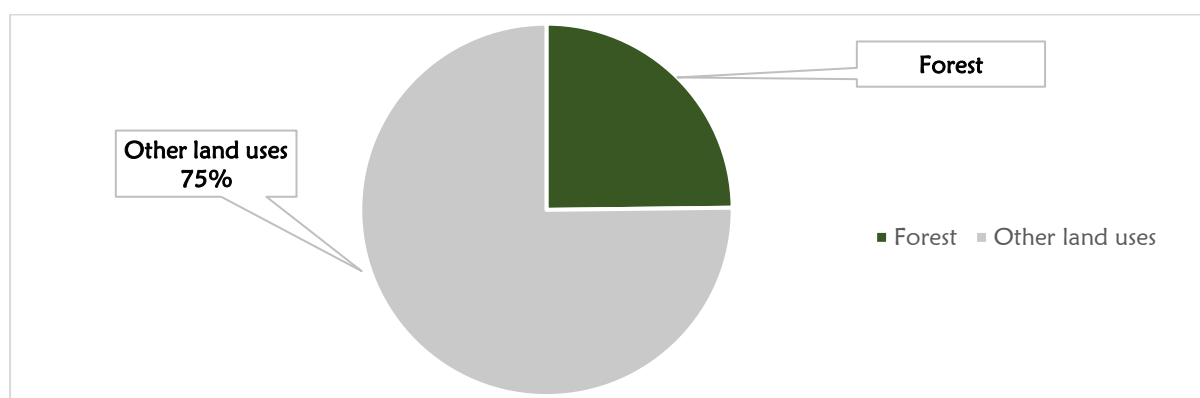
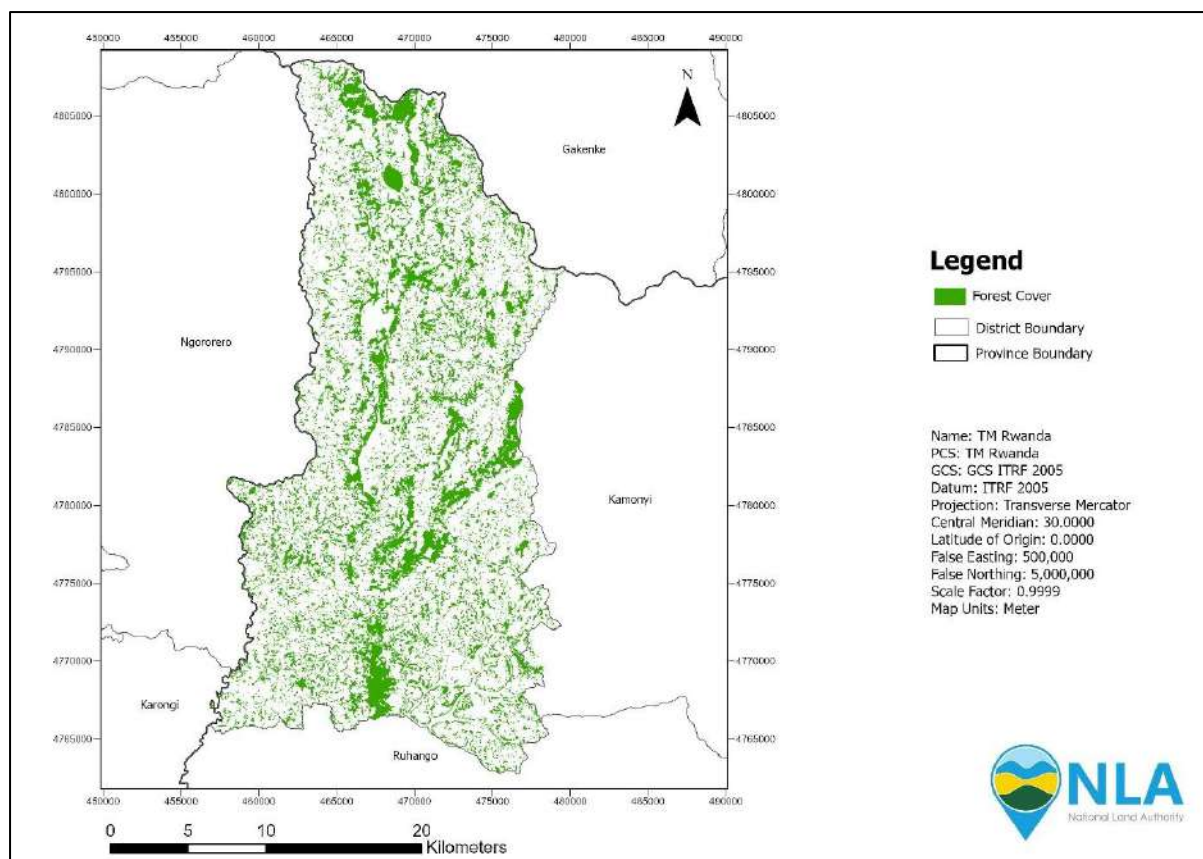


Figure 16: Proportion of forest allocation.



Map 16: Distribution of forest in Muhanga District

4.7.1.2.1 The proportion of locations with steep slopes above 55%

No	Slope	Area in hectare	Percentage (%)
1	Suitable slope	38111.07	58.95
2	Slope above 55%	26538.93	41.05
Total		64650.00	100.00

Table 24: The proportion of locations with steep slopes above 55%

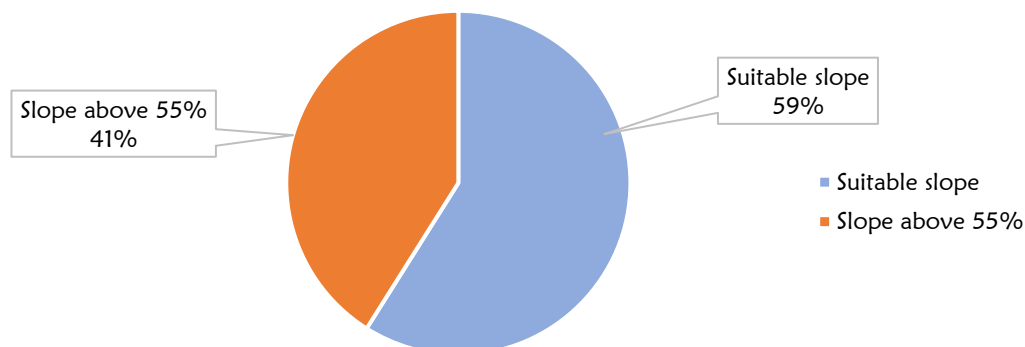
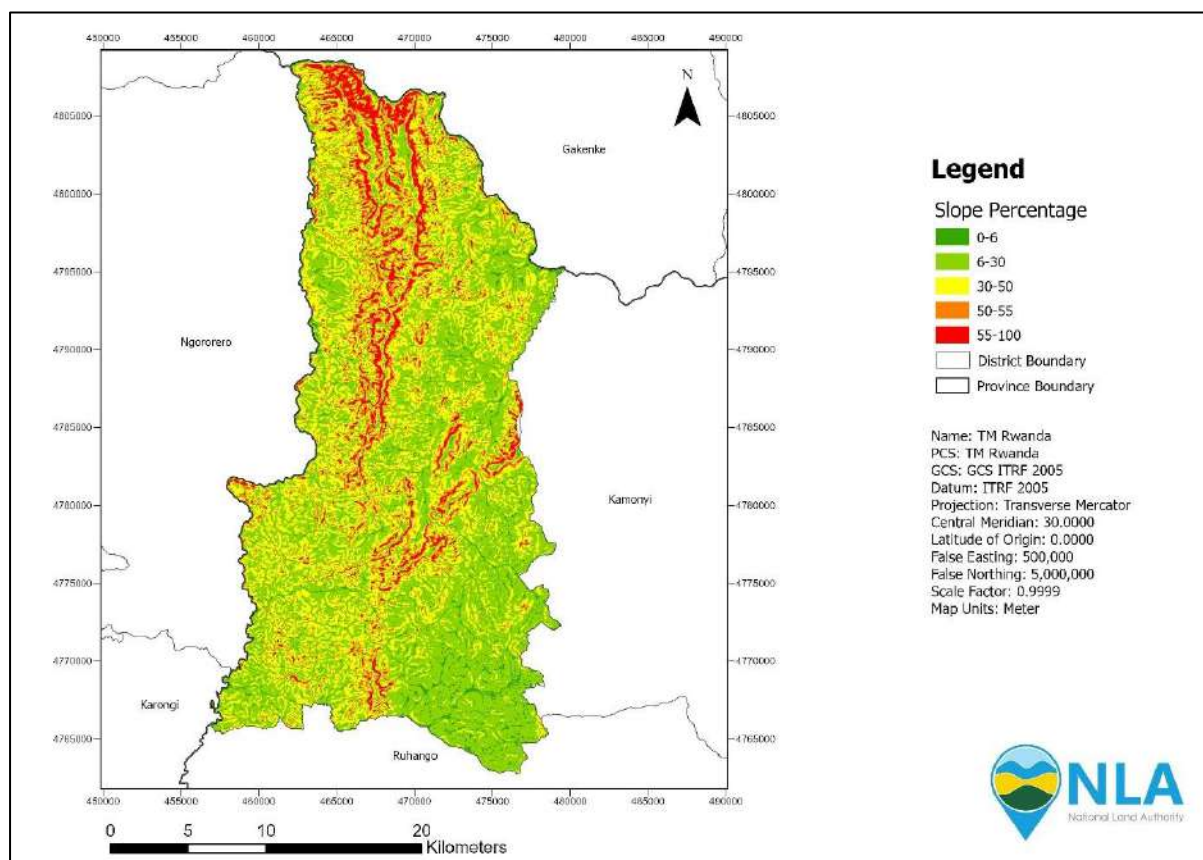


Figure 17: The proportion of steep slope above 55% and suitable slope



Map 17: Area with slope above 55% in Muhanga District

4.7.1.2.2 Afforestation on slopes above 55%

No	Afforestation status in slopes above 55%	Area in hectares	Percentage (%)
1	High slope to be afforested	14728.80	55.50
2	High slope already afforested	11810.13	44.50
Total		26538.93	100.00

Table 25: Afforestation status in the locations with slopes above 55%

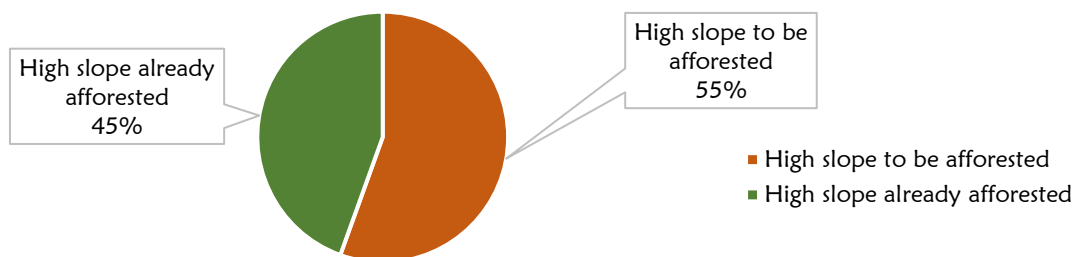


Figure 18: Proportion of land to be afforested on slopes over 55%

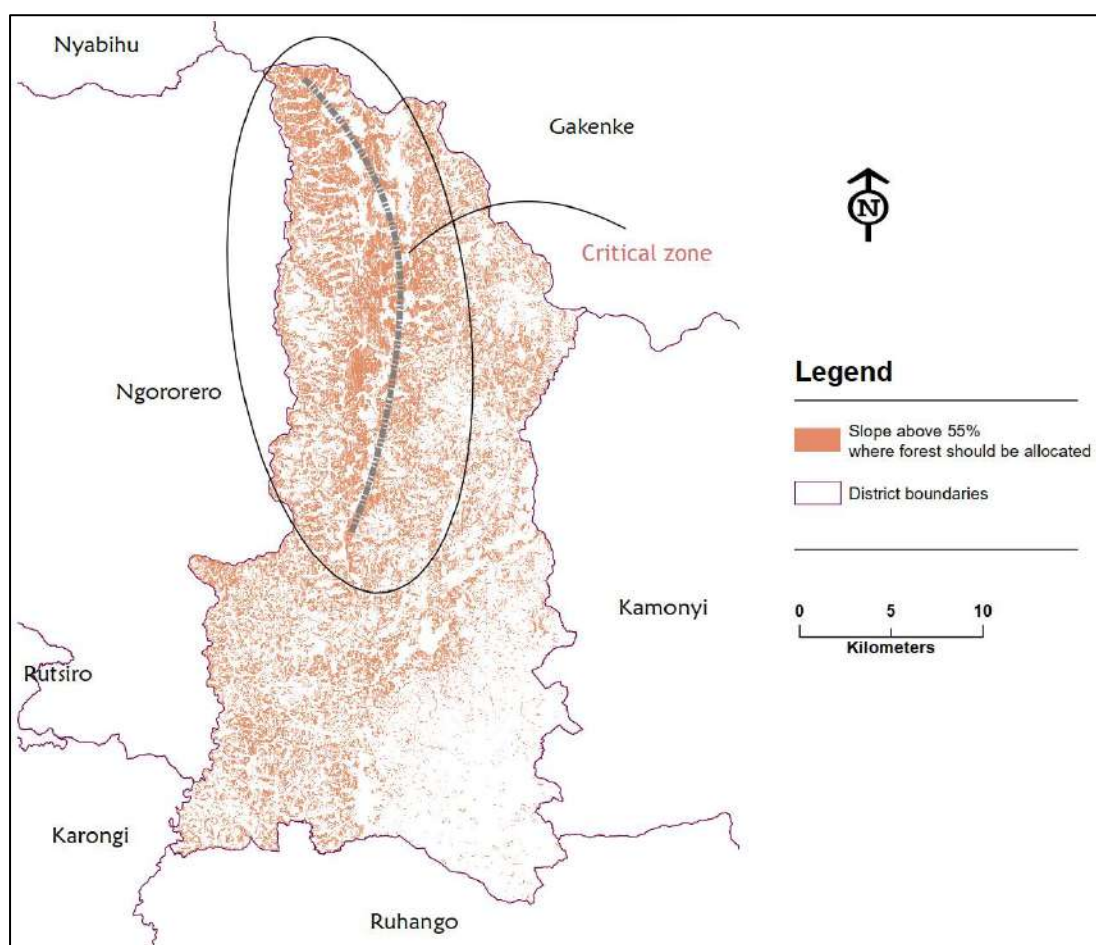


Figure 19: Allocation of forests in Muhanga on slope above 55%

A total of 11,810 hectares of high slope zone are not yet covered with forest, therefore that zone will be used as afforestation for enhancing the forestry and environmental protection mainly in the central to north parts of the district.

4.7.2 Swamplands

There are 935 swamps under the order No 006/03 of 30/01/2017, drawing up a list of swamplands, their characteristics, and boundaries, and determining modalities of their use, development, and management. They have a total of a recorded 276,477 ha where 74% of total

Swamplands are under conditional exploitation, 6% are under full exploitation, and 20% of the full Swamplands are fully protected.

4.7.2.1 Existing situation

Muhanga District has diverse marshlands in the established 2017 list of swamplands. The main wetland in Muhanga District area is Rugeramigozi in Muhanga satellite city: with major uses of agriculture of different crops like rice, and maize. The protected Swamplands aim to mitigate flood damage, absorb pollutants, and enhance water quality especially water and pollutants from Muhanga Satellite city and Remera Rurban. They also offer habitat for animals and plants, and many of them sustain a diverse range of life, including species and animals found nowhere else. Within the district, all Swamplands are opened to the conditional use for an integrated farming system on crop production that has an impact on socio-economic development of farmers in Muhanga District.

4.7.2.2 Planning perspectives

Zoning enforcement and ensure limited and acquisition for wetland for other functions. Muhanga District's Swamplands are designated/zoned for agriculture and others for conservation, where existing Swamplands should be used as recommendation as follows:

- Protection of the Swamplands marked to be preserved.
- Opening up for conditional use of the unprotected Swamplands for agriculture (following the laid down guidelines)
- Opening up and leaving some Swamplands parts of the Swamplands to be used conditionally for other uses, e.g., Recreation, research, tourism, etc.
- Conservation of all the buffers zones for Swamplands have their use guided by the above uses
- Use and retention of urban Swamplands as collection points and filters for stormwater from the urban areas, based on the fact that Swamplands are part of the “green infrastructure” of healthy catchments and provide a multitude of ecosystem services especially in urban areas
- Systematic restoration of degraded Swamplands in the country,
- Recovery or creation of urban Swamplands goes together with the protection of river banks, and is essential for the integrity of the water and Swamplands resources.

- For the Swamplands which are identified for conditional use, their proposed use(s) should be guided by undertaking Environmental Impact Assessment (EIA) to ensure their sustainable utilization.
- Development of ecotourism parks in the Swamplands along with development areas for conservation, educational and recreational purposes. The enhancement and development of tourism and recreational activities on Swamplands will enhance their conservation elements.

4.7.3 Water bodies

Countrywide, water bodies occupy 6.2 % of the total area of the country that accounts for about 1537 km². Most of the lakes and rivers are fed by marshes, which in turn are fed by shallow groundwater and seasonal floods. One hundred one lakes cover 149,487 ha, and 861 rivers totalling to 6462 km in length in Rwanda. The central pressures on water resources result from the use of utilizing the natural resources to meet basic household needs as well as social-economic development, e.g., undertaking Agriculture.

4.7.3.1 Existing situation

Nyabarongo River makes the district hydrographical belt (it crosses six sectors) and collects alone more than 90% of runoff/small rivers; Its tributaries are Miguramo, Nyakabanda, Bakokwe, Birikana, Ururumanza, Sagarara, Kiryango, Base, Akabebya, Mukunguri and pours into Akanyaru. In general, water is abundant in the district, especially in its Northern part.

4.7.3.2 Planning perspectives

In the implementation of NLUDMP 2020-2050, the following are recommended;

- Ensuring that all the water bodies and their buffer zones and the protected Swamplands and their buffer zones are fully protected totalling 4,242 Km², particularly prohibition of settlements in 50m from lakeshores, 10m for rivers and 20m buffer for wetland boundaries. Buffer zones are used for forestry, tourism, and conservation efforts.
- Ensuring policies relating to water resources extraction and protection with a focus on enhancing saving and water conservation are aligned with NLUDMP 2020-2050.
- Putting in place a prudent water resource management plan driven by projected increases in water consumption/demand and climate change at all levels of administration and catchment areas.

- Develop hydrological and hydraulic at district and catchment levels, supported by hydrological and hydraulic models, improved rainfall monitoring, river flow and groundwater monitoring and a better understanding of agro-meteorology and water quality testing.
 - Enhance and improve the knowledge and operations of water users within districts, catchments area, irrigated and mining sites etc. as instructed in the NLUDMP 2020-2050.
- Moreover, the district has a goal of constructing 560 ha radical Terraces, 100 ha progressive terraces and 222 Ha afforestation for Nyabarongo Riverbank protection (DDS 2018)

4.7.4 Mining

The Government of Rwanda recognizes that the mining sector has the potential to become one of the drivers of long-term sustainable growth through economic transformation, industrialization and inclusive growth taking into account environmental and social considerations and using green mining techniques. It can provide revenues to contribute to a rapid economic growth, a positive trade balance, foreign exchange earnings, and opportunities for employment, backwards and forward linkages that will overall generate substantial social and economic benefits to the Rwandan society.

Rwanda is endowed with varieties of minerals such as Cassiterite (SnO_2), Wolframite $[(\text{Fe},\text{Mn})\text{WO}_4]$, Colombo-tantalite $[(\text{Fe},\text{Mn})(\text{Nb},\text{Ta})_2\text{O}_6]$, Gold, Iron and gemstones such as Amethyst, Sapphire, Beryl, Green and black tourmaline, Topaz, corundum, Opal, Agate, Flint, Chialstolite and others. Among these, the main minerals being exploited and traded in Rwanda are Cassiterite (tin ore), Wolframite (tungsten), Coltan (niobium-tantalum), Amblygonite, gold (in small quantities) and gemstones (amethyst, sapphire and tourmaline). Other resources include quarry stones used in the construction industry such as amphibolite, granites and quartzite, volcanic rocks, clay, kaolin, dolomite, sand and gravel.

The mining sector employs over 60,000 people countrywide and has generated 733 USD in 2020. Its contribution to the GDP was 2% in 2020. The mining activities play an important role in the economic and social development of Muhanga District. The exploration and extraction of Coltan, Cassiterite and industrial minerals and construction material will employ a big number of people, especially the ones living in the nearby mining and quarrying concessions. The mining and quarrying activities will generate money through opportunities for

employment, backwards and forward linkages that will overall generate substantial social and economic benefits to the district.

4.7.4.1 Existing situation

The major minerals extracted in Muhanga District are Coltan, Cassiterite, Wolframite, Ambligonite, Beryllium, Amethyst, Industrial minerals and construction materials. These minerals are extracted in all sectors of Muhanga District, except Nyamabuye Sector due to its position to lodge the town of Muhanga. In a mining context, Muhanga District is becoming a mining District due to a huge quantity and diversification of extracted minerals. The mining consolidation (the merging of small mines sharing the same ore body in a big mine) has started in Muhanga District where the first mining consolidation of Kabacuzi has been launched by Rwanda Mines, Petroleum and Gas Board in 2020. This process will continue to ensure all the efforts and means of mining investors are put together to modernize the mining sector in Muhanga District. This consolidation will attract the foreign investors to come and pattern with the local investors.

4.7.4.2 Planning perspectives

The land use master plan will take into consideration the potential mining areas. Exploration of these potential mining areas is ongoing to estimate the mineral resources that have to be extracted. Due to the size of the mining concessions under exploration, their layers have to be overlaid on the major land uses except residential use. Mineral resources estimation will come up to concession size reduction. As the land use master plan is dynamic, it will update the potential mining areas.

To ensure sustainable mining the following needs to be ensured and undertaken going forward:

- Undertaking a land-use analysis (cost-benefit analysis) for current land use versus the proposed mining activities and use the analysis results to understand the best land use;
- Undertaking of a complete risks analysis (Environmental and Social Impact Assessment Study approved by the competent authority) to the natural and human environment before the licensing of the mining activities;
- Developing and Implement land-use master plan concerning the proposed mining activities;
- Undertake and enforce environmental and social assessment and monitoring (EIA, EA, SEIA, EMP);

- Enforce the programs for orderly decommissioning, rehabilitation, restoration, and utilization of mining sites after an operation;
- Develop a mine drainage and leaching of contaminants plan associated with mining metals to avoid impacts on rivers, streams and water quality.

Muhanga has initiative of Constructing mining treatment facility/ factory constructed, carrying out detailed studies for rehabilitation and degraded mines and quarry areas (DDS 2018). Moreover, the district plan to train mining cooperatives in mineral exploitation techniques, environment protection and climate change resilience.

4.7.5 Green Urbanization

In order to implement the National Green Growth and Climate Resilient Strategy (GGCRS), green principles should be key priorities integrated in planning of different land use categories. The two program principles under urbanization planning to be focused on during planning and implementation include; Integrated approach to sustainable land use planning and management that recommends employing an integrated approach to planning and sustainable land use management and Low Carbon Urban System that focus on promoting of green efficiency in master plan design, building designs etc. should ensure minimizing of carbon emission. With poor expropriation in industrial park, there are social and environmental threat to Local population which are mixed with industries within it.

4.7.5.1 Existing situation

The district is located mainly in the Agro-bio-climatic region called "Granite Ridge". Climate change and disaster management require to be mainstreamed as well as Conducting risk assessments and vulnerability mapping to develop effective disaster management systems.

Many cases of deforestation have been documented in Muhanga, according to the Upper Nyabarongo Watershed Rehabilitation Plan. This is especially due to the local population's usage of wood as a source of energy. Urban roads, other major roads are identified in the Muhanga however these roads shall be improved in terms of road condition.

4.7.5.2 Planning perspectives

Number of interventions must be implemented to guarantee that the NLUDMP 2020-2050 is environmentally sustainable in its execution. It requests that numerous policies and legal frameworks be reviewed and updated in parallel with the NLUDMP 2020-2050. Therefore, for a green urbanization the following are recommended:

- All Population, Urbanization, Settlements, and Housing (Push) programs of the district must comply with the projection of NLUDMP 2020-2050.
- Ensuring that all urban development processes incorporate climate risk and low-emission strategies on all the proposed activities;
- Promote climate-resilient human settlements and prevent informal settlements as well as well upgrading the existing ones.
- All the proposed investment in the proposed urban areas should have integrated, resilient, reliable and sustainable infrastructure which will enable the district to adapt to climate change and function efficiently at the local level
- All green infrastructure projects should be designed to complement gray infrastructure systems performing a combination of volume management, water quality improvement, and flood control;
- For all the urban developments, there should be identification and strengthening of the value of greenbelts and green spaces.
- All urban development plans and programs must support urban agriculture areas and programs to enhance food security in urban areas.
- Have the operators in the Industrial parks that go for cleaner and greener production and support the Zero waste economy and circular economy in their production activities.
- Ensure that Industrial parks are well supported in green planning, green technology, and production practices.
- Ensure that Strategic environmental assessment (SEA) is undertaken for all land-use master plans to ensure their sustainability.

Particularly Water harvesting techniques in planned settlements are planned to be undertaken, to reduce water run off for erosion control and storage of natural resources as well as addressing the water shortage issues in the district. Moreover, to the assistance of GGGI and REMA and other stakeholder, the district aspires to integrate the district's development plans to green growth and climate resilience measures to direct the district's growth in a green and climate-resilient manner, resulting in low-carbon urban development, disaster-resilient district, and increased green investment. For improving the greenness of the district, the Natural assets, including Swamplands, forests and steep slopes, are extended and connected to form a seamless and continuous green network running throughout Muhanga. They will serve as the backbone of Muhanga and are to be integrated in the concept plan as part of "Green Muhanga" (GGGI 2021).

4.7.6 Waste management

The amount of solid waste is increasing rapidly because of rapid growth and migration from rural to urban regions. The fast urban population increase has a significant socioeconomic and environmental influence on solid waste management techniques. The Rwandan goal is to provide 100% of the population with access to an improved type of sanitation system. Improved sanitation systems are considered to include flush toilets, Ecosan toilets and pit latrines with solid slabs.

4.7.6.1 Existing situation

The EICV 5 describe that 63.5% of the citizens in Muhanga dispose of their waste by dumping it in nearby bushes or fields. This is significantly higher than the national average of 46.5% and is an environmental concern. 1.8% of residents use a collection service, lower than the 8.3% national average. Solid waste from the town is dumped in a forest area located in the Kanyinya cell, in Muhanga sector, close to a stream, approximately 3 km from the city centre. Access to the site is not controlled and recycling processes are limited to sorting and recycling of plastic products and metal scraps. This is because plastic and metal can be sold to waste converting plants. Cooperatives engaged in waste collection recover organic waste and provide it to the local farmers as composting material.



Figure 20: Landfill in Muhanga satellite city

4.7.6.2 Planning perspectives

4.7.6.2.1 Solid waste

NLUDMP 2020-2050 recommends the following actions that the DLUP of Muhanga should comply with;

- Have a robust Solid Waste management system for all development that is based on reuse hierarchy but be focusing on zero waste generation.
- Support for the circular economy programs in all the planned activities of NLUDMP 2020-2050 so that there is a minimum generation of waste (total zero waste).
- Where they are waste treatment facilities ensure that they could be used for enhanced production of energy, fertilizer, or other production activities.
- Identification of Strategic targets and indicators for monitoring.

According to the Situation assessment and potential intervention areas for Muhanga done by Global green Growth Institute in 2019; There are two imminent challenges to be tackled in Muhanga: i) Limited infrastructure for disposal and treatment of waste and ii) Lack of a regulatory framework in Muhanga Solid Waste Management. Therefore, the intervention areas are identified as below: (i) Developing transit sites with decentralized waste composting and other recycling facilities. (ii) Developing a regulatory framework for waste collection services and pricing. (iii) Muhanga Master plan was proposed smart and green initiatives for solid waste management. (iv) Composting of organic waste. (v) Providing separate waste bins, clearly marked for various waste types (i.e., paper, glass, plastic, organic, etc.) in all public spaces. (vi) Reducing waste generation. (vii) Separating waste at source to enable efficient recycling. (viii) Implementing landfill monitoring systems to ensure green and efficient sanitary landfills.

4.7.6.2.2 Liquid waste

The following actions are proposed during the implementation of NLUDMP 2020-2050 to ensure that there are adequate sanitation and water control systems, and recycling programs. This would be achieved through the enforcement of the following: (i) Enhanced development of liquid waste management systems in cities, towns, urban, and rural settlement areas. (ii) Ensuring and having in place elaborated programs for the protection of waterways and systems where they exist. (iii) Promote sustainable agriculture to reduce environmental impact

By 2021 Currently, Muhanga seems there is to have no waterborne sewer network in the district Muhanga. To cater for wastewater generated in urban/ high-density areas, a series of collector

pipes draining to sewer treatment plants will be proposed. For rural/ low-density areas, on-site treatment, such as pit latrines with septic tanks, will be proposed. Generally, existing stormwater channels along main roads in Muhanga are in poor condition and in need of maintenance. Due to the inadequacy of drainage structures and the poor maintenance of existing structures, Muhanga experiences flooding during heavy storms.

The Muhanga city master plan has proposed some projects relating to sewer drainage; (i) Constructing a sewer network in urban/high density areas to ensure drainage from flush toilets. (ii) Constructing a sewer treatment plant to cater for the flows generated in urban areas with an approximate capacity of 36 Ml.

According to Muhanga City MP sustainable and economical methods to improve existing technology and introduce new wastewater technologies have been recommended; (i) Greywater harvesting. (ii) Replacement of pit latrines with Ecological Sanitation (Eco-San) toilets to save water, prevent contamination of groundwater sources, and reuse waste as fertiliser. (iii) Decentralised technologies such as septic tanks, biogas digesters, compost toilets, VIP's which are more sustainable in the context of rapid urbanisation; (iv) Implement groundwater quality monitoring system; (Comprehensive strategies for sustainable sanitation systems, from collection to reuse (i.e. converting sludge into energy sources, or fertiliser, etc.). (v) To improve existing environmental problems and enhance the health status of Muhanga, the following green and smart initiatives proposed in Muhanga. (vi) Promoting rainwater harvesting to ensure effective and efficient use of water resources. (vii) Implementing sustainable stormwater management techniques, i.e. Sustainable Urban Drainage Systems (SUDS), such as permeable paving, ponds, and infiltration trenches, etc. (viii) Planning sufficient green spaces to improve land value and quality of life, and reduce the risk of flooding from heavy rain as green spaces consume and attenuate runoff.

4.7.7 Stormwater Management

Flooding, erosion, and landslide records in the district will continuously be managed through establishing modern terraces, water harvesting and construction of gullies. The following actions are proposed during the implementation of NLUDMP 2020-2050 to ensure that there are adequate sanitation and stormwater control systems, and recycling programs as well as ensuring that they will be aligned in all land use master plans. Waste water and storm water from the industrial zone pose a threat to the Rugeramigozi wetland, which also serves as a source of clean water for Muhanga.

Some Swamplands and settlements are often affected by the impact of stormwater and public facilities lack the rainwater harvesting system, implementation of terraces program, afforestation, and restoring forest cover scheme will aim at increasing erosion control, protection of marshlands and buffer zones establishment to boost agricultural productivity as well as improve biodiversity and ecosystem services.

4.7.7.1 Existing situation

Muhanga experiences short, intense rainstorms resulting in large quantities of storm water runoff. These will cause the combined system to be very large and therefore very expensive. Flat slopes of Rugeramigozi in Nyamabuye Sector, Gifumba Cell cause flooding within the wetland during heavy rainfall. In Tyazo Cell is also stones mining causes landslides on Nkomankware mountain, resulting in erosion from steep slope of the mountain which also causes damage for people's infrastructures around. The Muhanga District is characterised by a series of hills and valleys, with steep slopes in the centre than flatten outwards. Topographically, stormwater runoff from the city flows from the middle of the district towards the district boundary. The district drains into two rivers, namely the Nyaborongo and Akanyaru, in the west and east respectively. Muhanga is divided into 113 contributing stormwater catchments.

4.7.7.2 Planning perspectives

The following actions need special attention:

- Enhanced development of stormwater management systems in cities, towns, urban, and rural settlement areas.
- Ensuring and having in place elaborated programs for the protection of waterways and systems where they exist.
- Promote rainwater harvesting practices from rooftops, households and drainage network
- Ensure appropriate drainage systems in residential areas and road infrastructure
- Establishment of a centralized wastewater and sewage treatment facility.

In Muhanga, the Rwanda Urban Development Project phase 2 (RUDPII) is the main document administering matters for Roads and Stormwater. According to information from the World Bank country office, the project is geared towards supporting provision of basic infrastructure to enhance the living conditions in the six secondary cities

As a detailed physical plan will be implemented for land readjustments and site servicing to ensure that the implementation is properly guided, also the storm water management network for handling the storm water from settlements have to be established. Periodic preventive

maintenance will be carried out by operate under the supervision Muhanga District to prevent flooding or water logging caused by clogged drains.

According to Muhanga secondary city master plan, the proposed network consists of a number of principal stormwater pipes with outfalls along watercourses. It should be highlighted that the complete network would need to be built by 2035 to meet present drainage demands as well as the increasing city. The following are examples of sustainable stormwater management practices which could be considered for Muhanga:

- Vegetated Swales - an open-channel drainage ways used to convey storm water runoff that can be used as replacement for the conventional drainage system
- Bioretention Swale - is a vegetated swale with additional bio-treatment system at the base
- 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.
- Constructed Wetland - are shallow and extensively vegetated water bodies designed to remove finer and dissolved particles.

4.8 TOURISM AND CONSERVATION

Tourism remains the top country's foreign exchange earner for more than a decade now and is a major drive for Rwanda's economic growth, development and poverty alleviation. The Government of Rwanda has set tourism sector specific development strategies aimed at ensuring that it benefits local people and contributes to the national economy. This is clearly highlighted in the National Tourism Policy and the Master Plan for Sustainable Tourism Development. Given the above, tourism contribution to Rwanda's economy has been increasing at a high rate due to the stability of the country and has been growing at an average rate of over 10% per year. The indirect contribution of tourism to Rwanda's GDP rose by 6.8% from 6.2%, RWF 933.5 billion (US\$ 1,129.9 million) in 2018. The industry is projected to increase significantly to 12.5% of Rwanda's GDP in 2028 (WTTC, 2018). In total, the tourism industry's contribution to employment indirectly grew by 3.9% (346,500 jobs) compared to 333,500 jobs in 2017. It is expected to rise significantly at 3.1% per annum, generating 469,000 jobs by 2028 (WTTC, 2018).

Tourism being recognised as an essential economic sector with huge potential to boost domestic economic growth and development, contribute to poverty, job creation, export growth and prosperity through revenues generated from tourism industry, the Government of Rwanda

has defined new and ambitious goals for the further development of the country and implementation of different strategies such as the National Strategy for Transformation whereby Rwanda has to double tourism revenues and reach 800 Million USD by 2024.

In a view to achieve the above objective, there is need for proactive tourism product diversification including but not limited to key niche products with great potential for Rwanda namely adventure, birding, community-based tourism, MICE tourism coupled with required soft skills in terms of guiding and storytelling to cater for travellers' expectations. In the same line, an aggressive marketing approach is required to ensure we drive travel traffic to Rwanda while ensuring travellers enjoy their experience.

Based on the 2050 Rwanda's Vision, the new tourism segments that will shape the future of the tourism industry shall include MICE, Medical, Education, Water-based, Adventure, and religious tourism. The projected 2050 contribution of each tourism segment is shown in table below;

Tourism Segments	Expected total GPD Contribution (%)	International	Domestic
Meetings, Incentives, Conference &Exhibition (MICE)	25%	20%	5%
Wildlife	20%	12%	8%
Cultural and Historical	15%	5%	10%
Religious	7%	3%	4%
Medical	5%	5%	-
Educational	3%	3%	-
Adventure	10%	8%	2%

Water- Tourism	Bases	15%	8%	7%
-------------------	-------	-----	----	----

Table 26: Tourism segment by 2050

In line with RDB's vision to diversify the tourism sector, all provinces based on their respective master plans or strategies would be required to develop tourism attractions and sites as well as encourage investments in areas beyond the current tourism hotspots. According to the 2050 Rwanda's Vision, new tourism segments will shape the future of the tourism industry, mainly sport, medical, education, water-based, urban, and adventure tourism. These segments reflect Rwanda's aspirations of becoming a high-value tourism destination hub through diversification. Even though some of these segments may not necessarily be land-based.

Some areas of interest for tourism development will be subject to several factors such as environmental impact assessment, accessibility, and compatibility with other economic activities of Rwanda. Key tourism zones like national parks, islands and Tourism strategic lands around lakes and high-end zones for hotels and leisure will take 3,525 Km² (13% of the country surface).

Resources		Total Area (Size)
National Parks (Akagera, Volcanoes, Nyungwe and Gishwati Mukura), expansions and their buffers.		2611 Km ²
Lakes Islands		16Km ²
Eco-tourism land around lakes		886Km ²
Functions	Tourist parcels outside national parks, allocated for tourism development	12km ²

Table 27: Land size of tourism areas for 2050

4.8.1 Tourism Development for Muhanga District

The tourism sector in Muhanga is still immature. There are two hotels and six motels in Muhanga District and they are all concentrated in Muhanga City. According to the Implementation Study of Muhanga LUDP, there is potential for Muhanga to further develop in the hospitality sector, but the lack of financial capital seems to be the reason for the lagging

hospitality industry. Muhanga is one of Rwanda's oldest cities with significant heritage and is a gateway to the Rwanda cultural heritage corridor. It offers a huge variety of attractions in terms of culture, sports & recreation, and arts and craft.

Muhanga is a significant heritage area in Rwanda, with numerous 19th century buildings that embody the history of Rwanda. Examples of heritage sites that have a potential to be developed into tourist attractions include Kabgayi Museum, Queen Mother Kankazi site, Muhanga has a rich cultural heritage in terms of arts and crafts tradition. It could capitalise on its hand-woven crafts, such as traditional baskets (uduseke), mats (imisambi), and traditional chairs for tourism. Cultural tourism sites in Muhanga includes the following:

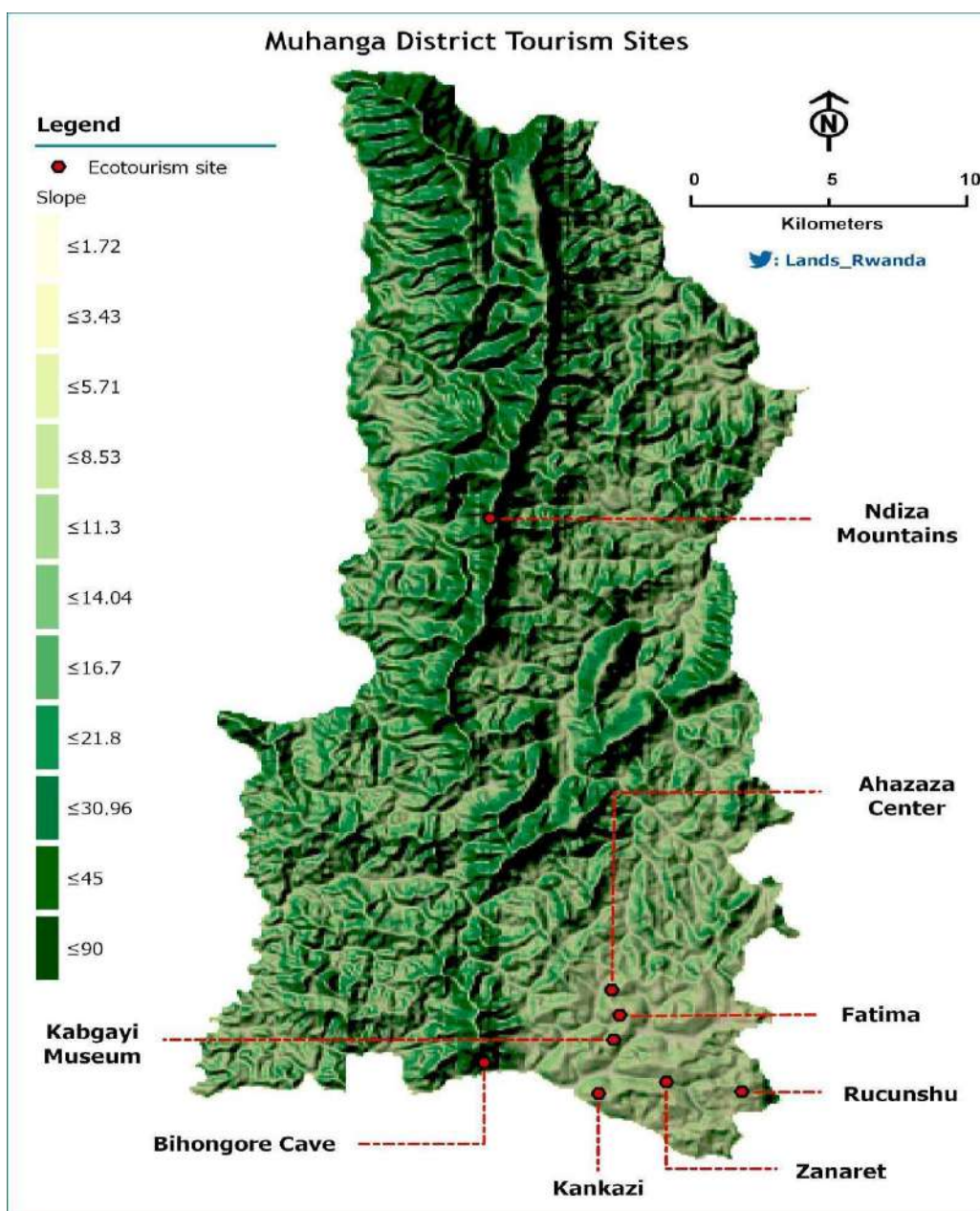


Figure 21: Tourism sites in Muhanga District

Muhanga natural landscape and terrain, and rich biodiversity with significant flora and fauna also offers opportunities for eco-tourism, sports and recreation. Potential sites for eco-tourism include Ndiza Mountain, Kirigi river, Busaga Forest and Bihongore Caves, where activities such as wildlife watching, photography tours, guided hikes, lake and river activities may occur.

Kabgayi Museum



Kabgayi Museum is built in 1925 and is the oldest church in Rwanda and has notable architecture and construction features. Located in Kamazuru Village of Gahogo Cell in Nyamabuye Sector, it is a 5 minutes' drive from Muhanga City. Existing conditions: The site is clean and well maintained. Around the Basilica a hospital, meseum, restaurants and accomodation facility "Center St Andre" are located.

Potential for improvement

Kankazi



Located in Kigarama Village of Mubuga Cell in Shyogwe Sector, Kankazi is about 20 minutes' drive from Muhanga City. Kankazi is where Queen Kankazi settled before she passed on. The remnants of her residence can still be seen there. Mother's faction who eventually succeeded King Rutarindwa.

Fatima



Fatima is a church located at a high point in Muhanga City in Nyarucyamu III of Gahogo Cell in Nyamabuye Sector. It has a unique structure and hosts an expansive view of Muhanga City.

Ahazaza Centre



Located in Ruvumera Village of Gahogo Cell in Nyamabuye Sector, Ahazaza Centre is a cultural centre that focuses on educating the youth of the area while funding the Ahazaza Primary School and ensuring its sustainability.

Ndiza Mountain

Ndiza Mountain is shared between Rugendabali Sector in Muhanga District and Ngororero District. Ndiza is one of the longest mountain ranges in Rwanda, providing opportunities for hiking and climbing excursions.

Kirigi River

Kirigi River, an inlet of Nyabarongo River, runs through Munazi Cell of Mushishiro Sector and Gasave Cell of Rugendabari Sector. The volume of this river changes depending on the season, with relatively higher volumes during the rainy season.

Bihongore Cave

Bihongore cave Located in Bihongore Mountain in Gisiza Village of Gifumba Cell in Nyamabuye Sector. The cave was once the bathing place of the Duchess of Rwanda, Ladegonde Kankazi. Religious tours are conducted to Bihongore Cave as it used to be prayer sites in the past.

Attraction name	Existing conditions / Assessments	Potential for improvement
Mini Basilica of Kabgayi	The site is clean and well maintained. Around the Basilica a hospital, petrol station, museum, restaurant and accomodation facility “Centre St Andre” are located	- Potential to attract cultural tourism with the development of museum - Development of souvenir’s shop / handcraft shop - Package the Basilica experience with accomodation to promote religious tourism - Need of proper signage - Open the Kabgayi museum and add to the offered attractions
Mount Ndiza & Busaga Natural Forest	This is the highest point of Muhanga District	- Need of signage and road access improvement - Local guide training - Development of long trail hiking & biking - Create small community based business around the mountains including guiding, handcraft, community shops and restaurants.
Bihongore Mountain	Daily used by local community for praying	- Potential to be developed in religious tourism - Development of adventure tourism mainly hiking combined

		with caving and mountain climbing - Set up an attractive informative signpost - Train local guide - Build a touristic center to increase souvenir shop, restaurants, etc. - Upgrade tourist trails and paths
Kabgayi water reservoir & Artificial Lake	An attractive water reservoir well maintained by the district	- Potential for development of leisure activities (fishing, pedal boat and floating bungalows) - Need proper signage and basic tourism facilities around the lake
Misizi water reservoir & Artificial Lake	An attractive water reservoir well maintained by the district	- Potential for development of leisure activities (fishing, pedal boat and floating bungalow) - Need proper signage and basic tourism facilities around the lake - Need to improve the road to the site
Queen mother's Kankazi's residence	Ruins the Queen Mother residence comprise of a standing wall and a compound remaining of the 1994 Tutsi genocide demolition	- Potential for development of gender balance based experience - Potential for development of historical museum - Need to be rebuild as per the original design - Need to be preserved and protected - Training of local guides and story tellers
Kabacuzi blacksmith weapon factory and Ryangombe residence	Located in Kabacuzi sector, the blacksmith factory also known as the technological revision center of Rwanda is the place where all metal weapons were made during pre-colonial period, the place is also well known to be the residence of the famous warrior Ryangombe and Ryabinga.	- Potential for development of an historical museum - Need to be preserved and protected - Training with local guides and story tellers

Table 28: Muhanga tourist attraction sites

To sustain tourism development in Muhanga, there is a need to increase investment in tourism infrastructure such as hotels. In addition, Muhanga District received a Presidential Pledge to construct a modern Hotel. The site of 17,8 ha has been identified for the implementation above Presidential Pledge. See below site map:

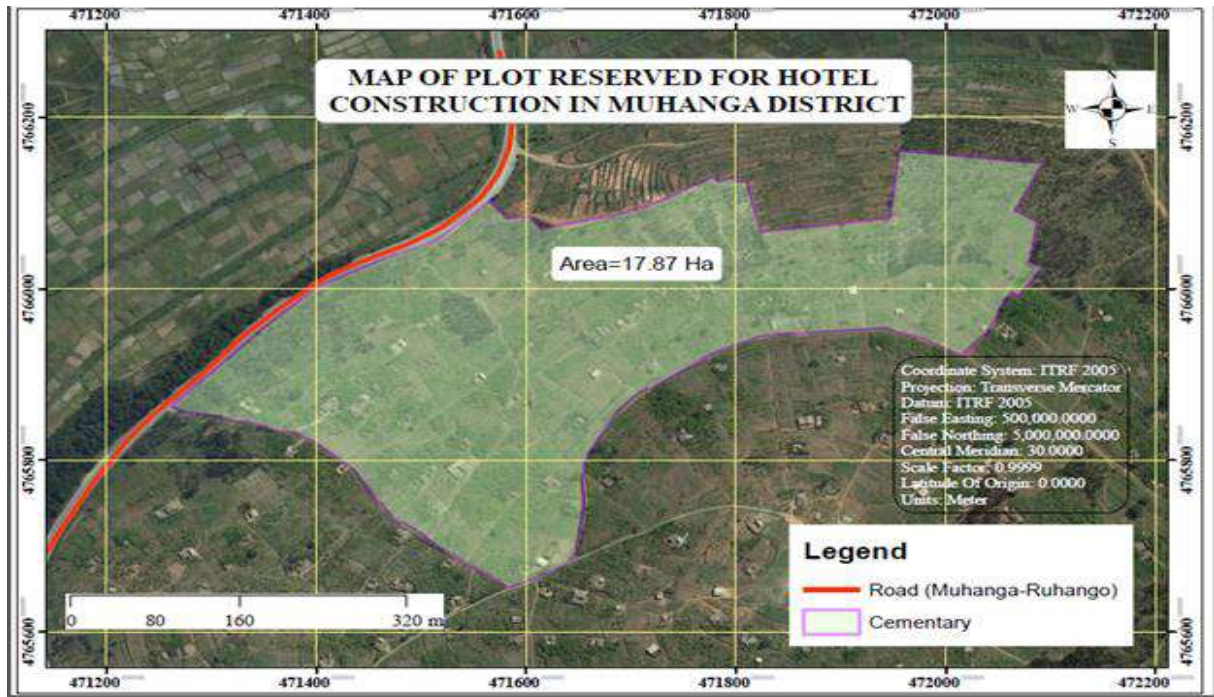


Figure 22: Hotel reserved land.

4.8.2 Planned tourism zones in Muhanga District land uses Master plan

As per the National Strategy of Transformation, Muhanga District will strengthen its technical capacities to increase productivity in handcrafts and tourism. Tourist sites within Muhanga will be identified and developed for revenue generation. In-depth details of the strategy and development programmes are elaborated in the Muhanga Tourism Strategic Plan. According to Muhanga zoning regulations, The Sports, and Eco-Tourism Zone (P2) is established to provide parks that offer active recreational uses with sporting facilities and forests with eco-tourism activities. Cultural Facilities such as Museums, Art Centres and Concert Halls are also allowed in this zone. While structures within the zone are allowed, the general character of the Sports and Eco-Tourism Zone should remain as green and recreational. All buildings in P2 zones shall adhere to the “Green Building Minimum Compliance Guidelines”.

4.9 ECONOMIC DEVELOPMENT

Rwanda aspires to provide economic prosperity, creating wealth for all Rwandans. It requires high and sustained economic growth over the long term. Rwanda's aspirations are translated as becoming an upper-middle-income country (UMIC) by 2035, and a high-income country (HIC) by 2050. Quantitatively, this means by 2035: GDP per capita of over USD 4,036; and by 2050: GDP per capita of over USD 12,476. Rwanda projects the population to increase by more than 50% to 17.6 million by 2035 and to double to about 22.1 million people by 2050. During this period, the share of the working-age population is expected to grow from around 56.3% of the people today to 65.7% in 2050. Fertility is declining backed up by investments in human capital.

4.9.1 Employment opportunities

Employment opportunities are the process of providing new jobs, especially for people who are unemployed. Satellite cities play a significant role in creating a more balanced and sustainable urban growth for the country. Stimulating urbanization through the satellite city agenda is expected to create jobs and reduce poverty. The strategic position of Muhanga District provides opportunities to develop trade at the national level. This position is an advantage for the promotion of the private sector and possibility of expanding urbanization for the development of socio-economic infrastructures to meet urban standards. Muhanga District have the potential to act as poles of growth and relieve the pressure on Kigali, which currently dominates the Rwandan economy. Urbanized at a rate of 16% but with a high reliance on agriculture and service sectors, economic strategy and infrastructure planning needs to be customized to the urge to increase the market size of Muhanga District. This can be done through rural-urban linkages and promoting urban density building on its strategic position as a hub for Kigali and the province and developing latent extractive and light manufacturing industries. Economic growth is also one of the main anticipated outcomes of a well-coordinated urbanisation which shall benefit all residents and provide the basis for socio-economic opportunities.

There four main components income of population in Muhanga District: agricultural income, wage income, business income, and rent income. Household agricultural income: this component is first divided into agricultural income (income from land cultivation) and livestock income. Agriculture is by far the most common economic activity with 81 % of the workforce being involved in agricultural activities. Wage income: this includes cash and in-

kind revenues received from farm and non-farm work. Non-farm self-employment (business): this includes income received net of labour and other inputs. · Income from rents: this includes actual rents received from renting out livestock, agricultural equipment and land (rent and sharecropping), as well as imputed rental value of owner-occupied dwellings. The EICV3 results indicate that at the national level, agriculture contributes the largest share of a household's income (46%), followed by wage income (25%), business income, and rents.

4.9.2 Trade and Logistics

4.9.2.1 Commercial and Trade

The driving sector for Muhanga will be mining, trade and logistics. Due to its consideration as a Satellite city, infrastructure services and construction will be on the rise. Muhanga is a district located at only 50 km from Kigali. Its population is estimated at 318,9655 people with population density of 647.7 people per Km². The poverty rate in its urban center is 13% and 33% in the overall district. These high rates are due to the fact that 81% of its population relies on agriculture, with a big part of the sector experiencing low productivity. Employment has increased from 15,000 units in 2014 to 175,000 in 2017 (EICV5) and it is projected to increase by 38% to reach 286,000 in 2031. As the city continues to grow, potentially doubling its population by 2031, there is an urgent need to create more jobs. Planning for the development of Muhanga needs to consider the reality of its relatively small market size and a high proportion of employment in agriculture. However, its strategic location in the centre of the country and close proximity to Kigali offers opportunities for it to act as a logistics hub, building on employment growth in the sector and, over time, a manufacturing centre. Furthermore, natural resources, in particular sand, clay soil and natural resources such as wolfram, cassiterite and laterite, are found in 11 out of 12 sectors. However, they are currently underexploited, with less than 1% of population working in mining and quarry, which offers an opportunity to develop the artisanal mining sector and attract foreign direct investment (FDI) and strengthen linkages with logistics and manufacturing.

In order to achieve the potential of Muhanga satellite city, there are three key priorities for growth: (i) developing human capital through education and health services for a more productive work force, (ii) creating an enabling environment to support local businesses and attract foreign direct investment (FDI) and (iii) increasing market access through improving urban density and mobility, strengthening rural-urban linkages and developing connections with local markets in Rwanda.

4.9.2.2 Logistics

Logistics refers to the overall process of managing how resources are acquired, stored, and transported to their destination. Logistics management involves identifying prospective distributors and suppliers and determining their effectiveness and accessibility.

4.9.3 Industrialization

4.9.3.1 Light industries

Light industry are industries that usually are less capital-intensive than heavy industry and are more consumer-oriented than business-oriented, as they typically produce smaller consumer goods. Most light industry products are produced for end users rather than as intermediates for use by other industries and they typically have less environmental impact than those associated with heavy industry. They focus on the production of small goods that will be sold to the people who use them rather than to another manufacturer.

Light industry in Muhanga District is one of the local economic factors which contribute in the development of the population locally as an economic booster. Local population in Muhanga benefit from light industry because many people especially young and fresh technicians from TVET schools found job in those small industries and help them to specialize in the technical career. Light industry is also recognized for its contribution to meeting the targets for the district performances, even their potential to contribute in the economy of the district. Materials from light industries very useful to Muhanga's economic growth in general and the trade balance in particular, as well as to productive employment. Light industry's policy is based on several guiding principles and on the promotion of domestic market development. Muhanga is an open market economy, committed to promoting commerce and driven growth. Muhanga is also an economic driven district, characterized by a small private sector struggling with competitiveness and supply-side capacity issues, which negatively affects the ability of companies to respond to market signals and compete globally. The public, both commercial and private consumers, lead to the benefits of buying light industry's products. Many more investors have expressed interest in carpentry, iron, gusudira, ubudozi, and other construction materials. Muhanga urban area is supposed to have more the one light industry planned for serving even rural areas and that plan have been developed to guide the development and diversification of the private sector. Producers must also convince consumers to buy locally

made products not just because they are from light industry, but because they are of good quality and competitive on price.

4.9.3.2 General Industries

Rwanda's 2011 policy was formulated to support Rwanda's goal of achieving middle-income status by 2010 partly through deliberate structural transformation and export promotion. At the time, agriculture formed the largest economic sector followed by a low productivity services sector. As of 2010, industry only contributed to 15% GDP primarily from construction and agro-food processing. Rwanda's trade deficit remained a concern despite increases in the flow of tourist revenue, foreign direct investment, and remittances. The main risk to Rwanda's trade deficit position was its over-reliance on imports for manufacturing inputs, and higher value-add products while mainly exporting commodities with volatile world market prices. As a first step, the Government of Rwanda had already implemented a series of initiatives to improve Rwanda's business environment.

In 2008, the Rwanda Development Board was established to support exporters and investors interested in setting up operation in Rwanda. On the policy side the SME Development policy, Trade policy and Competition policy were finalized in 2010 to provide ministries with strategic guidance to increase exports through a vibrant private sector.

Rwanda is highly ambitious in terms of its plans for per capita income growth over the medium- to long-term. It has settled an industrial policy that provides adequate support to those objectives, in light of the current structure of the world economy. Rwanda's existing industrial policy has provided a body of experience that can be used to inform future actions and priorities.

The key insight of this report is that while Rwanda has been very successful in promoting productivity growth through structural change, within-sector productivity growth has recently slowed down, and this in turn has led to a relative stagnation of aggregate productivity growth. In our view, the number one objective of Rwanda's future industrial policy should be to reverse this trend, and put the country on a balanced path of continued structural change supported by robust within-sector productivity growth. The key mechanism that supports within-sector productivity growth is Schumpeter's "creative destruction", namely the movement of economic resources from low-productivity to high-productivity firms.

4.10 MUHANGA LAND USE BALANCE SHEET

The land use balance sheet serves as a comprehensive overview encompassing all thematic sectors requiring land for their projects and future endeavours. It entails allocating land to each sector based on district potential and anticipated future requirements. This balanced planning approach ensures the effective management of land use by accommodating the needs of various sectors while minimizing conflicts over land. In the formulation of the Muhanga DLUP, the land use balance sheet serves as a guiding tool for planning authorities. Its purpose is to allocate land for diverse purposes, considering the needs of all sectors, thereby facilitating the efficient utilization of available resources and directing future development in alignment with the NLUDMP. For instance, agriculture receives a designated percentage share of land allocation, with careful consideration given to future population needs and food security projections. Similarly, allocation of land for settlement and residential purposes is based on population projections and anticipated future requirements.

During the elaboration of Muhanga DLUP, the land use balance sheet considered various aspects such as population and its projection as well as its future demand, for which various technologies such as SPSS, GIS, etc. were used. The collected data from different sectoral institutions were clearly analysed and merged into a single layer and associated tables showing the percentage of each land.

This section outlines the zoning equilibrium for both the urban and rural areas within Muhanga District, encompassing the satellite city, urban zones, and rural settlement areas. It encompasses an assessment of the current land use distribution, alongside an analysis and presentation of proposed land use allocations and their respective balances. The land use equilibrium is conveyed through spatial data in the form of shape files and supplemented with tables and graphs to enhance the comprehensibility of the report.

4.10.1 Muhanga Satellite City (Main Urban Area)

4.10.1.1 Existing Land Use Balance Sheet

The city of Muhanga, one of the three satellite cities closely linked to Kigali, is considered a hub for trade and mining processing under the NLUDMP 2020-2050. In fact, Muhanga has evolved as a central city of the country, connecting almost all parts of the country as the south, west and north. Considering this location, trade developed gradually in Muhanga, and business

buildings and infrastructure developed to take an important role. Muhanga satellite city possesses a large area of residential buildings and related infrastructure, which supports social livelihood. According to the local urban development plan of 2009, the residential area in Muhanga was 606 ha or 12%, while the commercial land was 11 ha, almost less than 1%. Public facilities occupied 11 ha, representing about 1%, mixed uses, i.e. a combination of residential and commercial, occupied 38 ha, and industrial land occupied 4 ha. However, the city already had a significant amount of agriculture and natural vegetation, which occupied an area of 3,573 ha, or 72%, and Swamplands, with 695 ha, or 14%.

Land Use	Area (ha)	Percentage (%)
Residential	606	12
Commercial	11	0
Public/ Institution	70	1
Mixed use	38	1
Industrial	4	0
Wetland	695	14
Nature vegetation/Agriculture	3,576	72
Total	5,000	100

Table 29: Existing Land Use Distribution in Muhanga City (Source: LUDP 2009)

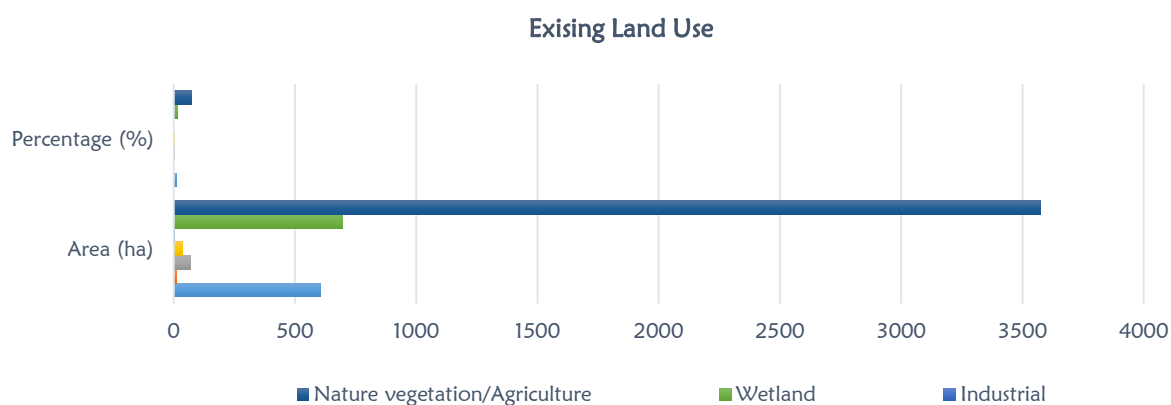
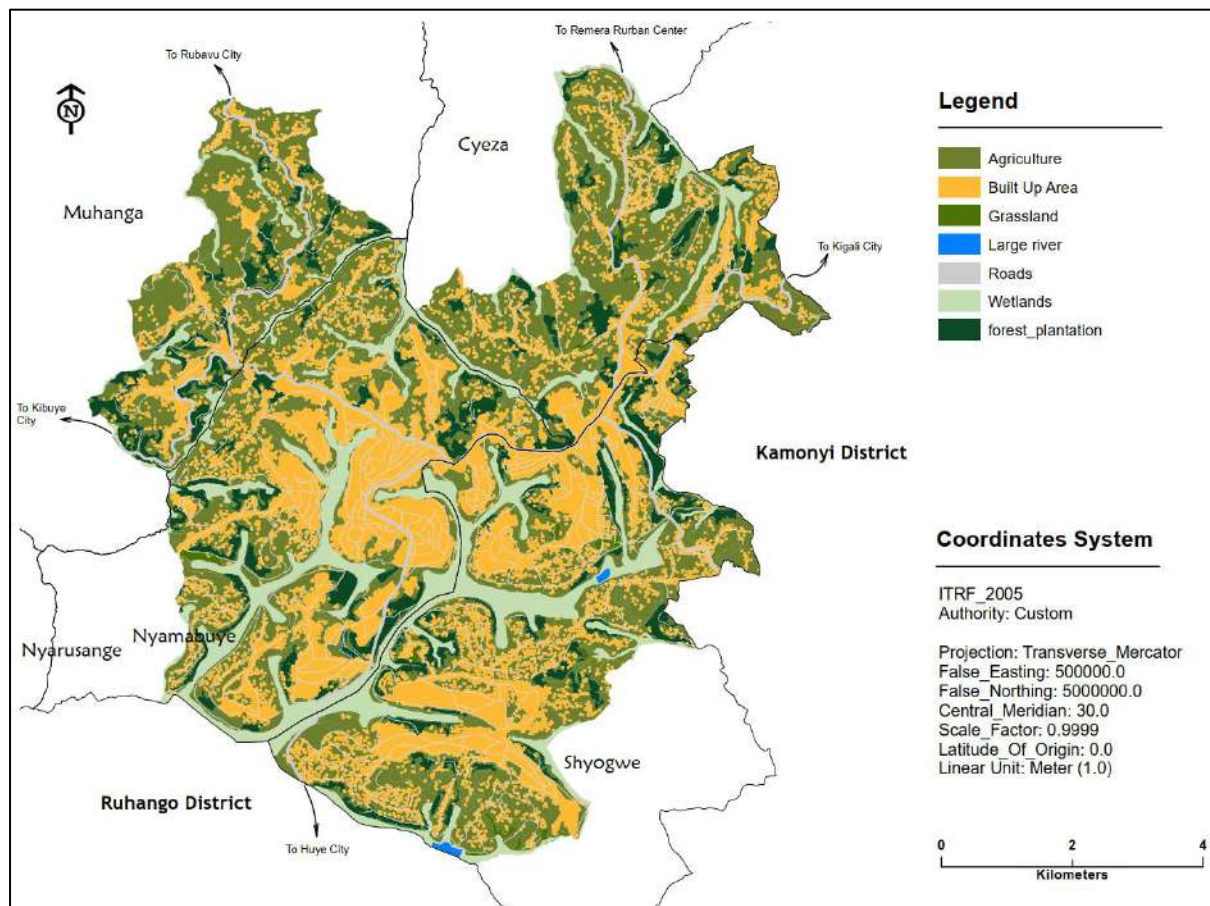


Figure 23: Muhanga city existing land use distribution (Source: LUDP 2009)

Based on the land cover of Muhanga satellite city, which was effectively revised and updated during the preparation of Muhanga DLUP, agriculture is currently the main land consumer, occupying 3,207.39 hectares of land equivalent to 41.3%. This agricultural land supports urban livelihood despite being insufficient to feed the people. The second land consumer in Muhanga satellite city is the built-up area, which occupies 2,394.51 hectares representing 30.8%, followed by the Swamplands, which occupy 877.1 hectares corresponding to 11.36%. The built-up area comes to include commercial, residential and other infrastructure area already developed in the form of buildings. The forest area accounts for 738.08 hectares, which is 9.51% of the total area of Muhanga satellite city. Total transportation area is 474.93 hectares, representing 6.12% of the total area of the city. The grassland occupies 58.69 hectares, which is equivalent to 0.7%, while aquatic land occupies 7.81 hectares, which is attributable to 0.1% of the total area.



Map 18: Muhanga Satellite City Existing Land Cover

As the map shows, the built-up area of Muhanga satellite city is heavily concentrated in the central part of the city, more specifically in the Nyamabuye Sector. This part is known as the Central Business District (CBD) with a high concentration of built infrastructure such as stores, shops, markets, banks, administrative offices, parking lots, hotels, bars and restaurants, etc.

Agriculture within the city boundaries is distributed across the west, north, east and south areas, with the exception of the central part where built-up zones are located. Swamplands and wooded areas are also widespread in the city with a significant rate.

Land Cover Class	Area in hectare	Percentage (%)
Agriculture	3207.39	41.34
Built Up Area	2394.51	30.86
Forest	738.08	9.51
Grassland	58.69	0.77
Large river	7.81	0.10
Roads	474.93	6.12
Swamplands	877.17	11.36
Total	7758.60	100

Table 30: Rational distribution of existing land cover in Muhanga satellite city

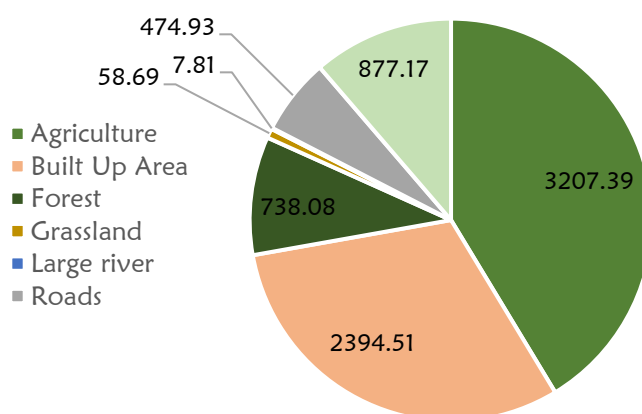


Figure 24: Muhanga Satellite City – Existing Land Cover

4.10.1.2 Population and needs assessment in Muhanga Satellite City

4.10.1.2.1 Existing population

The Rwandan population census of 2012 indicated that the total population of Muhanga District was 319,141 inhabitants with a population density of 492.3 inhabitants per square kilometer. The male population was 152,783, representing 47.9%, and the female population was 166,358, representing 52.1%. Among these statistical data, Muhanga city population according to 2012 population census accounted for about 50,608, representing about 15.9%, where 84.1% of the total population of Muhanga District resided in rural areas. The current population of Muhanga City is about 87,613 considering the areas that are considered as a city. Therefore, the male population accounts for about 46% and the female population accounts for about 54%. The population is now mainly concentrated in the densely built-up areas in the Nyamabuye sector and a large part of Shyogwe, part of Cyeza and the Muhanga sectors. The livelihood of the people in Muhanga city depends on trade, agriculture and transport to generate income.

4.10.1.2.2 Population projection

Population projection in the field of demography is an estimate of the future population. By contrast with intermediate counts and population censuses, which usually collect data in the field, projections are usually mathematical models based only on data that already exist and are produced by a governmental organization or by people who are not affiliated with a government. Population projection guides planning to analyse future needs and assists in effective allocation of land uses to manage resources well and guide future development.

By 2035, the population of the entire Muhanga District is projected to be about 550,000 with males making up 46% and females making up 54%. Meanwhile, in 2050, the population of Muhanga District will be approximately 1,000,000, of which 800,000 will be living in urban areas, excluding rural settlements. Following this statistics, the population of Muhanga satellite city in 2035 will be about 440,000. Similarly, in 2050, the population of Muhanga city will be about 800,000.

4.10.1.3 Muhanga Satellite City Land Use Allocation

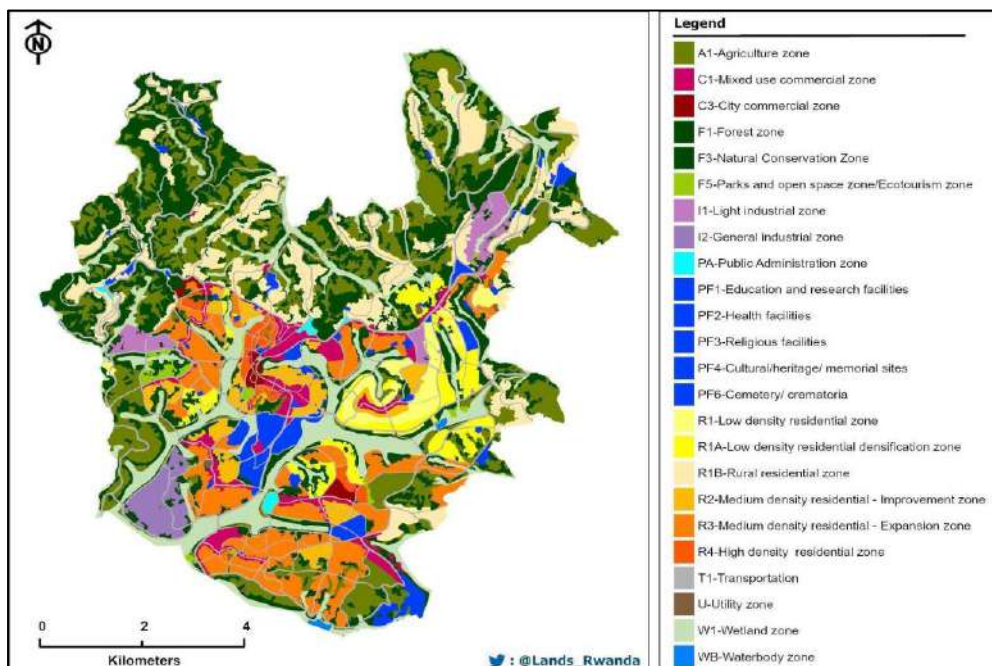
4.10.1.3.1 Planned Land Use Zoning by 2035

Land use zoning represents the process of planning and regulating land use for future development, in which all thematic sectors should be allocated on land effectively, taking into account their future land demands, in accordance with the needs of the population, in order to manage well the resources and achieve the desired social and environmental outcomes. During the elaboration of Muhanga DLUP, the land use zoning process was aligned with the NLUDMP 2020-2050 to facilitate local and national authorities to regulate and control land and real estate markets and ensure complementary uses.

Muhanga Satellite City consists of different proposed land use zones for both time horizons (2035 and 2050) to facilitate the implementation of the NLUDMP 2020-2050. In Muhanga City, different categories of land use zones were identified during the elaboration of Muhanga DLUP and with reference to Muhanga City Master Plan prepared by Surbana Jurong in 2020. After the population projection and needs assessment, a large area of land in Muhanga Satellite City was set aside for agriculture with various food crops that support the livelihood of the society, despite being insufficient to feed the entire population of the city. The agricultural lands in Muhanga city are mainly located in the northern part of the city, more specifically in the sectors of Cyeza and Muhanga. However, a small cluster of agricultural land is already found in the western part of the city, in a small part of the Nyamabuye and Muhanga sectors, and in the eastern part of the Shyogwe sector. Apart from agriculture, the city of Muhanga has a wide area of residential zones covering all categories. In fact, starting from the city center to the neighbourhoods far away from the CBD, the residential zones are classified into different categories. Residential zones in Muhanga city include R1, which stands for low-density residential zone. However, this zone is not intended for the entire city area, but only for a small part of Shyogwe sector to discourage low-density housing in the city. Meanwhile, R1A, a residential zone that stands for low-density residential densification zone, is distributed in the city, not to a large extent, but also not to a small extent compared to R1.

Other categories of residential areas in Muhanga city are R1B, which stands for rural residential zone and dominates almost the entire residential distribution in the northern part of the city, especially in Muhanga and Cyeza sectors. R2, which stands for medium density residential - improvement zone as well as R3 for medium density residential - extension zone, covers the large area of residential land. Owing to the fact that the current residential lands in Muhanga

City are highly informally developed and many parts are in need of improvement and the Master Plan earmarks these lands for R2. The parts that could be considered for residential expansion were reserved as R3 to favour the medium density residential zone. For R4, the high-density residential zone, it is noted that this zone is almost near or closer to the CBD where the towering residential buildings will further densify the city. With Muhanga DLUP, a significant area has been allocated for commercial use with C1, which represents a mixed commercial zone where both commercial and residential activities are allowed to be developed. Besides agriculture and residential and commercial areas, Swamplands have also been allocated in Muhanga satellite city, where mainly rice and maize are cultivated and are widely located across all parts of the city, especially in the south-eastern part. A considerable area has also been set aside for various public facilities, especially in the areas near Muhanga CBD. In Muhanga City, industrial zones have been planned both for heavy industries through the creation of a general industrial zone and for light industries. Industrial zones were planned in Nyamabuye and Cyeza sectors as shown on Muhanga City Land Use Plan map. Other zones allocated in Muhanga satellite city are forests, parks and open spaces or ecotourism zones, transport, utility zones, and water bodies.



Map 19: Muhanga Satellite City land use zoning plan by 2050

4.10.1.3.2 Planned Land Use Balance Sheet

The land use allocation in Muhanga Satellite City is planned for the year 2050, which is the first of the two-time horizons of the NLUDMP 2020-2050. This land use allocation was

prepared in accordance with the population projection and demand analysis conducted during the data collection and analysis. In terms of the total land area of Muhanga Satellite City, which is 7,861 hectares, the major land consumer is residential development, which occupies 2,028.1 hectares equivalent to 25.9% when all categories are considered. The residential zones in Muhanga satellite city reflect how the population will be distributed, considering the population projection and its future needs. The residential zones within the city are classified into 6 different categories, namely:

- (ix) R1 - Low Density Residential Zone, which covers 155.8 hectares, representing 2%;
- (iii) R1A - Low Density Residential Densification Zone, which covers 256.3 hectares, representing 3.3%;
- (iv) R1B - Rural Residential Zone, which covers 690.1 hectares, representing 8.8%;
- (v) R2-Medium Density Residential - Improvement Zone, which is planned on 211.9 hectares, equivalent to 2.7%;
- (vi) R3-Medium Density Residential - Expansion Zone, which is planned on 644.8 hectares, equivalent to 8.2%; and
- (vii) R4-High Density Residential Zone, which covers 69.2 hectares, which corresponds to 0.9%.

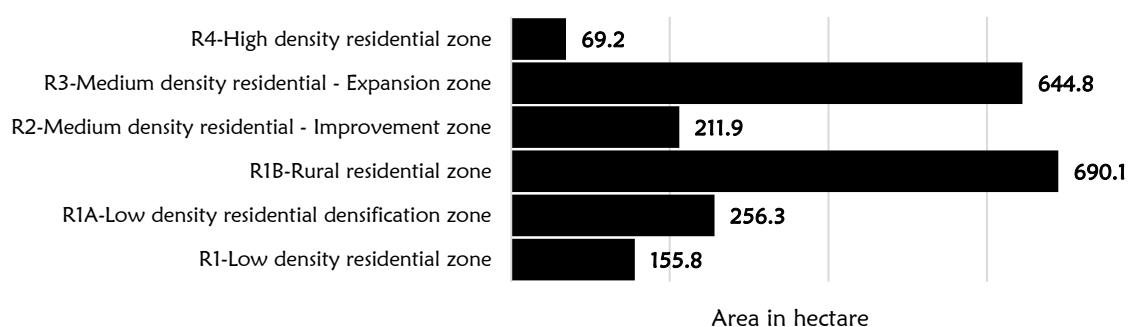


Figure 25: Allocation of residential zones in Muhanga satellite city

Following the residential zones, a total of 1804.6 hectares, which is 23% of the total area of the city considering the updated boundaries, is the second large percentage of land covered by forest, which was marked only taking into account the existing conditions, since no new forest land should be planned if there is less than 55% of slope.

Besides forest, the third land consumer identified in Muhanga satellite city planning is the agricultural zone, which occupies an area of 1,433.7 hectares, accounting for 18.2% of the total area of the city. Wetland is another major land usage for Muhanga satellite city in Muhanga DLUP, where it is planned on 861.7 hectares, which is 11%. Agricultural and wetland zones in Muhanga satellite city were considered and allocated to this significant land to sustain the development of agricultural sector and ensuring food security in the future. Both Swamplands and agricultural land in Muhanga satellite city will be used to grow food crops such as rice, maize, etc.

In long-term planning, the transportation of goods and people play an important role. This is why the master plan was prepared for Muhanga satellite city with a transport coverage of 668.4, which is 8.5%. A good distribution and road network favours the growth of economy, transportation of services and population in Muhanga city, which promotes future development. The residential zones should be connected to each other and to the commercial and other zones by an effective transportation network to promote economic development. The public facilities planned in Muhanga Satellite City cover an area of 425.8 hectares, which is 5.5% of the total area of the city. These facilities include: (i) educational and research facilities with an area of 320.7 hectares; (ii) Healthcare facilities covering an area of 30.1 hectares; (iii) religious facilities extending over an area of 36.9 hectares; (iv) cultural/heritage/memorial facilities covering a area of 1.5 hectares planned; and finally (v) cemeteries/crematoria stretching over an area of 36.6 hectares. All of these public facilities are usually planned in or near residential areas to serve residents' daily livelihoods. Residential zones always need various facilities that people need to live, so they should not be planned far away from residential zones.

Muhanga Satellite City has become a trading and mining processing hub, boosting planning of an important area for commercial zones. However, unlike the satellite city, the commercial use of Muhanga city is planned in two categories, namely the Mixed Commercial Zone and the City Commercial Zone, which includes the downtown area. Muhanga city Mixed Commercial Zone covers 256 hectares or 18.2% of the total city area, while City Commercial Zone covers 36.9 hectares or 0.5%. With the development of trade and commerce in the city of Muhanga, the plan has taken into account industrial zones to facilitate investment and employment. In Muhanga City, industrial zones are divided into two categories: general industrial zones and light industrial zones. Only Kigali, satellite and secondary cities deserve to have general industrial zones according to NLUDMP 2020-2050. In the satellite city of Muhanga, a general

industrial zone is planned on an area of 115.4 hectares, equivalent to 1.5%, and a light industrial zone covers an area of 118.6 hectares, also equivalent to 1.5%.

Other land use zones that have been planned in Muhanga satellite city are:

- (i) natural conservation zone allocated over 19.3 hectares representing 0.2% of the total land area;
- (ii) parks and open spaces as well as ecotourism zones are planned over 50.3 hectares, or 0.6%;
- (iii) public administration zones allocated over 19.2 hectares or 0.2%; (iv) utility zone which is 14.4 hectares corresponding to 0.2% as well as (v) water body zone of 8.6 hectares or 11%.

Land Use Zoning	Area in hectare	Percentage (%)
A1-Agriculture zone	1433.7	18.2
C1-Mixed use commercial zone	256	3.3
C3-City commercial zone	36.9	0.5
F1-Forest zone	1804.6	23.0
F3-Natural Conservation Zone	19.3	0.2
F5-Parks and open space zone/Ecotourism zone	50.3	0.6
I1-Light industrial zone	118.6	1.5
I2-General industrial zone	115.4	1.5
PA-Public Administration zone	19.2	0.2
PF1-Education and research facilities	320.7	4.1
PF2-Healthcare facilities	30.1	0.4
PF3-Religious facilities	36.9	0.5
PF4-Cultural/heritage/ memorial sites	1.5	0.0
PF6-Cemetery/ crematoria	36.6	0.5

R1-Low density residential zone	155.8	2.0
R1A-Low density residential densification zone	256.3	3.3
R1B-Rural residential zone	690.1	8.8
R2-Medium density residential - Improvement zone	211.9	2.7
R3-Medium density residential - Expansion zone	644.8	8.2
R4-High density residential zone	69.2	0.9
T1-Transportation	668.4	8.5
U-Utility zone	14.4	0.2
W1-Wetland zone	861.7	11.0
WB-Waterbody zone	8.6	0.11
Total	7861	100

Table 31: Muhanga Satellite City Planned Land Use Balance Sheet

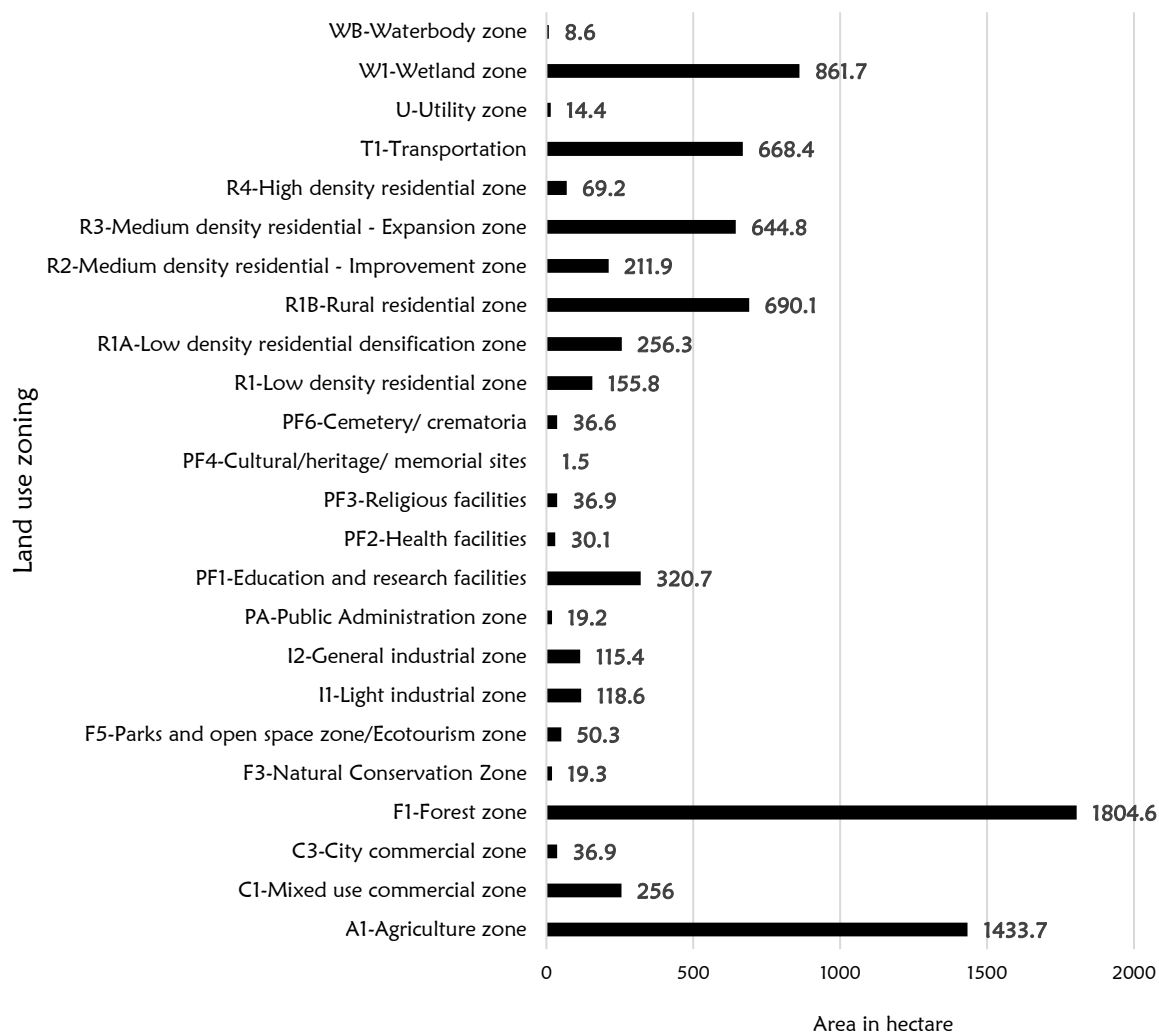


Figure 26: Muhanga Satellite City Planned Land Use Balance Sheet

4.10.2 Remera Rurban Center

4.10.2.1 Existing Land Use Balance Sheet

Remera Center is the only rurban emerging center of Muhanga District, and is located nearly in the center towards the north of the district with a large part in Kiyumba sector where the sector office, Nyabikenye hospital and Kiyumba TVET are located, and also another small part in the Kabacuzi sector. The center of Remera, respecting the new rurban boundary and taking into consideration the Existing situation, has a varied land use coverage on the surface, including agriculture, built-up areas, forest, Swamplands, grasslands, and roads. The current land use in Remera center is distributed according to the population pattern in this landscape. Agriculture is the main land use covering a large area in Remera where it occupies 498.68

hectares representing 61.6%. Agriculture encompasses Remera in all its parts, including the north, west and south, but is limited in the center where the built-up area is prominent.

Beside agriculture, the second land consumer is the forest, which covers 121.14 hectares, representing 15% of the total area of Remera rural area.

The forest in this area dominates the northern part from the middle, between two nodes, with node one being the existing center of Remera, located in the middle, and the second node enclosing Kiyumba center in the north. After forest, built-up area is the third class, occupying a large area of 91.78 hectares, which is 11.3% of the total area of Remera rural center. The heavily built-up areas, reflected in the map, are located within the vicinity of Remera center, in the central part of the urban area and in the northern part, where Kiyumba center is located. This category of built-up areas includes important infrastructural facilities such as Kiyumba TVET, Kiyumba Genocide Memorial, Nyabikenke Hospital, administrative buildings, churches, and residential buildings. Buildings in the area are scattered all over the land in an informal and planned pattern, with residential buildings scattered in the regions outlying the Remera and Kiyumba centers.

Land use Class	Area in hectare	Percentage (%)
Agriculture	498.68	61.6
Built Up Area	91.78	11.3
Forest	121.14	15.0
Grassland	0.98	0.1
Road	66.00	8.1
Swamplands	31.46	3.9
Total	810.03	100

Table 32: Remera rural center existing land use balance sheet

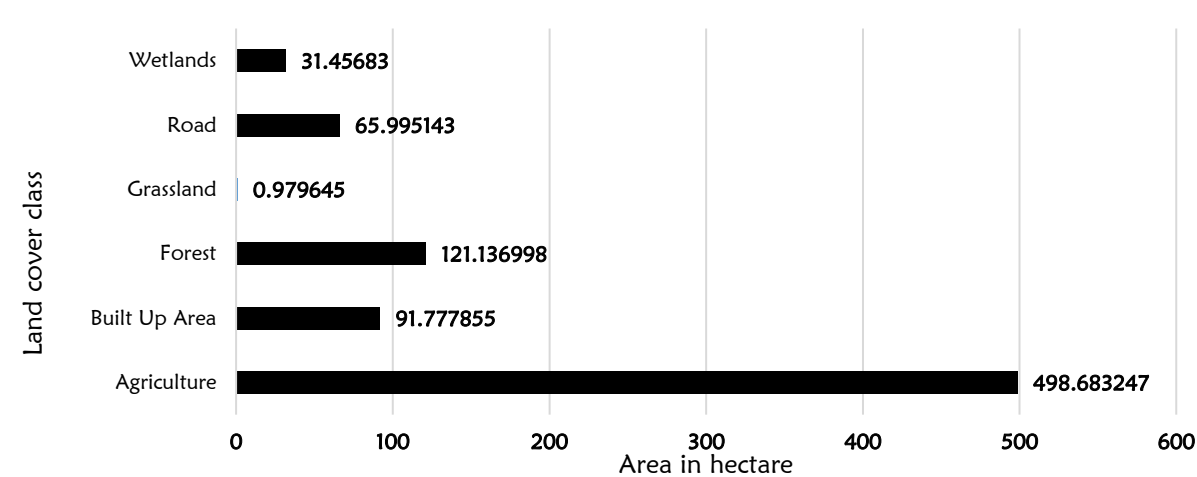
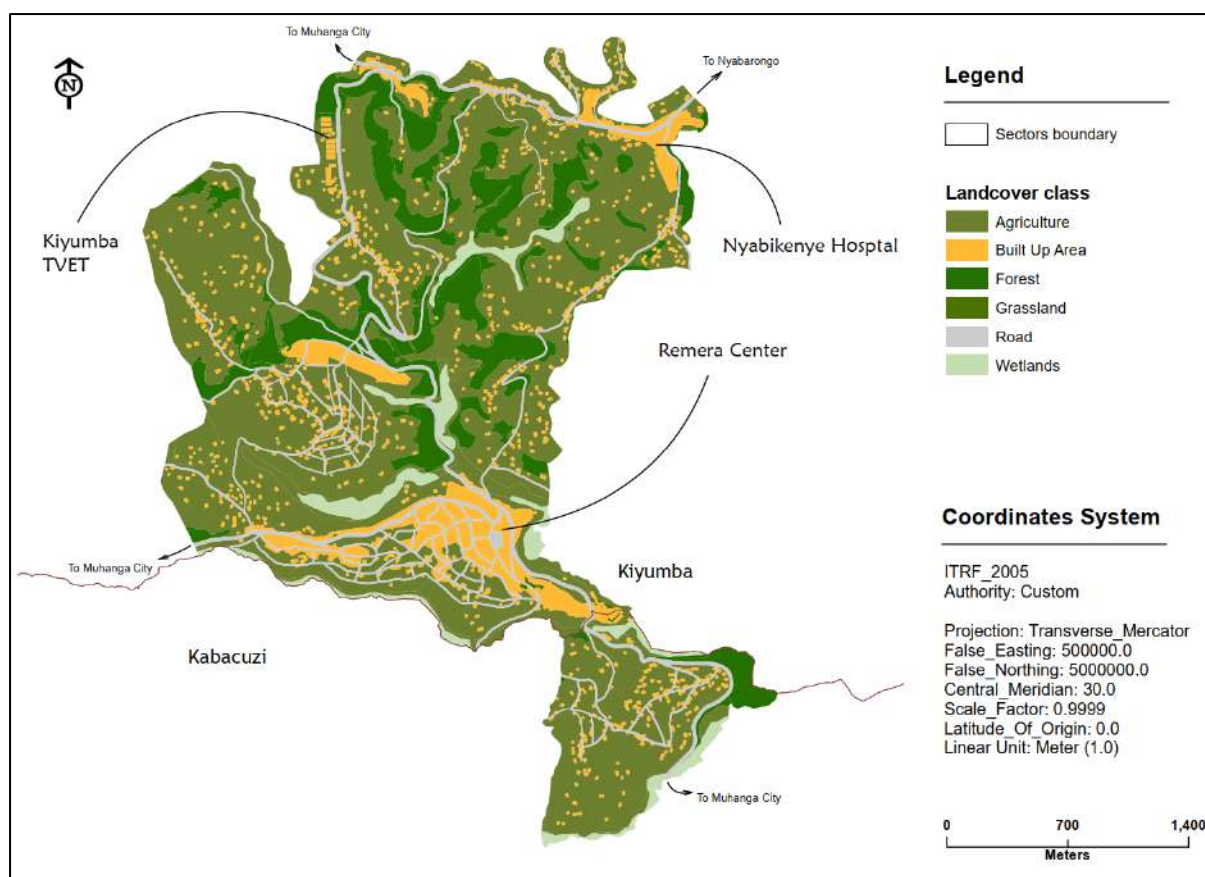


Figure 27: Remera urban center existing land use distribution

The existing transportation network in Remera covers an area of 66 hectares, which represents 8.1%. This road network connects the urban area from north to south and from west to east. Most of the road network is in the central part, where Remera neighbourhood is concentrated. Within Remera center, the road network is classified into different categories, with main roads and roads in residential areas. Besides roads, Swamplands are another important category, covering 31.9 hectares, which represents 3.9% of the total area of Remera urban center. The distribution of swamplands is based on the landscape topography of the area, and as can be seen on the map, many of them are in the central part of the area. Grassland is the ultimate land use class that makes up the Remera urban Center. It covers an area of 0.98 hectares, which is 0.1% of the total area of the urban center.



Map 20: Remera Rurban Center Existing Land Cover

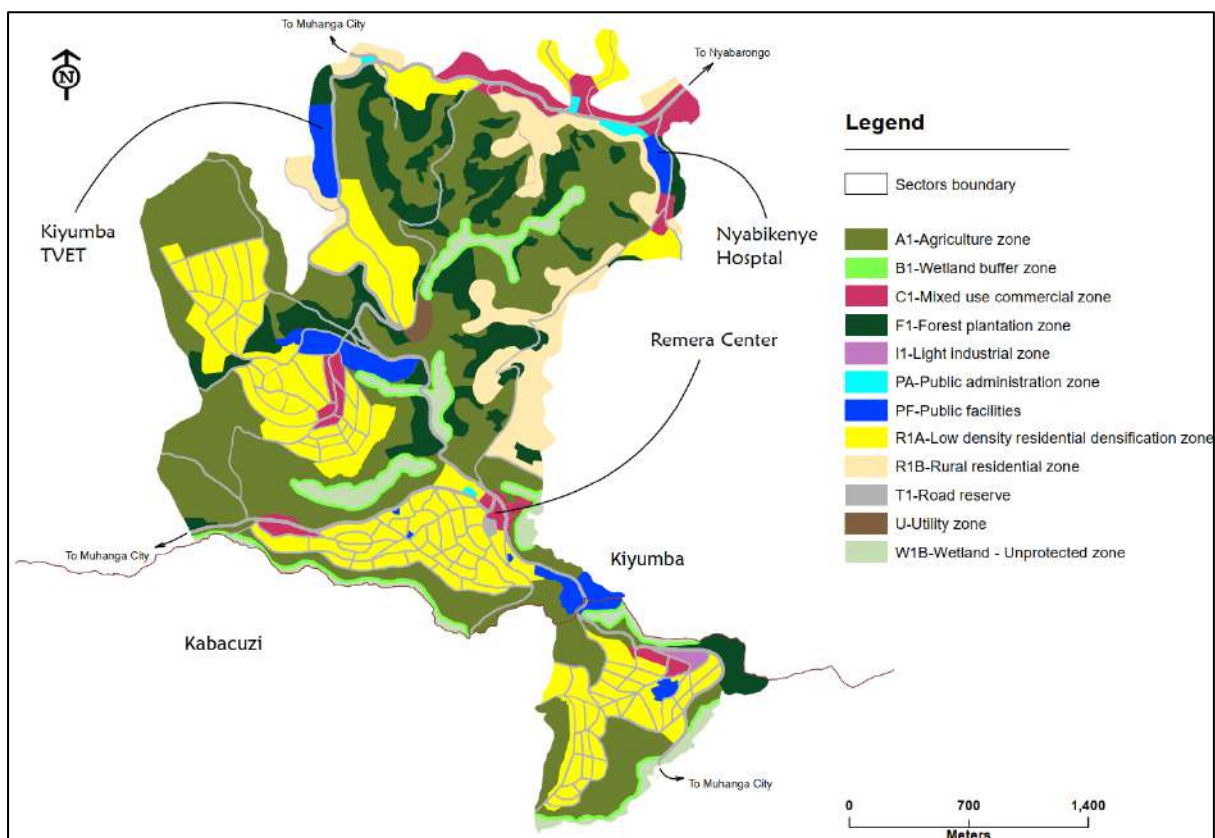
4.10.2.2 Remera rurban Center Land Allocation and Zoning Plan

4.10.2.2.1 Planned Land Use Zoning

During the development of the Muhanga DLUP, particular attention was given to aligning it with NLUDMP 2020-2050. This alignment was particularly emphasized for the Remera rurban center, aiming to empower both national and local authorities in regulating and managing land use and markets effectively. Moreover, it sought to foster community understanding of their land utilization in coherence with the overarching planning vision.

Similarly to Muhanga satellite city, Remera rurban center also consists of various proposed land use zones that are aligned with the 2050 planning horizon, as is the case for the entire district area, to facilitate the implementation of NLUDMP 2020-2050. In Remera rurban center, different categories of land use zones were identified during the elaboration of Muhanga DLUP. This was done considering population projections and needs assessments. In this context, a large portion of land in Remera rurban center was allocated to agriculture given the suitability of the area for agriculture, which is a viable means of social livelihood. Agriculture in Remera rurban center covers almost all parts from west to east and south to north.

A substantial portion of residential zoning is incorporated into Remera Land Use Plan, covering all parts from south to north. These residential zones concentrated within Remera urban center are primarily dominated by R1A, which stands for low-density residential densification zone, particularly in areas closer to Remera existing center, zones closer to the Catholic Church, and then in a portion near Kiyumba sector Office. However, R1B, which stands for rural residential, represents another category of residential use found in this urban area, mainly to the north and east. Several public facilities were considered in this urban center, including educational and research facilities (PF1) such as Kiyumba TVET and Healthcare facilities such as Nyabikenye Referral Hospital. In addition to these facilities, there are also religious facilities (PF3) as well as commercial mixed-use areas (C1), especially in the north, center, and south.



Map 21: Remera urban center land use zoning plan by 2050

The allocation of forest took another significant portion of land in Remera urban center during the elaboration of Muhanga DLUP. The concentration of forest lies in the middle part to the north as well as a small part to the south and west of this area. In addition, this DLUP consists of Swamplands covering a significant area in the middle part of the area as illustrated on the map above.

4.10.2.2.2 Planned Land Use Balance Sheet

The land use planning initiative for the Remera urban center, mirroring efforts across the district, was crafted with a projection toward the year 2050, corresponding to the initial phase of the NLUDMP 2020-2050. Despite the predominantly rugged terrain characterizing much of Muhanga District, Remera stands out as a viable candidate for urban development, albeit its non-flat topography. Consequently, within the NLUDMP 2020-2050 framework, Remera emerges as the focal point for urban expansion, designated as the district's secondary urban area following the establishment of Muhanga Satellite City, primarily catering to the central and northern regions. The land use planning strategy for this urban center encompasses diverse sectors, strategically allocating resources to meet the anticipated future needs of the population.

No	Zoning	Area in hectare	Percentage (%)
1	A1-Agriculture zone	295.03	35.97
2	B1-Wetland buffer zone	24.09	2.94
3	C1-Mixed use commercial zone	29.81	3.63
4	F1-Forest plantation zone	95.51	11.64
5	I1-Light industrial zone	1.36	0.17
6	PA-Public administration zone	2.51	0.31
7	PF1-Education and research facilities	16.71	2.04
8	PF2-Healthcare facilities	3.00	0.37
9	PF3-Religious facilities	5.84	0.71
10	PF4-Cultural, Heritage, Memorial sites	0.88	0.11
11	R1A-Low density residential densification zone	166.46	20.30
12	R1B-Rural residential zone	67.69	8.25
13	T1-Road reserve	77.04	9.39

14	U-Utility zone	2.64	0.32
15	W1B-Wetland - Unprotected zone	31.61	3.85
Total		820.18	100.00

Table 33: Remera rurban center planned land use balance sheet

With 295.05 hectares, which represents 35.97% of the total area of Remera, agricultural land occupies the largest part of the area in this rurban center. Agricultural use extends over all parts of the rurban area from west to east and from south to north. Agriculture in this area is dominated by beans, maize, sweet potatoes, and bananas. This land has been allocated to this area to ensure food security and meet the future needs of the population.

The second land use category that occupies large areas in Remera rurban area is residential zone and includes only 2 categories - R1A which stands for low-density residential densification zone, and R1B which stands for rural residential zone. According to the balance, R1A (low-density residential zone) is zoned on an area of 166.46 hectares, which is 20.30%. In fact, this zone covers the entire area in the south, middle and north and dominates the residential development of the rurban center of Remera. Besides R1A, there is R1B which represents rural residential zones and is in an area of 67.69 hectares, which corresponds to 8.25% of the Remera rurban area. R1B dominates the part of the north that is closer to Kiyumba sector office and Nyabikenke hospital. The rural residential zone also dominates the eastern part of Remera rurban area.

Forest allocation in this area also consumes a lot of land, as it is planned on an area of 95.51 hectares, which is 11.64% of the total area. In Remera rurban area, there is only one category of forest which is forest plantation, and no natural forest exists. Besides the forest, another major land consumer is road and its reserve, which stands for all the transportation needs in the zone. The transportation zone in Remera covers 77.04 hectares representing 9.39% of the total area. The proposed road network in this area connects and intersects all residential zones allowing the connectivity among the residential blocks and the main road that crosses Remera rurban area from north to south and west. This road connection ensures access to public facilities and other infrastructures that people need in their daily lives.

The Swamplands and their buffer zones in Remera rurban center occupy considerable area as well, and they should be used to support agriculture to enhance the food production to feed the

population. Considering only the Swamplands, they occupy an area of 31.61 hectares, representing 3.85% of the total area of the urban area. The category of Swamplands in the Remera rural area is unprotected and openly used for agricultural activities. The wetland buffer zones in this area occupy an area of 24.09 hectares, which is equivalent to 2.94%, and are also intended to protect the Swamplands, which are mainly used for agriculture.

Other land use zones were considered as part of Remera rural land use plan, including mixed commercial zones that support commercial activities while also including residential buildings. This zone occupies 29.81 hectares, which represents 2.94% of the total area. The allocation of the commercial zones was made considering the existing markets and commercial centers such as Remera, Nyabikenke and Kiyumba Centers. An allocation of public facilities such as PF1 which stands for educational and research facilities, PF2 which stands for Healthcare facilities, PF3 which stands for religious facilities, and PF4 which stands for culture, heritage and memorial facilities is also given. Furthermore, there are public administration zones, industrial zones, and utility zones, which are designed to support the social and economic livelihood of the community.

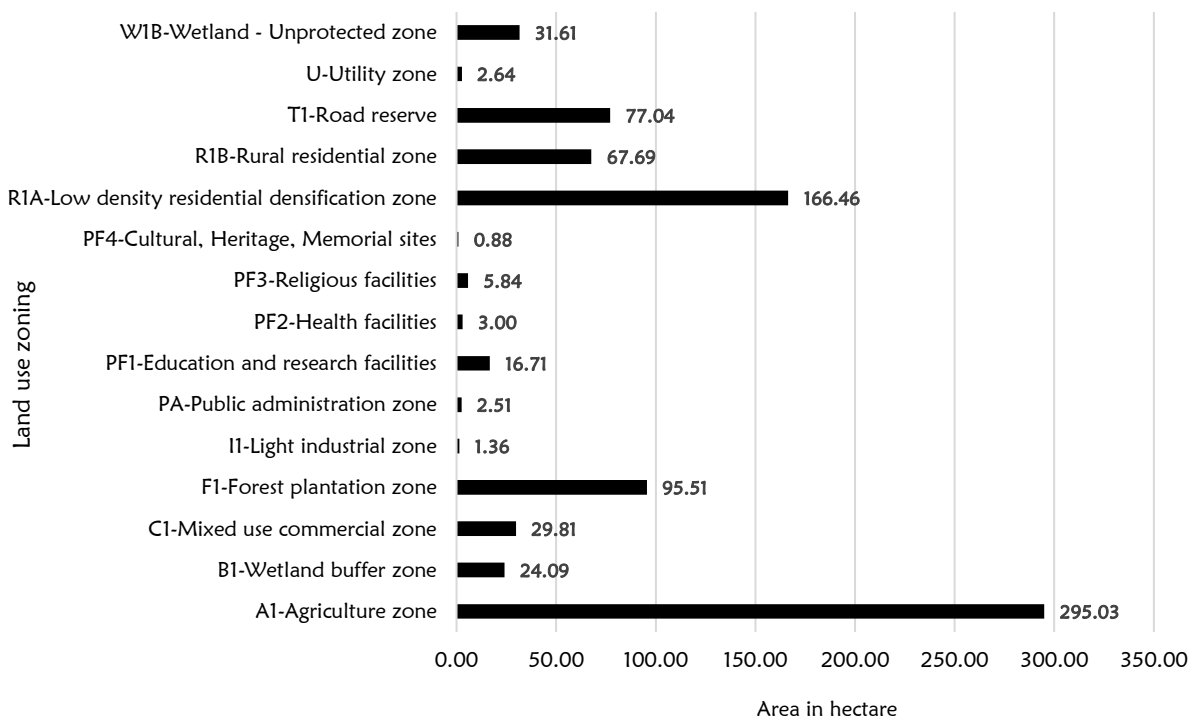


Figure 28: Remera rural center planned land use balance sheet

4.10.3 Rural Settlement Sites

4.10.3.1 Existing Land Use Balance Sheet

Muhanga District has turned into a satellite city district with Remera rural center, both of which form the urban area of the whole district. Urban area covers 8,531.64 hectares, which represents 13.20% of the total area of the district. However, a large part of the district is rural and consists of rural settlement sites and land outside the settlement boundaries, which together encompass an area of 56,118.83 hectares, representing 86.80% of the district area.

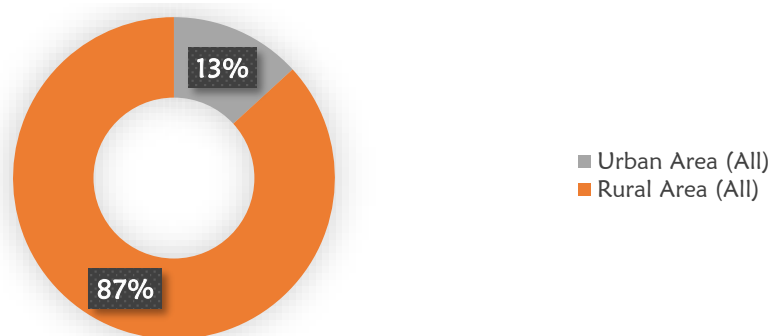


Figure 29: Rural area vs. urban area ratio in Muhanga District

Focusing only on this rural part of the district based on the Existing situation, the settlement is not defined nor planned. The buildings in the countryside of Muhanga do not follow any form of planning, which is a problem to the community as it does not effectively manage land resources. In this case, no land is demarcated for settlement activities, as well as other parts in reserve for other activities such as agriculture, mining, and so on. In Muhanga rural area, conflict exists between residential settlements and agriculture, forestry, mining, and other sectors that do not promote development. Agriculture has always been lagging behind due to the fact that all the land that can be used for agriculture are used for settlements or has already been given away to settlement.

No	Land cover class	Area in hectare	Percentage (%)
1	Rural built-up	2503.14	4.46
2	Non-built-up land	53615.32	95.54
Total		56118.46	100.00

Table 34: Muhanga District existing rural built-up balance sheet

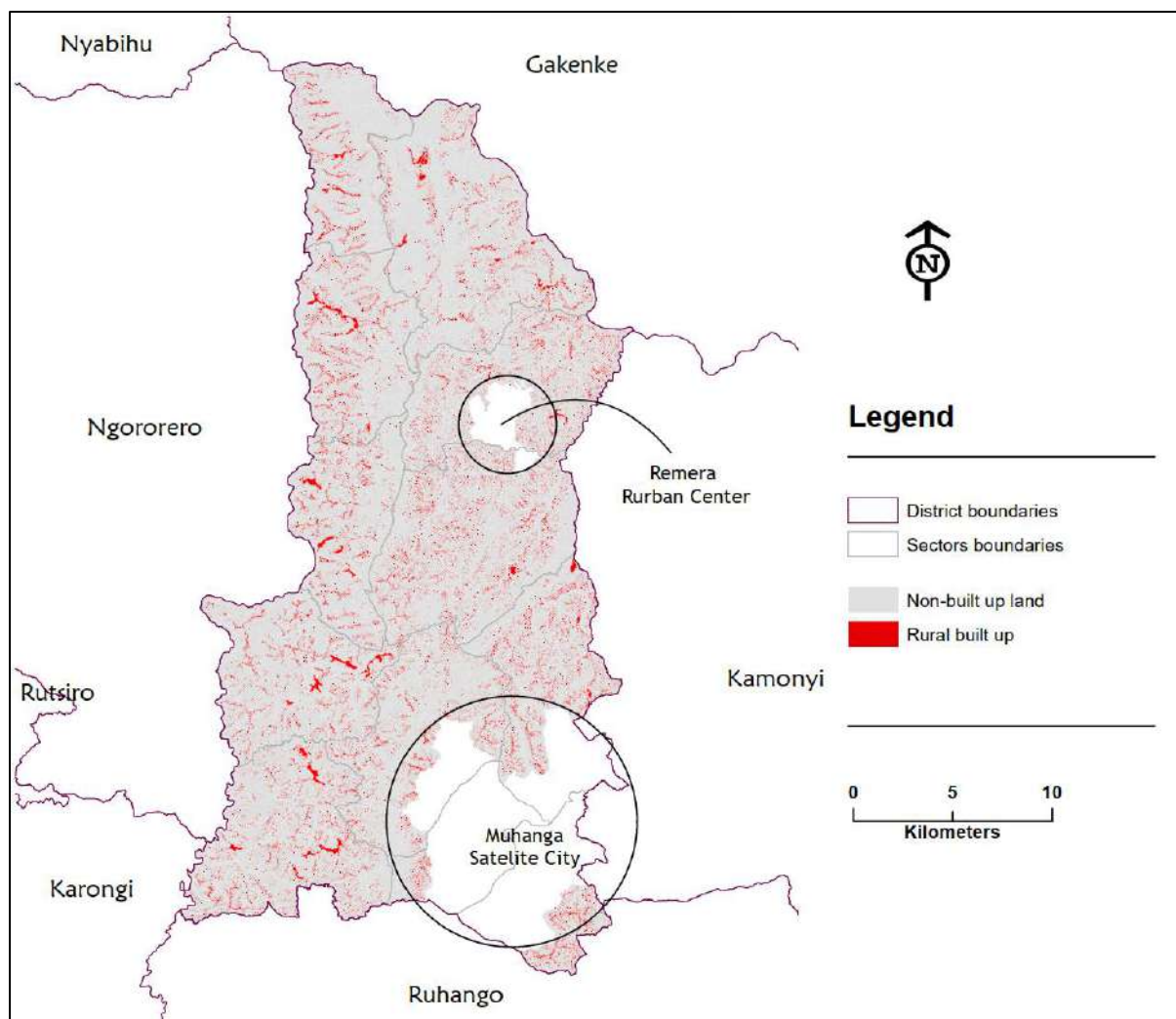
The built-up area in the rural part of Muhanga District covers 2,503.14 hectares, which is 4.46% of the overall rural area in the district. This area is made up of all form of buildings, mainly residential buildings, but also public facilities such as educational and research facilities, Healthcare facilities, churches, memorials and so on. In terms of the updated rural settlement sites boundaries, some buildings are placed inside the boundaries and others are outside the boundaries. The residential buildings that are outside the boundaries of the rural settlement sites need to be relocated within the sites to comply with the planning scheme of the DLUP or NLUDMP 2020-2050. Along with the rural settlement lands, there is another portion that is non-built-up and consists of various uses such as agriculture, forest, Swamplands, grasslands, and water bodies. This non-built-up land in the rural portion of the district covers an area of 53,615.32 hectares, which represents 95.54% of the total rural portion.



Figure 30: Existing portion of land against built-up outside of urban boundaries

The distribution of rural buildings in Muhanga does not favor any form of development, as it is more difficult to reach each house during the development and provision of infrastructure and services. This type of distribution of buildings makes it difficult for the population to reach the market and deliver their production. People in the rural areas of Muhanga District have great difficulty in accessing roads or other infrastructure such as schools, churches and Healthcare facilities. The problem lies with the government or investors who provide such infrastructures such as roads, electricity, etc., which leads to people resisting their rural mentality and not being informed about the country's vision. In addition, it is becoming increasingly difficult to provide security for everyone.

In Muhanga District, as in other parts of the country, the distribution of buildings in the countryside covers the entire land, which hinders the development of other sectors besides housing. As urban areas are in the east of Muhanga District, rural buildings mainly dominate the part from west to north, encompassing Nyarusange, Mushishiro, Rugendabali, Kibangu and Nyabinoni sectors, as well as Rongi sector in the north and rural parts of Cyeza, Muhanga, Kabacuzi and Kiyumba sectors.



Map 22: Muhanga District existing rural built-up distribution

Given the boundaries of the rural settlement sites, the land use in the entire district is made up of rural built-up areas, agriculture, grasslands, and some forest plantations, which are not counted as significant. Agricultural land in the updated rural settlement sites occupies over a large share accounting for 5,499.22 hectares representing 78.14% of the total area of the rural settlement sites. These agricultural lands are not used for extensive and modern agriculture, as they are mixed with buildings that serve mainly residential purposes.

No	Land cover class	Area in hectare	Percentage (%)
1	Agriculture	5,499.11	78.14
2	Built Up Area	1,421.70	20.20
3	Forest plantation	88.90	1.26

4	Grassland	28.12	0.40
Total		7037.83	100.00

Table 35: Existing land use within updated rural settlement sites

Besides agricultural land, the rural settlement sites are dominated by built-up area, covering 1,421.70 hectares, which is 20.20% of the total area of the rural settlement sites. This built-up area includes residential buildings as well as central buildings, which are usually used for commercial activities, and public facilities such as schools, Healthcare facilities, religious facilities, etc. Forest is another category of land cover, which covers an area of 88.90 hectares, equivalent to 1.26%. Grassland is another category of land cover that should be allocated to agricultural land in the planning. This grassland covers 28.12 hectares, which is 0.40% of the area of rural settlement areas.

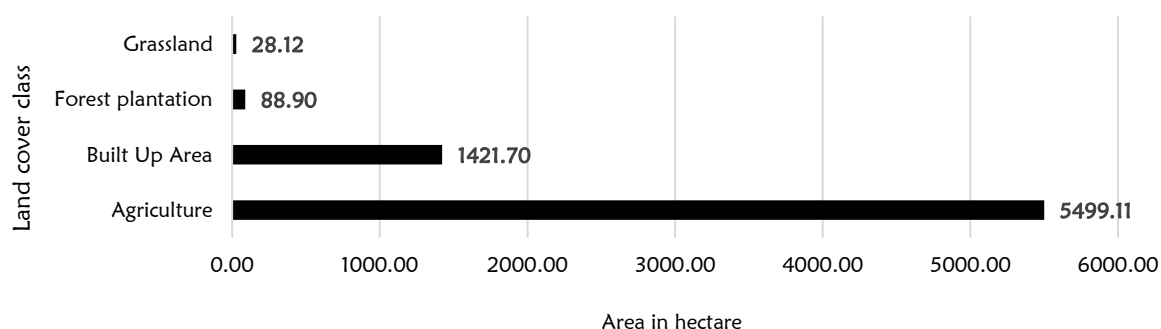
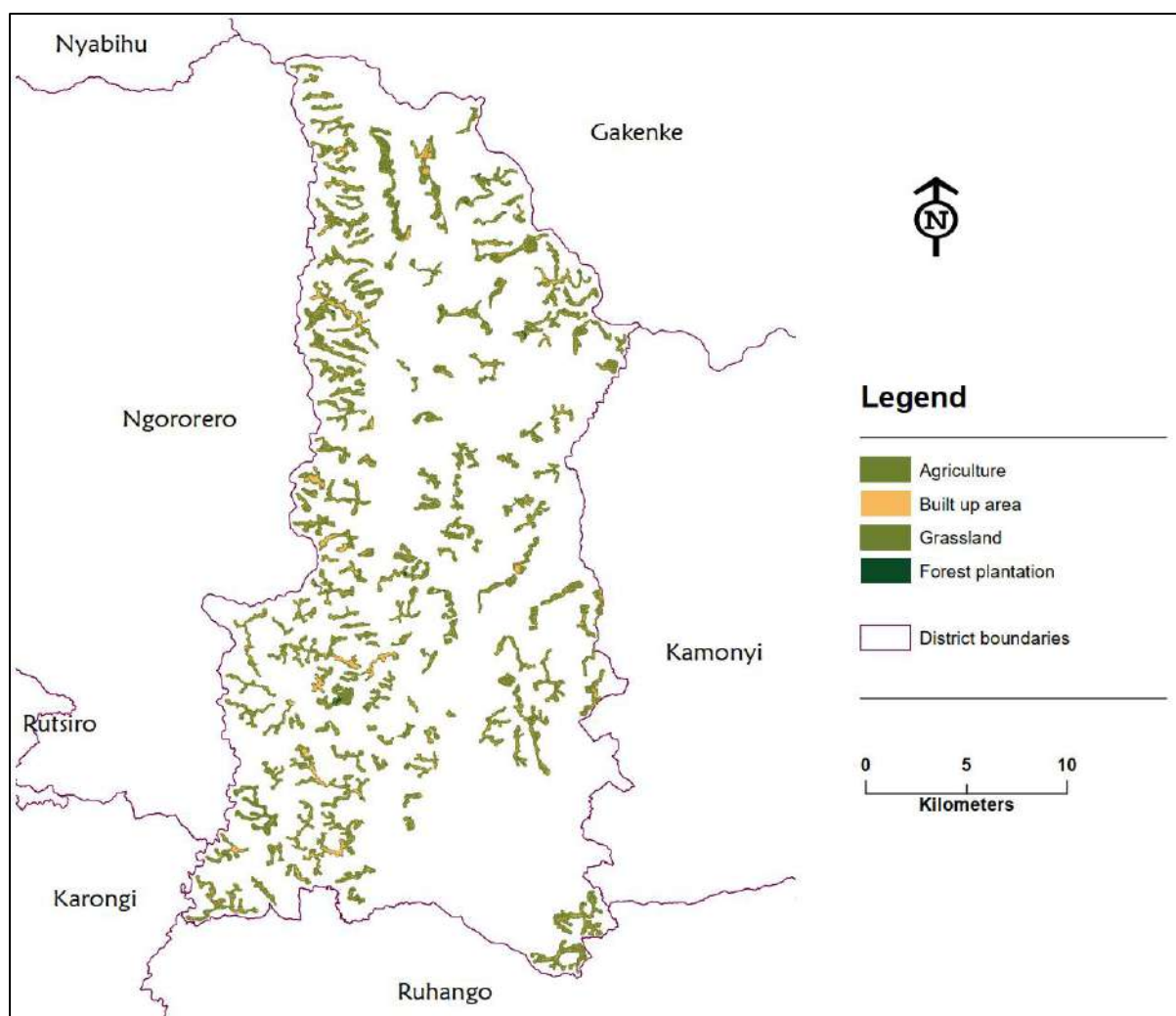


Figure 31: Proportion of existing land use within rural settlement areas



Map 23: Distribution of existing land uses inside rural settlement sites

4.10.4 Parts of Muhanga District outside the settlement boundaries

4.10.4.1 Existing land coverage

No	Land Cover Class	Area in hectare	Percentage (%)
1	Agriculture	39967.79	72.60
2	Built Up Area	1445.09	2.62
3	Forest plantation	10577.19	19.21
4	Grassland	1020.17	1.85
5	Large river	483.95	0.88

6	Natural Forest	154.67	0.28
7	Swamplands	1405.91	2.55
Total		55054.77	100.00

Table 36: Existing land cover outside settlement areas

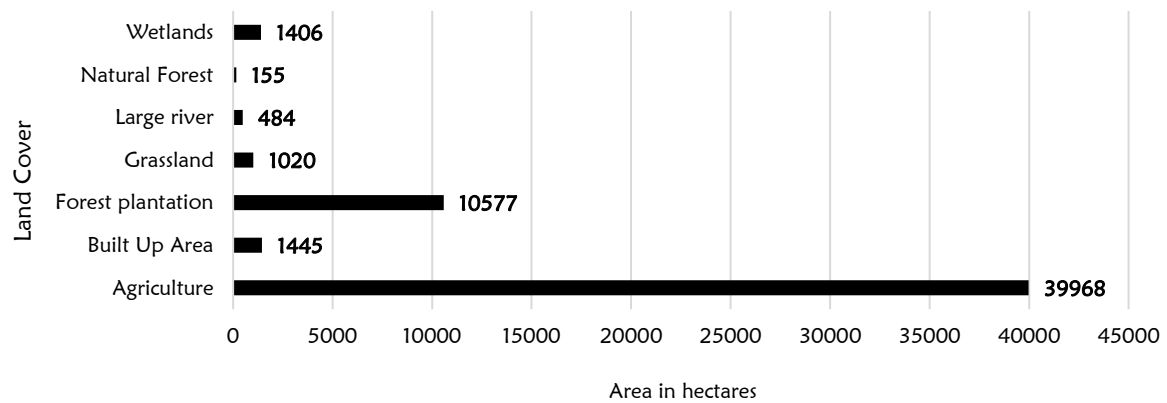
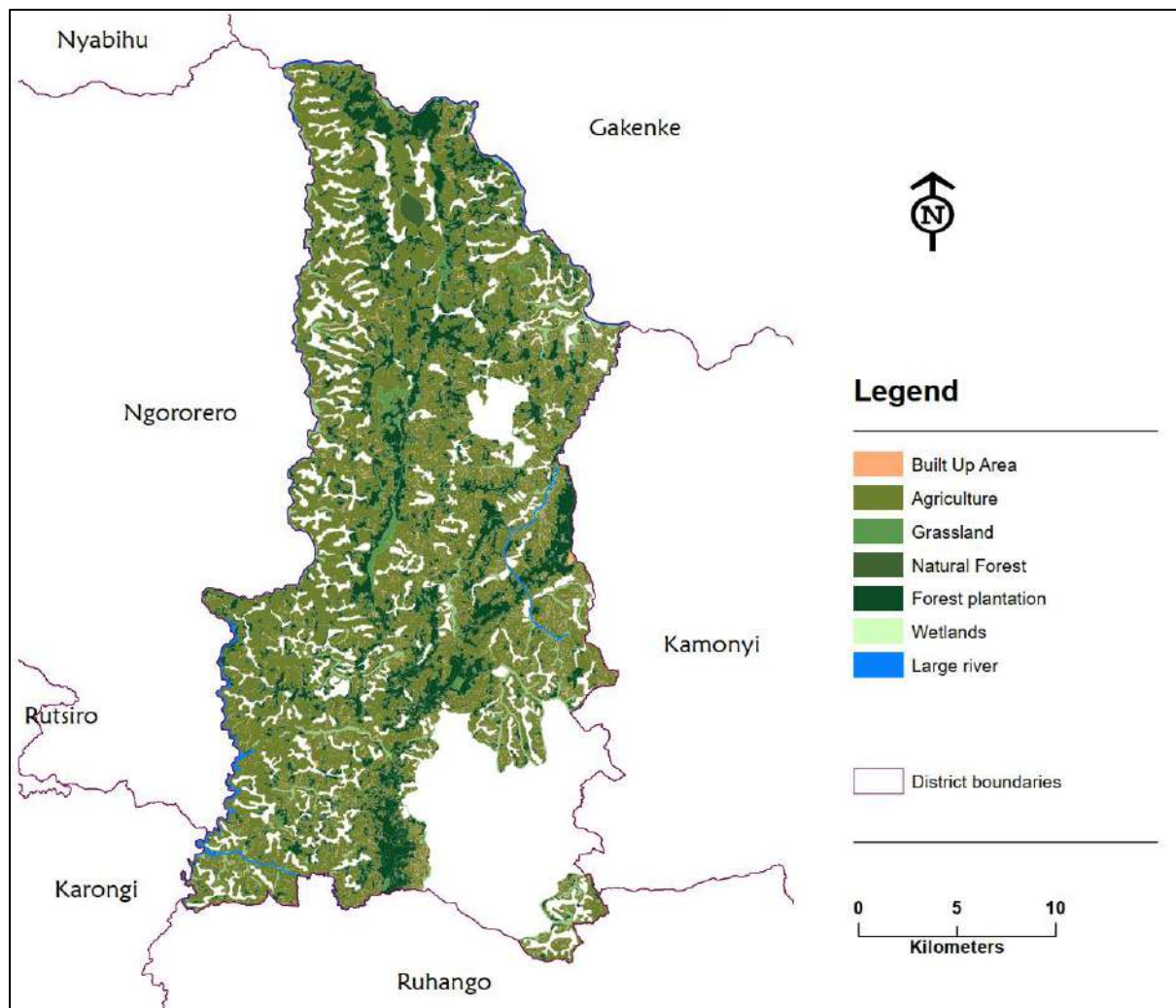


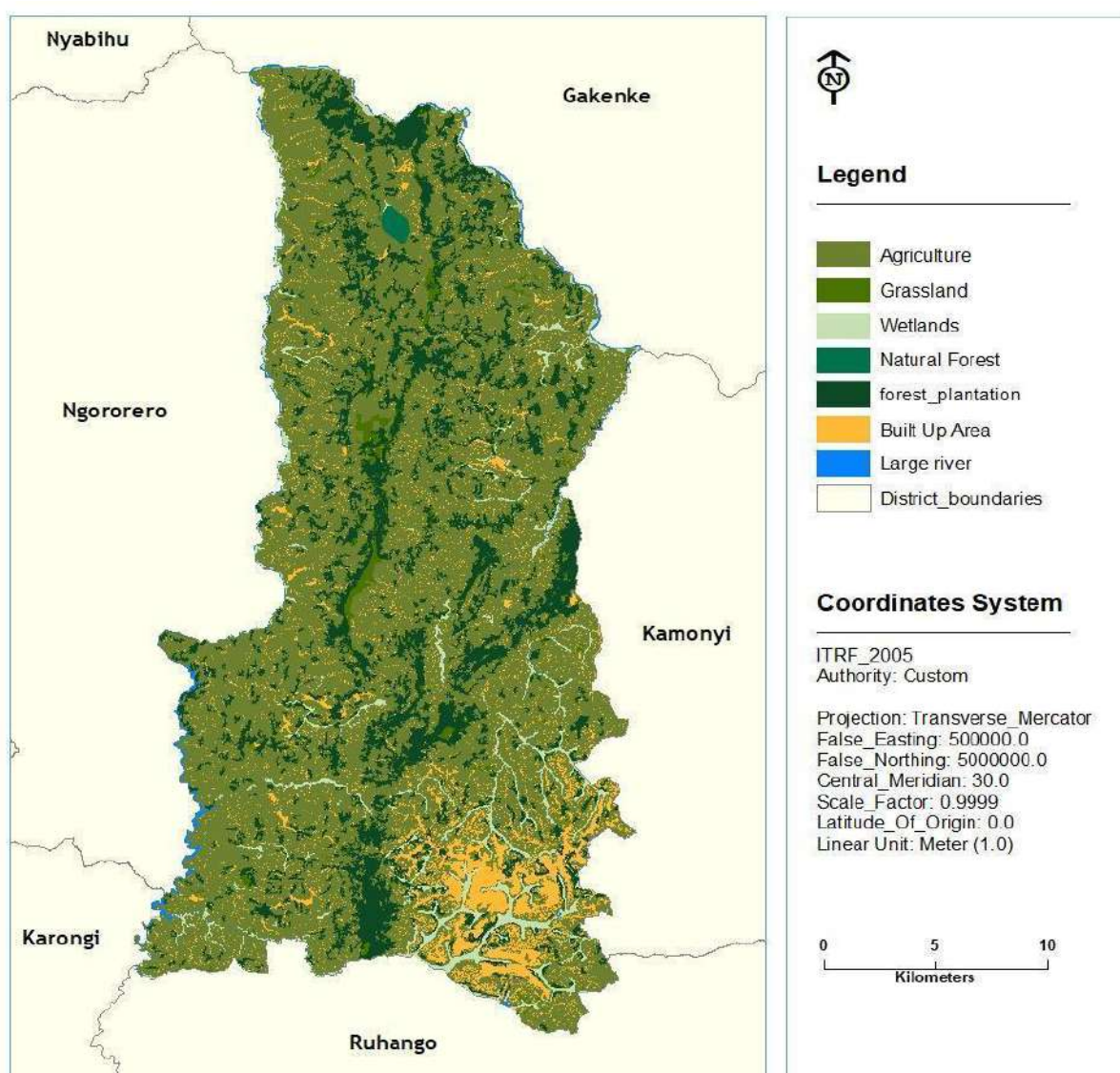
Figure 32: Proportion of existing land cover outside settlement areas



Map 24: Distribution of existing land cover outside settlement boundaries

4.10.5 Muhanga District Land Use Balance Sheet

4.10.5.1 Existing Land Use Balance Sheet



Map 25: Muhanga District existing land uses

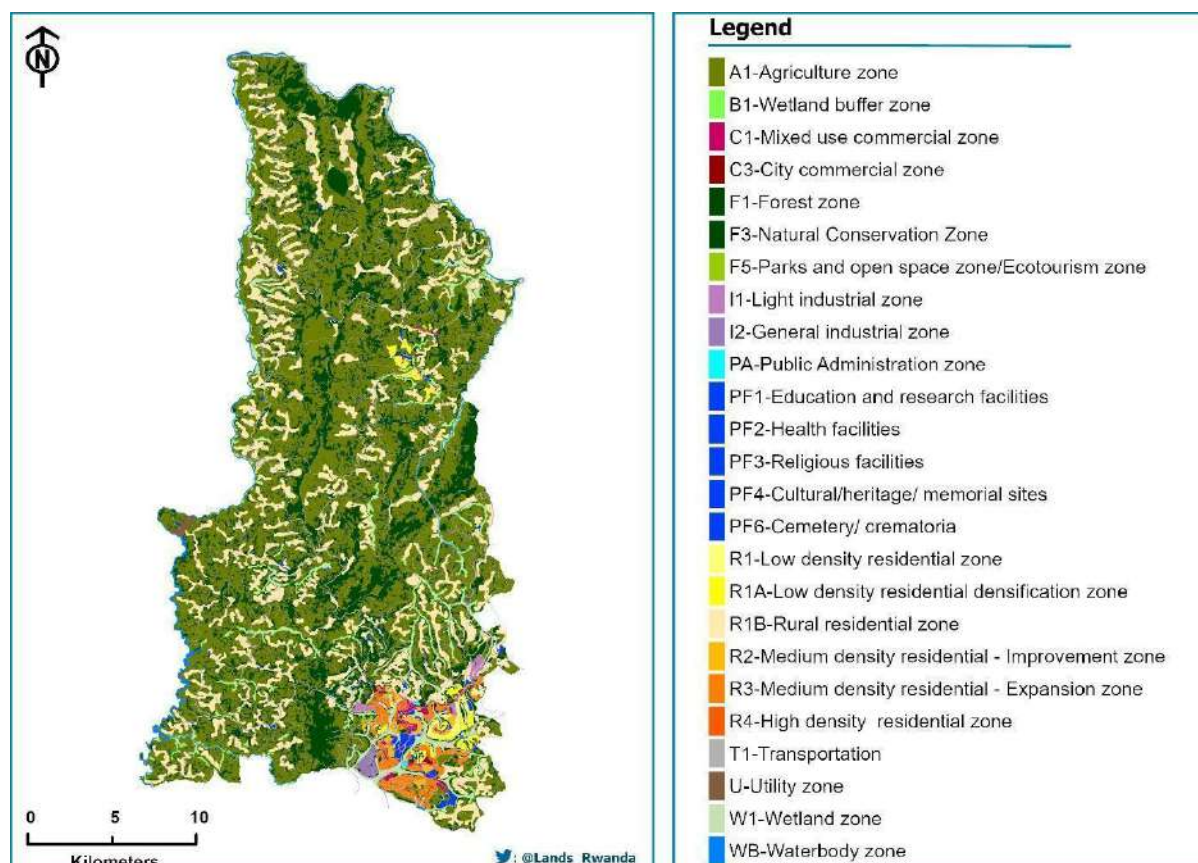
No	Class	Area_ha	Percentage (%)
1	Agriculture	45247.62	69.71
2	Natural Forest	154.66	0.24
3	Plantation Forest	11439.38	17.62

4	Built Up Area	5250.26	8.09
5	Water Bodies	491.76	0.76

Table 37: Muhanga District existing land uses

4.10.5.2 Land Use Zoning Plan and Balance Sheet

4.10.5.2.1 Muhanga District Zoning Plan



Map 26: Muhanga District land use zoning plan by 2035

4.10.5.2.2 Muhanga District Planned Land Use Balance Sheet

The proportion of land in Muhanga District is such that the dominant use is agriculture which occupies 31,589 hectares, representing 48.4% of the total area. Agriculture in Muhanga emerges as a major land use since 89% of the land in the district falls in the rural parts and only 11% in the urban areas. However, with the planning, there is also some agricultural land zoned in the urban areas, which keeps agriculture at the forefront of covering a large area in Muhanga District. The population tends to rely on the agricultural sector for their livelihoods as it has been the dominant traditional and inherited activity in the area and in the country for many

years. The second largest land use is forest, which eventually covers 16,672 hectares which corresponds to 25.5% of the district area. Given that Muhanga is a district with a large rural area, and dominated by steep mountains almost everywhere, the distribution of forests on these mountains is important to cover them against erosion. Like agriculture, forests are mainly distributed in rural areas, but a small part fall in urban areas in Muhanga satellite city and Remera rurban center.

In terms of dominant land use, the residential sector is the third largest sector to occupy land in Muhanga District, where the land use zoning analysis shows that it covers 8,337 hectares, which corresponds to 12.8% of the district area. As illustrated in Muhanga District urbanization and settlement pattern, residential areas are planned only in urban areas, considering Muhanga satellite city and Remera rurban center, as well as the 135 rural settlement sites in the whole district. Land outside these areas is planned for non-residential use only. The categories of residential zones in the Muhanga District Land Use Plan are as follows: R1B, a rural residential zone which is mainly found in all rural settlement's sites and some zones in urban areas and occupies an overall of 6,882.02 hectares, R1A - a low density residential densification zone which occupies 422.73 hectares. The other residential zones such as R1, R2, R3 and R4 are only proposed in the main urban area - Muhanga Satellite City. The R1 - low density residential zone occupies 155.77 hectares while R2 - medium density residential improvement zone occupies 211.95 hectares. R3 - medium density residential - expansion zone occupies 644.78 hectares and lastly R4 - high density residential zone occupies 69.24 hectares.

Alongside the residential areas, there is a broad use of land for public facilities which occupies 608.85 hectares, accounting for 0.94% of the total area of the district. Some of the public facilities planned in Muhanga District are education and research, health, religion, culture, heritage, memorial sites, cemetery, and crematoria. Education and research facilities (PF1) occupy 493.81 hectares, Healthcare facilities (PF2) occupy 33.08 hectares, religious facilities (PF3) occupy 42.77 hectares, cultural, heritage and memorial sites (PF4) occupy 2.58 hectares and cemeteries and crematoria (PF6) occupy 36.60 hectares.

Muhanga District Land Use Plan has also considered the zoning of commercial operations which was planned for a coverage area of 346.52 hectares, corresponding to 0.53% of the total area of the district. The commercial zones in Muhanga District are further categorised as C1 - mixed use commercial zone which occupies 309.56 hectares and C3 - urban commercial zone which occupies 36.94 hectares.

Among other land uses in the Muhanga District Land Use Plan, there is a road network throughout the district, considering all existing roads and, so far, some proposed roads located in urban areas and rural settlement sites. Transport in Muhanga District is regarded as a key aspect of development that facilitates the mobility of people in different services, the movement of products to the markets. Efficient transport in Muhanga District links the rural parts, especially in the northern areas, to Muhanga satellite city and Remera emerging center. Transportation zone (T1) in Muhanga District Land Use Plan occupies 3109.68 hectares which represent 4.79% of the total area of the district.

Besides the above land uses proposed in Muhanga DLUP, industrial zones are also planned over an area of 235.36 hectares, which is 0.36% of the total area of the district. The reason for planning industrial zones in Muhanga District is related to the fact that this area is now seen as a commercial hub of the county linking all the western, northern, southern, and eastern parts. Muhanga satellite city is also considered as a logistic and commercial core of the country that will help the city of Kigali to provide these services. The industrial zone planned in Muhanga District encompasses 2 categories: I1 - Light Industrial Zone and I2 - General Industrial Zone. The light industrial zone occupies only 120.01 hectares, which is 51% of the area reserved for industrial development. This zone is proposed in a specific part of Muhanga satellite city and Remera emerging center. Another category of industrial zone, I2 for general industrial zone, is planned only in Muhanga Satellite City, where it occupies 115.35 hectares in total, which is 49% of all industrial zones. Therefore, no industrial zones are planned in the rural settlement sites or outside the urban boundaries.

In Muhanga District, the swamplands were kept aside during the DLUP, and their buffer zones were planned in accordance with the Gazette respecting the distance of 20 meters. The Swamplands and their buffer zones in Muhanga District cover an area of 2952.57 hectares, corresponding to 4.55% of the total area of the district. The Swamplands occupy only 2269.59 hectares while their buffer zones occupy 682.98 hectares. The swamplands in Muhanga District are scattered in many parts regardless of whether they are urban or rural, but the main swamplands are in the south-east of the district, in the part of Muhanga satellite city.

Muhanga DLUP envisaged parks and open spaces zones and ecotourism zones occupying 50.30 hectares representing 0.08% of the district's area. Furthermore, there is also the public administration area planned on the coverage area of 27.40 hectares representing 0.04%, with public utilities occupying 80.40 hectares representing 0.12%. Considering the area of the whole

district, the rest is made up of water bodies which are generally rivers extending from Nyabarongo and moving from southwest to north towards the northeast. Other rivers considered are Bakokwe, Mukunguri, Miguramo, and Ururumanza as well as the dams and other water bodies which all occupy 488.36 hectares, representing 0.75% of the district area.

The allocation of land in the Muhanga DLUP is done after a significant amount of field work conducted across the district during data collection by a joint team made up of staff from the Rwandan Land Management and Use Authority, Muhanga District and different stakeholders. This data collection process was carried out in parallel with the corresponding consultation meetings that were conducted at grassroots level where the team met with local authorities, opinion leaders as well as the population itself which is the main target group of the project. The reason for the community outreach is to apply the bottom-up approach which is a valuable planning approach where people drive the planning based on their lives, their capacity and taking into account the vision of the county. The main reason for this DLUP is to ensure that every piece of land has its use, and assist in using land in a well-planned way that supports land management and vision for the 2035 target, which will in turn support the attainment of the NLUDMP 2020-2050 vision.

Generic Land Use			Land Use Zoning			
Land Use	Area in Hectare	%	Land Use	Area in Hectare	%	Color
Agriculture	32804.19	50.54	A1-Agriculture zone	31,589	48.4	
Commercial	346.52	0.53	C1-Mixed use commercial zone	309.56	0.48	
			C3-City commercial zone	36.94	0.06	
Forest	15815.80	24.36	F1-Forest zone	16,654	25.47	
			F3-Natural Conservation Zone	19.26	0.03	
Industrial	235.36	0.36	I1-Light industrial zone	120.01	0.18	

			I2-General industrial zone	115.35	0.17	
Open space	50.30	0.08	F5-Parks and open space zone / Ecotourism zone	50.30	0.07	
Public administration	27.40	0.04	PA-Public Administration zone	27.40	0.04	
Public facilities	608.85	0.94	PF1-Education and research facilities	493.81	0.76	
			PF2-Healthcare facilities	33.08	0.05	
			PF3-Religious facilities	42.77	0.06	
			PF4-Cultural/heritage/ memorial sites	2.58	0.01	
			PF6-Cemetery/ crematoria	36.60	0.06	
Public Utility	80.40	0.12	U-Utility zone	80.40	0.12	
Residential	8386.49	12.92	R1-Low density residential zone	155.77	0.24	
			R1A-Low density residential densification zone	422.73	0.65	
			R1B-Rural residential zone	6882.02	10.60	
			R2-Medium density residential - Improvement zone	211.95	0.32	
			R3-Medium density residential - Expansion zone	644.78	0.99	
			R4-High density residential zone	69.24	0.11	
Transportation	3109.68	4.79	T1-Transportation	3109.68	4.79	

Waterbody	488.36	0.75	WB-Waterbody zone	488.36	0.75	
Wetland	2269.59	3.50	W1-Wetland zone	2269.59	3.50	
Wetland buffers	682.98	1.05	B1-Wetland buffer zone	682.98	1.05	

Table 38: Muhanga District land use zoning – balance sheet

5 IMPLEMENTATION STRATEGIES

5.1 EXISTING LAWS ENFORCEMENT

Non-implementation of Muhanga DLUP will be punishable by Law n° 27/2021 of 10/06/2021 Governing Land as the law contains many articles related to land use planning and implementation. Some of them are the following:

- Article 54: The use of land is guided by the land use master plan of the area where the land is located.
- Article 61: Any permit granted in contradiction with the Land Use Master Plan is null and void and has no effects irrespective of any kind of prescription.
- Article 63: The change of land use is carried out in accordance with the master plan and approved by the institution in charge of land management and use.
- Article 65: The land planned for agricultural and livestock use is protected and conserved. Every person has an obligation to use the land planned for agricultural and livestock use in accordance with land use consolidation.
- Article 76: An individual who does not comply with the land use and development master plan commits a fault. He or she is liable to an administrative fine of not less than one million Rwandan francs (FRW 1,000,000) but not more than three million Rwandan francs (FRW 3,000,000). Without prejudice to other relevant laws, a person who performs activities on that land removes them or pays the cost for their removal.
- Article 78: The fine provided for under this Law is multiplied by ten (10) in case the fault referred to under article 76 of this Law is committed by a state-owned company, a non-public company, a cooperative organization, a national non-governmental organization, an international non-governmental organization, or a faith-based organization with legal personality.

5.2 LEGAL AND INSTITUTIONAL FRAMEWORK

One of the fundamental aspects of achieving the goals as set out in a Master Plan for a specific spatial space is the implementation of such a plan by the established implementation agency. The implementation of a Master Plan, which is the document (that contains public policy, programs and projects), is a major determinant of urban development and the government of the day has a major role to play. Stakeholders are the key players in the implementation of DLUPs.

5.3 PHASING PLAN

Phasing of Development is part of all land-use plans provisions and elaborated based on the local context. The leading spatial principle in phasing is Tiling, which simply prevents random and remote locations of development. The phasing plan for Muhanga District Land Use Plan intends to provide flexibility to the implementer agents to prioritize development in a particular area of the entire urban areas and source adequate funding to finance the selected projects. It provides the Government, communities, and donors/financiers with rationale to prioritize infrastructure and associated urban services to incrementally develop in a phased manner. Phasing plans have been elaborated in Muhanga Satellite City and Remera Rurbans; The 2 phases have been proposed in Muhanga Land Use Master Plan;

Phase 1: Phase 1 considered the areas, which already contain existing built up and basic infrastructures distributed. The area is already settled and contains all basic infrastructures. The district will continue the issuance of building construction permits and rehabilitation permits to achieve required proposed density. These areas will be priority during additional district infrastructures development and relevant stakeholders' investments.

Phase 2: Phase 2 development was planned in urban expansion; urban peripherals, for the areas suitable for urban development, but the same basic infrastructures are not developed there, and today still used as agriculture or livestock zones. Issuance of new building construction permits are prohibited in phase2, except big investment cases, where an inventor is willing to comfortably distribute all basic infrastructures (Roads, water, electricity.), without a government claim. District will provide construction permits in phase 2, after elaboration of detailed physical plans and distribution of all basic infrastructures (Water, electricity, Internet...).

5.4 LAND READJUSTMENT (DETAILED PHYSICAL PLANS)

Land readjustment of existing plots is recommended during implementation of Muhanga District Land Use Plan to assure rational development. Where the plots are of different quality or value, area or value adjustments are made. The underlying principle is that every owner must be compensated for their land with the land of equivalent value. The readjustment of the land transforms the irregularly shaped plots into regular and standard shape land with access to infrastructures such as roads, electricity, water, schools, hospitals and other services, which contributes to the value of the land in any specific area. Statutory phasing in each land-use plan will be compulsory. Community approach

The communities who are the landowners must be willing to participate in all phases from beginning to end including elaboration of site physical plans, data collection and all mapping and site demarcations exercises until the assignment is completed and approved, being provided by in-depth advice of planners and appraisal experts. A land readjustment map and appraisal documents must be approved together with the concerned detailed local plan as one unit. Alternatively, simplified voluntary land exchange processes shall be introduced. A readjustment is an essential tool for land consolidation and orderly development. Muhanga District communities should have ownership in all phases and must contribute as well as ensuring compliance during development. Any conflicts and disputes that may occur in the process should be resolved between landowners, the site committee established, local Village Chiefs and Cell Leaders. There must be established guidelines for local physical plan development procedures and implementation, roles and responsibilities for local communities, the site committee, local authorities and the consultants or experts developing the neighbourhood-planning site. Therefore, community approach is part of Muhanga DLUP for its successful implementation.

6 DLUP COMPLIANCE AND MONITORING

6.1 DLUP COMPLIANCE

Every 5 years, the Existing situation should be updated and the DLUP revised to assure implementation. The proposed compliance between the different planning levels is a must in order to avoid any mistakes made in the many plans, policies and projects before caused by lack of compliance. The purpose of this part is to set up administrative and planning tools, in which planning instructions transfer from level to level. A Continuous Compliant Planning (CCP) principle was adopted to ensure the fulfilment of the chain of planning. Before completion and approval of this plan, no construction permits will be issued until further approval by the District Council. Under this principle of CCP, the following measures and procedures are essential in order to achieve the desired compliance in planning process;

- Providing a non-objection to any land use plan and project by Rwanda Land Management and Use Authority in charge of Land Use Management through the strong back up coordination force from MINECOFIN will be instrumental in resolving coordination and compliance issues.
- NLUDMP 2020-2050 dominance, ensuring that the projects and activities of all Ministries & Authorities comply with this plan. The national development planning and budgeting process (MINECOFIN) should ensure that sector priorities and investments comply with the NLUDM. In other words, there must be a balance between economic planning and spatial planning.
- Delineate and enforce settlement boundaries. It is recommended that new boundaries will gain legal status only to supply developing needs for a period of 15 years (2020-2035). All master plans shall show implementation phases for midterm (2035) without overpassing this boundary. The areas of the development phases will be adjacent to each other to create a paving system for the efficient use of lands. The long-term boundary for 2050 will be protected for the next 15 year.
- Consolidation principles in land use planning will be directed towards and applied to all levels and all sectors of land-use planning.
- Regular updating of spatial data and base maps through large-scale mapping will greatly support the development of master plans and monitoring of land use.

- To improve the adequate performance of Building Permitting Management Information system (BPMIS) and its dissemination in all districts to serve the urban and rural construction and development permitting countrywide. Strong community outreach program and mind-set change on land use planning in Rwanda will be organized continuously in Muhanga District for community public awareness and ownership.

7 REFERENCES

1. Haining, R. (1993). Spatial data analysis in the social and environmental sciences, Cambridge University Press.
2. UN, The United Nations Sustainable Development Goals are (SDGs), 2015
3. Republic of Rwanda, Rwanda's Vision 2050 (2020, MINECOFIN)
4. Republic of Rwanda, National Strategy for Transformation (NST1): 2017-2024, MINECOFIN
5. Republic of Rwanda, National Housing Policy (2015), MININFRA
6. Republic of Rwanda, National Land Policy, 2019, MoE
7. Republic of Rwanda, National Urbanization Policy, 2015, MININFRA
8. Republic of Rwanda, National Investment Policy, RDB
9. Republic of Rwanda, National Human Settlement Policy, MININFRA
10. Republic of Rwanda, National Land Use Development Master Plan (NLUDMP 2020-2050) 2020-2050 (2020, MoE)
11. Republic of Rwanda, Green Growth and Climate Resilient Strategy, 2011, REMA
12. Republic of Rwanda, Rwanda National Land Use Planning Guidelines (NLUPG) (2017, Rwanda Land Management and Use Authority)
13. Republic of Rwanda, Rwanda Urban Planning Code (UPC) (2015), RHA
14. Republic of Rwanda, Urbanization and Rural Settlements Sector Strategic Plan 2018-2024 (2018, MININFRA)
15. Republic of Rwanda, Environmental Impact Assessment Guidelines, REMA 2007
16. Republic of Rwanda, Law n°. 27/2021 of 10/06/2021 governing land in Rwanda.
17. Republic of Rwanda, 2018. Law N°48/2018 of 13/08/2018 on Environment, 2018.
18. Republic of Rwanda, General Census, 2012 and 2022 National Institute of Statistics of Rwanda (NISR).
19. Republic of Rwanda, Integrated Household Living Conditions Survey, EICV 5, Thematic Report, Environmental and natural resources, March, 2020, NISR
20. Republic of Rwanda, Rwanda Building Code, 2015, RHA.
21. Republic of Rwanda, The National Environmental Policy of the Republic of Rwanda, MoE.
22. Republic of Rwanda, The Law N° 27/2021 du 10/06/2021 governing land in Rwanda, 2021, MoE.

23. Republic of Rwanda, The Law N°10/2012 of 02/05/2012 governing urban planning and building in Rwanda, 2012, MININFRA.
24. Republic of Rwanda, Law n°20/2011 of 21/06/2011 governing human habitation in Rwanda, 2011, MININFRA
25. Muhanga District Development Plan (DDS), 2018-2024
26. Muhanga District Potentialities Report, 2017
27. Muhanga District, Master Plan for Urban Development, 2020
28. Muhanga District, Local Economic Development (LED) Strategy 2017-2024

Bibonywe kugira ngo bishyirwe ku mugereka w'Iteka rya Minisitiri n° 004/24/10/TC ryo ku wa 22/08/2024 rishyiraho igishushanyo mbonera cy'imikoreshereze n'imitunganyirize by'ubutaka cy'Akarere ka Muhanga.	Seen to be annexed to Ministerial Order n° 004/24/10/TC of 22/08/2024 establishing land use and development master plan of Muhanga District.	Vu pour être annexé à l'Arrêté Ministériel n° 004/24/10/TC du 22/08/2024 établissant le schéma directeur d'utilisation et d'aménagement des terres du District de Muhanga.
---	--	--

Kigali, 22/08/2024

(sé)

MURANGWA Yusuf

Minisitiri w'Imari n'Igenamigambi

Minister of Finance and Economic Planning

Ministre des Finances et de la Planification Économique

Bibonywe kandi bishyizweho Ikirango cya Repubulika:

Seen and sealed with the Seal of the Republic:

Vu et scellé du Sceau de la République:

(sé)

Dr UGIRASHEBUJA Emmanuel

Minisitiri w'Ubutabera akaba n'Intumwa Nkuru ya Leta

Minister of Justice and Attorney General

Ministre de la Justice et Garde des Sceaux