REPUBLIC OF RWANDA

ULK POLYTECHNIC INSTITUTE

P.O BOX 2280 Kigali

Website://www.ulkpolytechnic.ac.rw

E-mail: polytechnic.institute@ulk.ac.rw

ACADEMIC YEAR 2023/2024

DEPARTEMENT OF CIVIL ENGINEERING

OPTION OF CONSTRUCTION TECHNOLOGY

FINAL YEAR PROJECT REPORT.

TOPIC: CONTRIBUTION OF GREEN INFRASTRUCTURES (ECO-FRIENDLY PARK) CONSTRUCTION PROJECT IN KIGALI CITY MASTER PLAN IMPLEMENTATION.

CASE STUDY: RWANKUBA VILLAGE/AGATEKO CELL/JALI

submitted in partial fulfilment of the requirements for the Award of advanced diploma in construction technology.

Presented by:

RWUBAKABABIRI Pierre Claver: 202150092

Under the guidance of:

Eng. MUKESHIMANA ANNONCEE

Kigali, October 2024

DECLARATION OF ORIGINALITY

I do hereby declare that the work presented in this dissertation is my own contribution to the best of my knowledge. The same work has never been submitted to any other University or Institution. I, therefore declare that this work is my own for the partial fulfillment of the award of advanced diploma in construction technology at ULK Polytechnic Institute.

The name of candidate: **RWUBAKABABIRI Pierre Claver (202150092)**

Signature of the candidate: ……/10/2024

Date of submission: ……

CERTIFICATION

This is to certify this dissertation work entitled "**Contribution Of Green Infrastructures (Eco-Friendly Park) Construction Project In Kigali City Master Plan Implementation. Case Study: Rwankuba Village/Agateko Cell/Jali Sector/ Gasabo District**" is an original work conducted by RWUBAKABABIRI Pierre Clave **(202150092)** under supervision and guidance of my supervisor.

Supervisor's name **Eng. MUKESHIMANA Annoncee**

Signature of the supervisor ……..……

Submission date…/10/2024

DEDICATION

I dedicate this dissertation work to:

My wife

My family

ACKNOWLEDGMENT

This Thesis has benefited greatly from substantial inputs, guidance and comments from many people and institutions.

First of all, I would like to thank to the Almighty God for giving the wisdom and granting me resources whether financial and non-financial that has made a great contribution to this research project and my education in general.

My gratitude and appreciation to the founder of **ULK**, **Prof. Dr. RWIGAMBA BALINDA**, for the idea and effort of his inspirational education standards.

My deep sense of gratitude and appreciation also goes to my supervisor, **Eng. MUKESHIMANA ANNONCEE** for her encouragement and support throughout this research. Your professional experience and your practical comments from reviews and critics have made my research fruitful.

I wish to express my sincere thanks to the authorities of ULK Polytechnic Institute, in particular the Department of Civil engineering, construction technology option, for their support in terms of knowledge that leads me to the success of the university struggle.

Thanks also to my all classmates and friends for their moral support and invaluable prayers.

May God bless you all!!!

RWUBAKABABIRI Pierre Claver

ABSTRACT

The main objective of the study is to examine the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan implementation. Case study of Rwankuba Village/Agateko Cell/Jali sector/ Gasabo district. The specific objectives were to show the location of Eco-friendly Park in the study area, to document the process of Kigali city master plan implementation and to examine the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan implementation. Researcher showed the location of Eco-friendly Park in the study area in Rwankuba Village.

By doing this, researcher used to show the affected land parcels, project location, topographic map and sections of the project.

According to the research findings, the process of Kigali city master plan implementation are priorities, phasing, and proposal for land resource mobilization, investment strategy and institutional set up 30% of respondents reported priorities as one of the process of master plan implementation, they said that during this step; master plan implementation is classified according to priorities stating which project comes first and then arrange them in sequence order 25% of respondents reported that phasing is step in master plan implementation whereby Master plan implementation projects are put into phases which coincide with the state phase plans 20% of respondents reported that the next step in master plan implementation is proposal for land resources mobilization whereby proposal of how land resources will be used to achieve master plan target is drafted.15% of respondents reported investment strategy, they said that in this stage.

The master plan stakeholders sit together with the private sector and other investors willing to invest in the master plan projects then make the investment strategy.10% of respondents reported institutional set up where by all stakeholders are assigned role and responsibility to perform in according with master plan implementation.

Kigali city master plan implementation provide green infrastructures (Eco-friendly Park) for creating a visitor attraction of international status; diversify the visitor experience in Kigali for overseas visitors and provide major opportunities for environmental education and public

awareness in recreated natural habitats. In addition, Kigali city master plan implementation targeted to focus on community well-being, cultural integration, and affordability. This demonstrates the country's commitment to sustainability and a green future for Rwandans.

Key words:

Green infrastructures;

Eco-friendly Park;

Kigali city master plan implementation.

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

RHA: Rwanda Housing Authority

HR: Human Resource

HRM : Human Resource Management

ULK: Kigali Independent University

UPI: ULK Polytechnic Institute

HOD: Head of Department

TABLE OF CONTENT

CHAPTER ONE: GENERAL INTRODUCTION

1.1. Introduction to the study

The study is about the examining the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan implementation. Case study: Rwankuba Village/Agateko Cell/Jali sector/ Gasabo district. This chapter of general introduction is taken as a research proposal and it provides the background of the study, statement of the problem, purpose of the study, objective of the study, research questions/ hypothesis, scope of the study, significance of the study and lastly the organization of the study.

1.2. Background of the study

Nowadays, the world is facing many environmental concerns, due to the rapid urbanization, concentration of economic activity, and climate change. Some of them are floods, water, and air pollution, urban sprawl, and waste disposal further resulting from unplanned development, competition for space in dense urban agglomerations, and environmental degradation. Rwanda's population is close to 13 million, with an annual growth rate of 2.86%. Its urbanization rate is increasing, and Kigali city is predicted to have the highest population density in the country. The Kigali Development Strategy for 2050 outlines clear green growth targets, including the development of urban recreation areas and green space for its citizens ensuring healthy and environmentally friendly lifestyles.

The Government of Rwanda's (GoR) development vision emphasizes the importance of environmental protection, natural resource management and climate change preparedness (Gakuba, 2012). The GoR has thus embraced a Green Growth strategy for the country. The Government's vision for Kigali's infrastructure, outlined in the Kigali Master Plan, mirrors this country-level strategy of Green Growth. In addition to developing Kigali and Rwanda in a way that secures the country's natural assets, Rwanda is also committed to creating accessible green and open spaces for its citizens and visitors. Rwanda's Vision 2050 outlines a target for 25% of

Kigali City to be turned into recreational spaces, and to create a park in every neighbourhood with 2,000 - 50,000 inhabitant (Kim, 2017).

The Green City Kigali is an initiative led by the Government of Rwanda to address environmental and urban challenges through innovative models of green urbanization. Covering a designated 600-hectare area on Kinyinya Hill, the project aligns with the City of Kigali Master Plan 2050, envisioning an affordable, sustainable urban community for 170,000 to 200,000 residents. The initial phase will focus on a 16-hectare pilot site, planned for 1,700 to 2,000 units through public-private partnerships. The project is a key component of the Rwandan-German Climate and Development Partnership and is supported by the German government through KfW Development Bank with a total financial commitment to date of EUR 40 million. The Green City Kigali Company, a special-purpose vehicle established by the Rwanda Green Fund and the Rwanda Social Security Board, will elaborate the design, deliver infrastructure and procure Private Developers to implement the 16Ha Pilot site. To learn more visit www.greencitykigali.com

Considering different initiative for the beautification of the city, rainwater management, and promotion of green spaces, the list of different green infrastructure that can contribute to the implementation of master plan in Kigali City is limited to the permeable pavement, Tree & Plants, Park as water retention, terracing, Natural Wetland, Rainwater harvesting, Green ditches, Eco Concrete solutions, Uphill forestation. The Green City Kigali Master Plan is built around four key pillars: affordable and socially equitable development, climate change adaptation and mitigation, resource efficiency, and culturally sensitive urban development. It is based on the existing Kigali Master Plan 2050 and outlines the rationale for the creation of a green city.

“The Green City Kigali is one of the Rwanda Green Fund’s flagship projects and we are pleased to see it progress to this stage. It is unique because it tackles environmental and urban challenges while also focusing on community well-being, cultural integration, and affordability. This demonstrates the country's commitment to sustainability and a green future for Rwandans,” said Teddy Mugabo, Chief Executive Officer of the Rwanda Green Fund.

“In the same way that the Green City Kigali Master plan is a result of cooperation between Rwanda and Germany, its implementation will rely on continued collaboration. This includes efforts from

key government institutions, professional bodies, the private sector, civil society, land owners, and the community. We are confident that our partnership with these diverse groups will drive the success of this important initiative," said Basil Karimba, Chief Executive Officer, Green City Kigali Company.

Green space typically refers to land with natural vegetation, including grass, trees, and other plants, that is open and accessible to the public. Green spaces can include parks, walkable streets with trees and plantings, planted lots, and gardens. The benefits of parks in Kigali city are endless from improving our physical and psychological health, to strengthening our communities, and making our cities and neighborhoods more attractive places to live and work. Park ecosystems provide important services such as water and air filtration, and habitat for pollinating species. Moreover, health studies have shown that urban parks positively influence on enhancing the quality of life for people of all ages (Gakuba, 2012). For example, spending time in or near nature lowers blood pressure and cholesterol levels, enhances survival after a heart attack, recoveries from surgery more rapidly, and reduces anxiety and stress, enhances one's ability to function effectively. Also, contacting with natural environments has also been linked to the reductio crime and aggression. Contact with nature significantly improved the symptoms of children with attention disorders and teens with behavioural disorders (Mlotha, 2018).

Furthermore, exposure to nature when engaging in physical activity is shown to increase health even more greatly. Physical activity is an indispensable part of staying healthy, reducing stress, fighting obesity, and preventing chronic conditions that lead to coronary disease, high blood pressure and diabetes. Kigali City parks enable citizens to keep healthy by providing sports facilities and their sports programs. In addition, participating in environmental stewardship activities provides people with the higher levels of health and well-being. Many studies show that volunteering for outdoor stewardship activities increases social connections and greater community cohesion than those not involved (Park, 2011).

Therefore, stewardship activities in Kigali urban parks benefit not only for the park's environment, but also the healthy life of individual and community. The diverse range of recreational programs offered through urban parks adds to the overall quality of life of participants. Kigali urban parks

programs provide a multitude of opportunities to engage in nature, arts, music, and sports for all ages. Especially, urban parks offer children direct motivations to explore, discover, and learn about natural environment. Another benefit from Kigali urban parks for youth is that community recreation programs contribute to building self-esteem and health knowledge, creativity and a sense of efficacy, and leadership skills. In addition, by participating in a variety of social and recreational opportunities, older adults get benefit from the social connections and interactions that are fundamental to their well-being (Imam, 2011).

Green infrastructure refers to interconnected networks of green spaces, including natural, semi-natural, or artificial ecological systems that provide benefits such as storm water management, wildlife conservation, and human recreation. Green infrastructure is a term that can encompass a wide array of specific practices, and a number of definitions exist (see the EPA's definition here). In our view: Green infrastructure is an approach to water management that protects, restores, or mimics the natural water cycle. Green infrastructure is effective, economical, and enhances community safety and quality of life. It means planting trees and restoring wetlands, rather than building a costly new water treatment plant. It means choosing water efficiency instead of building a new water supply dam. It means restoring floodplains instead of building taller levees.

Green infrastructure includes gradual build-up of native forest and human modified forest as it pertains green space for the rural, urban, river and salt water ecosystem that is helpful towards conservation of the nature and natural resources (Naumann et al., 2011). The goal for green infrastructure is the management of the land use system by the ecological restoration and habitat protection. It plays an important role to satisfy the human need and their well-being. It provides human empowerment as well as ecosystem services (Raj et al., 2020; Banerjee et al., 2020).

1.3. Problem statement

Master plan implementation for Kigali city attract businesses and industries to the city through the provision of commercial zones, industrial zones, incentives for investment and parks. Creating parks in Kigali city lead to greater social cohesiveness as the focal point of communities. Parks have long been recognized as key contributors to the aesthetic quality of neighbourhoods by providing green spaces (Kim, 2017). Also, parks in Kigali city play a special role in providing meeting places where community members can interact with each other. Many scholars have

pointed out that nature plays an important role in creating vital neighbourhood spaces that not only bring neighbours together, but that also strengthen neighbourhood social ties (Sullivan et al. 2004).

It is against this background that RWUBAKABABIRI Pierre Claver has identified a need to conduct a feasibility study of eco-friendly Park in line of better Kigali City Master Plan master implementation. This is important because there is no park in around this area while it is an essential foundation for better health, welfare economic productivity, and environmental sustainability and contribute to the master plan implementation in general. This eco-friendly Park is envisaged as a prime example of environmental practice and sustainable development seeking to provide equally for the very varied and potentially conflicting functions of conservation, tourism, education, recreation and economic development.

In so doing, it would create a visitor attraction of international status; diversify the visitor experience in Kigali for overseas visitors and provide major opportunities for environmental education and public awareness in recreated natural habitats (Imam, 2011). This study will help to come up with a clear concept for how an urban wetland recreation and eco-tourism park can be established. The results will be of direct benefit to residents of Kigali especially the residents of Rwankuba Village/Agateko Cell/Jali sector/ Gasabo district and will enable the country to reach their targets for sustainability and health. This eco-friendly Park will represent an example of a sustainable infrastructure project which will be implemented in the context of the Kigali Master Plan. It will be located at Rwankuba Village/Agateko Cell/Jali sector/ Gasabo district in Kigali city. The eco-friendly Park will approximately 6522.678533 m^2.

1.4. Purpose of the study

The purpose of this study is to undertake the various functions such as protection of natural resources and biodiversity; creation of places for recreation; support for economic development opportunities; development of neighbourhood gathering places; promotion of public health benefits; creation of civic and cultural infrastructure; shaping patterns of development through open spaces. In addition to that, this study was undertaken in partial fulfilment of the requirements for the Award of advanced diploma in construction technology.

1.5. Objective of the Study

1.5.1. Main objective

The general objective of this project was to examining the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan implementation. Case study: Rwankuba Village/Agateko Cell/Jali sector/ Gasabo district.

1.5.2. Specific objectives

This project's specific objectives were as follows:

1. To show the location of Eco-friendly Park in the study area.
2. To document the process of Kigali city master plan implementation;
3. To examine the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan implementation

1.6. Research questions

Based on the project's serviceability and functionality, answers to the following research questions were offered in order to fulfil the above particular objectives.

What is the location of Eco-friendly Park in the study area.

What are the process of Kigali city master plan implementation ?

What is the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan implementation

1.7. Scope of study

This study was delimited in terms of domain, space and content due to the scarcity of financial means and time.

1.7.1. Scope in domain

This study was focused on the domain of construction technology.

1.7.2. Scope in space

The research was conducted in Rwankuba Village/Agateko Cell/Jali sector/ Gasabo district in Kigali city. This area is chosen because the researcher hope could get reliable information easily.

1.7.3. Scope in time

In terms of content, this study was carried out in the academic year of 2023-2024.

1.8.Significance of the study

The research helped the people in terms of personal, academic and social interest. This section deals with motives which pushed the researchers to choose and be interested in her/his topic. The study will be important to the researchers, to ULK Polytechnic Institute and to the Rwandan society in general also Government, and to the other researchers.

1.8.1. Personal significance

The study will help the researcher to acquire knowledge and experience on the feasibility study for eco-friendly Park in the implementation of Kigali City Master Plan and it will also help the researcher to fulfill part of academic requirements for acquisition of advanced diploma (A1) in civil engineering, construction technology.

1.8.2. Academic significance

The research will provide a research report available to the library of ULK Polytechnic Institute and also this research will act as references to other future researchers who wish to carryout similar research in their studies.

1.8.3. Social significance

This research will help the society to be aware on the feasibility study for eco-friendly Park in the implementation of Kigali City Master Plan. The results of this study will be helpful to the residents of Rwankuba Village/Agateko Cell/Jali sector/ Gasabo district who will use this eco-friendly Park for environmental education, community interaction, and recreational spaces, conservation, tourism, and economic development

1.9.Research methodology

This section outlines the field of research as well as the various materials, techniques, and processes which were employed to accomplish the study's objectives. Where the case study will be detailed, as well as the architectural, structural design, and cost-estimating processes which will be used. The architectural design of this structure will be provided, Arch CAD 22 software was utilised to create architectural drawings such as Community Gardens, Irrigation Systems, Natural Playgrounds, Minimized Pavement, Native Species, Renewable Energy, Bike Racks, Eco-hut, Children's play area with swing and ides, Walking pathways, benches, flower garden, hedges green tunnel. The 3D model will be exported from the Arch CAD 22 and integrated into Lumion, which generated photorealistic photos of the planned flat. After the architectural drawings will be completed, structural plans will be created. The eco-friendly Park's intended structural plan will include community gardens, irrigation systems, natural playgrounds, minimized pavement, native species, renewable energy. Etab and Prokon structural design software will be utilised in this study.

1.10. Organisation of the research

This work consists of five chapters, where chapter one will be the general introduction, which comprises the introduction of the study, background of the study, problem statement, purpose of the study, the objectives of the study, research questions, scope of the study, significance of the study and the organisation of the study. The second chapter will be the literature review, which will be about the general understanding of the reviews of other researchers with the related studies. The third chapter will be the research methodology and it will focus on the methods and materials to be used to achieve the objectives of the study. The fourth chapter will be the results and discussions and it will be the most important one because it will show the presentation of the results acquired. The fifth one, which will be the last chapter, will cover the conclusion and recommendations with respect to the predefined objectives.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

A literature review is a gathering, ordering, and evaluation of what other researchers have written on a particular topic. A literature review normally forms part of a research thesis but it can also stand alone as a self-contained review of writings on a subject. Sources covered in the review may include scholarly journal articles, books, government reports and Web sites. A few papers, reports, we are reviewed as explained in this chapter

Key terms are words that are present in this research, each word in this research functions a different purpose, which shortens these elements. For instance, feasibility study, eco-friendly, eco-friendly Park, Master Plan, Kigali City Master Plan and Kigali City Master Plan implementation.

2.1.1. Feasibility study

A feasibility study is an assessment of the practicality of a project or system. A feasibility study aims to objectively and rationally uncover the strengths and weaknesses of an existing business or proposed venture, opportunities and threats present in the natural environment, the resources required to carry through, and ultimately the prospects for success. In its simplest terms, the two criteria to judge feasibility are cost required and value to be attained (Sall, 2022). A well-designed feasibility study should provide a historical background of the business or project, a description of the product or service, accounting statements, details of the operations and management, marketing research and policies, financial data, legal requirements and tax obligations. Generally, feasibility studies precede technical development and project implementation. A feasibility study evaluates the project's potential for success; therefore, perceived objectivity is an important factor in the credibility of the study for potential investors and lending institutions.[citation needed][5] It must therefore be conducted with an objective, unbiased approach to provide information upon which decisions can be based (Gakure et al., 2012).

2.1.2. Eco-friendly

Eco-friendly typically refers to a product or activity that is not only environmentally friendly but also sustainable, meaning it does not deplete natural resources or compromise the ability of future

generations to meet their own needs (Irene Jepkorir Ronoh, 2020). Eco-friendly products and activities aim to maintain a balance between ecological, social, and economic factors (Bohlmann & Van Heerden, 2005).

2.1.3. Eco-park

An eco-park is a green open space that is designed and managed with a focus on ecological sustainability and the principles of the Sustainable Development Goals (SDGs). It aims to provide environmental education, community interaction, and recreational spaces while also improving the surrounding environment. Eco parks provide a cognitive break from urban life, improve brain performance, and enhance wildlife and human values. The study found that residents recognize the environmental, socio-cultural, and economic benefits provided by neighborhood parks (Bohlmann & Van Heerden, 2005).

2.1.4. Eco-friendly Park

An eco-industrial park is a community of businesses located on a common property in which businesses seek to achieve enhanced environmental, economic and social performance through collaboration in managing environmental and resource issues. Visiting an eco-friendly park means getting as close to nature as possible. What features should these green spaces have? Here are seven components necessary for environmentally friendly recreation (Gogo & Oluoch, 2017). Eco-friendly parks minimize pavement usage and instead implement more walkways that are natural. These paths may consist of gravel, mulch and other alternatives to avoid the harmfulness of concrete. Eco-friendly parks change the narrative by creating natural playgrounds. The equipment consists of sustainable and biodegradable materials instead of plastic. For example, a play castle could use recycled wood instead of new lumber. These green areas also use trees and nature for recreation instead of manufactured systems. Various components of the eco-park include water body, Eco-hut, Children's play area with swing and ides, Walking pathways, benches, flower garden, hedges green tunnel etc. The eco-park has also been used for practicing yoga and meditation by the local people (Kim, 2017).

2.1.5. Master plan

A master plan is a document and policy guide designed to help communities create a vision of what they want to look like in the future (Haar, 2015). In addition, a master plan is a dynamic long-term planning document that provides a conceptual layout to guide future growth and development (Tims, 2009). Master planning is about making the connection between buildings, social settings, and their surrounding environments. Master plan is a type of urban plan that pertains to the physical development of a city or town over the long term. (Shapiro et al. , 2017). 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).

2.1.6. Kigali city Masterplan

The new City of Kigali master plan 2050 brings flexibility in building and also enhances social inclusion, among others. It indicates nine key integral areas of land use which will define the city of Kigali in the next 30 years. The Kigali City Master Plan includes the Detailed District Master Plans for Nyarugenge, Gasabo and Kicukiro, and was developed to incorporate, harmonise and update all the previous plans and translates the broad long-term strategies into detailed land use and zoning plans to guide the City's urban development (City of Kigali, 2020).

2.1.7. Master plan implementation

Implementation of master plan means the process by which the provided sufficient level of details in master plan are put in action to promote improvements as required for full city or rural development while considering environment protection (Bassett, 2017). The Implementation strategies provide a roadmap for action. It outlines what the city must do to implement the master plan. It provides an approach especially customized to the unique. This part of the master plan is the implementation plan and recommended actions. It sets out the potential projects, programs, policies and strategies to move the master plan towards fruition (Haar, 2015). With an emphasis on governance, the planning and regulatory framework, incentives and financial tools, capital

improvements, as well as other recommended strategies, this document addresses the current conditions of downtown in defining the necessary actions that will advance the long-term vision presented in the guiding framework.

2.2. Concepts of eco-friendly Park

2.2.1. What makes an Eco Park

Eco Parks are large, connected landscapes with high nature conservation and environmental protection ambitions. They are parks which use ecological landscape features to reduce watering and other maintenance while enhancing wildlife and human values. Eco Parks serve as a vehicle for reconnection, and for developing the systems understandings necessary for creative and resilient problem-solving (Kim, 2017). An Eco Park is not just about preservation, but also about restoring nature conservation and a large-scale transformation of both the social and environmental landscapes. Creating an Eco Park begins with an inventory and a tailor-made management plan submitted to local, provincial, and/ or national authorities for termed agreements, depending on location. We live in a world where biodiversity, environmental justice, climate change, habitat protection, and sustainable economic development are both social and environmental needs. When urban eco parks are ecologically designed landscapes, they can create a fertile piece of cultural and educational ground in which sustainability can take root and spread to neighboring communities and to generations beyond (Boland, 2001).

Even though parks developed out of a worldview that sets nature and culture in opposition to each other, they can be managed as systems to help citizens function at their best. Most parks are not very ecological, being based on the English pastoral landscape model, planting and maintaining a non-native and non-adaptive landscape at great expense where it isn't at home. Although the four categories of urban parks (Pleasure Grounds, Reform Parks, Recreation Facilities, and Open Spaces) may look "natural", sweeping green lawns that require huge inputs of water, fertilizer, pesticides, fuel, and labor are not sustainable, self-replicating, or ecological landscapes. Non-native plant species have a more finite life span, demanding high maintenance and frequent replanting (Malpas, 2011).

If instead we tend land from the perspective that humans are part of the integrated ecological reality - that people belong in nature - parks can help us break down the dichotomy between nature and culture. They can become a frame within which social and natural processes are allowed to generate and maintain the form itself. Eco parks speak to what is unique and valuable about a site and a region, where:

- Landscapes have ecological value
- Ecological design reduces resource inputs and waste outputs.
- Eco parks allow us to see and interact with the ecological riches that formal parks hide.
- Ecological and social concerns are in increasing conflation; modelling new expressions of the human relationship to nature provides solutions to both ecological and social problems and concerns.

In Sweden, Eco Parks must ecologically conserve at least 50% of the total area; the remainder can be open to forestry and other sustainable uses. Swedish Nature Reserves are generally 50 to 200 hectares, while Eco Park size averages at about 5000 hectares → legally binding Eco Park agreements with federal government→ wetland restoration, conservation burning, natural reforestation → responsible management of hunting, fishing, foraging, and other harvesting (Gakure et al., 2012)

Evaluation of Success as an Eco Park:

1. What types of habitats are on the property? What is their relative ecological value?
2. How can the park encourage (or require) sustainable human behaviors and well-being? Reduce car dependency? Boost diversity of livelihoods?

2.2.2. Difference between environmentally friendly and eco-friendly

Though they are often used interchangeably, the terms "environmentally friendly" and "eco-friendly" actually have slightly different meanings. Environmentally friendly refers to products or activities that cause minimal harm to the environment, while eco-friendly typically refers to a product or activity that is not only environmentally friendly but also sustainable, meaning it does not deplete natural resources or compromise the ability of future generations to meet their own needs. Eco-friendly products and activities aim to maintain a balance between ecological, social, and economic factors. They often incorporate principles of renewable energy, waste reduction, and

conservation to ensure long-term environmental sustainability. While these two terms are often used interchangeably, there is a subtle difference between them (Sall, 2022).

Environmentally friendly refers to products or activities that do not harm the environment, while eco-friendly focuses on processes and materials that are beneficial to the environment over their entire life cycle – from production to disposal. For example, an environmentally friendly product may be made with recycled materials and strives for minimal environmental impact during its use.

2.2.3. Sustainability of eco-friendly parks

Visiting an eco-friendly park means getting as close to nature as possible. What features should these green spaces have? Here are seven components necessary for environmentally friendly recreation.

1. Minimized Pavement

Pavement makes walking on park paths easier but harms the environment. Sunshine on concrete creates heat islands by warming the surrounding air. This hot air rises into the atmosphere and contributes to global warming. Parks must also consider how water erodes the pavement, leading to cracks and unsafe pathways. Eco-friendly parks minimize pavement usage and instead implement more natural walkways. These paths may consist of gravel, mulch and other alternatives to avoid the harmfulness of concrete. Some experts have suggested solar reflective pavement to decrease heat absorption and improve comfort.

2. Natural Playgrounds

Kids love playing on swing sets, monkey bars and jungle gyms. However, this equipment often contains plastic and metal and harms the environment. Plastic playground toys also release toxins, hurting local water supplies. How can park planners help children have fun while maintaining a safe environment?

Eco-friendly parks change the narrative by creating natural playgrounds. The equipment consists of sustainable and biodegradable materials instead of plastic. For example, a play castle could use recycled wood instead of new lumber. These green areas also use trees and nature for recreation instead of manufactured systems.

3. Irrigation Systems

Rain is natural in most climates, so preparing for it is essential. Environmentally conscious parks take advantage of rainfall through irrigation systems. These mechanisms capture water and use it for drinking or watering plants. They're also helpful in areas with water scarcity, such as the American Southwest.

An effective eco-friendly strategy for parks is to have a rainwater harvesting system. This approach addresses shortages by limiting runoff. An efficient harvesting system could support water fountains and crucial park infrastructure. Research shows this strategy enhances resources and helps groundwater sustainability.

4. Community Gardens

Planning a park with eco-friendly features means emphasizing green wherever possible. Planting trees, flowers, fruits and vegetables is an excellent start for healthier parks. Community gardens let people grow plants and take advantage of fresh food. They also make green spaces look more aesthetically pleasing and increase the sense of community.

Figure 2. 1**: Community Gardens**

Research shows community gardens benefit public health through better physical and social outcomes. They also improve air quality by absorbing carbon dioxide and emitting oxygen. Parks can implement stone walkways inside the garden to help visitors explore the vicinity.

6. Renewable Energy

Outdoor spaces still require energy to support infrastructure like offices, lights and water fountains. Conventional electricity systems get their power from fossil fuels, contributing to environmental harm. What do eco-friendly parks do? These recreational facilities leverage solar and wind energy, ventilation and other innovative techniques. For example, photovoltaic (PV) panels are suitable for keeping lights on. Windy areas like the American Midwest can utilize turbines to power parks.

Electric vehicle (EV) chargers are another eco-friendly practice in parks. These systems encourage people to bring zero-emission cars and limit their environmental impact. The future of parks could see wireless EV charging, increasing convenience and safety for drivers.

7. Bike Racks

Increasing sustainability in parks should include inclusivity for all transportation types. Some visitors choose not to drive or ride transit, opting instead for cycling or walking. Eco-friendly facilities should consist of plentiful space for safe walking and bike riding. Promoting these methods helps visitors feel more secure inside and outside the vicinity.

Some may want to ride bicycles to the park but walk inside it. Eco-friendly parks should implement bike racks to encourage cycling instead of driving. The public area would also benefit from bike loops to create designated paths for riders (Safkaur & Sagrim, 2019).

5. Native Species

While gardens are functional, parks should ensure these areas are safe for plants. Native species should be the only selections for the garden because they're best for the environment. Invasive species can ruin parks by stealing nutrients from existing plants. Therefore, indigenous flowers might not grow sufficiently and risk extinction.

For example, some American parks have planted Japanese honeysuckles for their aesthetics. However, their vines deprive and smother surrounding vegetation, making it dangerous for gardens.

2.2.4. Examples of Eco-Friendly Parks Worldwide

Greener spaces have been a priority for cities and countries worldwide. These six eco-friendly parks set the standard for creative and sustainable planning.

1. La Mexicana Park

Head to Mexico City to see La Mexicana Park for an excellent urban green space. This park is in the city's southwest corner and is a sustainability crown jewel. La Mexicana Park features over 2,500 trees and 70,000 square meters of grass for visitors. It is also a haven for wildlife, as ducks and migratory birds are present here (Sall, 2022).

Figure 2. 2**: La Mexicana Park**

Source: Parque La Mexicana

While the green space stands out, La Mexicana Park excels with conservation features. For example, the park features a rainwater collection system to provide facilities with water. The mechanism redistributes rainwater for irrigation and cleaning purposes, emphasizing conservation. La Mexicana Park only produces potable water for its drinking fountains (Zaccheaus et al., 2023).

2. Abraham Ledeboerpark

The Netherlands excels in sustainability with locations like Abraham Ledeboerpark. This recreational area just north of Enschede provides environmental education for locals and tourists with excellent management. You may see students studying or walking their dogs. The park gets its name from Abraham Ledeboer, a textile industry professional from Enschede.

Figure 2. 3**: Tubantia**

Abraham Ledeboerpark

Abraham Ledeboerpark features a lake, mature trees and relaxing green spaces for walking. Park officials have restored trees and walking paths after heavy storms to foster sustainability. Abraham Ledeboerpark's efforts have earned a Green Flag Award, denoting its eco-friendly practices (Wibowo, 2009).

3. Roma Street Parklands

Brisbane, Australia, is famous for the Gold Coast but also has an excellent eco-friendly park. This city prides itself on Roma Street Parklands north of the Brisbane River. This Green Flag Award winner showcases what sustainability efforts can do.

This park offers lakes, a children's playground and other fun features. Free guided tours will take you around the park, exploring all the green spaces. The Spectacle Garden is a local favorite because of its colorful flowers and artwork year-round. You also get open space to run around and relax on green grass (Egide & Kengere, 2023).

Figure 2. 4**: Greener Spaces Better Places**

Figure 1: Greener Spaces Better Places

Roma Street Parklands is relatively new, opening to the public in 2001. With the 2032 Olympics coming, Brisbane is helping the park's transit options. Local leaders are developing an underground station to reduce car dependency and traffic here.

4. The Eden Project

Southwest England contains one of the U.K.'s most significant sustainable efforts — the Eden Project. This park sits north of St. Austell and is just a short drive from the English Channel. The Eden Project is an environmental charity aiming to educate the public on

sustainability. Originally a clay pit, this facility features multiple domes with thousands of plants. Each dome has different biomes featuring climates you see worldwide. For example, the outdoor gardens, rainforest and Mediterranean biomes differ in temperature and humidity. The English attraction also displays a botanical garden with native plant species (Sall, 2022).

A rainwater collection system provides irrigation, so municipal water is only for people. Additionally, the facility leverages solar power and geothermal energy to ensure adequate heat.

5. Gardens by the Bay

Gardens by the Bay is a sizable nature park overlooking the Singapore Strait. Singapore is famous for sustainable design, and you see it here. The park uses innovative methods to decrease energy consumption to cool plants and visitors.

Figure 2. 5**: Green Roofs**

For instance, the air domes use dehumidifiers to lessen cooling needs. Advanced glass panels reduce solar heat gain while ensuring plants get enough sunlight. The facility also uses biomass for energy production when chilling underground water pipes.

Eco-friendly parks are at the heart of Gardens by the Bay. However, the star of the show might be the super trees(Claude, 2022). These spectacles reach up to 50 meters high and light

up the sky at night. The trees utilize audio speakers and harvest solar energy to ensure sustainability.

6. Discovery Green Park

Parks showing eco-friendly features are also in the United States. Head to Houston, Texas, for its 12-acre Discovery Green Park. This downtown urban green area utilizes recycled materials and ethically sourced wood from sustainable forests to reduce its environmental impact.

2.2.5. Benefits of a Sustainable Park

Parks are beneficial to communities because they create a space for community members to congregate safely and enjoy nature; kids can play under their parents' watchful eye and community members can improve their health with equipment, all within a relaxing environment. For your community to reap the benefits of parks and recreation areas fully, these places must have attractive designs, accessible amenities and play areas for everyone. Learn about the importance of parks and playgrounds and how they can be beneficial additions to your community.

Eco parks provide several benefits for the residents of a city. They contribute to the principles of sustainable development by creating a closed industrial loop and promoting self-sufficiency in energy consumption and waste recycling. Eco parks also offer cognitive breaks from the demands of urban life, improving brain performance and reducing mental exhaustion. In addition, eco parks have important ecological functions, such as softening the microclimate and increasing air humidity, which can enhance the overall environmental quality of the city. Furthermore, eco parks provide various ecosystem services, including environmental, socio-cultural, and economic benefits, such as social inclusion, health promotion, and urban renewal. These parks also play a role in preserving environmental resources and providing a clean environment free of pollution, contributing to the long-term economic success of the city. Overall, eco parks offer a range of benefits that improve the quality of life for city residents.

The benefits of parks make them irresistible to surrounding residents. In urban areas, community parks may be one of the only options for residents to enjoy nature and be active. In addition to the variety of amenities, community playgrounds and parks are beneficial in many other ways:

- Contribute to community identity
- Provide active and passive recreational opportunities
- Appeal to all ages
- Contribute to the health and wellness of a community
- Create valuable green space

Parks are beneficial to humans for many reasons, and they are also beneficial to native plants and animals. Especially in urban areas like cities, parks are an effective area to encourage native flora and fauna to grow. This will make the area more inviting and safe for wildlife to enjoy, as well.

2.2.5.1. Environmental Benefits of a Sustainable Park

Parks—and especially urban parks—play a crucial role in establishing a place for conservation and environmental stewardship. One of your local park's most important jobs is not only to provide a safe place for leisure and outdoor activities, but when a sustainable park is established, some of the benefits include:

- Sequestering carbon dioxide and improving air quality;
- Reducing pollutants and sediment runoff from storms;
- Replenishing aquifers with freshwater;
- Protecting natural wildlife habitats;
- Promoting natural biodiversity and providing places for native plants, animals, and insects to flourish;
- Lowering the ambient temperature of nearby neighborhoods;
- But how does it accomplish this? There are many innovations that help assist in these efforts.

2.3. Concept of master plan implementation

This section contains different literatures that have been conducted on master plan implementation. This section was done by using different lectures such as books, journals and websites.

2.3.1. Master plan implementation in other countries

Bangladesh has an aspiration to become a high-income country by 2041. To achieve the VISION, the government of Bangladesh prepared a master plan (Chaudhury, 2018). That master plan defines the intended goal and "five key viewpoints" that are to be kept in mind by all the members who are involved in the realization of the goal: 1) Enhancement of imported energy infrastructure and its flexible operation; 2) Efficient development and utilization of domestic natural resources (gas and coal); 3) Construction of a robust, high-quality power network; 4) Maximization of green energy and promotion of its introduction; 5) Improvement of human resources and mechanisms related to the stable supply of energy (Rahman, 2016). The Bangladesh master plan is being implemented starting at governmental level to district level with the intervention of private sector and citizen participation (Mia et al., 2015).

In Nigeria, the National ministry of Infrastructure established master plan for infrastructure development. The master plan of Nigeria is blue-print for boosting and modernizing the nation's stock of infrastructure, over the next 23 years (Wapwera & Egbu, 2013). The document was first drafted in 2012 and approved in 2014. Ever since, the Federal Government had followed through the implementation of the plan with varying degrees of success (Bassett, 2017). Amongst others, Government had set up the Infrastructure Delivery Coordinating Unit (IDCU) within the Infrastructure Department of the Federal Ministry of Finance, Budget and National Planning in line with the NIIMP framework to coordinate the implementation of the Programme (Ubani et al., 2014).

2.3.2. Master plan implementation in Rwanda

The Government approved the Rwanda National Land Use Development Master Plan in 2010 and other urban and human settlement planning tools (Hitayezu et al., 2018**)**. Since then these tools have been the sources of guidance for land use and spatial planning, land use zoning and efficient use of land in Rwanda (Antoine & Sinining, 2014**).** The revised Master Plan is projected to 2050 and will guide the growth and development of Kigali for the next 30 years (Antoine & Sinining, 2014**).** However, this being a dynamic document that has to respond to the ever changing social-

economic dynamics, it will be reviewed and updated periodically to ensure that the Master Plan grows as we all grow. The most important aspect of the Kigali Master Plan is to provide a road map for Kigali's future growth. The Masterplan guides changes in the City over the long term and gives physical form to its strategic vision and values (Twagirayezu, 2022). The Kigali City master planning process has provided the City tools to anticipate changes and pre-empt the solutions. The resulting master plan enables the City to make informed decisions about how the government's economic resources need to be utilized ensuring the development and growth best serve the City's population. It is estimated that in 2018 Kigali has a population of 1.5million which is projected to grow to a 3.8million in 2050 (Uwizeyimana, 2019).

2.3.3. Process of master plan implementation

The process of master plan implementation is based on 5 stages which are priorities, phasing, proposal for land resource mobilization, investment strategy and institutional set up (Tian & Shen, 2011).

1. **Priorities**

In this stage master plan implementation is classified according to priorities stating which project comes first and then arrange them in sequence order (Szuster & Dietrich 2014). Classify various projects identified as a part of development proposals by priority as under: essentials (Top priority), necessary (2nd priority), acceptable and desirable (3rd priority), deferrable (4th priority) (Haar, 2015).

2. **Phasing**

Master plan should advisably be in phases of 5 years to coincide with the state five-year plans. The targets set for each phase can be assessed as the mid-term review against the achievements at the end of each phase. For greenfield area phasing could include a 'zero' period for approvals, institutional set-up, initial land pooling and revisiting any strategy (Todes et al., 2010).

3. **Proposal for Land Resource Mobilization**

Implementation mechanism in which proposal of how land resources will be used to achieve master plan target is drafted. It is detailing approaches for land polling and development in lines with the suggested mechanism in the master plan perspective plan (Nguyen et al., 2021).

4. **Investment Strategy**

In this stage the master plan stakeholders sit together with the private sector and other investors willing to invest in the master plan projects then make the investment strategy. The Proposals for fiscal resource mobilization including (Spence, 2019)

5. Institutional Setup

In this stage all stakeholders are assigned role and responsibility to perform in according with master plan implementation. In addition, clearly provide Stakeholders' role and responsibility and organization chart (Hossain et al., 2015).

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Introduction

This chapter describes in details the various research methods that used by researcher in the course of the project. To accomplish the research project, a combined methodology approach which includes the qualitative and quantitative methods used to attain the objectives of the research project

3.1.1 Location of the site

This Fig.1 shows the site location which located in Rwankuba Village/Agateko Cell/Jali sector/ Gasabo district. The site where projected should be implemented had enough space needed, has access to water, has access to electricity and it has the road used by users.

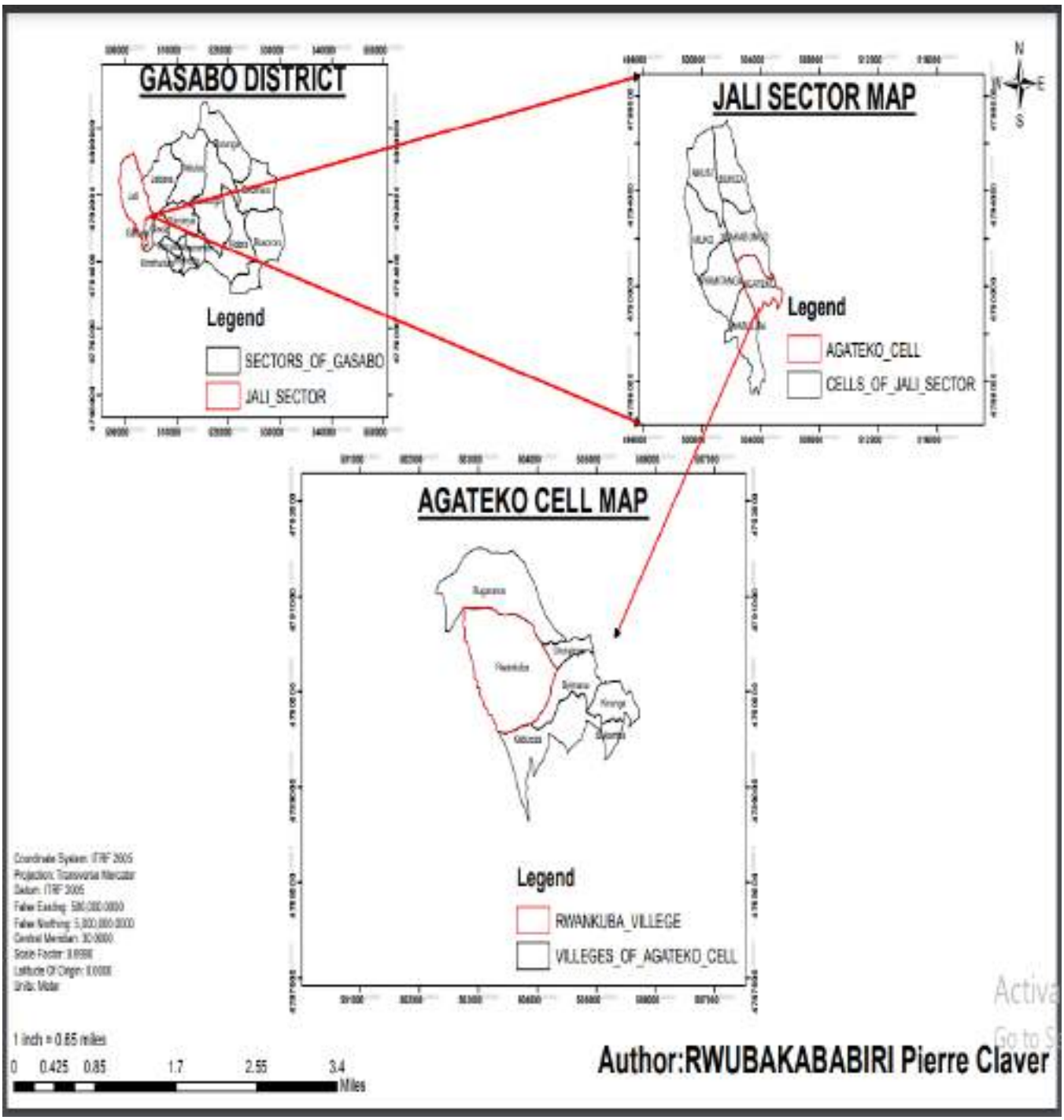

Figure 3. 1**: Map showing location of the study area**

3.2. Study population

The study population is a set of people, services, elements and events, group of things or households that are being investigated or that a research is concerned (Morrison, 2010). The population size for this study was the total people of Jali sector. Jali sector has 41,156 Population [2022] – Census, 37.37 km² Area, 1,101/km² Population Density [2022] and 5.1% Annual Population Change [2012 → 2022]

3.3. Sampling techniques and sample size

This section highlights sampling techniques used to pick the sample from a larger population and simple size used in this study

3.3.1. Sampling technique

Sampling techniques provides a range of methods that help to reduce the amount of data to be collected by considering only data from subgroup rather than all possible case elements (Saunders, et al., 2016). Sampling technique is the methodology that is used to select the sample from a larger population (Berg, 2009). For the purpose of this study, respondents were selected using simple random sampling technique. A simple random sample (or SRS) is a subset of individuals (a sample) chosen from a larger set (a population) in which a subset of individuals are chosen randomly, all with the same probability. It is a process of selecting a sample in a random way. In SRS, each subset of k individuals has the same probability of being chosen for the sample as any other subset of k individuals. Simple random sampling is a basic type of sampling and can be a component of other more complex sampling methods.

3.3.2. Sample size

Sample size is the unit that is selected during the process of sampling. If the researcher needs to draw a conclusion valid for the whole study population, should draw a sample in a way that it is representative of that population (Malhotra & Birks, 2006). For examining the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan

implementation. Case study: Rwankuba Village/Agateko Cell/Jali sector/ Gasabo district, the researcher selected respondents randomly. Under this research, the sample size was obtained from 41,156 people of Jali sector, and it was calculated using the Yamane's formula.

$$n = \frac{N}{1 + Ne^2}$$

Where:

n: represents the sample size

N: represents the number of households

e^2: represents the sampling error which is equal to 10%, around (0.1)

$$n = \frac{41{,}156}{1 + 41{,}156\ (0.1)^2}$$

$$n = \frac{41{,}156}{412.56}$$

n = 99.75761101415552≈ 100 respondents.

3.4. The used methods

The methods used in this dissertation research were based on interview and questionnaires which were given to the people of Agateko cell as well as Jali sector in order to know more information about the project and also site observation method was used in order to know enough information about the study area.

3.4.1. Interview technique

The interview can be defined as face-to-face conversation between an interviewer and the respondent, conducted for the purpose of obtaining information (Leedy & Omrod, 2015). The researcher made a set of questions known as interviews guide to be asked to the local authorities in Jali sector in order to collect information related to the location of Eco-friendly Park in the study

area, the process of Kigali city master plan implementation and the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan implementation.

3.4.2. Site observation method

Observation was way of gathering data by watching behaviour, events or physical characteristics in their natural setting on site. Observation will be the one of the most effective tools to analyse the site and discovers the functioning of the system in this project site observation will be used to gain enough information about the study area to know if the proposed area of construction is suitable to be constructed and to know if that area has the access to road, electricity and water.

3.4.3. Questionnaire technique

Questionnaire is a set of questions which are asked to get information from a respondent. It is a set of questions prepared by the researcher to be distributed to a particular sample (Orodho & Kombo, 2002). A questionnaire was designed and pre-tested before the researcher submits it to the selected respondents. A questionnaire was designed and pre-tested before the researchers submit it to the selected respondents. The questionnaires comprised both close-ended and open ended questions. The researchers used information obtained via questionnaires in order to make an efficient analysis. In the present study, the researcher submitted the questionnaires to the people of Jali sector in order to get the data related to the location of Eco-friendly Park in the study area, the process of Kigali city master plan implementation and the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan implementation.

3.4.4. Documentary review

The documentation is research tool which focuses on the systematic searching from any written documents which are relevant to the field of the research (Sekaran, 2005). With this method, various written documents containing information related to the topic under study were reviewed. Among those documents, include dissertations from ULK Polytechnic Institute main library, Jali Sector, REMA, Kigali City and Rwanda Housing Authority reports, journals and other important documents relevant to the location of Eco-friendly Park in the study area, the process of Kigali city master plan implementation and the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan implementation.

3.4.5. Participatory Rapid Appraisal (PRA)

The case study is not a method in itself; rather it is a methodological approach or strategy involving several methods (Roy, 2003).The case study is one of the strategies of inquiry used in qualitative research. This study employed a single-case exploratory case study approach as described in Yin (2003). The case study approach will be appropriate for this study, as it addresses a contemporary phenomenon that is heavily context dependant (Yin 2003). The case study is a form of social science study that seeks, through concentrated inquiry into a specific entity or case, to further understanding of complex phenomena (Yin, 2003). In this study, several methods will be used. First of all, the study is a case study of Rwankuba Village/Agateko Cell/Jali sector/ Gasabo district. The case study's unique strength is its ability to deal with a variety of evidence, including existing documents, archival records, interviews, observation and physical artefacts (Yin, 2003)

Like case study strategy, within PRA, a series of data collection methods will be used. For the purpose of Rwankuba Village case study, specifically for our case, participation was intended to generate ideas and identify attitudes from focus groups discussions with local residents, interviews with key informants like professionals and workshop. Also, existing documents such as aerial photographs, satellite images, maps, legal texts like laws, decrees and policy texts; transect walks and observation, focus group discussions, interviews are most heavily relied upon. The use of two or more study strategies is discussed by Esterberg, who states that using multiple strategies usually ensures a strong study framework (2002:37). Furthermore, empirical study can be useful and progressive in so far as it is employed together with theory and tested by logical inquiry (Yin, 2003).

3.5. Instruments and materials used at field and their functions

The equipment or instruments used at the field are different and each have its function, then all of those are in the table below.

Table 3. 1: Material, Tools, Equipment and Function

EQUIPIMENT, TOOLS AND MATERIAL	FUNCTION
1. Spectra precision GNNS ROVER	For establishment of bench mark and detail data collection, verification and implantation
2. Leica total station	For detail surveying and control surveying during field data collection
3. Dumpy level	Used in vertical control in establishment of a benchmark
4. DGPS	For navigation and localization of the field
5. Note book	For recording description and remark
6. Anticorrosive paint	Used for marking where there is a bench mark and chain age PK board and peg
7. Tape measure	Used for measure a small distance
8. Nail	Used us a monument in station mark
9. Pegs and ranging rood	Used for delimitation and demarcation of all right way that a project will take place
10. Smart phone	Used for communication and taking a picture of report during field data collection

The main challenge of such a process is to adapt the theoretical formulations to the wide range of conditions that occur in the field. These diverse field conditions must be taken into account in a traffic analysis methodology. The only distinction is that, because the two-lane highway analysis methodology considers both directions of traffic flow for the analysis of each travel direction, Peak Hour Factor should be calculated for both directions of traffic flow combined**.** (Wooldridge M F. K., 2003.)

Excessive blasting, cutting, side tipping of spoil and concentrated or uncontrolled surface water runoff negatively affect the environment and can lead to instability and erosion. Although many of these effects are often unavoidable, the design and the construction method adopted shall aim to minimize them. For studying and selecting suitable alignment corridors, a detailed analysis based on topographic maps, aerial photographs, geological maps, hydrological maps, land use and land cover maps and the like should also be reviewed (Wooldridge M F. K., 2003.)

3.6. Data Processing

ArcGIS 10.8.1 software was utilized to analyse a spatial location and decision making after buffering the delimitation area and to prepare the administrative map of the study area and the map of the output of the research; Microsoft Word and Excel 2016 was used to write the report. ArcGIS software for

CHAPTER IV: RESULTS AND DISCUSSION

4.1. Introduction

This chapter defines the results, findings, and discussions that were founded. The intention of the results and discussions is to examine the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan implementation. Case study of Rwankuba Village/Agateko Cell/Jali sector/ Gasabo district. It consists of the following: social demographic data of the respondents, location of Eco-friendly Park in the study area, the process of Kigali city master plan implementation and the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan implementation.

This subsection presents the social demographic data of the respondents by age, sex, level of education and employment status, in fact that respondents have given precise information, SPSS version 25.0 was used for analysis and the results are displayed in tables, and bar graph.

4.1.1. Identification of surveyed respondents by Age

Figure 4.1 is a bar graph that depicts the age of the respondents. It was observed that; 40% respondents were at the range of 21 to 35 years of age, 30%respondents were at the range of 36 to 49 years of age, 25% respondents were at the range of 50 to 63 years of age and 5% respondents were at the range over 63 years old.

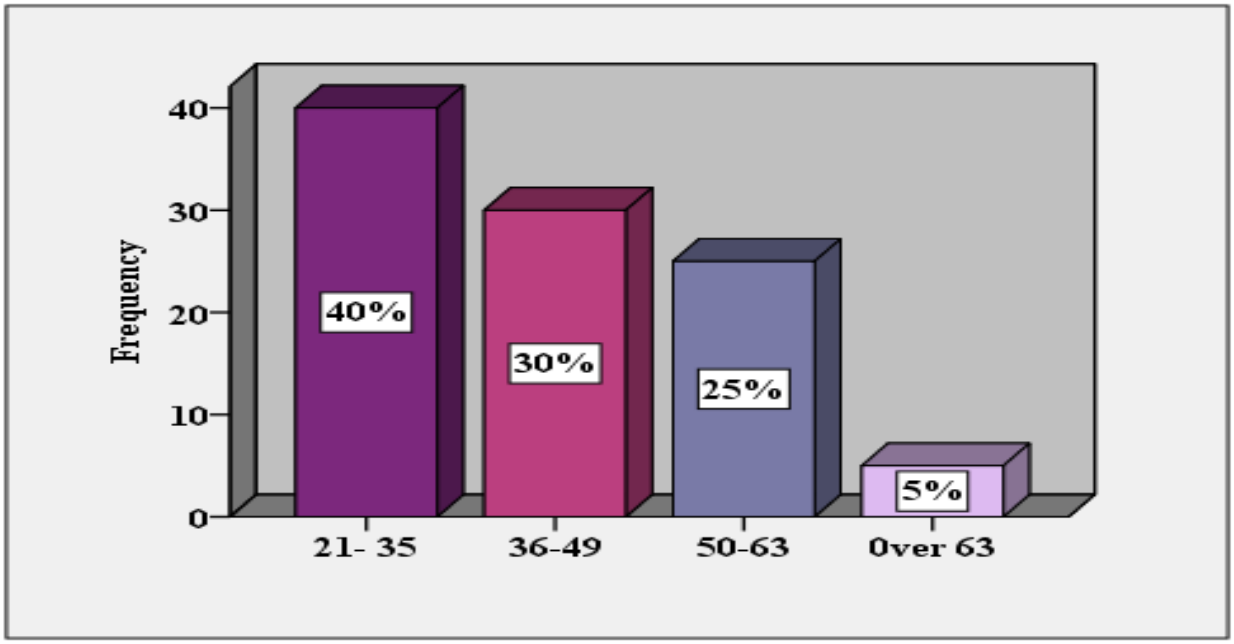

Figure 4. 1: Age by respondents

4.1.2. Identification of surveyed respondents by gender

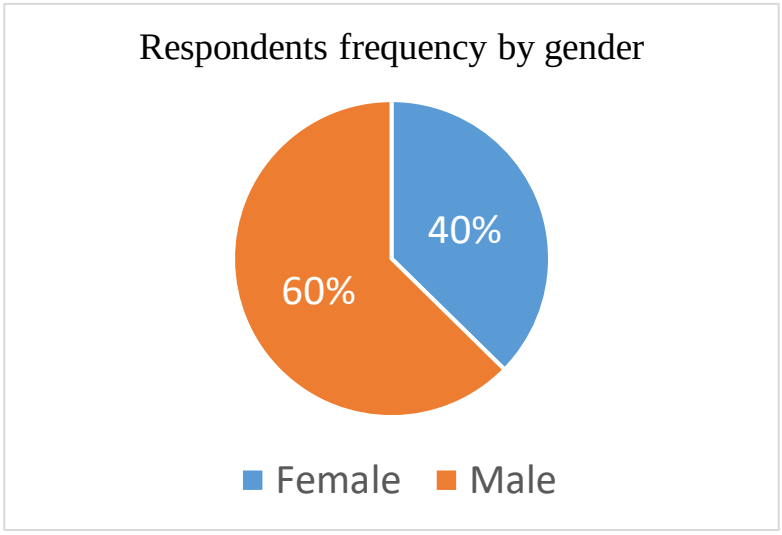

Figure 4. 2**: Respondents by gender**

Figure 4.2 presents the respondents by gender. The surveyed respondents under this study were given equal opportunity where both male and female participated actively in providing responses. There was enough freedom to the respondents in answering the research questions. 40% of respondents were female, while 60 % of respondents were male. The researcher surveyed the respondents according to their gender in order to make comparison between male and female participation in this survey. The results show that a large number were male with 60% of respondents, because the questions asked were not gender sensitive. The difference in number between man and women doesn't have any significance.

4.1.3. Identification of surveyed respondents by marital status

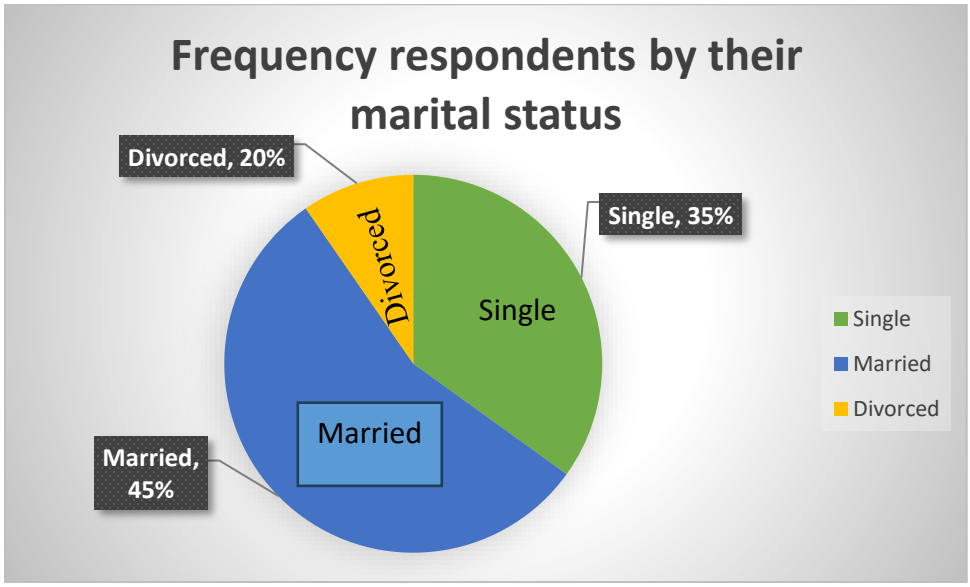

Figure 4. 3**: Respondents by marital status**

Figure 4.3 illustrate respondents by marital status. In this study, 20% of respondents were divorced, and 45% of respondents were married, while 35% of respondents were still single. The researcher surveyed respondents in relation to their marital status in order to investigate the level land investment among different marital status. The results show that the married peoples invest in land at high level than single and divorced ones. This is because most of single people are interested in real estate investment for business or other reasons.

4.1.4. Level of education

Table 2 depicts the level of education of the respondents. It was observed that; 45% respondents have bachelor's level of education, 30% respondents have secondary level of education, 20% have master's degree and 5% have PhD.

Table 4. 1: level of education of the respondents

Level of education		Frequency	Percent
	Secondary level	30	30
	Bachelor degree	45	45
	Masters	20	20
	PhD	5	5
	Total	100	100

4.2. Presentation of the results and findings

This section contains presentation and interpretation of the results and findings, which helped to achieve the specific objectives and research questions of this study. It includes the results and findings obtained from the surveyed respondents about the location of Eco-friendly Park in the study area, the process of Kigali city master plan implementation and the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan implementation.

4.2.1. Location of Eco-friendly Park in the study area in Rwankuba Village

In this section, researcher showed the location of Eco-friendly Park in the study area in Rwankuba Village. By doing this, researcher used to show the affected land parcels, project location, topographic map and sections of the project

Figure 4. 4**: Project affected UPIs**

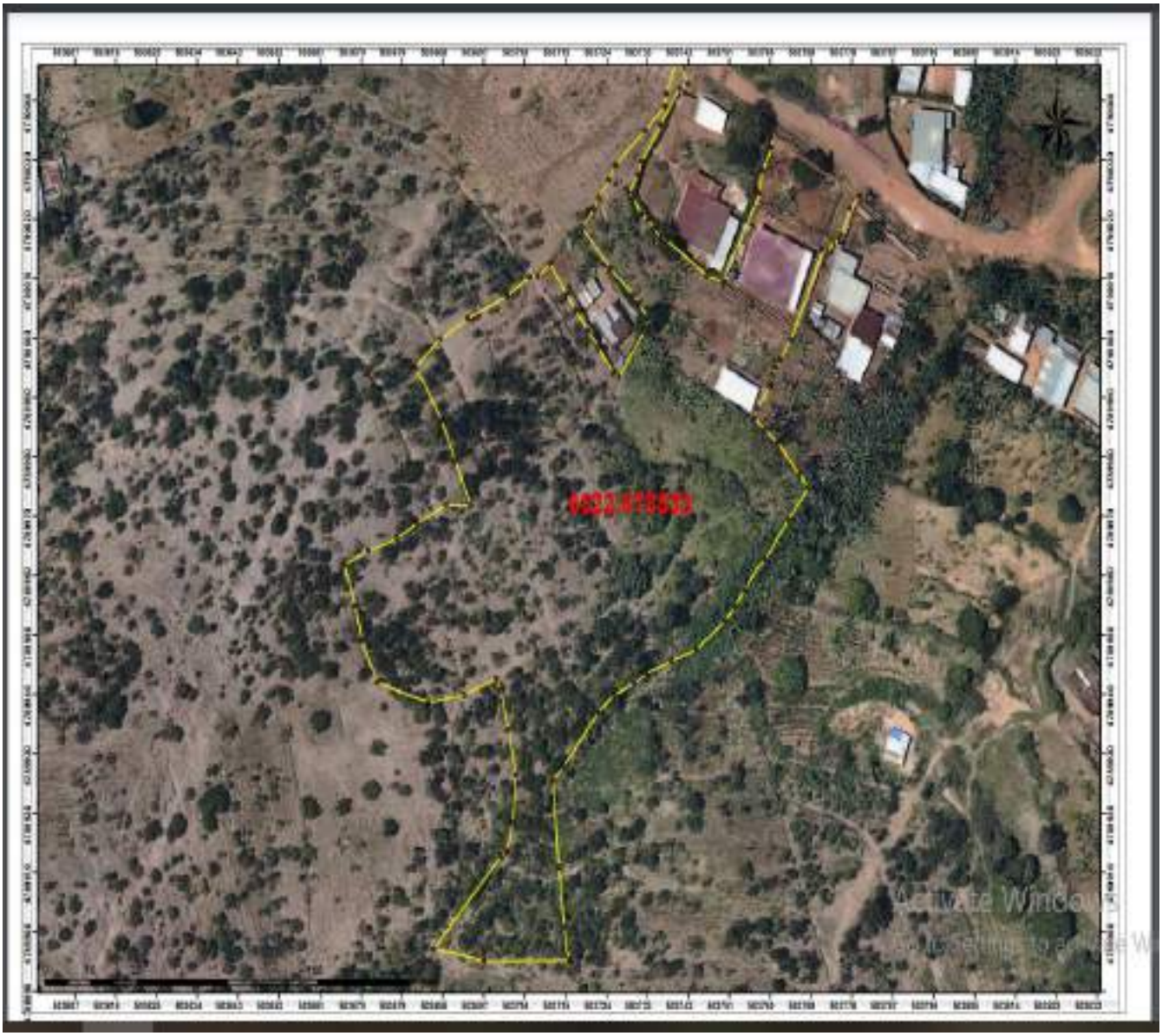

Figure 4. 5**: Project location**

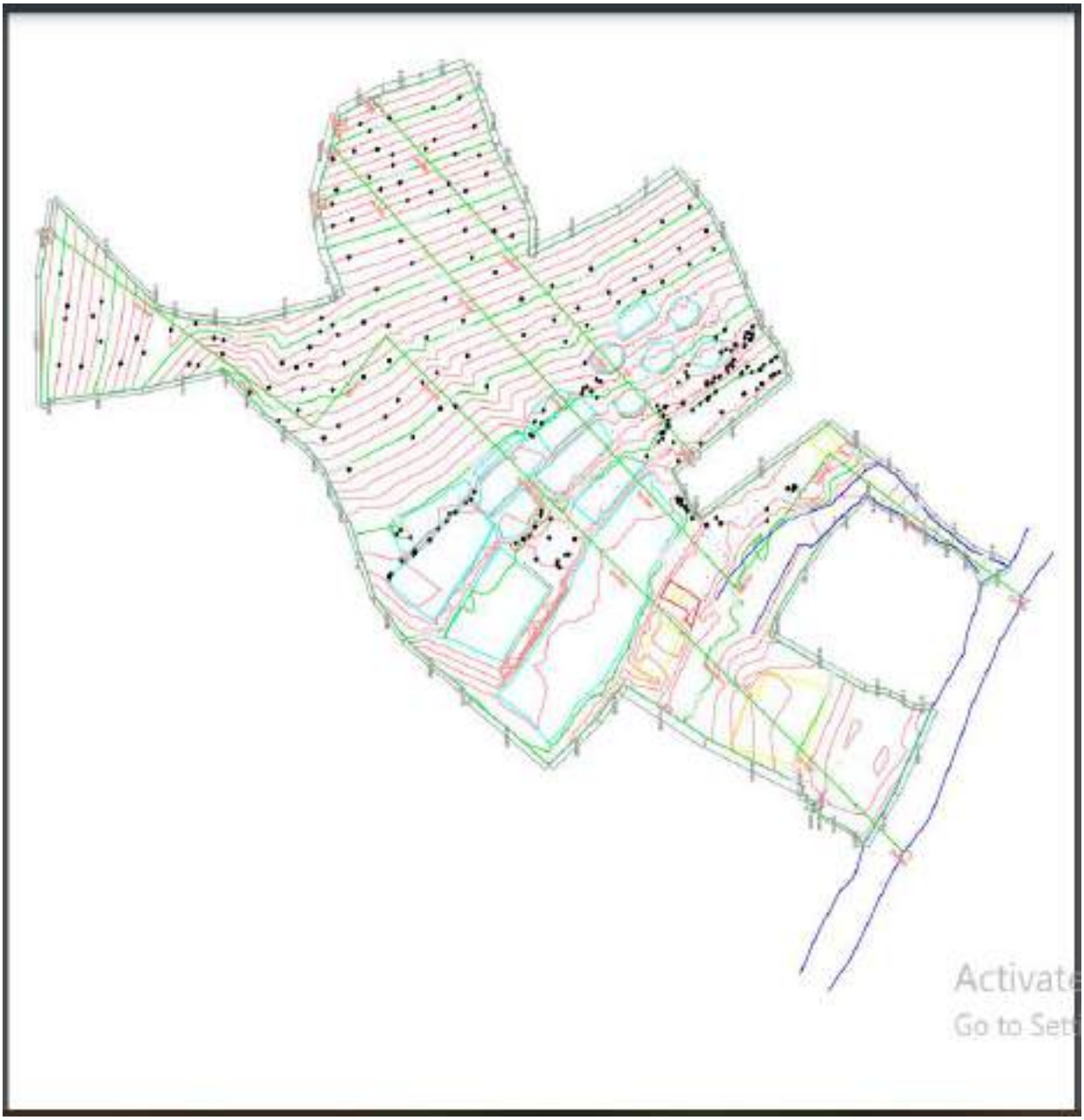

Figure 4. 6**: Topographic map of the study area**

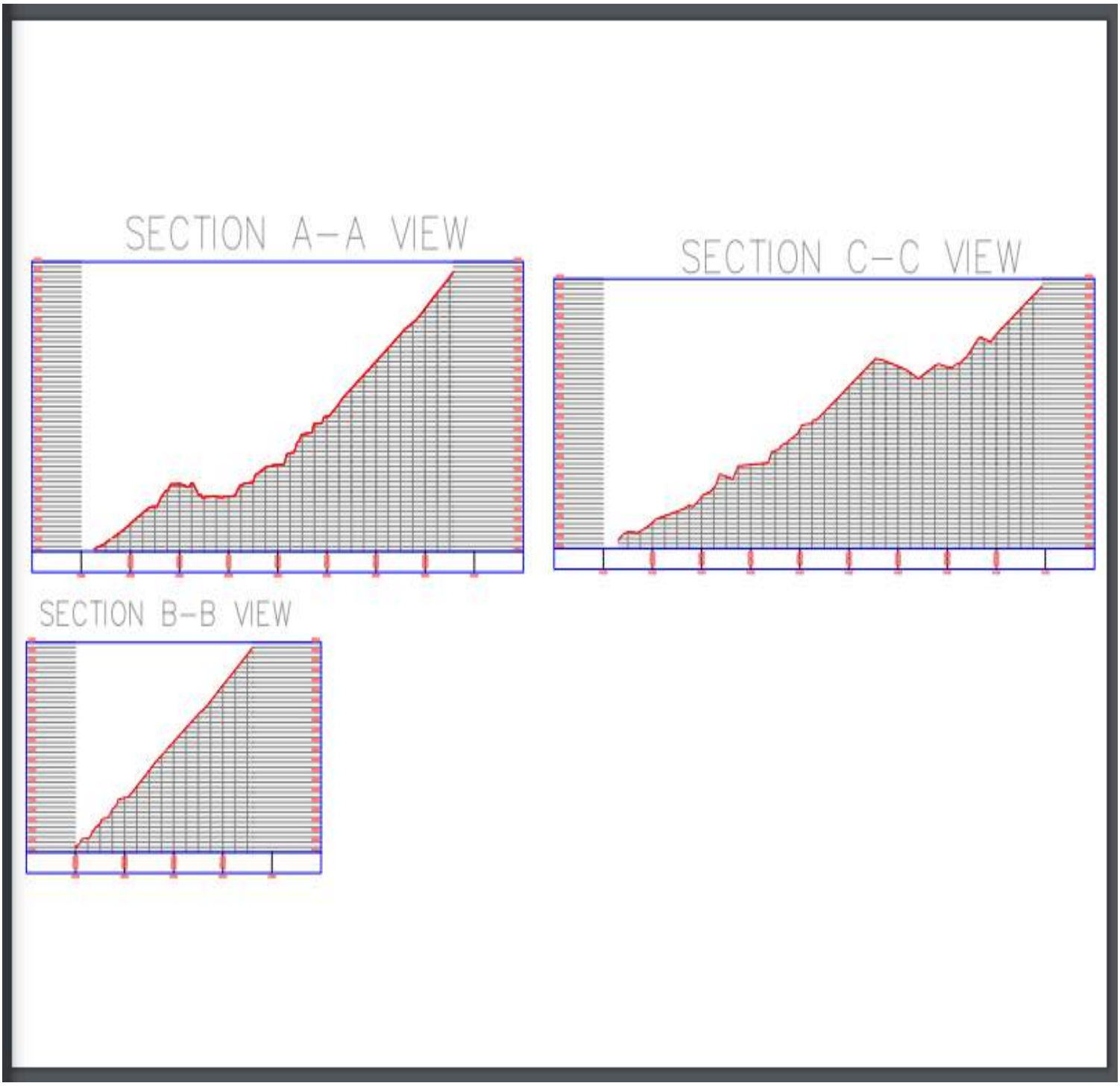

Figure 4. 7**: Sections of the project**

4.2.2. The process of Kigali city master plan implementation.

According to the research findings, the process of Kigali city master plan implementation are priorities, phasing, and proposal for land resource mobilization, investment strategy and institutional set up. The chart below has been formed in order to present well the gathered information as discussed above.

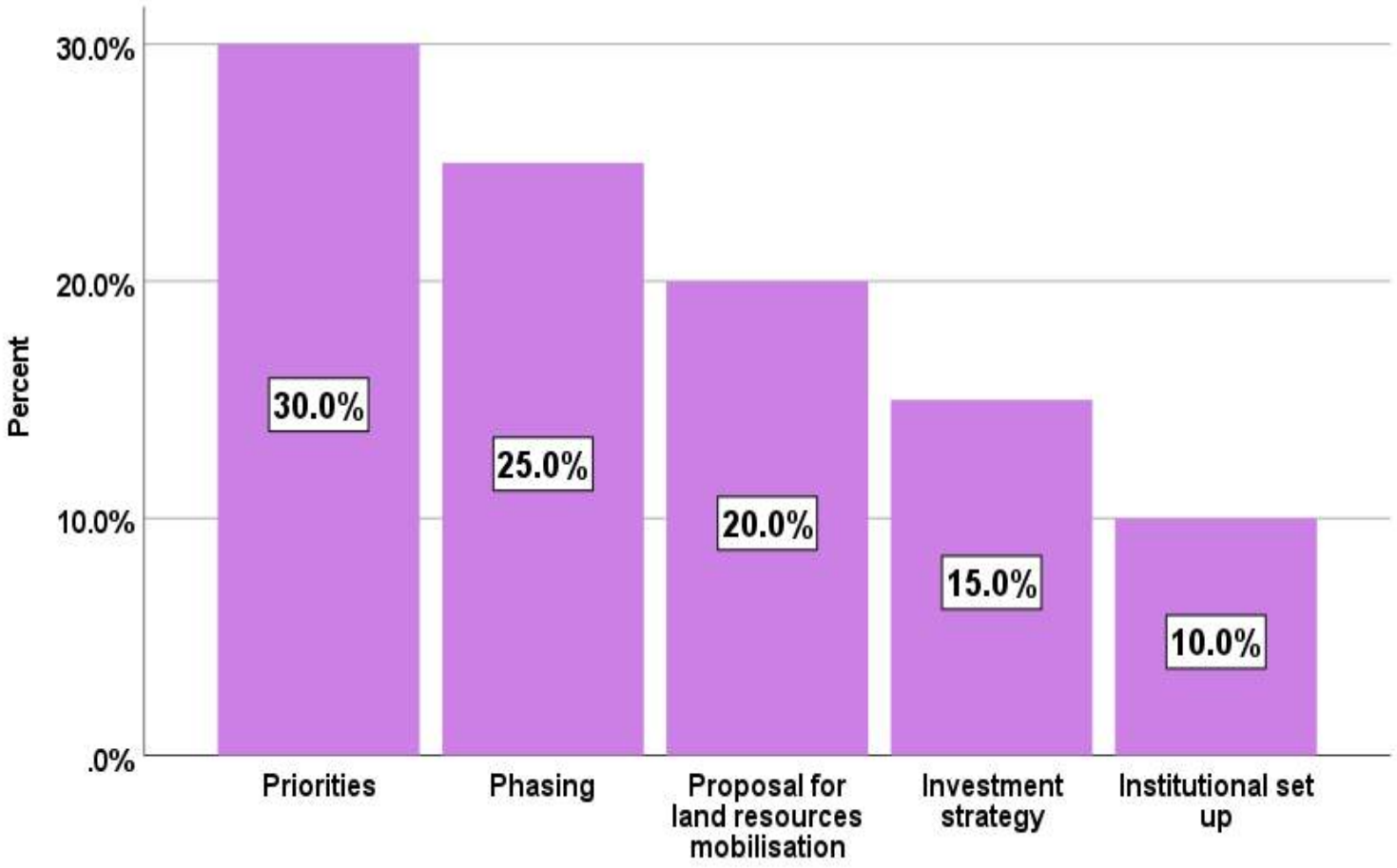

Figure 4. 8**: Process of Kigali city master plan implementation**

As shown in figure 1, 30% of respondents reported priorities as one of the process of master plan implementation, they said that during this step, master plan implementation is classified according to priorities stating which project comes first and then arrange them in sequence order. 25% of respondents reported that phasing is step in master plan implementation whereby Master plan implementation projects are put into phases which coincide with the state phase plans.20% of respondents reported that the next step in master plan implementation is proposal for land resources mobilization whereby proposal of how land resources will be used to achieve master plan target is drafted.15% of respondents reported investment strategy, they said that in this stage ;the master plan stakeholders sit together with the private sector and other investors willing to invest in the master plan projects then make the investment strategy.10% of respondents reported institutional set up where by all stakeholders are assigned role and responsibility to perform in according with master plan implementation.

The obtained results are like those of Bassett (2017) who demonstrated that during master plan implementation, the first phase is priorities in which master plan implementation is classified according to priorities stating which project comes first and then arrange them in sequence order. In line with this, Todes and others (2010) noted that during master plan implemantation, in the stage of phasing, master plan should advisably be in phases of 5 years to coincide with the state five-year plans.

The targets set for each phase can be assessed as the mid-term review against the achievements at the end of each phase. For Greenfield area phasing could include a 'zero' period for approvals, institutional set-up, initial land pooling and revisiting any strategy. Nguyen and others (2021) stated that in the 3rd phase of master plan implementation, the implementation mechanism in which proposal of how land resources will be used to achieve master plan target is drafted. Spence (2019) stated that in the 4th phase of master plan implementation, the implementation mechanism in which proposal of how land resources will be used to achieve master plan target is drafted. Hossain and others (2015) noted that in the 5th stage of master implementation, all stakeholders are assigned

role and responsibility to perform in according with master plan implementation. In addition, clearly provide Stakeholders' role and responsibility and organization chart.

4.2.3. Contribution of this project

One of the main objectives of Kigali city master plan implementation is to provide green infrastructures (Eco-friendly Park) for creating a visitor attraction of international status; diversify the visitor experience in Kigali for overseas visitors and provide major opportunities for environmental education and public awareness in recreated natural habitats. In addition, Kigali city master plan implementation targeted to focus on community well-being, cultural integration, and affordability. This demonstrates the country's commitment to sustainability and a green future for Rwandans. Green space typically refers to land with natural vegetation, including grass, trees, and other plants, that is open and accessible to the public. Kigali city master plan implementation helped in endless from improving our physical and psychological health, to strengthening our communities, and making our cities and neighbourhoods more attractive places to live and work.

Kigali city master plan implementation must be flexible and involve stakeholders from the onset. Master plans can provide a foundation for building credibility, support, and consensus from community members and stakeholders, informing citizens about a park's needs and its community assets, identifying capital improvement goals that are needed to assess fiscal requirements and fundraising needs, guiding critical decisions about parks and recreation facilities, infrastructure, programs, and services and developing recommendations and an implementation strategy

4.2.3.1. Environmental benefits of green infrastructures (Eco-friendly Park)

Parks and especially urban parks play a crucial role in Kigali city master plan implementation for establishing a place for conservation and environmental stewardship. One of your local park's most important jobs is not only to provide a safe place for leisure and outdoor activities, but when a sustainable park is established, some of the benefits include: Sequestering carbon dioxide and improving air quality; Reducing pollutants and sediment runoff from storms; Replenishing aquifers with freshwater; Protecting natural wildlife habitats; Promoting natural biodiversity and providing places for native plants, animals, and insects to flourish; Lowering the ambient temperature of nearby neighborhoods.

Parks and recreation infrastructure and facilities contribute to promote conservation and environmental sustainability. According to a report by the NPRA, parks facilities conserve natural resources and wildlife habitat, protect air and water quality, and preserve open space for current and future generations. Through stewardship activities, parks can involve the public in conservation efforts and increase awareness of environmental needs. Parks and open space conserves scenic vistas, maintains healthy ecosystems, and provides carbon-reducing sustainable landscapes.

4.2.3.2. Economic benefits of green infrastructures (Eco-friendly Park)

Studies show that well-planned parks and recreation systems can serve as a catalyst for economic development as the main purpose of Kigali city master plan implementation. Access to parks and recreation facilities and active transportation infrastructure can increase property values, foster job creation, and provide a foundation for place-based economic development. According to a report by the NRPA and the American Planning Association (APA) on The Role of Parks in Shaping Successful Cities, parks can attract consumers to nearby downtown regions, spur the opening of local restaurants, and increase tourism. Measuring the economic benefits of well-planned parks systems can be difficult. However, the Trust for Public Land has created a guide for Measuring the Economic Value of a City Park System that enumerates those benefits in terms of seven major factors property value, tourism, direct use, health, community cohesion, clean water, and clean air.

4.2.3.3. Social and Equity benefits of green infrastructures (Eco-friendly Park)

Parks and recreation facilities contribute to Kigali city master plan implementation through the provision of social and equity benefits for community members. According to an analysis of social equity and parks conducted by NPRA, public parks provide equal access to all citizens regardless of age, gender, socioeconomic status, ethnicity, or ability. Parks and recreation facilities can foster community pride, bring people together, create destination-oriented places, and connect people to each other and nature. “Pocket parks” are small outdoor spaces, often in urban areas, that provide active recreation opportunities for residents including children in underserved areas.

According to an issue brief on pocket parks by the National Recreation and Park Association, successful parks have four key qualities. They are accessible, allow people to engage in activities, comfortable, and sociable places. These small parks may be created by transforming vacant lots, rooftops, or previously hardscaped areas along sidewalks and active transportation routes.

4.2.3.4. Benefits of Parks and Recreation Master Planning

It is important for local government leaders to understand the relationship between community parks and recreation services, economic development, and quality of life. The master planning process enables local governments to assess recreation needs and interests of community members. It enables decision makers to prioritize resource allocation decisions for new facilities and rehabilitation projects, programs, and services in a manner that is fiscally responsible, environmentally sound, publicly supported, and politically prudent.

A report produced by the Project for Public Spaces cites several benefits of the parks and recreation master planning process. It notes that good master plans must be flexible and involve stakeholders from the onset. Master plans can provide a foundation for building credibility, support, and consensus from community members and stakeholders, informing citizens about a park's needs and its community assets, identifying capital improvement goals that are needed to assess fiscal requirements and fundraising needs, guiding critical decisions about parks and recreation facilities, infrastructure, programs, and services and developing recommendations and an implementation strategy

In addition to providing a design blueprint for facilities, the master plan can be used as a promotional document to foster support and political involvement. A successful master planning process will transform a community's vision into tangible plans to create outstanding recreation opportunities, well-maintained facilities, and a customer-focused and responsive park system.

CHAPTER 5: CONCLUSION AND RECOMMENDATION

5.0. Introduction

This section provides the conclusion and recommendations of this research, which have been formulated referring to the obtained results found in the study area. Also, this chapter discusses the general conclusion and recommendations based on research process and research findings.

5.1. Conclusion

The main objective of the study is to examine the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan implementation. Case study of Rwankuba Village/Agateko Cell/Jali sector/ Gasabo district. The specific objectives were to show the location of Eco-friendly Park in the study area, to document the process of Kigali city master plan implementation and to examine the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan implementation. Researcher showed the location of Eco-friendly Park in the study area in Rwankuba Village.

By doing this, researcher used to show the affected land parcels, project location, topographic map and sections of the project.

According to the research findings, the process of Kigali city master plan implementation are priorities, phasing, and proposal for land resource mobilization, investment strategy and institutional set up. 30% of respondents reported priorities as one of the process of master plan implementation, they said that during this step, master plan implementation is classified according to priorities stating which project comes first and then arrange them in sequence order. 25% of respondents reported that phasing is step in master plan implementation whereby Master plan implementation projects are put into phases which coincide with the state phase plans. 20% of respondents reported that the next step in master plan implementation is proposal for land resources mobilization whereby proposal of how land resources will be used to achieve master plan target is drafted.15% of respondents reported investment strategy, they said that in this stage; the master plan stakeholders sit together with the private sector and other investors willing to invest in the master plan projects then make the investment strategy.10% of respondents reported

institutional set up where by all stakeholders are assigned role and responsibility to perform in according with master plan implementation.

Kigali city master plan implementation provide green infrastructures (Eco-friendly Park) for creating a visitor attraction of international status; diversify the visitor experience in Kigali for overseas visitors and provide major opportunities for environmental education and public awareness in recreated natural habitats.

In addition, Kigali city master plan implementation targeted to focus on community well-being, cultural integration, and affordability. This demonstrates the country's commitment to sustainability and a green future for Rwandans. Green space typically refers to land with natural vegetation, including grass, trees, and other plants, that is open and accessible to the public.

Kigali city master plan implementation helped in endless from improving our physical and psychological health, to strengthening our communities, and making our cities and neighborhoods more attractive places to live and work.

5.2. Recommendations

Based on the findings, the following recommendations are proposed for policymakers and urban planners: Develop and enforce policies that mandate and incentivize green infrastructure. Financial incentives, such as tax abatements and grants, can offset initial costs and encourage adoption. Regulatory frameworks should prioritize green infrastructure and remove barriers to its implementation.

Collaborate with private sector and community organizations to leverage resources and expertise for green infrastructure projects. Public-private partnerships can enhance the funding, design, and implementation of green infrastructure, ensuring its success and sustainability. Ensure that green infrastructure is incorporated into broader urban planning efforts to achieve cohesive and effective implementation. Integrated planning can maximize the environmental, economic, and social benefits of green infrastructure, contributing to overall urban resilience and sustainability. Increase awareness and understanding of green infrastructure's benefits through education and outreach programs. Engage communities in the planning and implementation of green infrastructure projects to foster a sense of ownership and social cohesion.

Education and outreach efforts can drive demand and support for green infrastructure. Offer training programs for professionals to address technical and structural concerns in the design, installation, and maintenance of green infrastructure. Building capacity and expertise in green infrastructure is essential for its effective implementation and long-term success.

REFERENCE

City of Kigali. (2020). Transport Plan: Kigali Master Plan 2050. City of Kigali, October, 143.

Claude, D. M. J. (2022). Effect of Electronic Banking on Customer Satisfaction in Rwanda: Case of Bank of Kigali Headquarter. Scholars Journal of Economics, Business and Management, 9(1), 14–29.

Egide, K., & Kengere, O. A. (2023). Micro Finance Credit Scheme and Youth Entrepreneurship Performance in Rwanda: A Case of Youth Facilitated by Vision Fund in Nyarugenge District. Cognizance Journal of Multidisciplinary Studies, 3(11), 128–152.

Gakuba, A. (2012). RWANDA ENVIRONMENT MANAGEMENT AUTHORITY Study for Establishing Urban Wetland Recreation and Eco-tourism Park in Nyandungu Valley, Kigali City (Rwanda) Study for Establishing Urban Wetland Recreation and Eco-tourism Park in Nyandungu Valley, Kigali City (R.

Gakure, P. R. W., Waithaka, S. M., Wanjau, K., & Omboi, B. (2012). THE SALIENT CHARACTERISTICS OF MICROFINANCE INSTITUTIONS IN KENYA : (A Case Study of BIMAS). 2(9), 26–32.

Gogo, P. A., & Oluoch, O. (2017). Effect of Savings and Credit Co-Operative Societies' Financial Services on Demand for Credit by Members-A Survey of Deposit Taking Saccos in Nairobi. International Journal of Social Sciences and Information Technology, III(Viii), 2410–2421. http://www.ijssit.com

Imam, E. (2011). Mapping of Landscape Cover Using Remote Sensing and GIS in Chandoli National Park, India. Momona Ethiopian Journal of Science, 3(2).

Irene Jepkorir Ronoh. (2020). Developing an Eco-Industrial Park; Structures and Policies: A Case study of the KenGen Green Energy Park, Kenya presented for the partial fulfillment of the requirements for the degree of Master of Science (M.Sc.) in Sustainable Energy Science. Angewandte Chemie International Edition, 6(11), 951–952.

Kim, E. J. (2017). Greening Industrial Parks - A Case Study on South Korea's Eco - Industrial Park Program. 22.

Koenig, A. W. (2009). Eco-Industrial Park Development A Guide for North America. April.

Mlotha, M. J. (2018). Analysis of Land Use/Land Cover Change Impacts Upon Ecosystem Services in Montane Tropical Forest of Rwanda: Forest Carbon Assessment and REDD+ Preparedness.

Park, R. O. (2011). Request for Proposal To Develop a Land Holding and. July, 6–10.

Safkaur, O., & Sagrim, Y. (2019). Impact of Human Resources Development on Organizational Financial Performance and Its Impact on Good Government Governance. International Journal of Economics and Financial Issues, 9(5), 29–37.

Sall, M. A. (2022). Banks and Poverty Alleviation : An Assessment of the African Development Bank ' s Activities. 2(2), 81–87.

Wibowo, M. A. (2009). Economy of Indonesia: A Systemic Approach. International Symposium in Developing Economies: Commonalities among Diversities, 107(2003), 279–287.

Zaccheaus, J., NWALA, Maurie, N., & Abubakar Adagu, S. (2023). Effect of Formal Financial Sector on Financial Deepening in Nigeria. International Journal of Economics, Business and Management Research, 07(07), 70–90. https://doi.org/10.51505/ijebmr.2023.7706

APPENDIX

Appendix 1**:** Structure of questionnaires for respondents

Field questionnaire for respondents

I, **RWUBAKABABIRI Pierre Claver,** as finalist student at ULK Polytechnic Institute, department of Civil engineering and the option of construction technology. I am conducting a research entitled **"CONTRIBUTION OF GREEN INFRASTRUCTURES (ECO-FRIENDLY PARK) CONSTRUCTION PROJECT IN KIGALI CITY MASTER PLAN IMPLEMENTATION. CASE STUDY: RWANKUBA VILLAGE/AGATEKO CELL/JALI''.** Thus, this questionnaire will help to collect basis data for the research. This survey questionnaire has purely academic goals, and any information provided is confidential and will be utilized exclusively for the study. It would be greatly appreciated for offering me few minutes from your time for responding the following questions.

Section A: Biographical information of participants

Answering each question please put a tick on the right answer.

1) Kindly indicate your age group.

- O 21-35 Years
- O 36 -49 Years
- O 50-63 Years
- O Above 63 Years

2) Kindly indicate your gender.

- O Female
- O Male

3) Kindly indicate your marital status.

- O Single
- O Married
- O Divorced

3) Indicate your Level of Education

Secondary level	
Bachelor degree	
Masters	
PhD	

Section B: Open questions

Please tick the most appropriate

1. What are the process of Kigali city master plan implementation?

Priorities	
Phasing	
Proposal for land resource mobilization	
Investment strategy	
Institutional set up.	

2. What is the contribution of green infrastructures (Eco-friendly Park) construction project in Kigali city master plan implementation?

It creates a visitor attraction of international status	
It provides major opportunities for environmental education	
It provides public awareness in recreated natural habitats	
It provides community well-being, cultural integration, and affordability.	

It helped in endless from improving our physical and psychological health,	
It helps to make our cities and neighborhoods more attractive places to live and work.	
It enhances the funding, design, and implementation of green infrastructure, ensuring its success and sustainability	
It ensures that green infrastructure is incorporated into broader urban planning efforts to achieve cohesive and effective implementation	
It increases awareness and understanding of green infrastructure's benefits through education and outreach programs	
It engages communities in the planning and implementation of green infrastructure projects to foster a sense of ownership and social cohesion	
It provides a foundation for building credibility, support, and consensus from community members and stakeholders, informing citizens about a park's needs and its community assets, identifying capital improvement goals that are needed to assess fiscal requirements and fundraising needs, guiding critical decisions about parks and recreation facilities, infrastructure, programs, and services and developing recommendations and an implementation strategy	

Thankyou!

D