



Brainae Journal of Business, Science, and Technology

ISSN "2789-374X (print)" "2789-3758 (online)"

Volume 26, Issue 8, August 2023

ASSESSMENT OF THE INFLUENCE OF MASTER PLANS IN KIGALI CITY DEVELOPMENT IN RWANDA

Author: SINGIRANKABO Damas

PhD Candidate in Civil Engineering at Brainae University (BU), Delaware, USA.

Tel.: +250 783 413 872

Co-author: Dr. HATEGEKIMANA Jean Paul

BRAINAE UNIVERSITY

Tel.: (+250) 783 590 293; +1 (251) 237-9112

Received: May 10th, 2023; **Accepted:** July 30th, 2023; **Published:** August 04th, 2023

DOI: <https://doi.org/10.5281/zenodo.8215856>

ABSTRACT:

The master plan is based on study of existing situation of each and every component of a city comprising land use, socio-economic and other facilities based on analysis of existing situation, forecasting of future trends, and finally making proposals for the growth and management of the city. The master plan is as a long-term plan which provides guidelines for urban growth and guides people in locating their investment in the city in an orderly manner. A master plan is an important tool which guides, controls and manages an urban growth and development in a planned manner. However, the study was assessing the impact of master plans in Kigali city development in Rwanda. By using ArcGIS software as the main tool for analysis, the actual land uses that exist on ground were compared to the planned land uses on the master plan using GIS overlay tools. By comparing the current situation and the situation before the adoption of the master plan, this study evaluated the level of availability and accessibility of these indicators of urban quality of life in the study area. The comparison was done using the paired sample t- test analysis by SPSS. The findings of this study are that there is high conformance for public facilities; a medium conformance for infrastructure, commercial and natural area; a low conformance for agriculture; a very low conformance for industries, residential and open spaces. The result from the paired sample t-test analysis revealed that the master plan has partly impact in the development of the residents' living condition in Kigali City. The study concluded that the low level of Kigali City master plan implementation is based among others on the zoning categories and regulations which are not feasible by the low-income citizens.

Keywords: *Master plan, impact, city development*

INTRODUCTION:

The Rwandan population is expected to double to around 16 million by 2020. Given that the major aspiration of Vision 2020 is to transform Rwanda's economy into a middle-income country, this requires an annual growth rate of at least 11.5 %. This is achieved only through transformation from a subsistence agriculture economy to a knowledge-based society, with high levels of savings and private investment, thereby reducing the country dependence on external aid. The construction industry has great potential to generate wealth and employment to the citizenry and is envisaged to contribute immensely towards this growth. The industrial sector in Rwanda contributes about 15% of the National Gross Domestic Product (GDP) and is therefore a crucial component of the national economy. Rwanda Vision 2020 projects an overall growth of the industrial sector by an additional 5%, to 20% of National GDP.

The construction industry in particular, contributes about 49% of Rwanda's industrial GDP making it a vital industrial sub-sector in the country. The 2011 Industrial Policy prioritizes the construction industry sub sector's potential to spur the overall industrial sector growth and development, enabling Rwanda to become a middle-income country. It is in this context that the elaboration of various Industrial Subsector Master Plans identifying potentialities of industrial resources available, their location, how they can be exploited sustainably, and by whom have been initiated. Producing and implementing the Industrial Subsector Master Plans is an affirmative action desired to develop Rwanda's industrial sector as a key driver of economic growth. The plans serve as important planning instruments in expanding the drivers of economic growth and promoting Rwanda's long-term industrial competitiveness in the selected subsectors.

In the pursuit of the long-term industrial competitiveness, industries are encouraged to shift towards higher value-added activities and productivity-driven growth initiatives, as well as adoption and application of technology innovativeness. This

ultimately allow the sectors be progressively integrated into the regional and global production networks and supply chains. The growth of the sectors entails concomitant development of human capital focusing on available and gaps of technically skilled, knowledgeable, creative and ICT trained workforce to match the requirements of the industries and services. At the managerial level, the focus is on nurturing corporate leadership capabilities and skills, in areas such as product branding and international marketing. The Master Plan informs on investments potentials, both foreign and domestic, on what, where and the how's of the targeted subsectors and attendant policy requirements that drive and promote growth as well as sustainability and competitiveness. Such growth needs to be guided by careful and timely planning to ensure that Kigali is able to address the increasing real estate demand in an organized and controlled manner. For this reason, the City of Kigali has adopted a legal framework which guides and regulates urban planning and development in the City of Kigali. The Kigali Conceptual Master Plan (KCMP) was approved by the Ministry of Infrastructure in 2008 (The City of Kigali, 2010).

PROBLEM STATEMENT:

Producing and implementing the Industrial Subsector Master Plans is an affirmative action desired to develop Rwanda's industrial sector as a key driver of economic growth. The plans serve as important planning instruments in expanding the drivers of economic growth and promoting Rwanda's long-term industrial competitiveness in the selected subsectors. In the pursuit of the long-term industrial competitiveness, industries were encouraged to shift towards higher value-added activities and productivity-driven growth initiatives, as well as adoption and application of technology innovativeness. (Berke et al., 2006). To ensure the implementation of a master plan, a continuous follow up is required and assessments within certain periods of time are needed. The assessment of plans can be done by planners, policy makers, donors and scholars. However, apart from the studies that generally discuss the unsuccessful implementation of plans for African cities, for example that of Silva, (2015) mentioned above, there are no studies that evaluate specifically the implementation of the Kigali City master plan.

RESEARCH OBJECTIVES

General objective

The main objective of this study was to assess the impact of master plans in Kigali city development in Rwanda.

Specific Objectives

1. To assess the level of conformance of master plan of Kigali City to the current situation on the ground,
2. To determine how the implementation of master plan is impacting Kigali city development,
3. To determine challenges of master plan implementation within Kigali City

RESEARCH QUESTIONS

This study verified null and alternative hypothesis.

1. What is the level of conformance of master plan of Kigali City to the current situation on the ground?
2. How is the implementation of master plan impacting Kigali city development?
3. What are the challenges of master plan implementation within Kigali City?

CONCEPTUAL FRAMEWORK

To evaluate the impacts of master plan of Kigali City on city development in the study area, the author of this study proposed a framework to guide the evaluation. The framework has the following five dimensions according to the objectives of master plan of Kigali City: adequate allocation of land use; creation of attractive recreational features; provision of efficient transportation, infrastructure and public facilities; creation of employment opportunities and provision of comprehensive housing solution for all groups of people. The selection of these five dimensions was based on the main objectives of the detailed master plan for Kigali City that have a direct impact on urban quality of life. The following figure is an illustration of this framework.

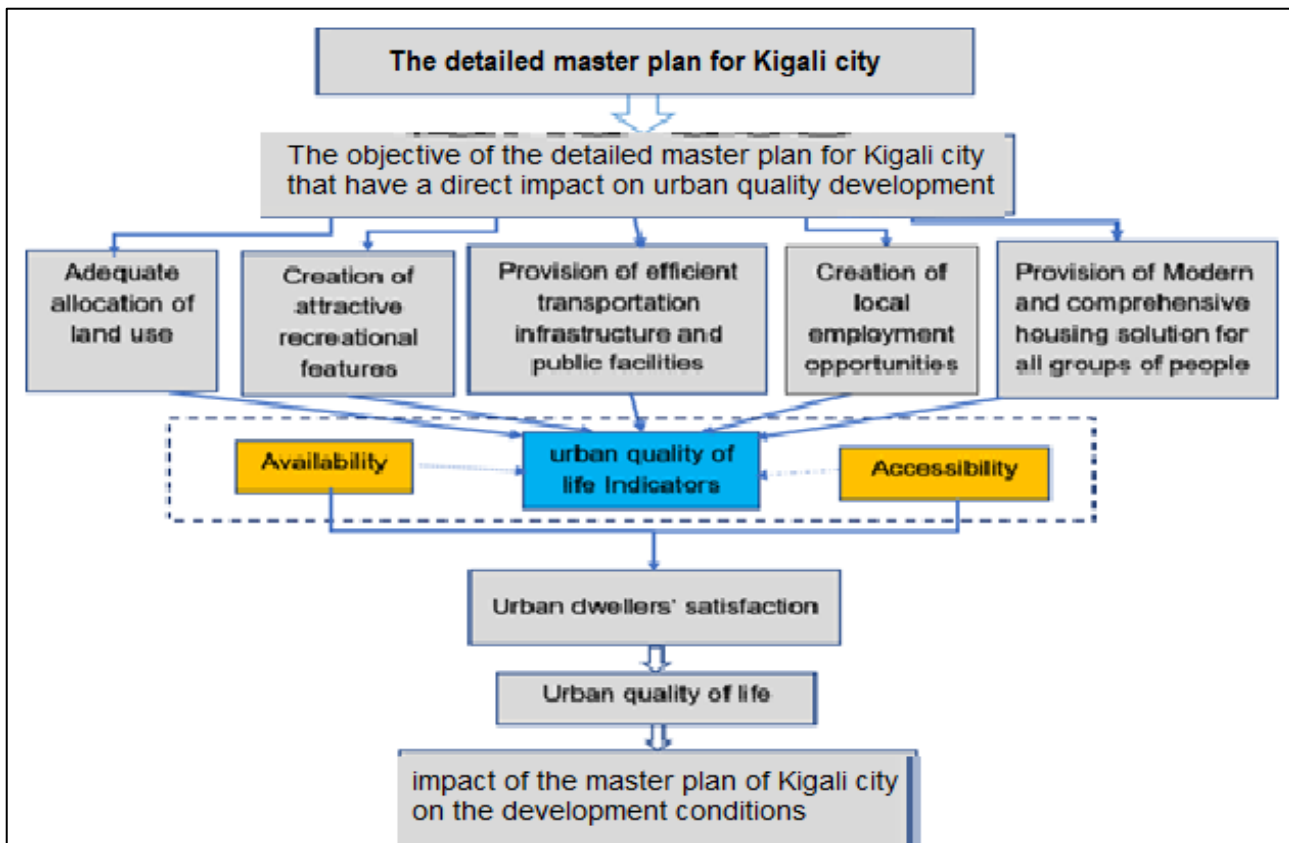


Figure 1: Conceptual Framework

Source: Author (2023)

LITERATURE REVIEW:

Planning

Different authors define the term “planning” differently. However, the definitions of this term seem to express the same concepts. For instance, Shapiro (2001), defines “planning” as a systematic process of establishing a need and then working out the best way to meet the need, within a strategic framework that enables you to identify priorities and determines your operational principles.

Urban planning

Urban planning is the technical and political process concerned with the control of the use of land and design of urban environment, including transportation networks, to guide and ensure the orderly development of settlements and communities (Serag et al., 2015). Additionally, Pinson (2010) defines “urban planning” as a notion that encompasses the whole set of social activities aimed at anticipating, representing and regulating the development of an urban or a regional area. Thus, urban planning articulates intellectual activities of study and prospective, social and economic forecasting with more concrete activities such as infrastructure programming, land reservation and land use regulation (Pinson, 2010).

Master plan

This definition is related to that of Hameed & Nadeem (2008), who define the term master plan as a tool to guide and manage the future growth of cities in a planned manner. Thus, the master plan is based on study of existing situation of each and every component of a city comprising land use, socio-economic and other facilities based on analysis of existing situation, forecasting of future trends, and finally making proposals for the growth and management of the city (Hameed & Nadeem, 2008).

Steps in preparing a comprehensive plan/master plan

According to Chandler (2000), there is a sequence of ten steps that can be followed in developing a comprehensive plan/a master plan. These are discussed hereafter as follow: Plan to Plan; the key factors associated with this step include the allocation of time, human resources, money, and energy to the effort. when planners mistakenly think that they will deal with these issues as problems arise, this logic is faulty and potentially fatal to the planning process. Structure and schedule the process; this step involves featuring discrete planning activities, the party (s) responsible for each activity, and the due date as well as the key stakeholders. Gather and analyze the data.

Land use planning in Kigali City

In 2008, the Rwanda's Ministry of Infrastructure has developed and approved the KCMP (The City of Kigali, 2010). The KCMP specifies the need to develop Detailed Master Plans for each of the three Districts as well as the key areas of Kigali City. In addition, in 2010 the Kigali City has developed an urban design for the Central Business District (CBD) areas and a detailed Master Plan for Nyarugenge District. Later, in 2013, the Detailed Master Plans for the other two constituent Districts of Kigali City namely Kicukiro and Gasabo were approved (The City of Kigali, 2013):

Seven Residential Districts

The residential district is made of Single-Family Residential District (R1), Mixed Single-Family Residential District (R1A), Rural Residential District (R1B), Low Rise Residential District (R2), Low Rise Residential District (R2A), Medium Rise Residential District (R3) and High-Rise Residential District (R4).

Four Parks and Open Space Districts

The parks and open space District are made of Passive Recreational District (P1), Active Recreational District (P2), Agricultural District (P3) and Protected Area (P4). The description for each zoning category is presented in appendix B. The following section describes the tools for the implementation of the detailed master plan for Nyarugenge District.

Tools and strategies for Kigali City master plan implementation in Nyarugenge District.

A master plan preparation alone does not ensure the implementation of what proposed (Hameed & Nadeem, 2008). For a successful implementation of a plan, it requires comprehensive implementation tools. The general tools for implementing the master plan include legal protection of the plan, Capital Improvement Program (CIP), zoning regulations, land sub-division regulations, building regulations, and urban renewal program. For the implementation of the Detailed Master Plan of Nyarugenge District, the key tools and strategies proposed are the following: the implementation of the Zoning Plan, the Capital Improvement Plan, and the development of Special Projects (The City of Kigali, 2010).

Zoning Plan

The Zoning Plan is composed of a zoning map and a set of zoning regulations. The zoning map identifies specific zoning districts within the planning area, it also identifies the desired intensity and building height for that area (The City of Kigali, 2013).

Capital improvement plan

The capital improvement plan is proposed for the development of Nyarugenge District, by focusing on the development of infrastructures and providing essential public facilities required to support the proposed land use plans.

Special projects

Some special projects have been identified within Nyarugenge District. Those are for instance, the development of the market and commercial centre in Gitega Sector, the development of proposed golf course in Mageragere sector and the development of proposed equestrian club and resort in Mageragere Sector.

Developments priorities proposed in the Land Use Plan for the study area

To ensure the successful implementation of the master plan, the Kigali city has proposed implementation mechanism made of special projects which are supposed to be undertaken in phases. For Nyarugenge, Muhima and Kigali sectors, there are key priorities that have been proposed to be implemented in phase the 1st (2010-2015) and the 2nd (2016-2020).

Key development proposed in Nyarugenge Sector

Since Nyarugenge sector is part of CBD, it is prioritized to be redeveloped into an attractive area for investment for creating employment opportunities. The developments priorities proposed for Nyarugenge sectors are among others the following (The City of Kigali, 2010):

-Centre Ville Roundabout Redevelopment

The existing City centre located in the Centre Ville Roundabout is proposed to be revitalized. This involves the redevelopment of the prime area of Nyarugenge CBD, around the centre ville roundabout. This is proposed to be done through consolidation, amalgamation and regularization of the existing small commercial parcels into a single integrated strata development parcel; improvement of road and infrastructures, as well as development of circular pedestrian bridge around the roundabout.

-Nyarugenge commercial and Heritage Village redevelopment

The redevelopment of this area is supposed to be undertaken through various activities such as the acquisition of land areas required for public use, development of public spaces including the pedestrianization of one of the existing roads, redevelopment and regularization of the existing small commercial parcels and improvement road and infrastructures

-The Upper Kiyovu Residential Development

This involves the redevelopment of the area around the current statehouse into a modern residential complex. The scope of works includes the conversion of the statehouse into museum, community club and public park, as well as land sale of the residential and hotel parcel.

Key development; proposed for Muhima sector

Being another part of the CBD, Muhima sector is proposed to be redeveloped into attractive commercial and office spaces. To achieve this objective, key priorities include the following among others (The City of Kigali, 2010).

-Kigali CBD Phase 1

The eastern corner of Muhima, is proposed to be developed as the new CBD and is envisioned to house a mix of high-end retail and office spaces. This is supposed to be done through the development of infrastructure, public open spaces and land sale of commercial parcels.

-Nyabugogo Transport Hub and Market

The existing taxi park at Nyabugogo is proposed to be developed into an integrated transportation interchange, with complementary commercial and office facilities, serving as an important transportation node at the junctions of Muhima, Kanyinya and Gitega Sectors. It is proposed that the Taxi Park be upgraded into an integrated Transport Hub, to allow for a more organized flow of public transport, and thus creating a safer environment for both vehicles and pedestrians.

-Kigali CBD Wetland Park

The wetlands located north of Muhima are proposed to be developed as a Wetland Park offering a range of recreational, educational and critical environmental benefits. The scope of work for this project includes land clearing., development of the Wetland Park and development of pedestrian bridge connecting the park and the CBD phase1.

RESEARCH METHODOLOGY:

Nyarugenge District, with an area of 134.2 km² is the smallest of the three Districts of Kigali City and lies to the west of the city. It is located 10 km from the Kigali international Airport. Nyarugenge District is divided into 10 sectors (imirenge): Gitega, Kanyinya, Kigali, Kimisagara, Mageragere, Muhima, Nyakabanda, Nyamirambo, Nyarugenge and Rwezamenyo. The district was chosen as a case study since its master plan was adopted before the adoption of the master plans for other Districts of Kigali City.

The total households in the selected cells were 6393, counting 1526 for Rwampara cell, 1306 for Agatare cell, 36 for Ubumwe Cell, 822 for Nyabugogo cell, 1941 for Kigali cell and 762 for Rwesero cell. Those correspond to 23.87% for Rwampara cell, 20.43% for Agatare cell, 0.56% for Ubumwe Cell, 12.86% for Nyabugogo cell, 30.36% for Kigali cell and 11.92% for Rwesero cell. The sample size was 362 households corresponds to a total of 82 households in Rwampara cell, 75 households in Agatare cell, 2 households in Ubumwe cell, 47 households in Nyabugogo cell, 112 households in Kigali cell and 44 households in Rwesero cell. For this study, the sample size was selected by using multilevel Mixed Methods sampling technique. During this research, firstly the data was collected through field observation in order to be familiar with the study area and to observe the physical status of the master plan implementation on the ground. Then, the systematic random sampling method was additionally applied to precisely determine the households to be surveyed. The systematic random sampling method is easy to implement, and it may be started without a complete listing frame. Regarding the interviews, purposive sampling was used to determine the interviewees based on the authorities in charge of urban planning and master plan implementation at Kigali City level and those who oversee master plan implementation at local level.

Purposive sampling was chosen since the information about the master plan implementation can only be obtained from the authorities in charge of these issues. These authorities are the urban planner who works at Kigali City level and the sector land managers of the three selected sectors. As study evaluated two cases one was the conformance between the master plan and the current existing land use on the ground; the second evaluation was the impact of master plan implementation on the living condition of urban dwellers in Nyarugenge, Muhima and Kigali sectors. Therefore, data processing and data analysis were done in two ways accordingly. The level of conformance of master plan implementation was evaluated based on the three indicators of the degree of conformity. In this study, ArcGIS software was used as the main tool for processing geodata sets through the overlay analysis method. The actual land uses that exist on ground were compared to the planned land uses on the master plan to determine the above-mentioned indicators of the degree of conformity. This evaluation focused on eight major types of land use: residential, commercial, public facilities, natural area, infrastructures, agriculture, industrial and open space.

RESULTS AND DISCUSSIONS

Findings indicated that the evaluation of conformance between the master plan and the outcomes on the ground, focused on eight major types of land use: residential, commercial, public facilities, natural area, infrastructures, agriculture, industrial and open space. The results from the overlay analysis for each of these eight land uses are summarized in the following tables and further discussed deeply in next sections.

Table 1: Level of conformance for existing land uses to the master plan

S/N	Land use type	Accordance		Unfulfillment		Deviation		Total existing	
		Area (m ²)	PCT (%)	Area (m ²)	PCT (%)	Area (m ²)	PCT (%)	Area (m ²)	PCT (%)
1	Residential	1629212.9	42.3	2186324.4	56.8	32559.9	0.8	3848097.2	100
2	Commercial	715883.5	64.6	385372.6	34.8	6342.5	0.6	1107598.5	100
3	Public facilities	1246062.3	80.4	303779.1	19.6	-	-	1549841.5	100
4	Natural area	7807893.1	92.4	573270.1	6.8	69808.6	0.8	8450971.8	100
5	Infrastructure	1883797.6	72.2	336343.3	12.9	389998.7	14.9	2610139.7	100
6	Agriculture	3146599.5	16.9	15456676.5	83.1	-	-	18603276.0	100
7	Industries	69810.6	20.9	263742.7	79.1	-	-	333553.3	100
8	Open spaces	10695.8	40.9	15481.6	59.1	-	-	26177.4	100

Source: Author (2023)

A high level of accordancy with low unfulfillment and with low deviation indicates a good conformance between the master plan and the current existing land use. However, when the total existing area for a certain land use is much smaller than the total area proposed for such land use, a high percentage of accordancy level calculated based on the total area proposed for a certain land use does not necessarily mean the high conformance. In steady, it means that most of the land occupied by such land use is consistent with the master plan. However, it may happen that a huge area of land is still missing to be implemented as proposed. Therefore, for better interpretation of the result, it is also necessary to consider how much is such accordancy level with respect to the total area proposed for such land use.

Table 2: Level of conformance with respect to the total area proposed for each land use

S/N	Land use type	Area in conformance with the master plan		Total area proposed	
		(m ²)	PCT (%)	Area (m ²)	PCT (%)
1	Residential	1629212.9	33.6	4849427.6	100
2	Commercial	715883.5	41.5	1723885.2	100
3	Public facilities	1246062.3	68.9	1807246.7	100
4	Natural area	7807893.1	49.5	15774928.9	100
5	Infrastructure	1883797.6	48.6	3876471.8	100
6	Agriculture	3146599.5	81.2	3876471.8	100
7	Industries	69810.6	29.0	240895.4	100
8	Open spaces	10695.8	0.3	3467442.7	100

Source: Author (2023)

This study revealed that among eight major land uses, public facility is the highest land use that conforms to the master plan with a high level of conformance. Commercial, natural area and infrastructures have a medium level of conformance since more than a half of each of them is located in accordance with the master plan.

Challenges of implementing Kigali City master plan

During the implementation of Kigali City Master Plan, different challenges were encountered. The following table discussed these challenges and how they should be overcome.

Table 3: Findings on the challenges of implementing Kigali City Master Plan

S/N	Challenges	Description of the challenge	How to overcome the challenges	Source
1	Lack of coordinating body for planning and urban development	There are different national and City level agencies that are responsible for development of housing, planning and infrastructure provisions. However, there isn't an inter-ministerial City Planning Committee in Kigali. This leads to the uncoordinated development of those activities in some cases whereby planning and implementation work independently.	Establishment of additional institutions responsible to realize the Master Plan and Capacity building in order to be able to handle any type of urban project	The City of Kigali, 2022
2	Limited Institutional Capacities	The existing institutions dealing with infrastructure and urban development are relatively small (in size) and low in capacity. Most of the staffs are young and need experience		

		to handle large-scale urban projects.		
3	Limited public-owned land	Majority of land in Kigali is owned by private parties and the public land is very limited. Meanwhile there is a great demand of land for infrastructure, affordable housing and public facilities.	Integrated Strategy for Land Consolidation	Interview with City urban planner
4	Budget limited for the Government	The implementation of Kigali city master plan is challenged by the limited City funding whereby there is large funding requirement to acquire the private land for public use, and to Provide public infrastructure, as well as affordable public housing for the lower and medium income group.	Capital Improvement, Projects and Catalytic Projects	
5	Low capacity of the citizens to do what is planned for their lands	Some of the hindrances that occurred in the implementation of the master plan are the low capacity of the citizens to do what is planned for their lands. In this case, it requires relocating the residents from their properties while many people are not willing to be relocated.	An integrated strategy is required to consolidate land for implementing the key projects and the Master Plan	Interview with City urban planner
6	Lack of citizens participation during the planning process	The grassroots community have very little information about the Master Plan. They have not been given time to share their suggestions on how the Master Plan should look so as not to be surprised during the implementation stage.	Review of the master plan and allow citizen participation	Rwanda Housing Authority, 2018.
7	Issues of the perceptions of the people	Since the master plan is new in the minds of Rwanda's peoples, their perceptions on its implementation are not common. Some citizens think that they are not concerned with the implementation of the master plan. In addition, there are some people who think that the master plan is meant to favour riches and exclude the poor.	Public awareness: Let the public be aware of what a master plan is and its role.	Interview with City urban planner

The following section presents descriptive statistics of the surveyed respondents on master plan implementation and its impact on the living condition of urban in Nyarugenge District

Descriptive Statistics

In the descriptive statistics of the findings from household survey, respondents' knowledge about Kigali City Master Plan, respondents' views on the role played by master plan implementation, respondents' knowledge on proposed zoning category and the level of respondents' satisfaction with the zoning category proposed in their neighborhoods.

Respondents' knowledge about Kigali City Master Plan

The summary of descriptive statistics shows that about 92.3% of the total respondents know what a master plan is, while 7.7% did not. In addition the same table indicated that 80.5% of the respondents from the three sectors (Nyarugenge, Muhima and Kigali) know the type of zoning proposed for their neighborhood. Meanwhile their counter parts of 19.5% did not know.

Table 4: Respondents' knowledge about Kigali City Master Plan

Variables	Observation	Mean	Std. Deviation
People who know what a master plan is	362	0.9227	0.26751
People who know if there is a master plan designed for their neighbourhood	338	0.8047	0.39699
People who know the type of zoning proposed for their neighbourhood	362	0.8895	0.31394

Source: Author (2023)

The role played by Kigali City master plan implementation

In order to find out whether Kigali City Master Plan implementation plays role on the living condition of dwellers, people were asked to talk about their views on the role played by Kigali City Master Plan implementation on their living condition. 64% of the total people surveyed agreed that the implementation of the master plan plays role in the improvement of their living condition. However, 36% of respondents disagreed. consequently, the result presented in table 8 shows that apart from 36% of respondents who said that the master plan does not play any role on their living condition, the rest 50.2%, 8%, 3% and 2.8% of respondents agreed that the master plan implementation helps them to access the basic infrastructures, to live in a clean environment, to access affordable housing and to get employment opportunities respectively.

Table 5: Role played by Kigali City Master Plan implementation

Role played by master plan implementation	Frequency	Percent
Access to basic infrastructures	182	50.2
Living in a clean environment	29	8
Access to affordable housing	11	3
Access to employment opportunities	10	2.8
No role	130	36
Total	362	100

Source: Author (2023).

Impact of master plan implementation on the living condition of urban

The purpose was to identify whether the implementation of the master plan plays role in the improvement of the living condition of the dwellers in the study area.

Table 6: Level of availability and accessibility of urban quality of life indicators

S/N	Indicator	Level of availability/accessibility		Mean difference	Std. Deviation	t	df	Sig. (2-tailed)
		Current	Before					
1	Pedestrian infrastructures	0.671	0.323	0.348	0.477	13.9	361	0.000
2	Streets	0.834	0.696	0.138	0.353	7.4	361	0.000
3	Traffic lights	0.053	0.047	0.006	0.074	1.4	361	0.158
4	Bus stops	0.450	0.262	0.188	0.391	9.1	361	0.000
5	System of garbage collection	0.583	0.406	0.177	0.382	8.805	361	0.000
6	Nursery schools	0.735	0.682	0.052	0.235	4.2	361	0.000
7	Primary school	0.865	0.796	0.069	0.265	5.0	361	0.000
8	Health facilities	0.843	0.779	0.064	0.255	4.7	361	0.000
9	Clean water	0.978	0.517	0.461	0.499	17.6	361	0.000
10	Power of electricity	0.978	0.586	0.392	0.489	15.3	361	0.000
11	Sewage system	0.481	0.362	0.119	0.324	7.0	361	0.000
12	Affordable housing	0.218	0.456	-0.238	0.445	-10.2	361	0.000
13	Recreational area	0.227	0.218	0.008	0.190	0.8	361	0.406
14	Governmental administrative offices	0.923	0.812	0.111	0.314	6.7	361	0.000
15	Employment opportunities	0.080	0.069	0.011	0.128	1.6	361	0.103

Source: Author (2023)

The above table illustrates the result obtained from the paired samples t-test analysis concerning the availability/accessibility of the selected indicators of urban quality of life. Each indicator is discussed in the follow section

Accessibility of pedestrian infrastructures

By comparing the current accessibility of pedestrian infrastructures with their accessibility before the adoption of the master plan, the result from the paired sampled t-test analysis showed that the number of people who access pedestrian infrastructures, has increased from 32.3% to 67.1% of the total people surveyed. This is because new pedestrian infrastructures have been constructed after the adoption of the master plan as agreed by 58.8% of the total people surveyed.

Table 7: Time taken before and after the adoption of the master plan

S/N	Variables	Mean (min)	Mean difference (min)	Std. Deviation	t	df	Sign
1	Current time taken to reach the nearest bus stop	18	-4	7	-9	361	0.000
	Time taken to reach the nearest bus stop before the adoption of the master plan	21					
2	Current time taken to reach the nearest nursery school currently	12	-2	12	-4	361	0.000
	Time was taken to reach the nearest nursery schools before the adoption of the master plan	14					
3	Current time taken to reach the nearest primary school	12	-3	6	-9	361	0.000
	Time was taken to reach the nearest primary schools before the adoption of the master plan	15					
4	Time taken to reach the nearest health facility currently	15	-8	9	-16	361	0.000
	Time was taken to reach the nearest health facility before the adoption of the master plan	23					
5	Time taken to reach the nearest water tap currently for people whose houses are not connected to the water supply line	2	-5	6	-17	361	0.000
	Time was taken to reach the nearest water tap before the adoption of the master plan	7					

Source: Author (2023)

Accessibility of streets in the neighborhood

Therefore, 13.80% of the people surveyed got streets constructed in their neighbourhoods after the adoption of the master plan. Moreover, the analysis showed that people are likely satisfied with the accessibility of streets in their neighbourhoods. Furthermore, the respondents said that the available streets facilitate transportation and serve as connections for enhancing friendship among dwellers between neighbourhoods.

Table 8: Level of residents' satisfaction with availability/accessibility of indicators of urban quality of life

S/N	Variables	Mean satisfaction	Std.
1	Availability and accessibility of pedestrian infrastructure	3	1
2	Availability and accessibility of Streets	3	1
3	Availability of traffic lights	2	1
4	Availability, accessibility and the quality of bus stops	3	2
5	The system of garbage collection	3	2
6	Availability and accessibility of nursery schools	3	1
7	Availability and accessibility of primary schools	4	1
8	Availability and accessibility of health facilities	3	6
9	Availability and accessibility of clear water	4	1
10	Availability of the power of electricity	4	1
11	Availability and accessibility of sewage system	2	1
12	Availability and accessibility of affordable housing	2	1
13	Availability and accessibility of recreational facilities	2	1
14	Availability and quality of administrative offices	4	1
15	Availability of employment opportunities	2	1
16	Availability and accessibility of pedestrian infrastructure	3	1

1=Definitely not satisfied, 2=Unlikely satisfied, 3=Likely satisfied, 4=Very satisfied,5=Excellently satisfied

Source: Author (2023)

In fact, only 4.7% of the surveyed people agreed that traffic lights existed before the adoption of the master plan while 5.3% of the surveyed people agreed that traffic lights are currently available. Hence, there is an increase of only 0.6%.

General Conclusion

The review of literature and the interview with urban planner and local leaders were conducted. It was identified that the key development proposed in Nyarugenge Sector include the Centre Ville Roundabout Redevelopment, Nyarugenge commercial and Heritage Village redevelopment, and the Upper Kiyovu Residential Development. The key developments proposed for Muhima sector include Kigali CBD Phase 1 development as the new CBD which envisioned to house a mix of high-end retail and office spaces, the Nyabugogo Transport Hub and Market redevelopment into an integrated transportation with complementary commercial and office facilities, and the Kigali CBD Wetland development as a wetland park that offers a range of recreational, educational and critical environmental benefits.

Recommendations

As this study has identified challenges that affect the implementation of the Kigali City master plan and their corresponding ways of overcoming these challenges, this study suggests recommendations on strategic interventions for sustainable implementation of Kigali City Master plan. In addition, based on the findings from the household survey about how the implementation of Kigali CityMater Plan is impacting on the living condition of urban dwellers, this study suggests recommendation on how the dwellers' living condition should be well improved through the implementation of the master plan.

References

- [1] Ali, A., Sharafi, H. A., & Ghazanfarpour, H. (2014). Analysis urban life quality, case study residents of Rostam Abad City. *American Journal of Engineering Research (AJER)*, 3(3),322–329.
- [2] Azorín, J. M., & Cameron, R. (2010). The application of mixed methods in organizational research: A literature review. *Electronic Journal of Business Research Methods*, 8(2),95–105.
- [3] Barr, J., Lund, G., Services, F. I., Kironde, E., & Apindi, E. (2017). *Rwanda State of Environment and Outlook Report 2017: Achieving Sustainable Urbanization*. Kigali,Rwanda.
- [4] Berke, P., Backhurst, M., Day, M., Ericksen, N., Laurian, L., Crawford, J., & Dixon, J. (2006). What makes plan implementation successful? An evaluation of local plans and implementation practices in New Zealand. *Environment and Planning B: Planning and Design*.
- [5] Chandler, M. (2000). Ten Steps in Preparing a Comprehensive Plan. *the planning commissionat work*, (39), 9–11.
- [6] Chetty, P. (2016). Importance of research approach in research. *Research Design Strategy*.CNBC Africa. (2018). Kigali City master plan under review. Rwanda.
- [7] Creswell, J. W. (2014). *Research design: qualitative, quantitative, and mixed methods approaches*. SAGE.
- [8] Czapłski, J. (2013). *The quality of life in Poland - winners and losers. Social diagnosis 2013 objective and subjective quality of life in Poland*.
- [9] Dukale, Y. (2012). *Assessment of urban plan and design implementation and management in Ethiopian secondary towns: The Case of Dilla*. Addis Ababa University.
- [10] Faludi, A. (2000). The performance of spatial planning. *Planning Practice and Research*,15(4), 299–318.
- [11] Geraldine, P., FelicioLorelie, C., GrepoVincent, F., ReyesLancelot, C., & Yupingkun. (2015). Traffic Light Displays and Driver Behaviors, 3266–3273.
- [12] Feneri, A. m, Vagiona, D., & Karanikolas, N. (2013). Measuring quality of life (QOL) inurban environment: An integrated approach, (September).
- [13] Garau, C., & Pavan, V. M. (2018). Evaluating Urban Quality: Indicators and AssessmentTools for Smart Sustainable Cities. *Sustainability*.
- [14] Georgiou, J. (2009). Quality of Life Indicators: The Objective-Subjective Interrelationship that Exists within One ' s ' Place of Residence ' in Old Age, 3–20.
- [15] Gilhooly, M., & Gilhooly, K. (2005). Quality of Life: Meaning , Measurement , and Models. Golafshani, N. (2003). Understanding Reliability and Validity in Qualitative Research, 8(4), 597–606.
- [16] Goodfellow, T. (2014). Rwanda's urban transition and the RPF political settlement: Expropriation, construction and taxation in Kigali. *Journal of Eastern African Studies*,8(2), 311–329.
- [17] Government of Rwanda. Law No . 27 / 2001 Relating to Rights and Protection of the Child Against Violence (2001). Rwanda.
- [18] Gwaleba, M. J. (2016). *Improving Tenure Security of Informal Settlements Through Participatory Land Use Planning (PLUP)*. Technical University of Munich.
- [19] Hameed, R., & Nadeem, O. (2008). Challenges of Implementing Urban Master Plans: The Lahore Experience. *International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering*, 2(12), 1297–1304.
- [20] Han, Y., Zhang, Y., & Yang, X. (2016). Analysis on the Differences of Pre-School EducationDevelopment in Western China from the Perspective of Balanced Urban and Rural AreasDevelopment. *Open Journal of Social Sciences*, 4, 115–121.
- [21] Harney, B. (2009). The economics of exclusionary zoning and affordable housing. *StetsonLaw Review*, 38(91), 489.
- [22] Johar, F., Sabri, S., & Yunos, F. (2013). Implementation of the physical development strategyin Iskandar. *Paper Presented in Track E (Development, Policy, and Control) at the 2ndInternational Conference on Regional Development, Semarang (Indonesia)*.
- [23] Kartas, M., & Jütersonke, O. (2012). Urban Resilience in Situations of Chronic Violence CaseStudy of Kigali , Rwanda, (May), 1–39.
- [24] Khaef, S., & Zebardast, E. (2016). Assessing Quality of Life Dimensions in Deteriorated Inner Areas: A case from Javadieh Neighborhood in Tehran Metropolis. *Social Indicators Research*, 127(2), 761–775.
- [25] Kothari, C. . (2004). *Research Methodology: Methods & Techniques*. New Age Internationa (P) Ltd.
- [26] Laurian, L., Day, M., Berke, P., Ericksen, N., Backhurst, M., Crawford, J., & Dixon, J. (2004). Evaluating plan implementation: A conformance-based methodology. *Journal ofthe American Planning Association*, 70(4), 471–480.
- [27] Leather, J., Fabian, H., Gota, S., & Mejia, A. (2011). Walkability and Pedestrian Facilities in Asian Cities State and Issues Walkability and Pedestrian Facilities in Asian Cities. *ADB Sustainable Development Working Paper Series*, (17).
- [28] Mabaso, A., Shekede, M., Chirisa, I., Zanamwe, L., Gwitira, I., & Bandauko, E. (2015). Urban physical development and master planning in Zimbabwe: An assessment of conformance in the City of Mutare. *University of Namibia, Journal for Studies in Humanities and Social Sciences*, 4(1 & 2), 72–88.
- [29] Mayer, C. J., & Somerville, C. T. (2000). Land use regulation and new construction. *Regionaland Urban Economics*.
- [30] McGready, J. (2006). *The Paired t-test and Hypothesis Testing*. The Johns HopkinsUniversity and John McGready.
- [31] Ministry of Infrastructure. (2012). *Public transport policy and strategy for Rwanda*. Government of Rwanda.
- [32] Mishra, A. K. (2012). Urban master plans in Rajasthan, India: the case of Alwar, 4(1), 31–44. Mugisha, J. (2016). Compensation for Land Expropriation in Rwanda: The Need for Conventional Approaches to Valuation. *Journal of Land Administration in EasternAfrica*, 3(1), 296–306.
- [33] Myers, D. (2016). Building Knowledge about Quality of Life for Urban Planning. Niyonsenga, D. (2018). *Assessing public transport supply for Kigali, Rwanda*. University of Twente.
- [34] Nkubito, F. (2016). *Impact of zoning-based planning systems on housing affordability for the urban poor: The case of Kigali city, Rwanda*. University of Manchester.
- [35] Nováková, B., & Šoltés, V. (2016). Quality of life research: material living conditions in the Visegrad group countries. *Economics and Sociology*, 9(1), 282–294.
- [36] Oringo, J. O. (2016). Constraints on research productivity in Kenyan universities: Case studyof university of Nairobi, Kenya. *International Journal of Recent Advances in Multidisciplinary Research*, 3(8), 1785–1794.