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School of Architecture and Built Environment

MSc in Geo-Information Science for Environment and Sustainable Development

Spatial Distribution Pattern of Access to Basic Amenities in Unplanned Settlements in Kigali City;

Case study of Jali-Kanyinya sectors from 2008 to 2024.

Thesis submitted to the University of Rwanda: College of Science and Technology in partial fulfillment of the requirements for the award of the Degree of Master of Science in Geo-Information for Environment and Sustainable Development.

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Declaration

I, Jean Damascene NDIKURYAYO hereby declare that this dissertation entitled" **Spatial Distribution Pattern of Access to Basic Amenities in Unplanned Settlements in Kigali City; Case study of Jali-Kanyinya sectors from 2008 to 2024"**, submitted in partial fulfillment of the requirements for the degree of Masters in Geo-Information Science for Environment and Sustainable Development (GIS-ESD), represents my original work. All sources of information and material used in this dissertation have been acknowledged through citations and references.

I confirm that this dissertation is the product of my own research and assistance received from supervisors, faculty members, or other individuals has been acknowledged and credited, and has not been previously submitted for any other degree or qualification at any other institution.

Signed:

……. Date: 25/08/2024

Approval

It is hereby confirmed that this thesis entitled **"Spatial Distribution Pattern of Access to Basic Amenities in Unplanned Settlements in Kigali City; Case study of Jali-Kanyinya sectors from 2008 to 2024"** submitted by **Jean Damascene NDIKURYAYO** has been assessed and accepted by the post-graduate coordination team in the school of Architecture and Built Environment

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List of Abbreviation

CoK: City of Kigali

DEM: Digital Elevation Model

GIS: Geographical Information Science

GoR: Government of Rwanda

GPS: Global Positioning System

IHLCS (EICV): Integrated Household Living Conditions Survey

ITRF: International Terrestrial Reference Frame

KCMP: Kigali City Master Plan

MININFRA: Ministry of Infrastructures

NLA: National Land Authority

NISR: National Institute of Statistics of Rwanda

OSC: One Stop Center

SDGs: Sustainable Development Goals

SqKm: Square Kilometer

RHA: Rwanda Housing Authority

RUM: Rural Urban Migration

UNDP: United Nation Development Program

UN: United Nation

UNESCAP: United Nations Economics and Social Commission for Asia and the Pacific

USGS: United State Geological Survey.

Abstract

The purpose of this research is to analyze the spatial distribution of access to basic amenities in unplanned settlements in Kigali City, focusing on the Jali-Kanyinya sectors from 2008 to 2024. Rapid urbanization in Kigali has led to significant changes in land use and settlement patterns, resulting in a growing population in unplanned areas. A substantial portion of the urban population faces challenges in accessing essential services such as water, sanitation, healthcare, and education. This research introduces the study's background and significance, outlining the research objectives and questions, emphasizing the need to understand residents' socio-economic and demographic characteristics and their challenges in accessing basic amenities. A review of existing literature on global urbanization trends and Rwanda's context highlights the impact of unplanned settlements on socio-economic well-being and gaps in understanding the spatial distribution of basic services. The methodology employs a mixed-methods approach, including qualitative interviews and quantitative data collection from 402 respondents, utilizing Geographic Information Systems (GIS) and statistical analysis to assess the availability and accessibility of basic amenities. The results reveal significant disparities in access to essential services influenced by various socio-economic factors, indicating that many residents experience poor access to healthcare and educational facilities, exacerbated by inadequate infrastructure and planning. The conclusions summarize key findings and their implications for urban planning and policy in Kigali, addressing the study's limitations and suggesting areas for future research. Practical recommendations for improving access to basic amenities in unplanned settlements advocate for strategic urban planning, community engagement, and government programs aimed at enhancing living conditions. This thesis contributes to a deeper understanding of the challenges faced by residents in unplanned settlements in Kigali and underscores the urgent need for effective urban policies to promote equitable access to basic services amidst rapid urban growth.

Keywords: Basic amenities, unplanned settlements, Spatial distribution, accessibility.

CHAPTER I: INTRODUCTION

1.1. Background of the study

The increase in urban population is accompanied with an expansion in urban land and unplanned ssettlements play a crucial role in shaping urbanization patterns across Africa, Latin America and the Caribbean, Asia, and Oceania (López et al., 2017; Nduwayezu, 2015; CoK,2020; Adrien & Asano, 2021). The absence of planning in peri-urban areas has negatively impacted the provision and upkeep of urban facilities, utilities, and amenities (Barbosa et al., 2022). Basic amenities refer to the provision of essential needs such as water, food, electricity and energy, shelter, sanitation, healthcare, and education to enhance people's lives. (Shrestha, 2021). These amenities are essential to make life easier and more pleasant. The lack of access to public amenities is often cited as a major issue by residents living in unplanned settlements in many peri-urban areas (Gupta & Guin, 2015; Hitayezu et al., 2018). Improved access to basic infrastructure and urban amenities is one of the driving factors behind migration to cities. Additionally, urban growth driven by economic development tends to provide more amenities, although rural-urban migration can result in minimal amenities being shared by a larger population (Kumar, 2014; Potts, 2013). These unplanned settlements in peri-urban areas often differ in character and fail to conform to zoning regulations, sharing common issues such as inadequate housing, insufficient or inappropriate living space, and poor public services and utilities (Adrien & Asano, 2021; United Nations, 2018).

Its importance has been highlighted internationally since the inclusion of sustainable development goals (SDGs) like clean water and sanitation, which aim to improve hygiene and help eliminate neglected tropical diseases such as parasitic and bacterial infections. By 2050, about 70% of the global population will reside in urban areas, with over 1 billion people living in slums or unplanned settlements, many lacking access to basic amenities like healthcare (Stig, 2018; Potts, 2013; Busso et al., 2021). These ambitious but achievable goals, along with a comprehensive United Nations development agenda, set the path for global efforts to attain them by 2015. Recently, international agencies like UNDP, UN-Habitat, UNESCAP, and the World Bank have emphasized the significance of basic amenities for well-being and improving living standards. They have established

initiatives, assistance, norms, and standards (Bank et al., 2015). UN-Habitat (2012) states that developing regions need decent, affordable housing and basic services to overcome the challenging living conditions in unplanned settlements. In Africa, recent urban visions and development plans for new or modern cities aim to enhance the living conditions of the rapidly growing urban population and stimulate local economies (Mitra et al., 2017; Meredith & Macdonald, 2017).

These plans require investments in basic infrastructure, including road construction, housing development, electricity distribution, health facilities, clean water, and sanitation. Implementing such plans often significantly impacts population relocation, involving the reorganization, redevelopment, and upgrading of large urban areas. This often displaces many urban dwellers in peri-urban areas, especially the poor, who are typically in centrally located areas attractive to investors (Noorloos & Kloosterboer, 2018; Watson, 2014). Urban land acquisition for public and private investments and the resulting involuntary development-induced displacement and resettlement of urban households through urban renewal and redevelopment policies are almost inevitable during periods of rapid economic development in many countries (Noorloos & Kloosterboer, 2018; Strauch, Takano, & Hordijk, 2015; Wang & Aoki, 2018).

In 2012, the Rwanda Housing Authority conducted a housing stock survey, finding that of the 223,000 dwelling units, 19.15% were in good condition, 32.06% needed upgrading, and 48.79% required replacement (Aime T. and Ronger M., 2018). Similar situations exist elsewhere, as seen in Kabul City, Afghanistan, where a study found 63.2% of houses in poor condition, 25% in moderate condition, and 14.7% in good condition (Nazire H., 2016). Many countries have similar rates of unplanned settlements, such as Burkina Faso with 12.4%, Congo with 11.8%, and South Africa with 11.6%. The regional urban development model and quality of life significantly influence the availability of urban services, and one of the primary goals of urban planning is to provide these amenities to urban residents (Licence, 2015). Regional differences in infrastructure access and availability lead to variations in living standards within and between regions. Knowledge of the existing facilities' nature and distribution is essential before planning future development. Poverty has driven the expansion of unplanned settlements in urban areas, where low-income people live. UN-Habitat (2015) estimates that more than half (61.7%) of the urban population in African countries experiences unplanned urban growth (UN-Habitat, 2015). Unplanned settlements are residential areas where inhabitants lack land

ownership security, basic services, and city infrastructure, and the housing often does not comply with current planning and building regulations (Hitayezu et al., 2018; Ischak et al., 2018). These settlements are often in geographically and environmentally hazardous areas (UN-Habitat, 2016).

According to the Ministerial order on urban planning and building regulations in Rwanda (2015), urban planning principles include optimum density in human settlements, public health, sanitation and safety, location-based building typologies, safe and efficient mobility, effective public transportation, land requirements for urban roads, and adequate infrastructure and socio-economic facilities to meet present and future urban population needs. These principles highlight the crucial role of access to basic amenities in both planned and unplanned residential settlements, guided by Vision 2050, which aims to ensure high living standards for all Rwandans, improve quality of life, and develop modern infrastructure for prosperity (GoR, 2015; GoR, 2020). Although there is still a long way to go in Rwanda, about 87% of households in unplanned settlements have access to improved water, 97% to improved sanitation, 89% to waste collection services, and 96% to electricity (Hitayezu et al., 2018). However, residents of unplanned settlements in peri-urban areas face severe post-relocation poverty risks, including social disjunction, loss of income, food insecurity, and loss of access to transportation and other basic amenities, with the intensity varying by location (Habiyambere et al., 2019). This study aims to analyze the spatial distribution and concentration of basic amenities in unplanned residential areas in the Jali-Kanyinya region, examine the magnitude of spatial concentration and differences in basic amenities provision, and identify over-served and underserved areas

1.2. Problem Statement

Like most cities in developing countries, Kigali city also has undergone rapid urbanization, resulting in a growing urban population and leading to a rapid increase in the size and number of unplanned settlements (Tsinda et al., 2013). Trend of urbanization within Kigali and the issue of unplanned settlement remains the biggest challenge due to the people migrating to the urban periphery from both rural and core city regions for infrastructures, social, legal, and economic reasons that influence these migrations.

The current development of Kigali is guided by different zoning regulations established in 2008 (Manirakiza et al., 2019) and revised in 2020 (City of Kigali, 2020). The aim of Kigali zoning regulations was to provide a consistent framework in implementing the city's updated master plan and directing public and private sector growth (City of Kigali, 2020). The goals, definitions and regulations ensure that construction proceeds in a logical pattern in the city. According to Kigali master plan 2020, the existing land uses in Kigali included; residential, commercial, public facilities, industries, natural area agriculture, open space, water bodies, infrastructure and special uses. Agricultural, natural area, residential and infrastructure take up most of Kigali land area with 457.95 km2, 123.61 km2, 80.87 km2 and 27.99 km2 respectively (City of Kigali, 2020). To meet the housing standards, an individual should request for a construction permit from the city of Kigali one stop center. All arrangements of the Rwanda building code, counting the securing of essential building permits and certificates of inhabitants, along with the necessities of all other appropriate development codes or directions, might be met to set up a housing unit (Baffoe et al., 2020).

The mean cost of construction of residential houses is 12 million Rwandan Francs, accounting for 60% of the total value of the property each of housing owners possess (City of Kigali, 2020). Regardless of the fact that some Kigali districts like Nyarugenge have over 700,000 confirmed clay deposits (Ministry of Trade and Industry, 2011), construction materials are still expensive in Kigali city. Housing affordability in East African cities like Kigali is commonly impacted by low household income, high construction costs, limited access to bank loans, construction materials, and investment taxes (Uwayezu & Vries, 2020). On one hand, due to the high cost of living (high housing costs), low to middle income city dwellers are pushed out of the capital and settle in unplanned settlements located in rural fringes of Kigali city like Kanyinya and Jali

sectors, where they are still close enough to benefit from the city's economic density and services (World Bank, 2017). 54% residents in Kigali are poor and low income, earning between 38$ and 225$ per month. Around 13% of them are extremely poor, earning less than 38$ per month. Access to decent housing has thus been a major challenge for the city's poor, low and middle residents (Uwayezu & Vries, 2020). It appears that other factors, such as the higher price of land in Kigali and stricter building codes are driving migration from urban centers to peri-urban areas like Kanyinya and Jali (World Bank, 2017). These factors have sparked growth on the city's outskirts and also development of unplanned settlements. Official estimates put the population living in Kigali's unplanned settlements at 79% (Hitayezu et al., 2018). Unplanned settlements are unevenly divided across Kigali's three districts, with Nyarugenge district being home to most unplanned dwellings 202 total unplanned villages followed by Gasabo with 129 unplanned villages and Kicukiro Districts with 113 unplanned villages and the study area is in this unplanned villages (Hitayezu, 2018).

All these living expenses pushed people to migrate from the city center to unplanned settlements in areas like the Jali and Kanyinya sectors, which have poor distribution of basic amenities. However, this migration has led them to live in poor living conditions which poses a big health challenge to residents (CoK, 2020), they also experienced several adverse socio-economic impacts, including insecurity of tenure, financial instability, share few basic infrastructures, and food insecurity (Nikuze et al.,2019). However, the idea of conducting research was aimed to advocate for the challenges faced by Jali and Kanyinya residents because this region has a unique case of very steep slopes and high altitude, combined with poor distribution and accessibility of basic amenities compared to other regions of Kigali City. In addition, there was no other recent study on the unplanned settlements suggested the on-site upgrading approach, the basic amenities are the most common challenges for peri-urban communities as highlighted by Joshi Deep (2020) in a comparative study among settlements in different countries. There are no prompt details on distance and accessibility networks towards schools, health facilities, electricity, and sanitation in selected peri-urban study areas. Moreover, to the best of my knowledge, to date, there is also no scientific study conducted in this area of interest to see if the increase of unplanned settlement communities nowadays is related or correlated with basic amenities in the study area. Moreover, while existing literature acknowledges the impact of unplanned settlements on socio-economic well-being, there remains a gap in understanding the specific spatial distribution patterns of basic

amenities within these settlements, particularly in the Jali-Kanyinya sectors. Therefore, identification impacts of unplanned settlements community in access to basic services will be highlighted. This study provides a holistic picture of the spatial distribution pattern of access to basic amenities in unplanned settlement selected sites.

The delimitation of this study is related to basic amenities like schools, health center, roads, water accessibility and sanitation in Jali-Kanyinya study area and this is for people living in unplanned settlements in the study area. If this study is successfully completed the findings of this study will provide valuable insights for improving living conditions in unplanned settlements and contribute to more equitable urban development in Kigali City. Furthermore, it will inform the city planner by highlights the underserved areas, overserved and role of government programs on wellbeing of people in study area like accessing clean water and sanitation, education for all and healthy life vision2020 Umurenge program, National Strategies for Transformation (NST-1), and Sustainable Development Goals (SDGS).

1.3. Research Objectives

The main objective of the study is **to assess the spatial distribution pattern of access to Basic amenities in unplanned settlements in the study area over periods 2008 to 2024.** To achieve this overall objective, the specific research objectives and associated research questions have been formulated as follow:

1.3.1. Specific Objectives

I. To analyze the spatial distribution patterns of access to water and sanitation, electricity, healthcare, education, and road networks within the Jali-Kanyinya sectors of Kigali City.

II. To identify the factors influencing the uneven distribution of basic amenities within unplanned settlements.

III. To assess the challenges faced by residents of Kanyinya and Jali sectors in accessing basic amenities.

IV. To propose strategies for improving the spatial distribution of basic amenities in unplanned settlements in Kigali City.

1.3.2. Research questions

The achievement of stated above specific objectives the set of associated research questions as follows below:

1. What is the current spatial distribution pattern of access to water and sanitation, electricity, healthcare, education, and road networks in the Jali-Kanyinya sectors of Kigali City?

2. What are the key factors contributing to the uneven distribution of basic amenities within unplanned settlements in Kigali City?

3. What are the main challenges faced by residents of Kanyinya and Jali sectors in accessing basic amenities?

4. What strategies can be implemented to improve the spatial distribution of basic amenities and enhance living conditions in unplanned settlements in Kigali City, particularly in the Jali-Kanyinya sectors?

1.4. Motivation and Significance of the Research

The study will focus on illustrating different Status of availability of basic amenities in peri-urban areas in the case study. The analyzed data will give us the information on the evolution and continuous developments of residents in study area as the role of government programs on wellbeing of people like accessing clean water and sanitation, education for all and healthy like vision 2020 Umurenge program, National Strategies for Transformation (NST-1), and Sustainable Development Goals (SDGS). The final obtained results will highlight the underserved areas, overserved for further planning strategies for development.

The motivation for this study stems from the rapid urbanization observed in Kigali, which has led to significant changes in land use and settlement patterns. This urban expansion often outpaces the capacity of city planners to provide essential services, leading to disparities in access to basic amenities. The Jali and Kanyinya sectors, despite being part of Kigali City, are relatively remote and predominantly covered by agricultural land and forests. However, due to the establishment of the Kigali City Master Plan and its rigid regulations, many people have migrated from the city center to these areas, seeking more affordable land and housing.

The Jali-Kanyinya sectors are one of highest altitude in Kigali city after Mount Kigali and are characterized by steep slopes, making them strategically significant yet challenging to access. This geographical complexity further complicates the equitable distribution of amenities. Understanding the spatial distribution patterns of basic amenities in these unplanned settlements is crucial for addressing the needs of the growing population and ensuring sustainable urban development.

This study is particularly interesting because it addresses the intersection of urban planning, socio-economic development, and environmental sustainability. By identifying the factors influencing the uneven distribution of basic amenities and assessing the socio-economic and demographic characteristics of residents, the research aims to provide insights that can inform policy decisions and urban planning strategies. The findings will contribute to a better understanding of the challenges faced by peri-urban communities and support efforts to improve living conditions in unplanned settlements.

1.5. Analytical framework of the study

The analytical framework for the study on the spatial distribution pattern of access to basic amenities in unplanned settlements in Kigali City, specifically the Jali-Kanyinya sectors, encompasses several interconnected elements. Firstly, urbanization and migration patterns drive the growth of unplanned settlements, influenced by factors such as population growth and rural-to-urban migration. These settlements exist within a policy and planning context shaped by urban development policies and governance structures. Socio-economic and demographic characteristics of residents, including income level and household size, further influence access to basic amenities. The spatial distribution of amenities, including water supply and healthcare services, is mapped considering factors like proximity and accessibility. Infrastructure and service provision mechanisms are analyzed to understand challenges and constraints. Community participation and empowerment play a crucial role in addressing gaps in service delivery. The impact of inadequate amenities on residents' quality of life underscores the need for effective policy interventions and strategies. This framework is visually represented in the figure 1.

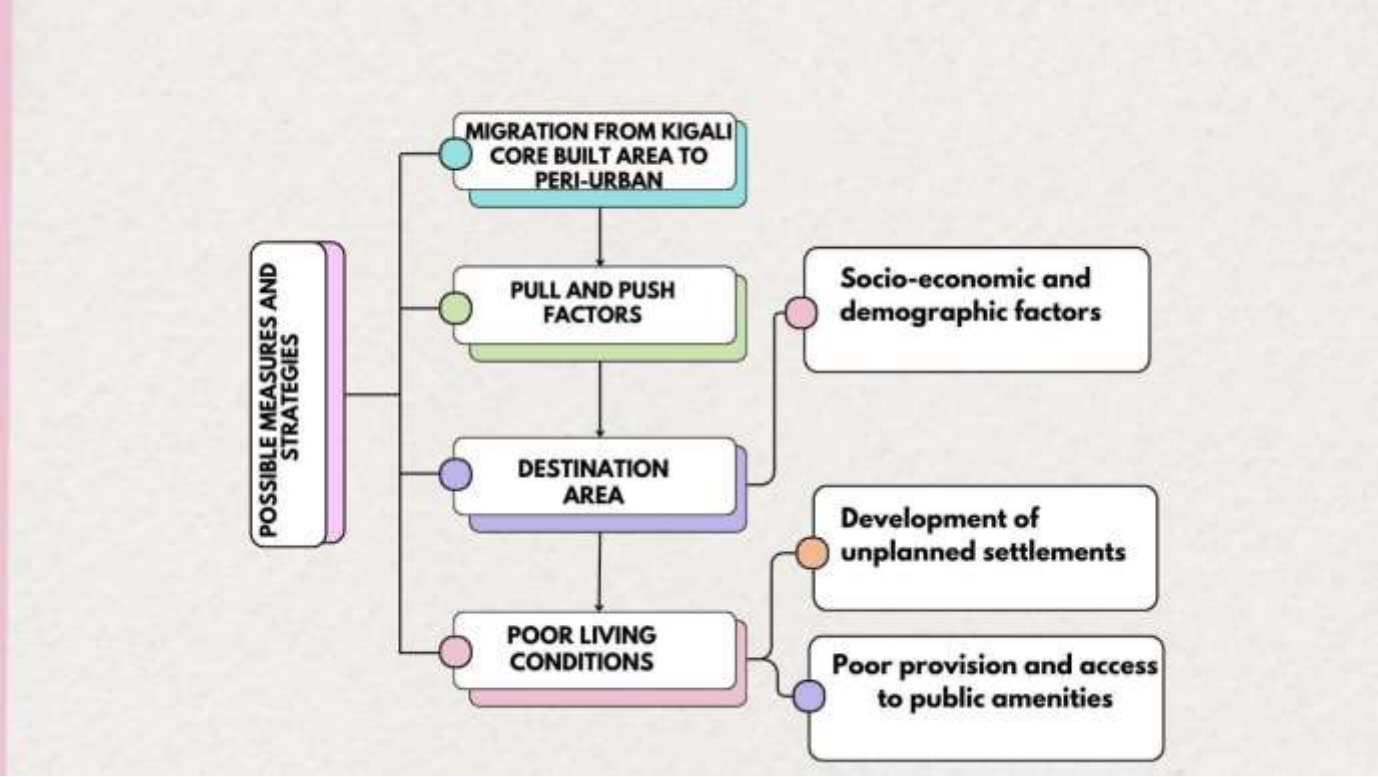

Figure 1: Analytical framework (Source: Author)

A diagram illustrating the interconnected elements of the analytical framework, including urbanization and migration patterns, pull and push factors, socio-economic and demographic characteristics, development of unplanned settlements, poor provision and access to public amenities, and possible measures and strategies. Firstly, it begins with the migration of people from rural to urban areas; the majority of migrants are low and middle-income households, limited by the affordability of life in city centers due to factors such as unaffordable housing, high cost of living, and expensive land, pushing them towards peri-urban areas where cheap land and cost of living attract them. Subsequently, informal housing developments emerge in destination areas based on socio-economic and demographic factors, leading to the formation of unplanned settlements. However, the provision of public amenities such as sanitation, water, electricity, roads networks and healthcare facilities become challenging and expensive due to the high cost of land expropriation, adversely affecting residents' access to these amenities and consequently their living conditions. In response, measures and strategies have to be implemented, including neighborhood planning, equitable distribution of public amenities, community participation and empowerment, among others.

1.6. Research matrix.

To ensure that the various components of the study link together in a logical manner and there are no essential parts of the study are missing. The research matrix below on table 1 shows rows and columns into which the components of a research project fit, including the research objectives, Data required, Data source, and expected results

Research Objectives	Research Questions	Data Required	Data Source	Methods and techniques	Expected Data
1. To analyze the spatial distribution patterns of access to basic amenities within the Jali-Kanyinya sectors of Kigali City.	-What is the current spatial distribution pattern of access to basic amenities in the Jali-Kanyinya sectors of Kigali City.	- Geographic data (Orthophoto, Topographic and Existing features data)	Kigali City OSC, National Land Authority, and field data collection, USGS Earth explorer (https://earthexplorer.usgs.gov/)	-Spatial analysis using GIS tools - Microsoft Excel	Identification of areas with high and low access to basic amenities, potential spatial clusters or disparities in access.
2. To identify the factors influencing the uneven distribution of basic amenities within unplanned settlements.	-What are the key factors contributing to the uneven distribution of basic amenities within unplanned settlements in Kigali City?	- Socio-economic data -Demographic data -Existing infrastructure data	Surveys, Kigali city OSC, observations, interviews with residents, review of existing literature	- Statistical analysis using Microsoft excel to identify factors influencing amenity distribution. -GIS tools	Identification of socio-economic, demographic, and infrastructural factors contributing to disparities in basic amenity provision within unplanned settlements.

3. To assess challenges faced by residents of Kanyinya and Jali sectors in accessing basic amenities.	-What are the main challenges faced by residents of Kanyinya and Jali sectors in accessing basic amenities?	- Demographic data - Data on the existing infrastructure in unplanned settlements	Kigali city OSC, Census data, household surveys, community assessments, Review of existing literature	-Surveys, Interview, Focus group discussions, and Field observation -GIS tools	Understanding the relationship between socio-economic/demographic characteristics and access to basic amenities.
4. To propose strategies for improving the spatial distribution of basic amenities in unplanned settlements in Kigali City.	-What strategies can be implemented to improve the spatial distribution of basic amenities and enhance living conditions in unplanned settlements in Kigali City, particularly in the Jali-Kanyinya sectors	-Data on past and ongoing initiatives aimed at improving living conditions and access to basic amenities in Kigali city	Interviews, Focused group discussion, Review of Existing Literature, participatory mapping exercises	-Qualitative analysis (thematic analysis, content analysis)	Recommendations for implementation will be provided to guide decision-makers and stakeholders in taking concrete actions to enhance the spatial distribution of basic amenities, ultimately improving living conditions in unplanned settlements in Kigali City.

Table 1: Research matrix

1.7. Structure of Thesis

The current study has been organized in the following five chapters:

Chapter one (Introduction)includes general and broad background regarding basic amenities spatial distribution pattern in unplanned settlement. Unplanned settlement and its drawbacks on people's lives will be noted. It includes information regarding the research problem of the study area. The first chapter includes: background of the study, problem statement, research objectives, research questions, motivation and significance of the research, research matrix, analytical framework and structure of the thesis.

Chapter two (Literature review) highlights a review of major theories behind unplanned settlement patterns developed by different authors in peri-urban areas. Will discuss the mapping process and proper analysis of outcomes and sample behavior. Unplanned settlements are explained and more specifically for Peri -urban areas in the study region.

Chapter three (Research Methodology) presents how primary and secondary data step by step will be gathered which consists of questionnaire administration to acquire local people's views about Unplanned settlements development pattern. It encloses the field observation steps. Landsat images, high resolution images and topographic maps acquisition steps will be developed. It will count all geo-processing and analysis methods used through ArcGIS 10.8 and SPSS software for statistical analysis.

Chapter four (Results and Discussions) takes account of all results that will be obtained after geoprocessing and data analysis. The information regarding unplanned settlement driving forces in peri-urban areas and will properly visualize in charts and tables. The discussion part contains the meanings, relationship, and implications of obtained results. It details reasons under Unplanned settlements evolution compared with other planned settlements. Relationship of driving forces and the implication of future Unplanned settlements effects on the well-being of people there will be determined. It will also present required maps of unplanned settlement status of 2008,2016 and 2024 as well as the magnitudes of unplanned settlement changes in the study area.

Chapter six (Conclusion and Recommendations) incorporates the summarized results of the investigated aspects and recommendations from the study. The broader

interpretation and results of spatial unplanned settlement patterns. Noticed recommendations for further research in the same field of study and the requirements to prohibit future unplanned settlement development.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

The spatial distribution of basic amenities within urban areas is a critical determinant of urban livability and socio-economic development, both globally and in the context of Africa and Rwanda. As urbanization accelerates worldwide, disparities in access to essential services become increasingly pronounced, particularly in unplanned settlements. This literature review aims to examine existing research on the spatial distribution of basic amenities, including water supply, sanitation, healthcare facilities, education facilities, and electricity, within urban environments, with a specific focus on unplanned settlements in Kigali City, Rwanda.

2.2. Global urbanization and unplanned settlement trends

World urbanization is rapidly increasing, with populations continuing to concentrate in cities, leading to significant social and economic changes (Ekandem et al. 2014). Parnell et al. (2013) highlighted that in 1900, only 13% of the world's population resided in cities, a figure that rose to 29% by 1950, and is projected to further increase to 70% or 6.3 billion people by 2050. This trend is expected to be particularly prominent in small and medium-sized cities rather than mega-cities. Urbanization was defined as involving the rapid transformation of human populations and land cover to enhance socio-economic conditions (Ekandem et al. 2014; Parnell et al. 2013). Parnell et al. (2013) argued that global urbanization is driven by four main forces: natural population growth, rural-to-urban migration, mass migration due to extreme events, and redefinition of urban boundaries. Global urbanization presents numerous challenges that demand careful attention from policymakers, urban planners, and researchers. One of the main challenges is the rapid population growth in urban areas, leading to increased pressure on infrastructure, housing, and basic services (United Nations, 2018). This growth exacerbates issues such as overcrowding, inadequate housing, and strains on transportation systems (Katz & Krikelas, 2019). Additionally, urbanization often results in the expansion of unplanned settlements or slums, characterized by poor living conditions, lack of access to clean water and sanitation, and limited economic opportunities (UN-Habitat, 2016). These conditions contribute to social inequalities and pose significant health risks to urban residents

(Grogan & Chen, 2019). Furthermore, the rapid growth of urbanization can lead to environmental degradation, including air and water pollution, loss of green spaces, and increased vulnerability to climate change (Seto et al., 2018). Managing these challenges requires comprehensive urban planning strategies that prioritize sustainability, equity, and resilience (Carmona et al., 2019). However, achieving these goals requires overcoming various institutional, financial, and governance barriers (Angel et al., 2019). Thus, addressing the challenges of global urbanization necessitates collaborative efforts at local, national, and international levels to create inclusive and sustainable urban environments for present and future generations.

Urbanization in Africa also is a dynamic phenomenon, characterized by rapid population growth and significant rural-to-urban migration, resulting in the expansion of cities and the emergence of unplanned settlements. These unplanned settlements pose numerous challenges, exacerbating issues such as poverty, inadequate housing, insufficient infrastructure, and limited access to essential services (UN-Habitat, 2016). One of the primary challenges in unplanned settlements is inadequate housing, with a large proportion of the population living in substandard and overcrowded dwellings (African Development Bank, 2019). Statistics indicate that as of 2020, approximately 60% of Africa's urban population resides in informal settlements (UN-Habitat, 2016). These settlements often lack secure land tenure and access to basic services such as clean water, sanitation, and electricity (World Bank, 2018). Social and economic disparities are also prevalent in unplanned settlements, with marginalized communities facing barriers to education, healthcare, and formal employment opportunities (United Nations, 2018). The informal economy dominates in these areas, with around 70% of urban employment in sub-Saharan Africa being informal (African Development Bank, 2019), leading to precarious livelihoods and limited access to social protection mechanisms. Furthermore, rapid urbanization strains existing infrastructure and services, including transportation systems, water supply, and waste management facilities (Gebremedhin et al., 2019). The inadequate provision of basic services in unplanned settlements not only impacts residents' quality of life but also poses significant health and environmental risks.

In response to those urban challenges, UN-Habitat (2018) promoted five principles for sustainable settlement planning; (i) the adequate space for streets and an efficient street network, (ii) high density, (iii) mixed land use, (iv) social mix (houses affordable in different price ranges and tenure types to accommodate different incomes) and (v)

limited land use specialization. Implementation of above these principles, urban development should have clear planning framework, with set criteria for public space such as streets, affordable housing, and the integration of land uses in response to current urbanization challenges such as population growth, urban sprawl, poverty, inequality, pollution, congestion, as well as urban biodiversity, urban mobility, and energy. (UN-Habitant, 2018).

2.3. Urbanization in Rwanda

Rwanda has experienced rapid urbanization over the past decade and is expected to continue growing in the near future. The urban population is projected to rise from 1.7 million in 2012 to 4.9 million in 2032, with an average growth rate of 4.1 percent (World Bank Group, 2017). In the early 1900s, the colonial authority established Kigali, and subsequently, Butare, Byumba, Cyangugu, Gisenyi, Gitarama, Kibungo, Kibuye, Nyanza, and Ruhengeri were developed to accommodate workers around various administrative centers. Additionally, smaller settlements such as Gakeke, Gatsibo, Ruhango, Rubengera, and Rwamagana emerged, providing essential social services like education and healthcare to their communities (REMA, 2017). Law No. 10/2012, dated 02/05/2012, governing Urban Planning and Building Management in Rwanda, categorizes urban settlements into three categories based on population estimates. It distinguishes cities with at least 200,000 inhabitants, municipalities with 30,000 to 200,000 inhabitants, and agglomerations with 10,000 to 30,000 inhabitants. Furthermore, the hierarchy of urban areas is defined, starting from the capital city, followed by secondary cities, district towns, and trading centers (World Bank Group, 2017).

Rwanda's urbanization has been propelled by two primary forces: internal migration from rural areas to cities and population growth within urban areas, leading to the integration of densely populated areas into the country's urban fabric. Notably, secondary cities such as Rubavu, with a growth rate of 5.5% per year, and Musanze, with a rate of 4.1% per year, experienced significant population growth between 2012 and 2015. Additionally, smaller towns like Byumba and Nyagatare saw growth rates exceeding 10% per year. Urbanization in Rwanda is concentrated along four main corridors: The Kigali metropolitan area and its surroundings, the northwestern corridor from Rubavu to Musanze, known as the "Virunga Belt," the southern belt from Kigali to Butare along the main highways, and the Lake Kivu Belt from Rubavu to Karongi and

Rusizi. The eastern region, while relatively dense, is experiencing rapid growth, with the highest population growth rate observed in the eastern province since 2002 (Rajashekar, Richard, & Stoelinga, 2019).

The trends of urbanization in Rwanda have been driven by population and spatial growth. Between 2000 and 2015, the rate of land consumption was high in several regions, with Gisenyi, Gitarama, and Butare experiencing notable rates. Similarly, population growth rates were significant in various urban centers, particularly Gisenyi and Kigali (Zhongming, Wangqiang, & Wei, 2020). Moreover, the expansion of urban areas, particularly around Kigali and its suburbs, has led to a doubling of urban areas at the national level, increasing from 83 km2 to 167 km2 (World Bank Group, 2017).

2.4. Spatial distribution of basic amenities

According to Seto et al. (2018), the expansion of urban areas has outpaced the development of essential infrastructure, resulting in inadequate access to basic amenities for many urban residents. This trend is particularly evident in Africa, where urbanization rates are among the highest globally. The United Nations (2018) reports that African cities are experiencing unprecedented population growth, placing immense pressure on existing infrastructure and exacerbating inequalities in access to services. Within the Rwandan context, urbanization has been accompanied by significant challenges related to infrastructure development and service delivery. Despite efforts to improve living conditions in urban areas, unplanned settlements continue to face deficiencies in basic amenities. The World Bank Group (2017) highlights the rapid growth of Rwanda's urban population and the need for increased investment in infrastructure to support sustainable urban development. In Kigali City, unplanned settlements such as those in the Jali-Kanyinya sectors bear the brunt of these challenges, with limited access to water, sanitation, healthcare, education, and electricity. Researchers such as Rajashekar, Richard, & Stoelinga (2019) emphasize the importance of addressing these disparities to promote inclusive and sustainable urban development in Rwanda. In Rwanda, initiatives such as Law No. 10/2012, which guides urban planning and building management, aim to improve infrastructure provision and enhance the quality of life for urban residents. However, more targeted interventions are needed to address the specific needs of unplanned settlements and ensure equitable access to basic amenities.

In Kigali City, the spatial distribution of basic amenities in Kigali, Rwanda, reflects broader urbanization trends and policy efforts to enhance living standards. The Kigali City Master Plan (KCMP) 2020 provides a comprehensive framework for equitable distribution of healthcare, education, water supply, sanitation, and transportation facilities across the city's districts. For instance, the KCMP highlights the need for new hospitals and health centers, particularly in underserved areas, to ensure equitable access to healthcare. As of 2020, there were 41 health centers and four district hospitals in Kigali, yet disparities remain in their distribution, particularly in the outer districts of the city. Similarly, the KCMP plans for more schools and the upgrading of existing ones to reduce the distance students travel, especially in peri-urban regions. In 2020, Kigali had approximately 200 primaries and 80 secondary schools, but the distribution is uneven, with central districts like Nyarugenge and Gasabo having a higher concentration of educational institutions compared to peripheral areas like Kicukiro. Improving access to clean water and sanitation is a critical component, with projects aimed at expanding water supply networks and constructing public sanitation facilities in densely populated areas. As of 2020, about 92% of households in Kigali had access to an improved water source, yet only 65% had access to improved sanitation facilities. The transportation infrastructure is also targeted for enhancement, with proposals for new roads, bus rapid transit (BRT) systems, and non-motorized transport infrastructure to improve connectivity and alleviate congestion (City of Kigali, 2020).

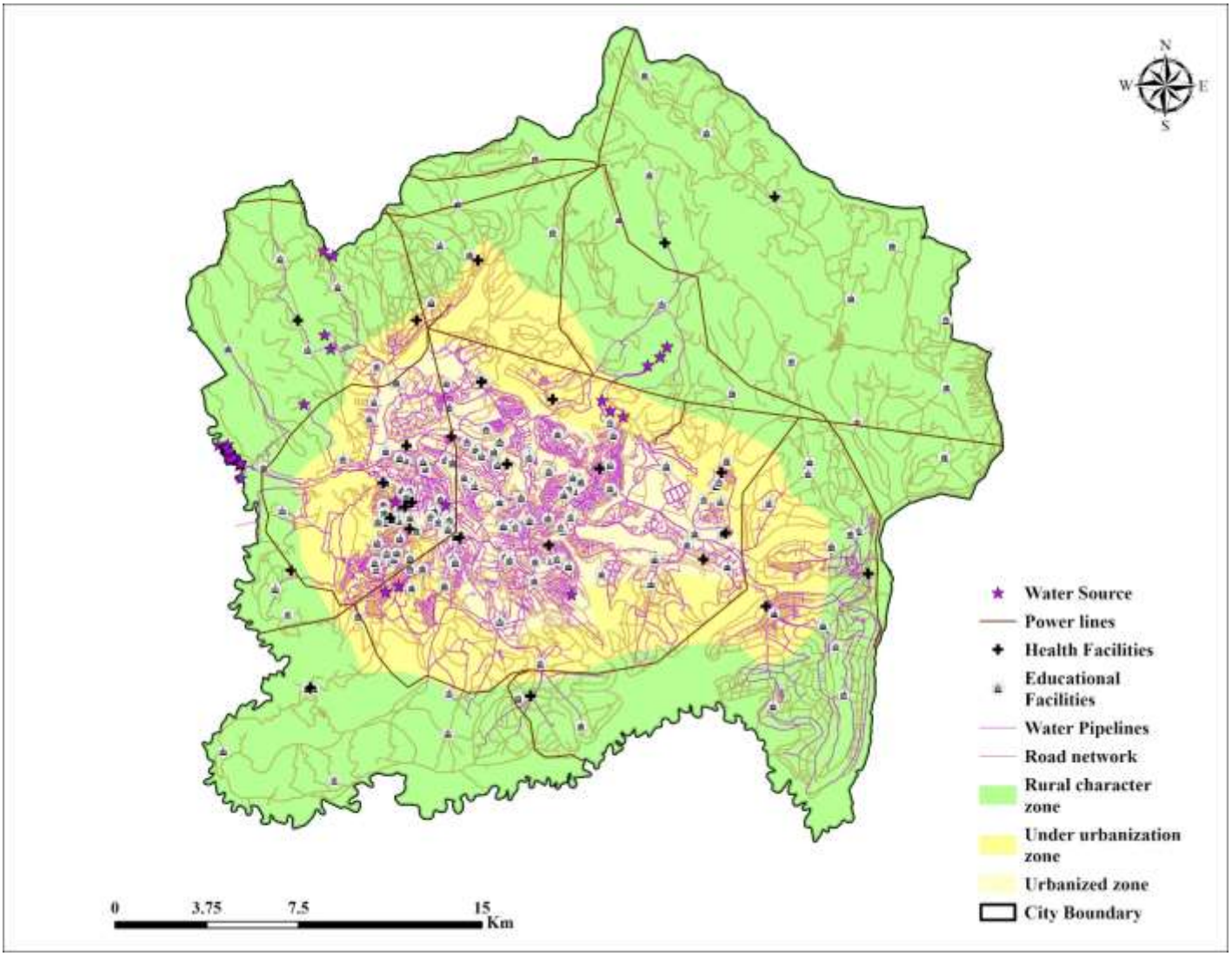

Figure 2: Spatial distribution of basic amenities within Kigali city (Source: City of Kigali)

2.1. Policies, Laws, Regulations, and Guidelines Aiming to Reduce Unplanned Settlements and Improve the Distribution of Basic Amenities in Rwanda

The policies, laws, regulations, and guidelines in Rwanda aim to reduce unplanned settlements and improve the distribution of basic amenities through various comprehensive interventions. The Rwanda National Urbanization Policy, established in 2015, promotes planned urbanization, sustainable land use, and infrastructure development. The National Urban Housing Policy, established in 2008, ensures access to affordable housing by developing housing projects, regulating standards, and addressing the needs of low-income groups. The National Water and Sanitation Policy, established in 2023, focuses on sustainable water supply and sanitation by maintaining infrastructure, promoting sanitation projects, and ensuring equitable access. The Rwanda National Land Policy, established in 2004 and revised in 2019, regulates land use and development, promotes efficient land management, and supports land tenure security. The National Environmental Policy, established in 2003 and revised in 2019, ensures environmental protection and sustainability by regulating development impacts and supporting green initiatives. Rwanda Vision 2050 outlines a long-term strategy for inclusive and sustainable urban growth, infrastructure enhancement, and economic transformation. The Rwanda Decentralization Policy of 2021 enhances local governance and service delivery through decentralized decision-making, strengthened governance structures, and community participation. The Integrated Development Programme coordinates urban and rural development, promoting integrated planning and sectoral coordination. The Public Private Partnership (PPP) Policy encourages public-private collaboration to invest in infrastructure projects and improve service delivery. The Kigali City and Districts Master Plan (2020-2050) guides urban development with zoning regulations and infrastructure planning for sustainable growth. The Rwanda Building Code of 2019 ensures construction standards, safety, and sustainable practices. Local Development Plans (LDPs) address local infrastructure projects and development needs through community participation. Lastly, the Urban Planning Code of 2015 defines land use zones and planning standards to ensure coordinated and sustainable urban development.

Policy/Plan/Regulation/Code	Purpose	Interventions
Rwanda National Urbanization Policy 2015	Guide sustainable urban development	- Promote planned urbanization - Encourage sustainable land use - Enhance infrastructure development
National Urban Housing Policy 2008	Ensure access to adequate and affordable housing	- Promote development of affordable housing - Regulate housing standards - Address housing needs of low-income groups
National Water and Sanitation Policy 2023	Ensure sustainable water supply and sanitation	- Develop and maintain water supply infrastructure - Promote sanitation projects - Ensure equitable access to services
Rwanda National Land Policy 2019	Guide land use and management	- Regulate land use and development - Promote efficient land management practices - Support land tenure security - Promote sustainable use of natural resources
National Environmental Policy 2003	Ensure environmental protection and sustainability	- Regulate environmental impacts of development - Support green initiatives
Rwanda Vision 2050	Long-term development strategy	- Promote inclusive and sustainable urban growth - Enhance infrastructure and service delivery - Support economic transformation
Rwanda Decentralization Policy 2021	Enhance local governance and service delivery	- Decentralize decision-making processes - Strengthen local governance structures - Promote community participation
Integrated Development Programme (IDP)	Coordinate development efforts in urban and rural areas	- Promote integrated planning - Enhance coordination between sectors - Support comprehensive development initiatives
Public Private Partnership (PPP) Guidelines 2018	Encourage collaboration between public and private sectors	- Promote investment in infrastructure projects - Enhance service delivery through

		partnerships - Support innovation and efficiency
Kigali City and Districts Master Plan 2020 -2050	Guide urban development and land use in Kigali	- Develop zoning regulations - Plan infrastructure projects - Promote sustainable urban growth
Rwanda Building Code 2019	Ensure construction standards and safety	- Regulate building practices - Ensure safety and durability of structures - Promote sustainable building practices
Urban Planning Code 2015	Guide urban planning and land use regulations	- Define land use zones - Establish planning standards and procedures - Ensure coordinated and sustainable urban development

Table 2: Policies, laws, regulations, and guidelines aiming to reduce unplanned settlements and improve the distribution of basic amenities in Rwanda

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Introduction

The study used mixed methods (Qualitative and qualitative methods), which comprised two main phases: data collection and a literature review relevant to the research topic. Using a descriptive approach, the research focused on direct field observations and measurements to assess the current state of access to basic amenities. Additionally, surveys, interviews and informal discussions were conducted with samples selected from people residing in unplanned settlements of the Jali and Kanyinya sectors to gather insights into their access to basic amenities. Mixed research methods including qualitative and quantitative methods were used in surveys and interviews, where quantitative method was used to provide a comprehensive analysis of the spatial distribution pattern of access to basic amenities. Surveys were conducted with close-ended questions to a statistically significant sample of households in the four selected cells to collect numerical data on various aspects of basic amenities. While qualitative methods were used semi-structured interviews, focus groups, and informal discussions with open-ended questions to gather detailed responses. The qualitative methods aimed to capture the lived experiences, perceptions, and challenges faced by individuals in accessing basic amenities. Geographic Information Systems (GIS) were used during fieldwork to record, analyze, process, and visually represent data related to basic amenities access. The results were represented through maps, photographs, graphs, and tables.

3.2. Study area description

The research was conducted in Kigali, Rwanda. The research study covered 62.096SqKm and, Administratively the study area covers parts of the following two sectors: Jali and Kanyinya sectors from two districts that are Gasabo and Nyarugenge of Kigali city, it is located in North-west of Kigali city. Kanyinya has a surface area of 37.37 sq km with a population of 31,026 people, of whom 15,776 are male and 15,250 are female, with a population density of 1,101 inhabitants/sq km. Jali has a surface area of 24.17 sq km with a population of 41,156 people, of whom 20,279 are male and 20,877 are female, with a population density of 1,283 inhabitants/sq km (NISR, 2022). The study area was chosen based on its increased household in areas with steep slopes and hillsides as well as

increased development of unplanned settlements in the land proposed for agriculture and forest uses that do not match with Kigali master plan. The site has many new houses built nowadays with different irregular and undefined shape, walls constructed of adobe bricks or mud, unequal sized, and the study area is located near Kigali city center which can be a reason for people to relocate there. Moreover, the focus of the studies is to deal with a spatial distribution pattern of basic amenities and analysis of connectivity with social welfare in study area.

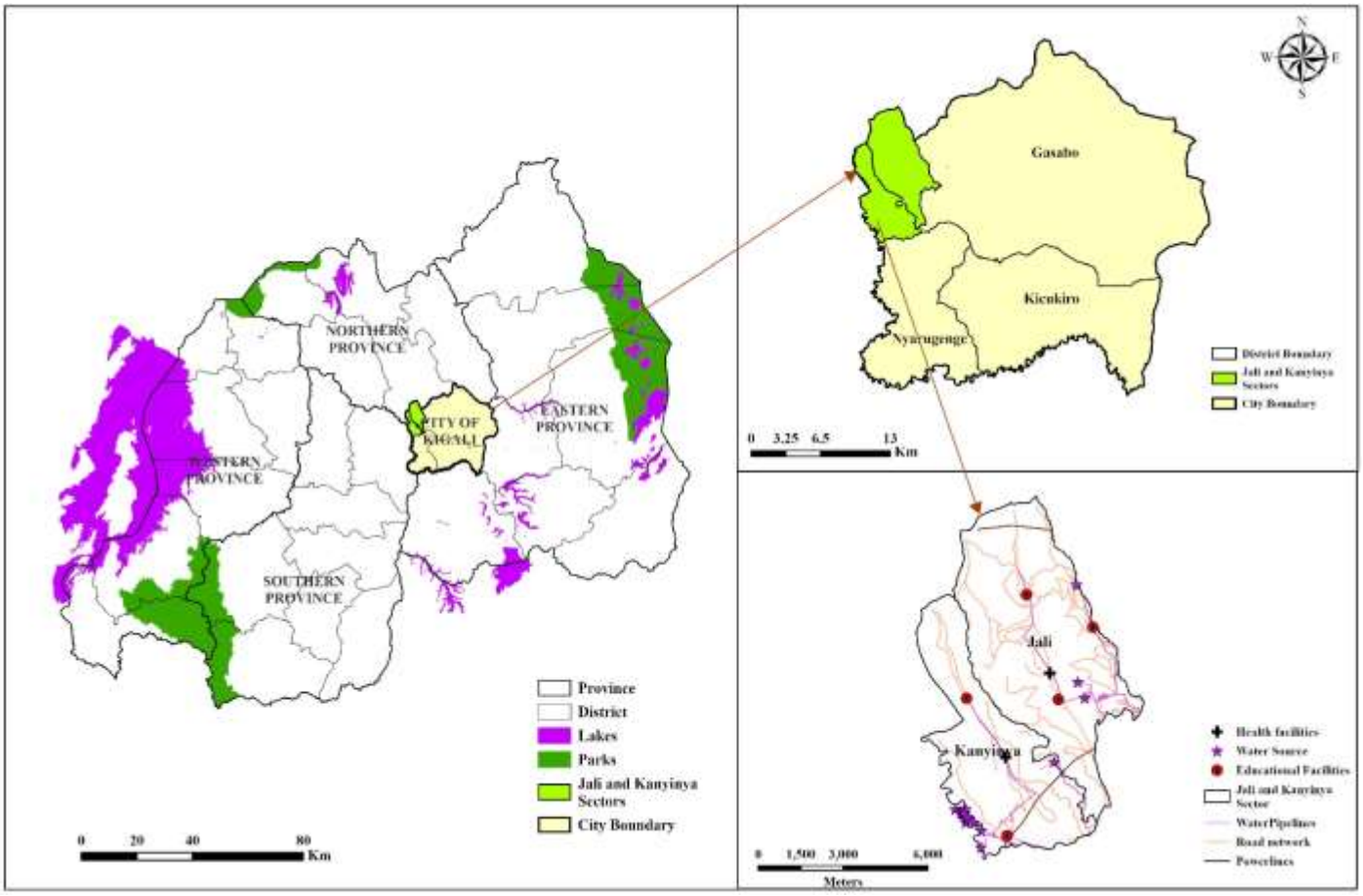

Figure 3: Location of Jali-Kanyinya sectors (Source: City of Kigali, NISR)

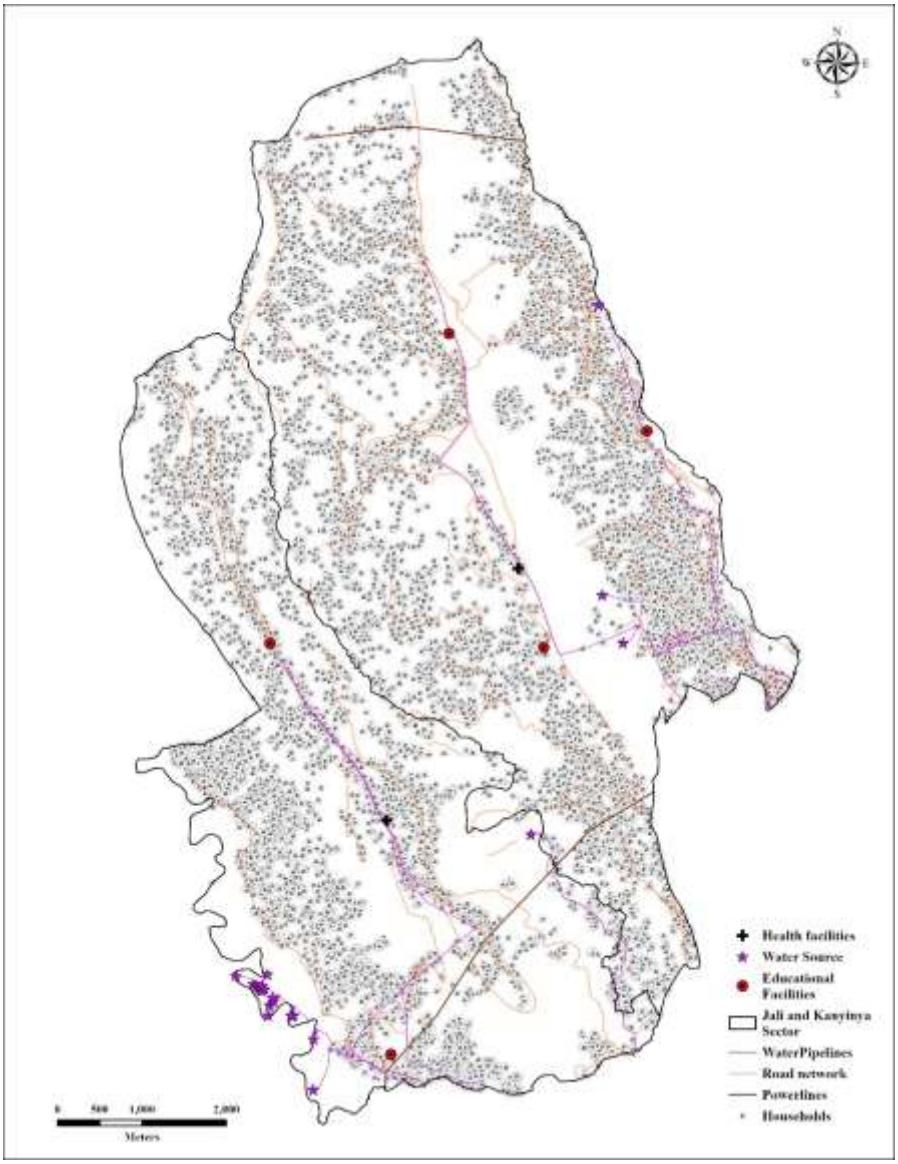

Figure 4: Distribution of households and basic amenities within Jali and Kanyinya Sectors (Source: RHA, NISR)

3.3. Research design

To attain the result in this study, the research design below in figure 3 was followed. The first step was to get knowledge from studies similar to the one I undertook. The second step was to formulate the research problem, research objectives and questions, and identify data needed to answer the research questions in the study. The third one was the data collection, organization and processing. Last but not least is the data Analysis

assessment accuracy of results, validation and discussion about results obtained and thesis reporting. The stated data was converted into maps, charts, graphs, and images.

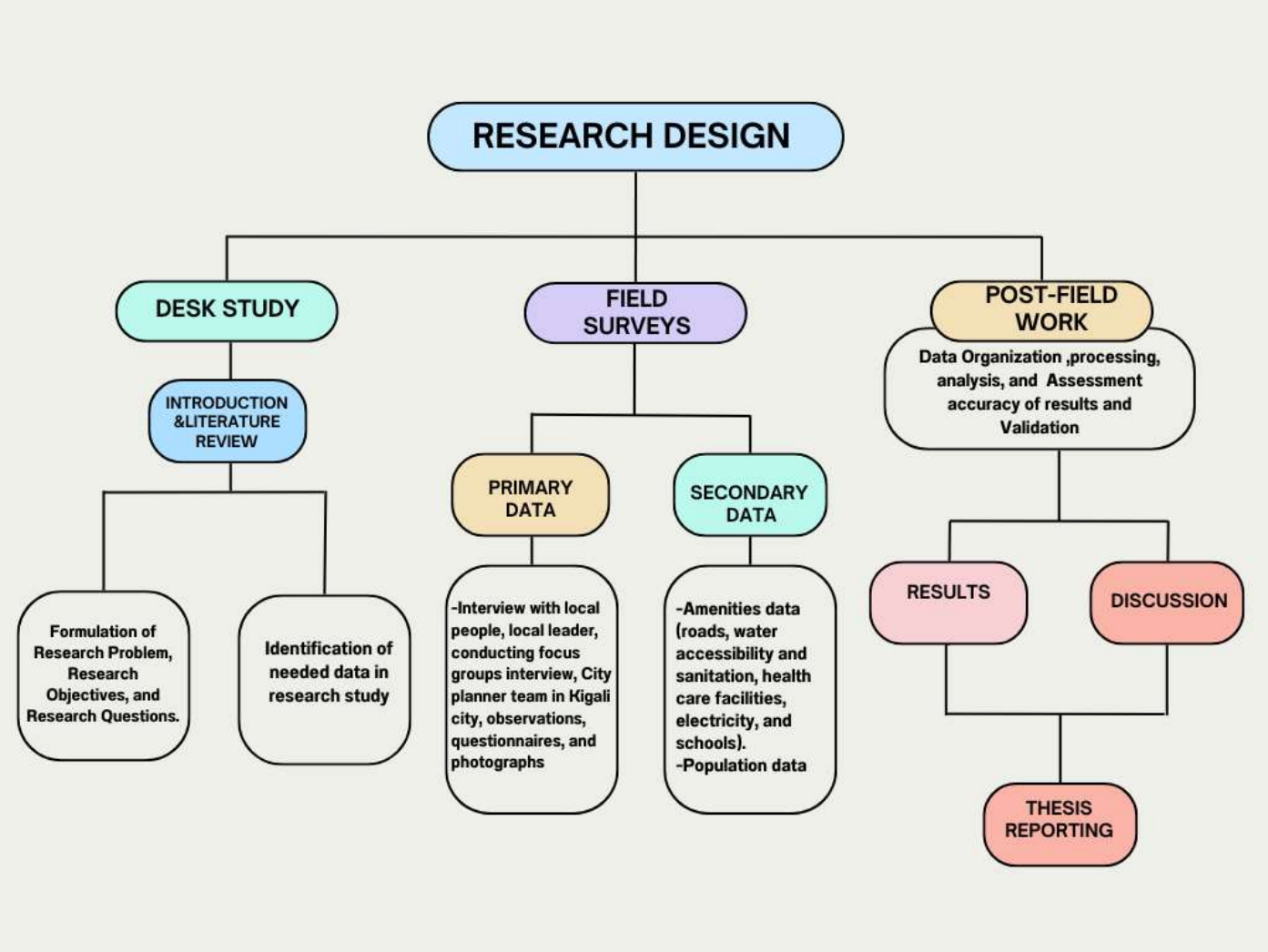

Figure 5: Research design (Source: Author)

3.4. Data collection methods

Spatial and non-spatial data used in this research have been collected through various techniques, including the literature review, field observation and measurements, survey, and interview. Each method has provided specific data that were processed and analyzed in order to attain results to answer the research objectives and questions.

3.4.1. Primary data collection

3.4.1.1. Field observation, measurements and mapping

In conducting field observation and measurements, methodology used involved a systematic approach to gather firsthand insights into the spatial distribution of basic amenities within the Jali-Kanyinya sectors of Kigali City. The unplanned settlements of the Jali-Kanyinya sectors were visited for observing and documenting the presence and condition of basic amenities. This involved physically inspecting water, electricity, sanitation facilities, health facilities, educational facilities, and transportation. Time was spent to engage with residents to gain a deeper understanding of their daily experiences and challenges in accessing basic amenities.

To ensure accuracy and precision in observations, various measurement techniques were used. These included assessing the dimensions and capacities of infrastructure such as water wells and sanitation facilities. Additionally, GPS devices were used to record geographical coordinates, enabling us to map the locations of amenities and visualize their spatial distribution.

3.4.1.2. Survey

I. Sampling Technique

In the pursuit of understanding the spatial distribution pattern of access to basic amenities within the Jali-Kanyinya sectors of Kigali City, both random and purposive sampling techniques were used in this study. This combined approach was chosen to ensure the sample adequately represented the diverse socio-economic and demographic characteristics of the unplanned settlements under study. Random sampling was used to provide a broad and unbiased representation of the population, while purposive sampling was strategically used to select respondents who could offer rich and meaningful insights into the research topic. The selection of respondents was guided by predefined criteria aimed at capturing a broad range of information and experiences. Criteria included factors such as residence within the Jali-Kanyinya sectors, socio-economic status, household composition, and proximity to basic amenities. Four cells were selected for as a sample and those cells were in the unplanned settlements with

limited access to basic amenities. Two cells were selected from Kanyinya sectors (Nyamweru and Nzove cell) while two cells were selected from Jali sectors (Nyabuliba and Nyakabungo cell).

II. Sample size

In study focusing on the spatial distribution pattern of access to basic amenities within the Jali-Kanyinya sectors of Kigali City from 2008 to 2024, the determination of an appropriate sample size was crucial to ensure the representativeness and reliability of findings. However, the sample was taken from Nzove, Nyamweru, Nyabuliba, and Nyakabungo cells, where there were 9,036 households.

The formula for simple random sampling was used in this study, which is presented below:

$$n = \frac{\mathrm{N} * z^2 * \mathrm{p} * (1 - \mathrm{p})}{e^2 * (N - 1) + z^2 * p * (1 - p)}$$

Where:

-N=9036 (total number of households),

-Z is 1.96 (for a 95% confidence level),

-p=0.5 (maximum variability),

-e=0.05 (5% margin of error).

By using this formula:

$$n = \frac{9036 * (1.96)^2 * 0.5 * (1 - 0.5)}{(0.05)^2 * (9036 - 1) + (1.96)^2 * 0.1 * (1 - 0.1)} = 401.3 \approx 402$$

Several factors were considered in determining the appropriate sample size for each stakeholder group. These factors included the geographical spread of the study area, the demographic diversity of the population, the availability of resources for data collection and analysis, and the feasibility of engaging with participants within the constraints of

time and budget. A primary focus of the study was to understand the experiences and perceptions of residents, particularly those residing in unplanned settlements within the Jali-Kanyinya sectors. Recognizing the importance of including voices from these marginalized communities, the main aim was to recruit a substantial number of residents to participate in surveys.

III. Survey questionnaire design

The questionnaire design was informed by the specific research objectives and the need to capture a wide range of perspectives and experiences related to access to basic amenities from residents of Jali and Kanyinya sectors. To achieve this, the questionnaire was structured using a quantitative method in order to capture a lot of quantitative data where questions were structured with giving respondents the option of choosing the right question which helped to capture very rich quantitative data.

3.4.1.3. Interviews

The interviews were semi-structured in nature, allowing for flexibility and adaptability in the conversation while ensuring consistency in covering key topics and themes. During the interview, a qualitative method like open ended questions, active listening, note-taking and audio recording were used. An interview guide was developed to provide a framework for the discussion, outlining key areas of inquiry such as access to water, sanitation, healthcare, education, and infrastructure development. This guide served as a reference point for the interviewer, facilitating a focused and productive exchange with the participants. In addition, interviews were conducted in person, either at the participants' residences or at convenient locations within the study area. The conversations were recorded with the consent of the participants to ensure accurate capture of information.

Participants for the interviews were selected purposively to ensure representation from diverse stakeholder groups. These include local leaders and representatives from the infrastructure provisions institutions like Rwanda energy Group (REG) for getting insight into electricity. Construction, water supply and other business enterprise ltd (COWBE Ltd) private company under water and sanitation corporation (WASAC) provides water and cleaning companies. These key stakeholders play a critical role in

provision of basic amenities in urban development policies and implementing infrastructure projects within the Jali-Kanyinya sectors. While the sample size for this group was 5 local leaders, 2 at sector level and infrastructure officers, 2 COWBE officials, 1 REG official, and 2 from sanitation companies and they were smaller compared to the resident population, efforts were made to include a diverse range of perspectives, including representatives from different administrative levels and departments within the council.

In processing the qualitative data from interview voice recordings for the study on access to basic amenities in the Jali-Kanyinya sectors, a systematic methodology was used. The process began with listening to the recordings and summarizing the key points from each interview. These summaries captured essential insights and repeated themes relevant to the research objectives. Once the summaries were completed, they were reviewed and categorized based on predefined themes and emerging patterns related to the availability and accessibility of basic amenities such as water, sanitation, electricity, healthcare, education, and road networks. This thematic categorization facilitated a structured analysis of the qualitative data, enabling the identification of common challenges and unique perspectives from the respondents.

3.4.2. Secondary data collection

In conducting the study on the spatial distribution pattern of access to basic amenities within the Jali-Kanyinya sectors of Kigali City, a comprehensive approach was taken to gather secondary data. Alongside consulting policies, laws, district reports, and scholarly articles, various secondary data sources were used to enhance the analysis. Shapefiles were obtained from the National Land Authority, City of Kigali, and Ministry of Infrastructure. These spatial data provided crucial geographic information such as administrative boundaries and the distribution of basic amenities within the study area. They formed the basis for mapping and analyzing the spatial distribution of basic amenities, allowing for examination of accessibility patterns and disparities in detail. Additionally, orthophotos and base maps were used during the digitization process. Orthophotos provided high-resolution imagery that helped in identifying land cover and land use patterns, while basemaps offered essential context for geo-referencing and spatial analysis.

3.4.3. Data Analysis

In the study investigating the spatial distribution pattern of access to basic amenities within the Jali-Kanyinya sectors of Kigali City, the presentation and analysis of data were essential components of the research methodology. Leveraging Geographic Information Systems (GIS) and imagery, advanced techniques were used to visualize, process, and interpret spatial data, thereby uncovering insights into basic amenity provision and spatial disparities. Excel were also used to analyze non-spatial data.

Geographic Information Systems (GIS), using ArcGIS Pro 3.1 and ArcMap 10.8, played a central role in data presentation and analysis through integrated spatial data layers, such as infrastructure locations, population density, and land use classifications, to create detailed maps illustrating the spatial distribution of basic amenities within the Jali-Kanyinya sectors. By overlaying and analyzing these layers, areas of both abundance and scarcity in basic amenity provision were identified, as well as potential spatial clusters or disparities.

In addition to GIS mapping, imagery analysis provided valuable insights into the physical characteristics and environmental conditions of the study area. Base maps, Land-SAT 8, Sentinel-2 and orthophotos were used to assess land cover, land use patterns, and changes in the landscape over time (2008-2024) through image classification. Imagery analysis complemented GIS mapping efforts by offering a visual representation of the spatial context in which basic amenities are situated.

Spatial analysis techniques were used to extract meaningful patterns and relationships from the spatial data collected. This included proximity analysis to assess the accessibility of basic amenities from residential areas, spatial autocorrelation to identify spatial clusters or hotspots of amenity provision, and buffer analysis to examine the impact of infrastructure proximity on amenity access. Through spatial analysis, we gained a better understanding of the spatial dynamics underlying basic amenity provision and its implications for residents.

3.4.4. Data processing

Processing data was an important step in converting raw data into useful insights. Careful cleaning, validation, normalization, and standardization of the data ensured accuracy and consistency. GIS was used to process spatial data, while Excel handled non-spatial data. Through GIS data processing and statistical analysis techniques, spatial patterns, differences in space, and factors influencing the availability of basic amenities were identified. The results of the data processing included maps, graphs, charts, tables, and photographs.

CHAPTER 4: RESULTS AND DISCUSSIONS

4.1. Introduction

This chapter presents and discusses the results and findings on the spatial distribution pattern of access to Basic Amenities in Unplanned Settlements in Kigali City, focusing on the case study of the Jali-Kanyinya sectors from 2008 to 2024. The findings are presented relative to the research questions and objectives of the study. The objectives addressed are: "To analyze the spatial distribution patterns of access to basic amenities within the Jali-Kanyinya sectors of Kigali City, with a focus on the availability and accessibility of essential services such as water, sanitation, electricity, healthcare, education, and road networks, To identify the factors influencing the uneven distribution of basic amenities within unplanned settlements, To assess the socio-economic and demographic characteristics of the residents and their challenges in relation to access to basic amenities, and to propose strategies for improving the spatial distribution of basic amenities in unplanned settlements in Kigali City".

Additionally, subcategories of vital issues are presented under different research questions. Some of these categories were pre-existing and included in the interview guide, while others were developed as a result of the interview process and the various responses provided by respondents during the investigative process. The study findings are discussed accordingly, aligning with the survey's design and execution. The collected data was properly screened and analyzed according to the study's objectives, using both qualitative and quantitative methods in the data analysis process.

Interview with Jali and Kanyinya sector /cell executive secretary on the distribution amenities both saying that as the capacity raised will raise the basic amenities like schools, health post, settlement to bring people from high-risk zone and upgrading some site. Kanyinya secretary says that ``In the future plan we will build settlement to bring the people in high-risk zone, school, strengthen health post, maintain local road, increase electricity, water and raise awareness on sanitation; as capacity increase every year in district budget will think about one or more asset to build''.

4.2. Socio-economic and demographic characteristics of the residents and their challenges in relation to access to basic amenities.

A total of four hundred and two (402) participants were chosen for the research conducted in Jali and Kanyinya sectors. Their origin, age, gender, marital status, occupation, income, and educational background were taken into account to understand the demographic characteristics of respondents. Occupation, income, and educational background are on the appendix.

4.2.1. Origin of Respondents

103 respondents stated that they are native to Jali and Kanyinya sectors, whereas 299 respondents mentioned that they migrated from different regions to Kanyinya and Jali sectors. Among them, 205 respondents reported that they came from the countryside, while 94 respondents stated that they moved from other sectors within Kigali city. People who migrated from the countryside mentioned that they came to Jali and Kanyinya sectors in search of job opportunities, where they reside while still having access to jobs and services in the city center. Among those who moved from Kigali, 46 respondents relocated to Jali and Kanyinya Sectors from unplanned settlements in the city center, 25 respondents were expropriated for public interest reasons, and 23 respondents migrated due to the high cost of living in urban centers, especially housing costs.

Respondents mentioned various reasons for choosing these sectors: 103 respondents were attracted by job opportunities, particularly in Kanyinya sector, which hosts industries like Skol Brewery (SBL) offers short commuting distances to workplaces. 66 respondents were attracted by the availability of cheap land, where the net price of a plot (15x20m) ranges between 500,000-3,000,000 RWF, significantly lower than other sectors in Kigali City. Additionally, 130 respondents were attracted by affordable housing options, with some mentioning rental fees as low as 5,000 RWF - 60,000 RWF, and others reporting that they acquired housing without paying rental fees as owners entrusted them with their property.

4.2.2. Age of Respondents

The research considered the age of respondents and the results presented in the table 3 below.

Age group	Number of respondents	Percentage (%)
18-30	113	28.11%
30-40	183	45.52%
40-50	57	14.18%
50-Above	49	12.19%
Total	**402**	**100%**

Table 3: Age of respondents (Source: Author)

As reflected in the table 3 above, the study results indicate that 28% (113 respondents) are between 18 and 30 years old, following this, 45.5% (183 respondents) fall within the 30-40 age range, accounting for the largest proportion as the population trends in this region are mainly driven by rural-to-urban migration and urban-to-rural migration. However, the situation differs from regions where population trends are driven by natural growth, where the dominant demographic consists of young people under 19 years old. Additionally, 14.18% (57 respondents) are aged between 40-50 years old, while 12.19% (49 respondents) are 50 years old and above. The consideration of age in this study

stems from the recognition that access to basic amenities varies across age groups, with older people often facing greater challenges compared to younger adults. The research adopted 18 years old as the minimum age threshold, aligning with Rwanda's cultural perspective that people mature upon reaching this age of 18 years old and also marking the legal starting point for employment. The figure 4 below summarizes the age distribution of respondents and the corresponding percentage within each age group.

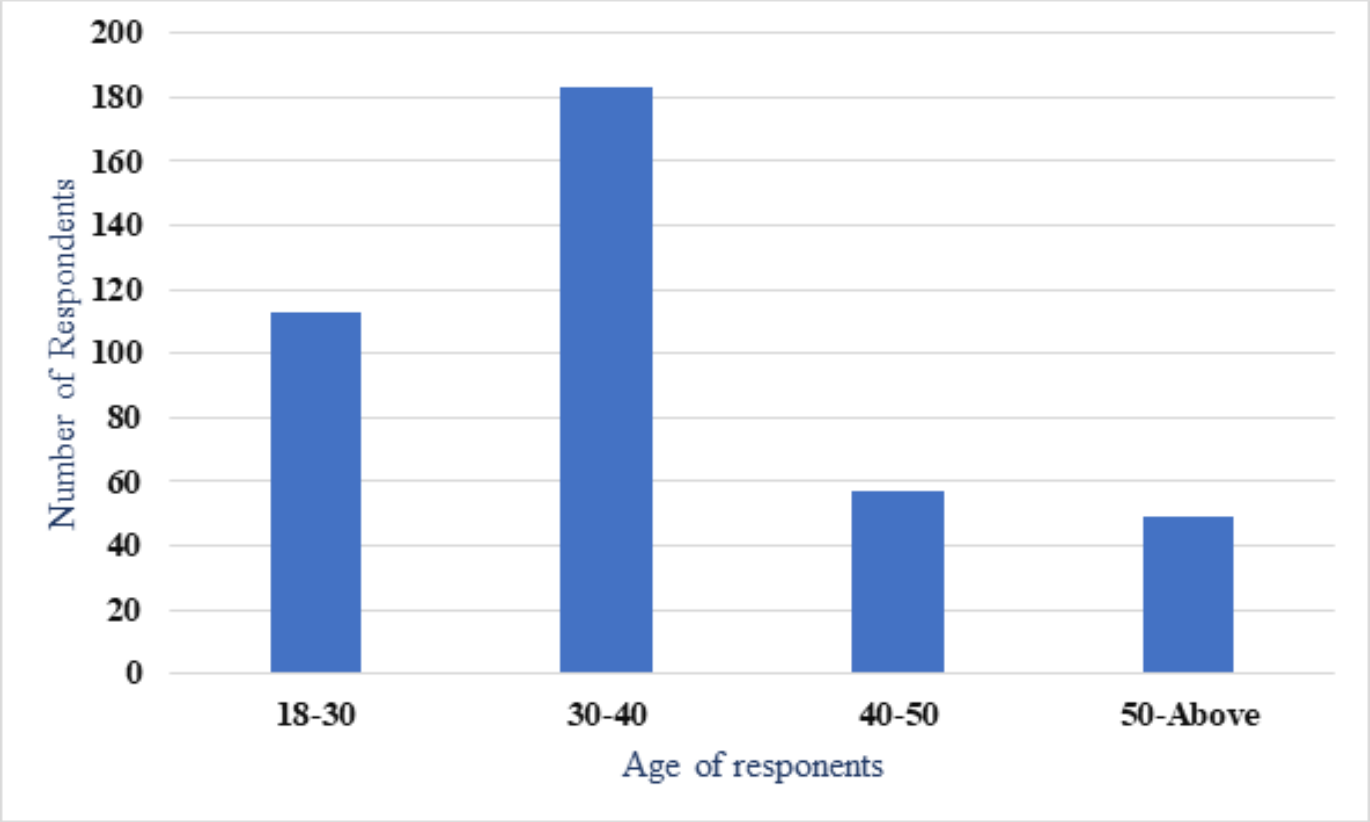

Figure 6: Age distribution of respondents and the corresponding percentage within each age group (Source: Author)

4.2.3. Sex of Respondents

The research considered the sex of respondents, and the results were analyzed accordingly. Priority was given to both sexes, but predominantly to females, as they are the ones who typically experience the most difficulty in accessing basic amenities.

Sector	Village	Male	Female
Kanyinya	Nyamweru	36	53
Kanyinya	Rutagara I	91	101
Kanyinya	Rutagara II	11	5
Jali	Kirehe	24	48
Jali	Gitaba	16	17
Total		**178**	**224**

Table 4: Sex of Respondents (Source: Author)

According to the figure 5 above, the largest proportion of respondents were female, accounting for 55.7% (224 respondents), while males constituted 44.3% (178 respondents). Gender was taken into consideration in the research to ensure a balanced representation and to gather accurate data. However, females were prioritized, as they typically have a better understanding of the challenges related to accessing basic amenities.

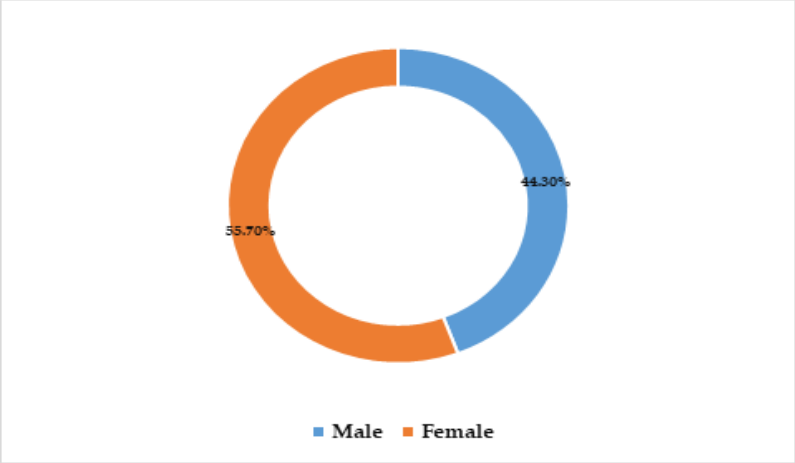

Figure 7: Sex of respondents (Source: Author)

4.2.4. Marital Status of Respondents

The research also considered the marital status of respondents in order to understand access to basic amenities according to marital status.

Marital status	Respondents	Percentage (%)
Single	146	36.32
Married	201	50.00
Divorced	18	4.48
Widowed	37	9.20
Total	**402**	**100%**

Table 5: Marital status of respondents (Source: Author)

The results presented in the table 4 show that the largest number of respondents, accounting for 50% (201 respondents), were married, while 36% (146 respondents), were single. Additionally, 4.4% (18 respondents) were divorced, while 9.2% (37 respondents) were widowed, with many having been widowed as a result of the Genocide against Tutsi in 1994. The figure 6 below illustrates the marital status of respondents versus the number of respondents in each marital group.

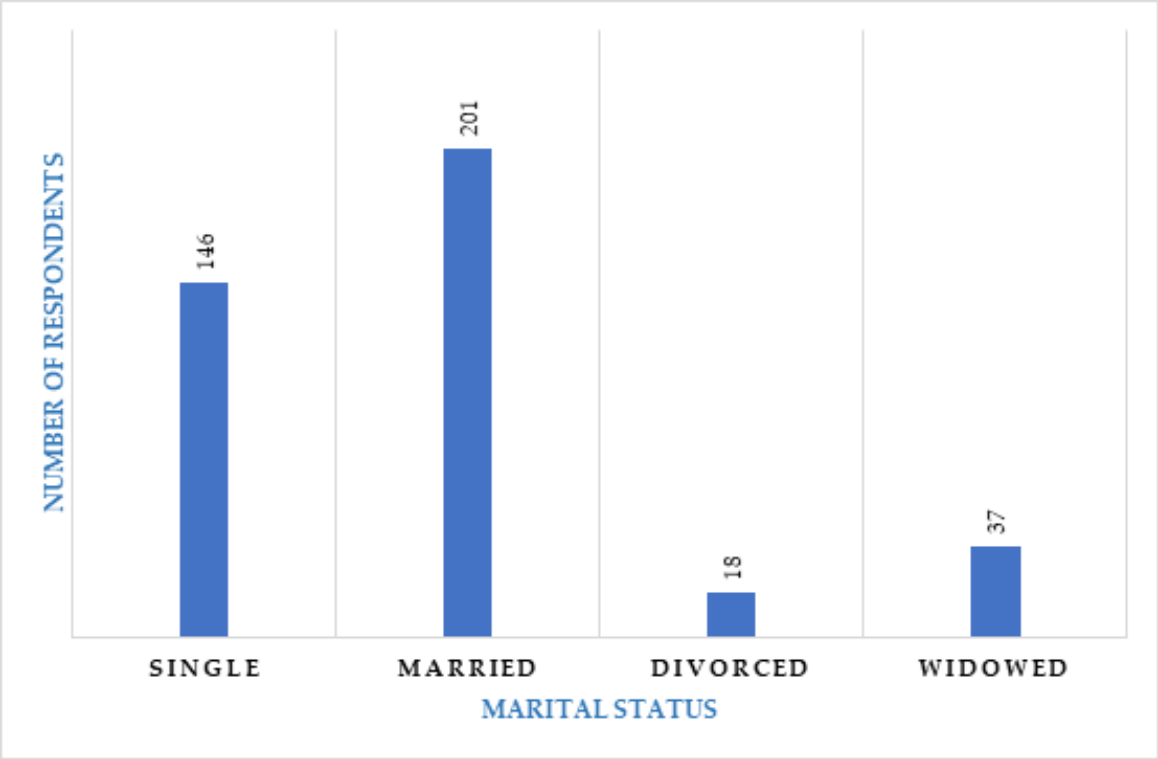

Figure 8: Marital status of respondents versus the number of respondents in each marital group (Source: Author)

4.3. Land Use and Land Cover Change in Kanyinya and Jali Sectors from 2008 to 2024

It was highly observed that most of Jali and Kanyinya land was gradually being converted to non-agricultural activities such as housing development especially since 2013. Land that was previously used for agriculture and forest is being built up by people coming from Kigali city center and the countryside. 117 respondents who are native residents of Jali and Kanyinya sectors reported that the movement of people from Kigali city center to these sectors has reduced agricultural and forest land due to the

development of housing and infrastructure on fertile agricultural land. Since land and house construction remained cheaper compared to other regions of Kigali city, these sectors have become more attractive.

The land and infrastructure officers of Jali and Kanyinya sectors emphasized that there has been approximately a 20% reduction of agricultural land and a 16% reduction of forest cover in these sectors since 2013. This is mainly observed in the Nzove and Nyamweru cells in Kanyinya sector and Agateko cell in Jali sector, which are regarded as urban cells. This change was attributed to the establishment of the Kigali city master plan in 2013. 46 respondents from sectors like Gitega, Kimisagara, Gisozi, and others highlighted that after the establishment of the Kigali city master plan, land started to become expensive, and developing housing became very difficult due to rigid zoning regulations. Consequently, some people, including these 46 respondents, started to migrate from the city center to sectors like Kanyinya and Jali, where land and housing are still cheap.

However, the reduction of agricultural and forest land has affected native residents in general. Out of 402 respondents, 96 were dependent on agricultural activities and ended up losing their jobs since they sold off their land. They stated that agricultural productivity has reduced due to the increase in demand for non-agricultural land use, which has raised conflicts between agricultural and non-agricultural land use. As a result, people who no longer have land for cultivation started to shift from agricultural to non-agricultural activities, such as construction and other jobs, in order to support their families.

For analyzing the land use change of Kanyinya and Jali sectors, Landsat images from 2008 and 2016 were used to analyze the change between 2008-2016, while Sentinel-2 images were used to assess land use and land cover in 2024, which helped to see the change between 2016 and 2024. Six classes were used to analyze the change: farmland, built-up areas, water bodies, wetlands, bare ground, and forest.

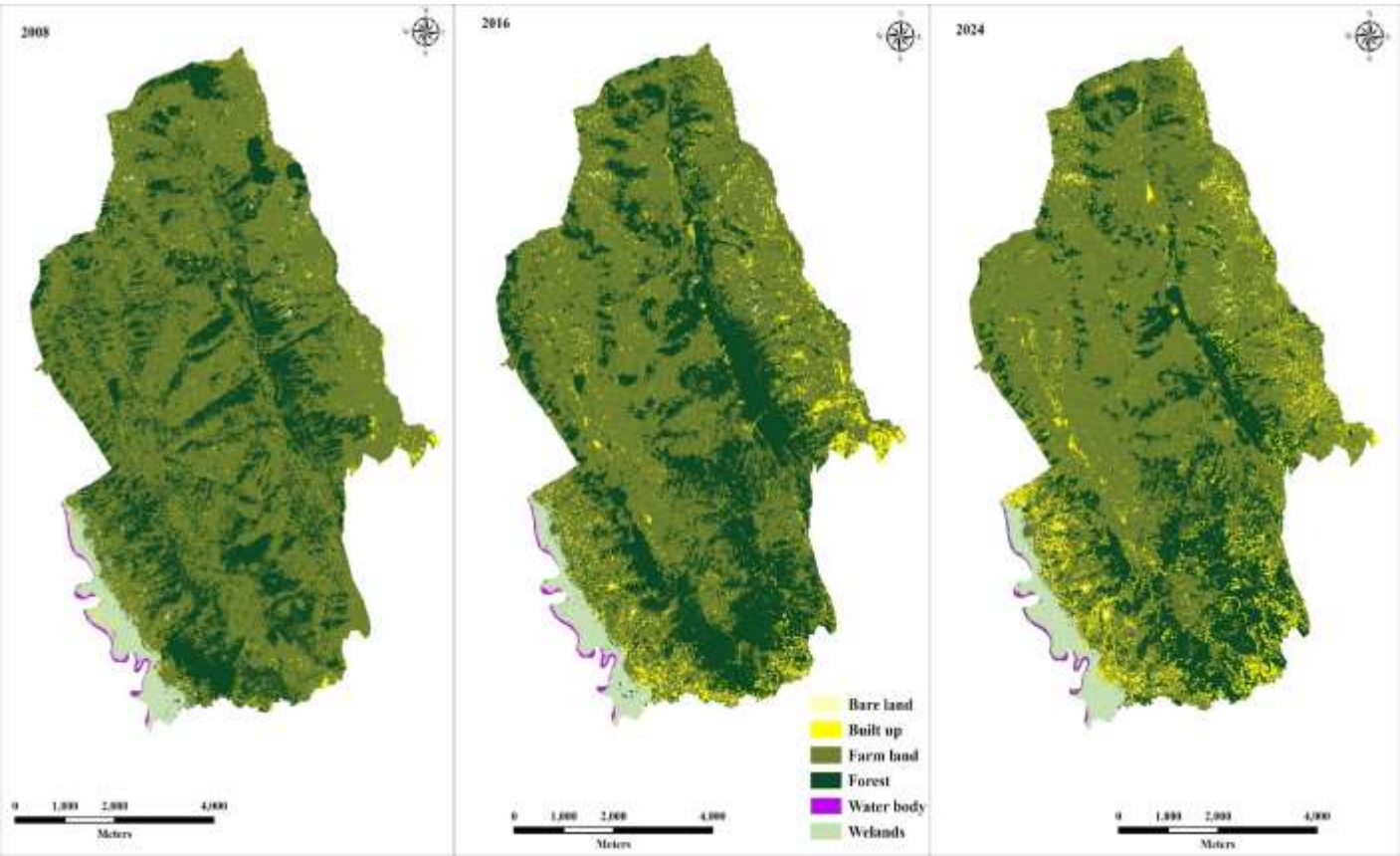

Figure 9: Land Use and Land Cover Change in Kanyinya and Jali Sectors from 2008 to 2024 (Source: USGS Explorer)

The figure 7 above represent the change in land use and cover in the Kanyinya and Jali sectors between 2008 and 2024. In 2024, settlements appeared to be scattered on agricultural land compared to 2016 and 2008.

LULC Classes	Area in ha (2008)	Area in ha (2016)	Area in ha (2024)
Bare land	11.48	13.00	14.87
Built up	103.08	278.43	518.69
Farm land	3964.16	3832.00	3712.29
Forest	1910.70	1859.36	1728.60
Water body	19.95	21.45	21.60
Wetlands	192.55	197.46	204.75
Total	**6200.00**	**6200.00**	**6200.00**

Table 6: Land Use and Land Cover Change in Kanyinya and Jali Sectors from 2008 to 2024 (Source: USGS Explorer)

The table 5 shows the areas of land use and cover in 2008, 2016, and 2024. There is an apparent change, especially in the built-up area. The area covered by buildings was 103.3 hectares in 2008, increasing to 278.4 hectares in 2016 and 518.6 hectares in 2024. This increase in built-up area correspondingly reduced agricultural land from 3,964.19 hectares in 2008 to 3,832.0 hectares in 2018 and 3,712.29 hectares in 2024. This implies that the increase in built-up area has reduced the agricultural land.

In the areas marked as built-up, land cover also includes space for basic facilities. Between 2008 and 2024, basic amenities were gradually developed in the Jali and Kanyinya sectors. According to local residents, all eight nursery schools found in Jali and Kanyinya sectors were established at different times: four between 2008 and 2016, and four between 2016 and 2024. The access to nursery schools was very poor between 2008 and 2016, and poor between 2016 and 2024. Early Childhood Development (ECD) centers were also implemented after the establishment of nursery schools, allowing children to start at ECD centers before continuing to nursery schools.

Of the six primary schools in the study area, four existed in 2008, while the other two were developed between 2008 and 2016. In 2008, there was one secondary school, and between 2008 and 2016, three more secondary schools were established. Additionally, there were two health centers in 2008, and another health center was constructed in 2007. For the Kanyinya sector specifically, Nzove Primary School was established in 1981 and Kanyinya Primary School in 1985. A nursery school was established in 2024 after the outbreak of COVID-19. Kanyinya Secondary School was established in 1988, Nzove Secondary School in 2022, and TVET Kanyinya in 2017.

Electricity was first distributed in 1968 in Rutagara I, while the areas of Jali and Kanyinya received electricity after the Genocide against the Tutsi in 1994. Water was distributed in 1999 after the construction of the Nzove water treatment plant.

4.4. The spatial distribution patterns of access to basic amenities within the Jali-Kanyinya sectors of Kigali City, with a focus on the availability and accessibility of essential services

The analysis of the availability and accessibility of essential services such as water, sanitation, electricity, healthcare, education, and road networks in Jali and Kanyinya sectors was conducted using Geographic Information System (GIS) and various datasets including household data (building footprints), existing schools, health facilities, water and sanitation infrastructure, electricity grids, and road networks. A total of 16,524 households in Jali and Kanyinya were used to examine the spatial distribution and determine the level of access to these basic amenities.

To illustrate the disparities in access based on distance moved by people to amenity, five distinct categories were established:

1. Very good, for ≤500m
2. Good, for 500-1000m
3. Moderate, for 1000-1500m
4. Limited, for 1500-2000m
5. Very limited and for ≥2000m

These categories were used to categorize areas based on the level of accessibility to basic amenities determined building regulation (Republic of Rwanda ,2017), providing insights into the spatial distribution patterns and identifying areas with varying degrees of access to basic amenities.

4.4.1. Availability and accessibility to Nursery schools in the study area.

There are five nursery schools within the Jali sector: Light Nursery School, Nyaburiba Nursery School, E.P Jali Catholic, G.S Rubingo, and Gihogwe Secondary School. Among these, three nurseries (E.P Jali Catholic, G.S Rubungo, and Gihogwe Secondary School) are located within schools that offer both nursery, primary and secondary education. In the Kanyinya sector, there are three nursery schools: Bibungo Nursery School, G.S Nzove, and G.S Kanyinya. G.S Nzove and G.S Kanyinya do not have nursery sections only; There is also primary and secondary education available.

Accessibility to Nursery school education was studied based on the distance traveled by beneficiaries (students) towards the facility. This is how accessibility to Nursery schools has been classified: ≤500: Very good; 500-1000: Good; 1000-1500: Moderate; 1500-2000: Limited; ≥2000: very limited accessibility. The figure 9 below indicates accessibility to Nursery school education facilities in the study areas and it shows that there are still a number of households with limited and very limited access to Nursery school education within Kanyinya and Jali sectors.

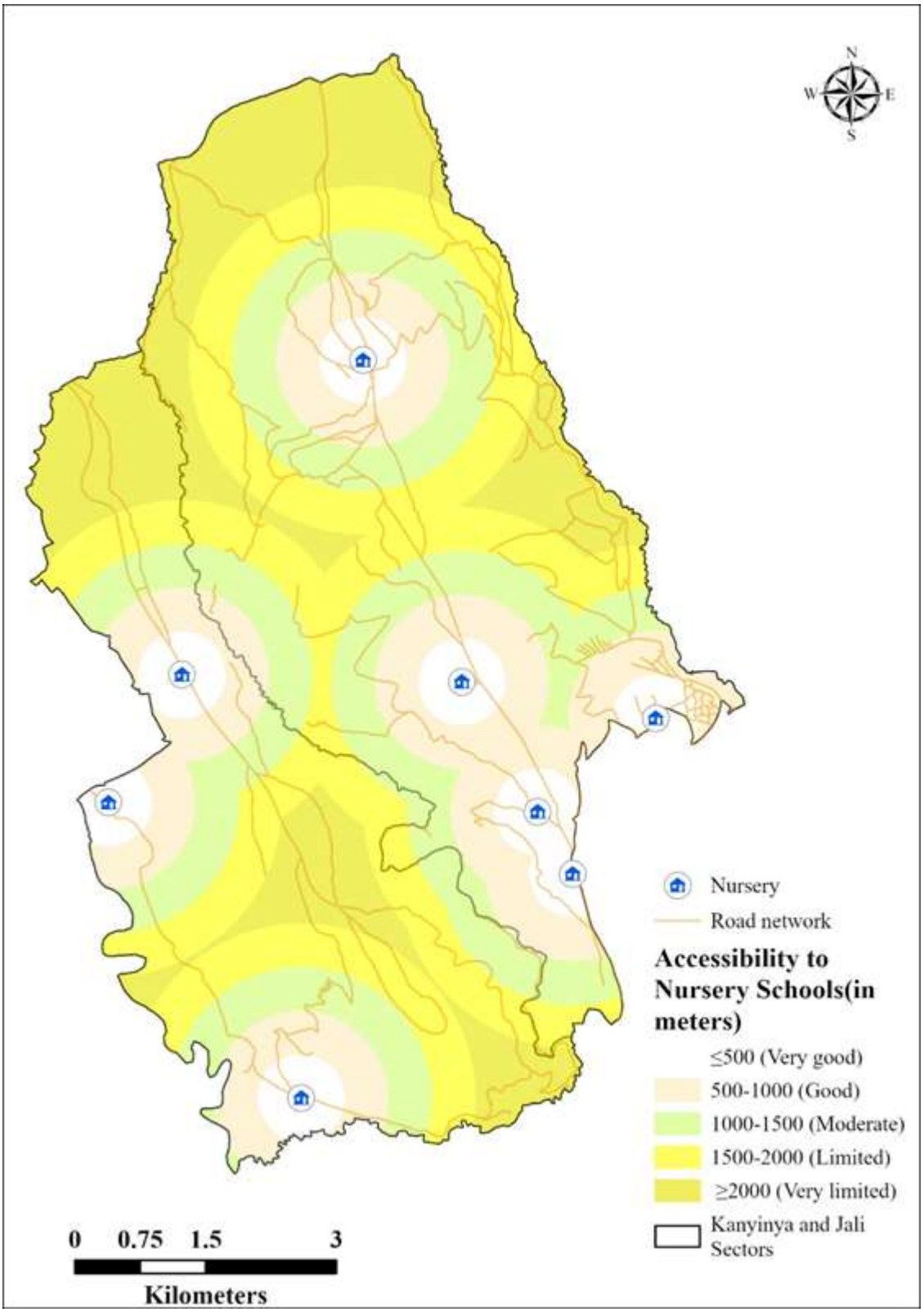

Figure 10: Availability and accessibility to Nursery schools (Source: NISR)

The number of households with very good, good and moderate accessibility to nursery school facilities is nearly equal to the number of households with limited and very limited accessibility. The results presented in table below shows that 2,070 households have very good access; 3,648 households have good access; 3,322 Moderate access; 3,642 have limited access and 3,842 have very limited accessibilities to nursery school facilities. These quantified results show the picture of the status of accessibility to nursery schools. Since 3,642 Households have limited access and 3,842 have very limited accessibility to nursery school facilities, it implies a significant gap in access to nursery schools. Children who need to access nursery schools are required to commute very long distances, approximately 2 kilometers and above. This extended distance is particularly challenging for nursery-aged children, typically between three and six years old.

Status of accessible distance(m)	Households with respect to travel distance	Status of access based on distance (m)
≤500	2,070	Very Good
500-1000	3,648	Good
100-1500	3,322	Moderate
1500-2000	3,642	Limited
≥2000	3,842	Very Limited
Total	**16,524**	

Table 7: Availability and accessibility to Nursery schools (Source: NISR)

During the field survey, out of 402 respondents surveyed, 338 shared their experiences regarding their children's access to nursery school., 11 respondents reported that their access to nursery schools is very good, with a walking distance of less than 0.5 km. Additionally, 96 respondents stated that their access is good, requiring a walk between 0.5 km to 1 km. Furthermore, 123 respondents indicated that their access to basic amenities is poor, with a walking distance ranging from 1 km to 1.5 km. In contrast, 108 respondents described their access as very poor, as they need to walk over 1.5 km, which is considered very far for children attending nursery school, given that the suggested distance to nursery school is less than or equal to 500 m (Republic of Rwanda, 2017).

Ranking	Respondents	Distance (km)
Very good	11	≤0.5
Good	96	0.5-1
Poor	123	1-1.5
Very poor	108	≥1.5

Table 8: Ranking of availability and accessibility to Nursery schools in the study area (Source: Author)

4.4.2. Availability and accessibility to primary schools in the study area

There are four primary schools within the Jali sector: E.P Cyuga, E.P Jali Catholic, G.S Rubungo, and Gihogwe Secondary School. Among these, two primary schools (G.S Rubungo, and Gihogwe Secondary School) are located within schools that offer both nursery, primary and secondary education. In the Kanyinya sector, there are 2 primary schools: G.S Nzove, and G.S Kanyinya. All of this primary located in Kanyinya sector do not have primary sections only; There is also secondary education available.

Accessibility to primary school education was studied based on the distance traveled by beneficiaries (students) towards the facility. This is how accessibility to secondary school facilities has been classified: ≤1000: Very good access; 1000-2000: Good Access; 2000-3000: Moderate access; 3000-4000: Limited Access; ≥4000: very limited accessibility. The figure below indicates accessibility to primary school education in the study areas and it shows that there still remains a significant number of households with limited and very limited access to primary education. This is evidenced by the fact that some students are required to cover approximately 4 kilometers to access primary school facilities.

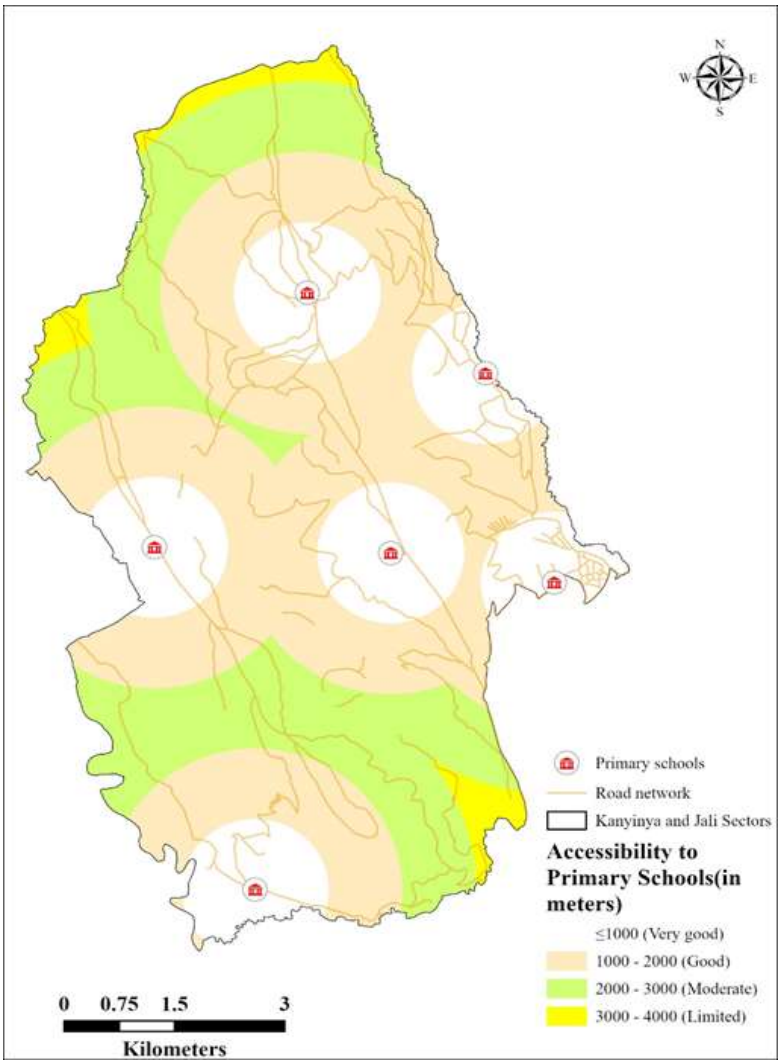

Figure 11: Availability and accessibility to Primary schools (Source: NISR)

The quantified travel distances towards the primary school facilities have shown that 4,756 households are located within a very good accessibility distance, whereas 7,083 households are within a good accessibility distance towards the primary school facility. Additionally, 4,248 households are within a moderate accessibility range. As shown in the table below, there are still a number of households (437 households) with limited access to primary school facilities. Fortunately, there are no households with very limited access to primary education facilities. However, there is still a need for primary schools, which calls for an increase in the number of primary school facilities in the Jali and Kanyinya sectors to ensure equitable access to primary school education.

Status of accessible distance(m)	Households with respect to travel distance	Status of access based on distance (m)
≤1000	4,756	Very good
1000-2000	7,083	Good
2000-3000	4,248	Moderate
3000-4000	437	Limited
Total	**16,524**	

Table 9:Availability and accessibility to Primary schools (Source: NISR)

During the field survey, out of 402 respondents surveyed, 350 shared their experiences regarding their children's access to primary school, 23 respondents reported that their access to primary school is very good, with a walking distance of less than 1 km. Additionally, 96 respondents stated that their access is good, requiring a walk between 1 km to 2 km. Furthermore, 123 respondents indicated that their access to basic amenities is poor, with a walking distance ranging from 2 km to 3 km. In contrast, 108 respondents

described their access as very poor, as they need to walk over 3km, which is considered very far for children attending primary school, given that the suggested distance to primary school is less than or equal to 1 km (Republic of Rwanda, 2017).

Ranking	Respondents	Distance (km)
Very good	23	≤1
Good	96	1 to 2
Poor	123	2 to 3
Very poor	108	≥3

Table 10: Ranking of availability and accessibility to Primary schools in the study area (Source: Author)

4.4.3. Availability and accessibility to secondary schools in the study area

There are 2 secondary schools within the Jali sector: G.S Rubungo, and Gihogwe Secondary School. All of these secondary schools are located within schools that offer both nursery, primary and secondary education. In the Kanyinya sector, there are 2 secondary schools: G.S Nzove, and G.S Kanyinya. All of these secondary schools located in Kanyinya sector do not have nursery sections only; There is also primary and secondary education available.

Accessibility to secondary school education was studied based on the distance traveled by beneficiaries towards the facility. This is how accessibility to secondary schools has been classified: ≤2000: Very good access; 2000-4000: Good Access; 4000-6000: Moderate access; 6000-8000: Limited Access; ≥8000: very limited accessibility.

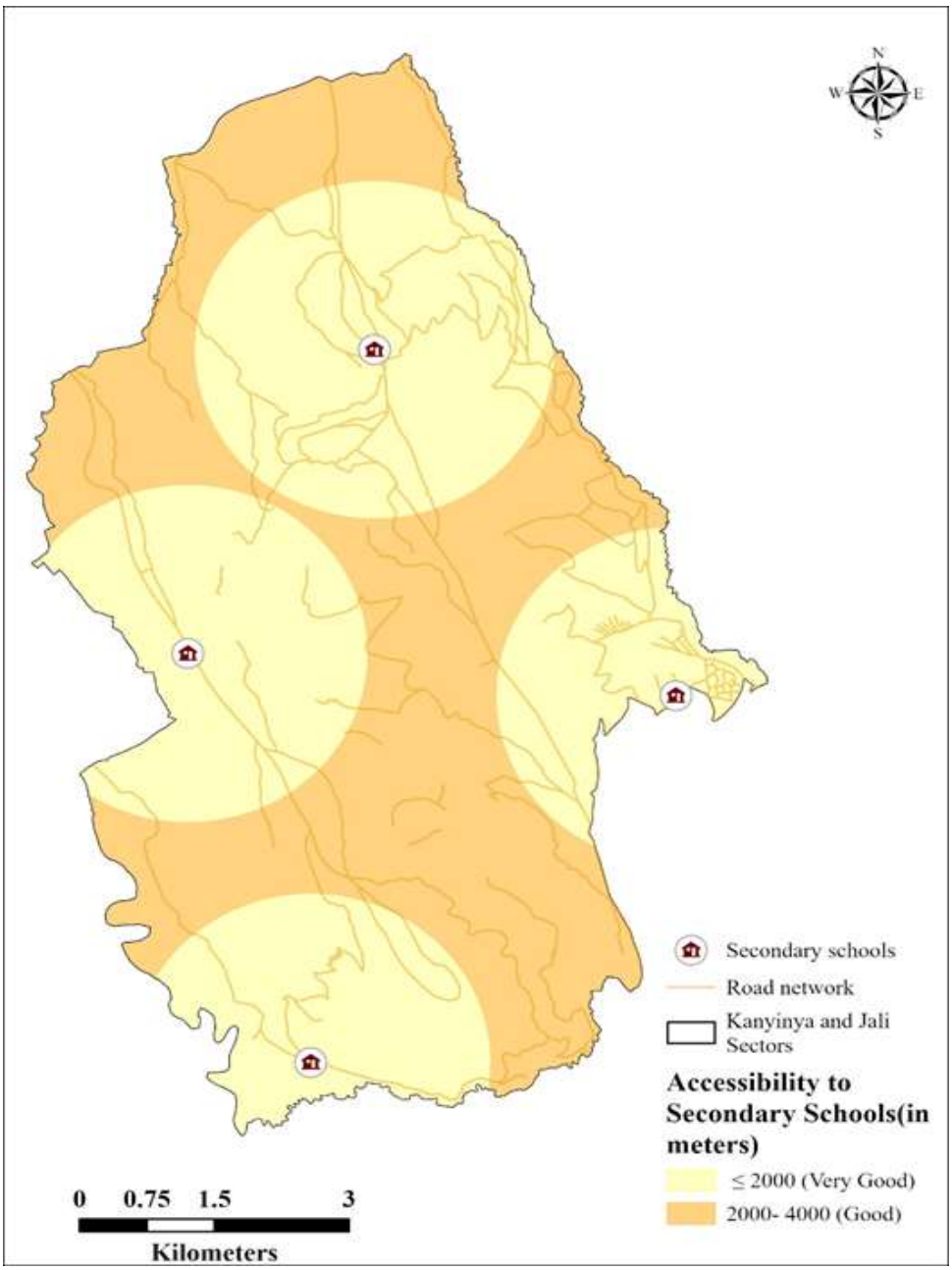

Figure 12: Availability and accessibility to secondary schools (Source: NISR)

The results from the study as shown in the figure 10 above indicates that most of the population live in very good accessibility distance towards the secondary school facility with respect to their distribution in the planned and unplanned areas/zone. The quantified travel distance towards the facility have shown that 9,706 households are located in very good accessibility distance whereas 6,818 households have good accessibility to secondary schools.

Status of accessible distance(m)	Households with respect to travel distance	Status of access based on distance (m)
≤2000	9706	Very good
4000	6818	Good
Total	**16524**	

Table 11: Availability and accessibility to secondary schools (Source: NISR)

During the field survey, out of 402 respondents surveyed, 257 shared their experiences regarding their children's access to secondary school, 36 respondents reported that their access to secondary schools is very good, with a walking distance of less than 2 km. Additionally, 105respondents stated that their access is good, requiring a walk between 2 km to 4 km. Furthermore, 116 respondents indicated that their access to basic amenities is poor, with a walking distance ranging from 4 km to 6 km. In contrast, 98 respondents described their access as very poor, as they need to walk over 6km, which is considered very far for children attending secondary school, given that the suggested distance to secondary school is less than or equal to 2 km (Republic of Rwanda, 2017).

Ranking	Respondents	Distance (km)
Very good	36	≤2
Good	105	2 to 4
Poor	116	4 to 6
Very poor	98	≥6

Table 12: Ranking of availability and accessibility to secondary schools in the study area (Source: Author)

4.4.4. Availability and accessibility to health facilities in the study area

There are three available health centers within the study area (Gihogwe, Jali, and Kanyinya health centers). Accessibility to these health facilities was assessed based on the distance traveled by beneficiaries to reach the facility. The classification of accessibility to health centers is as follows: ≤500 meters: Very good access; 500-1000 meters: Good Access; 1000-1500 meters: Moderate access; 1500-2000 meters: Limited Access; ≥2000 meters: Very limited accessibility. The figure below illustrates the accessibility to health facilities in the study areas.

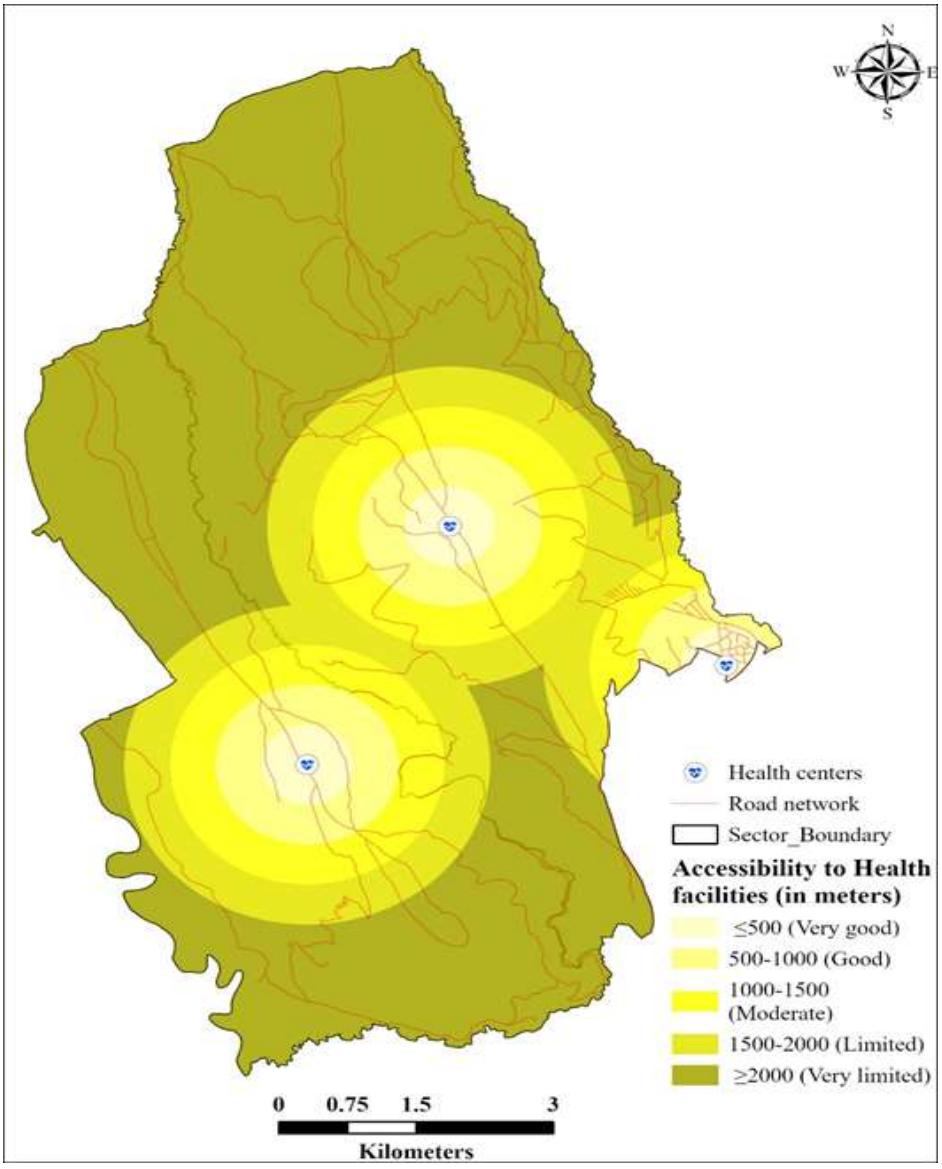

Figure 13: Availability and accessibility to health facilities (Source: NISR)

The table 12 below presents the quantified results of accessibility to health facilities in the study area. It indicates that only 1,105 households have very good access, 1,112 have good access, 1,842 have moderate access, 2,921 have limited access, and 9,544 have very limited accessibility to health centers. However, there remains a significant gap in access to basic amenities in the Jali and Kanyinya sectors, where 12,465 households have limited and very limited access to health facilities.

Status of accessible distance(m)	Footprints with respect to travel distance	Status of access based on distance (m)
≤500	1105	Very good
500-1000	1112	Good
1000-1500	1842	Moderate
1500-2000	2921	Limited
≥10000	9544	Very limited
Total	**16524**	

Figure 14: Availability and accessibility to health facilities (Source: NISR)

During the field survey, out of 402 respondents surveyed, 36 respondents reported that their access to health centers is very good, with a walking distance of less than 0.5 km. Additionally, 92 respondents stated that their access is good, requiring a walk between 0.5 km to 1 km. Furthermore, 168 respondents indicated that their access to basic amenities is poor, with a walking distance ranging from 1 km to 1.5 km. In contrast, 106 respondents described their access as very poor, as they need to walk over 6km, which is considered very far for children attending health centers, given that the suggested distance to health centers is less than or equal to 500 m.

Ranking	Respondents	Distance (km)
Very good	36	≤0.5
Good	92	0.5 to 1
Poor	168	1 to 1.5
Very poor	106	≥1.5

Figure 15: Ranking of availability and accessibility to health facilities in the study area (Source: Author)

4.4.5. Availability and accessibility to clean water in the study area

In Jali and Kanyinya sectors, clean water was distributed from a single central source, such as a water treatment plant and spring, to various points in the distribution network, including households, commercial areas, public facilities, and institutions. There are three water treatment plants in the study area: one in the Jali sector (Bugarama treatment plant) and two in the Kanyinya sector (Usine and Nzove treatment plants). In addition, there are 31 water sources in the study area, with 28 of them located in Nzove, and one spring, Mutobo, located in the Jali sector. All of these water sources and treatment plants serve the study area but also other parts of Kigali city.

The distribution of clean water depended on the land use type, where clean water was distributed in areas predetermined as development zones, such as commercial zones, residential zones, industrial zones, and public facility zones, covering only 17.1% of the study area. The remaining part is reserved for agriculture and forests, with many people living in those zones having limited access to water. As an interviewed officer from WASAC mentioned, the distribution of water depends on the ongoing land use plan to avoid contradiction with the implementation of Kigali City Master Plan 2050. This leads

to poor access to clean water for residents. The map below shows the distribution of water sources, pipelines network, water treatment plants, and the Mutobo spring in respect to the ongoing land use plan.

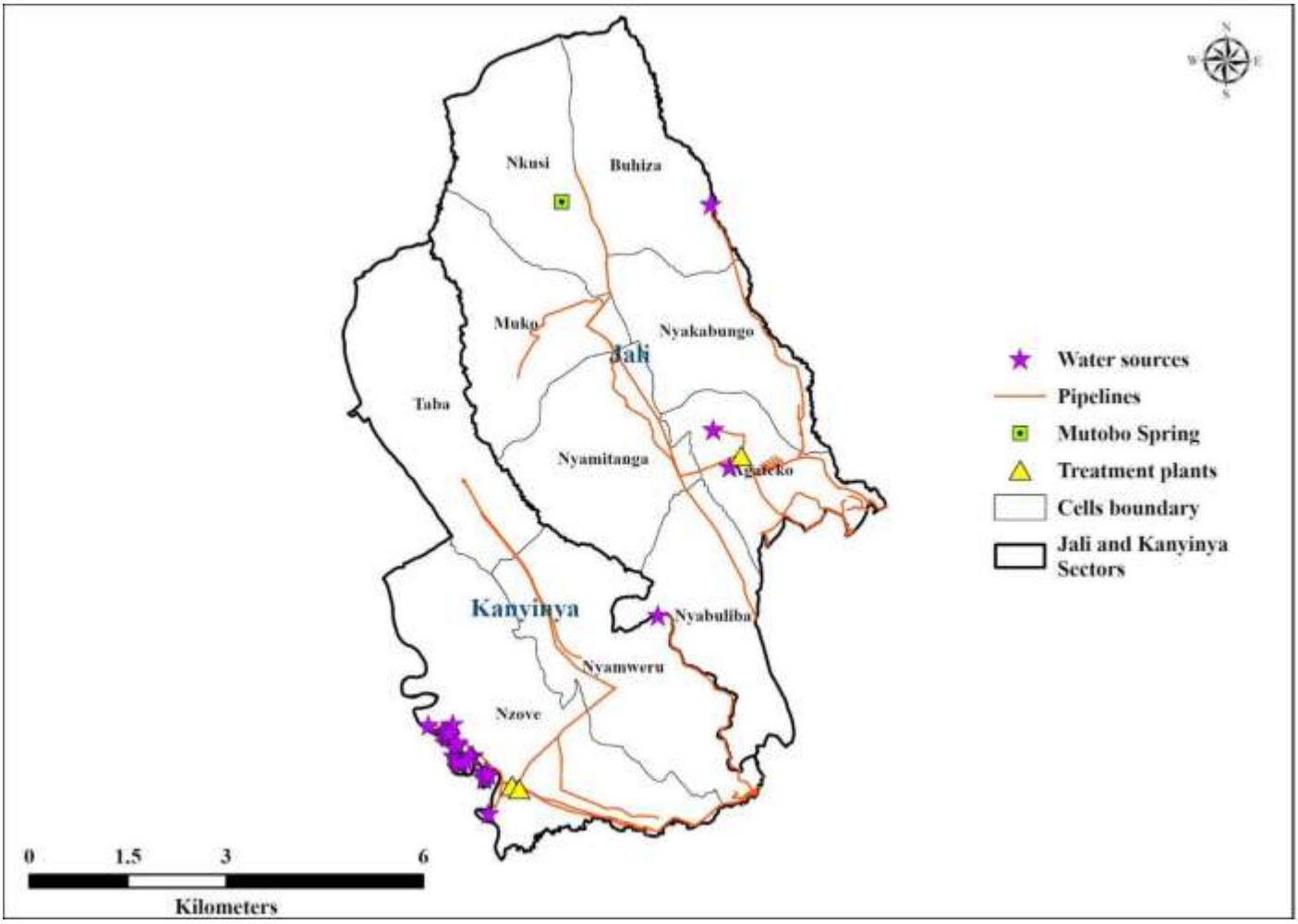

Figure 16: Availability and accessibility to clean water (Source: WASAC)

25 respondents reported having very good access to clean water, as they only need to travel less than 1 kilometer to access it, with some having water directly in their households. Additionally, 138 respondents indicated having good access to clean water, primarily accessing it from public wells and traveling between 1 and 2 kilometers to reach it. On the other hand, 141 respondents stated that they have poor access to clean water, needing to walk between 2 kilometers and 3 kilometers, sometimes using water from rivers and ponds. Furthermore, 98 respondents reported having very poor access to clean water, as they need to travel over 3 kilometers to access it. Very poor access is mainly

concentrated in Buhiza, Nyakabungo, and Nkusi cells. The figure 14 below illustrates where residents with poor and very poor access to clean water fetch water.

Figure 17: Informal water source in Nyakabungo Cell (Source: Author)

4.4.6. Availability and accessibility to sanitation in the study area

97 respondents reported having good access to sanitation, as they have a company responsible for solid and liquid waste collection. Additionally, 122 respondents stated that they consider their access to sanitation as good because there is a company responsible for sanitation, although they sometimes experience delays in waste collection. Meanwhile, 160 people mentioned having poor access to sanitation, as they reside in unplanned settlements lacking road networks. This situation requires employees of the waste management company to cover long distances to collect waste from unplanned settlements to the waste transfer site. Furthermore, 23 respondents indicated having no access to sanitation services or waste management methods. They struggle to find ways to dispose of waste due to the absence of road networks and the inability to afford waste transfer services. Consequently, they use to dump waste in forests, agricultural lands, and other environmental areas. The figure 15 below illustrates how residents with poor and very poor access to sanitation services dispose of waste.

Figure 18: Solid waste disposal in Nyabuliba cell (Source: Author)

4.4.7. Availability and accessibility to electricity in the study area

In terms of all basic amenities, electricity is accessible to all, both in planned and unplanned settlements. 183 respondents stated that they have very good access to electricity, either through on-grid or off-grid sources. Additionally, 153 respondents reported having good access to electricity, while 57 respondents indicated poor access, and 9 respondents noted very poor access. Those with very poor and poor access do not have electricity in their households and instead walk to neighboring areas or other households with electricity to access it. Among the respondents, 316 rely on on-grid electricity, while 27 rely on off-grid electricity. The figure 16 below illustrates the

distribution of electricity in some of the unplanned settlements in the Jali and Kanyinya sectors that have access to electricity.

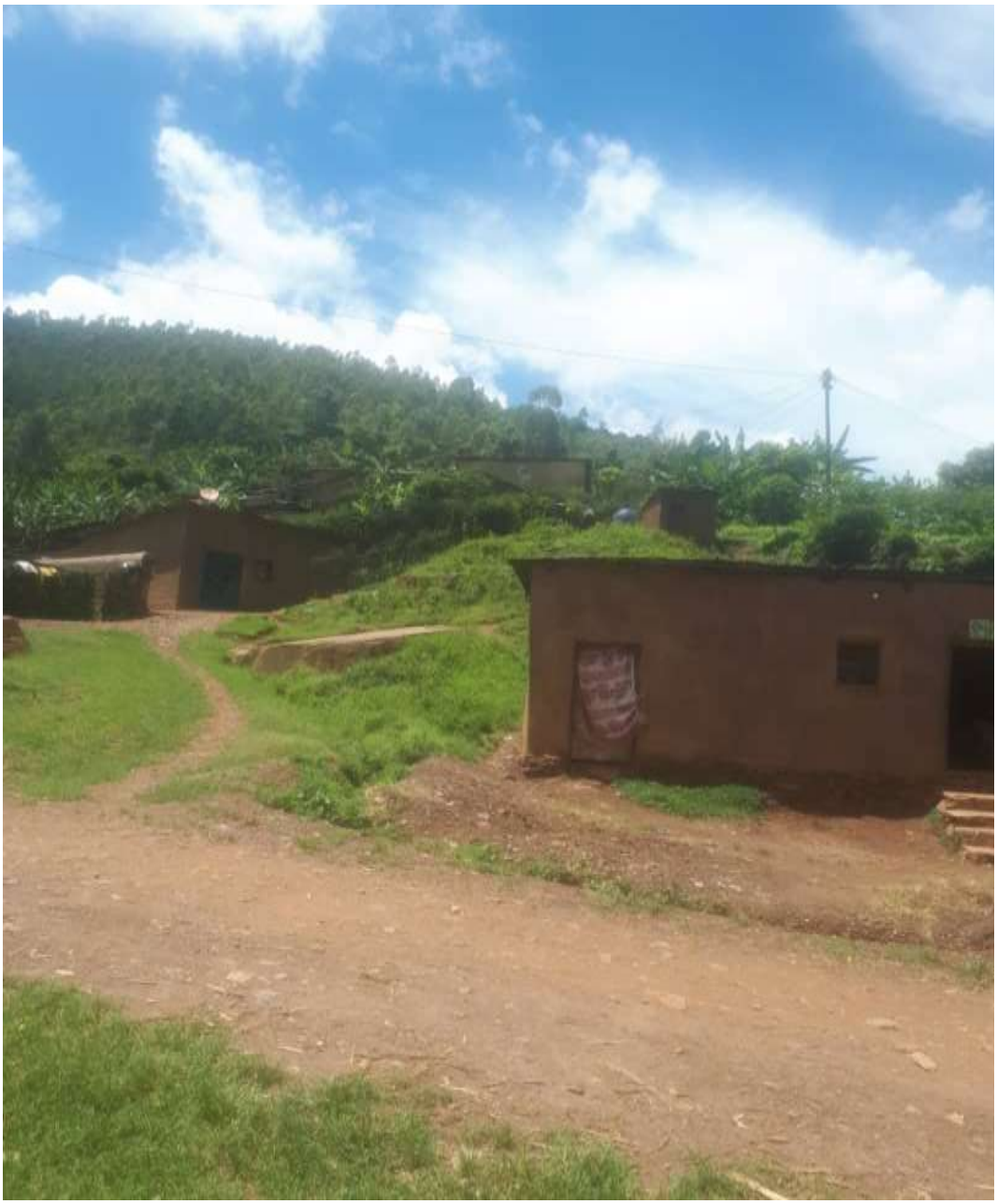

Figure 19: Distribution of electricity in unplanned settlements in Nyamweru Cell (Source: Author)

4.5. Factors influencing the uneven distribution of basic amenities within unplanned settlements.

4.5.1. Topography

Respondents from Kanyinya and Jali sectors (154 respondents) identified topography (slope and elevation) as factors affecting both the distribution and access to basic amenities, including public transport, in this region.

4.5.1.1. Slope

154 respondents identified the slope of Kanyinya and Jali as another factor contributing to the uneven distribution of basic amenities within the study area. Given that this region is characterized by steep slopes, topographic challenges present significant obstacles to the equitable distribution of basic amenities. Steep slopes not only limit the feasible locations for basic amenities but also lead to the complexity and high cost of construction and transportation. Sector and infrastructure officers mentioned that development is permitted on slopes less than or equal to 30%, while steep slopes are reserved for forest and open spaces as specified in the Rwanda Building Code 2019. Consequently, areas with gentler slopes are more likely to attract investments in basic amenities due to their greater suitability for development, except for areas occupied by wetlands (3.1 sqkm). The figure 17 below shows the slope of Kanyinya and Jali sectors.

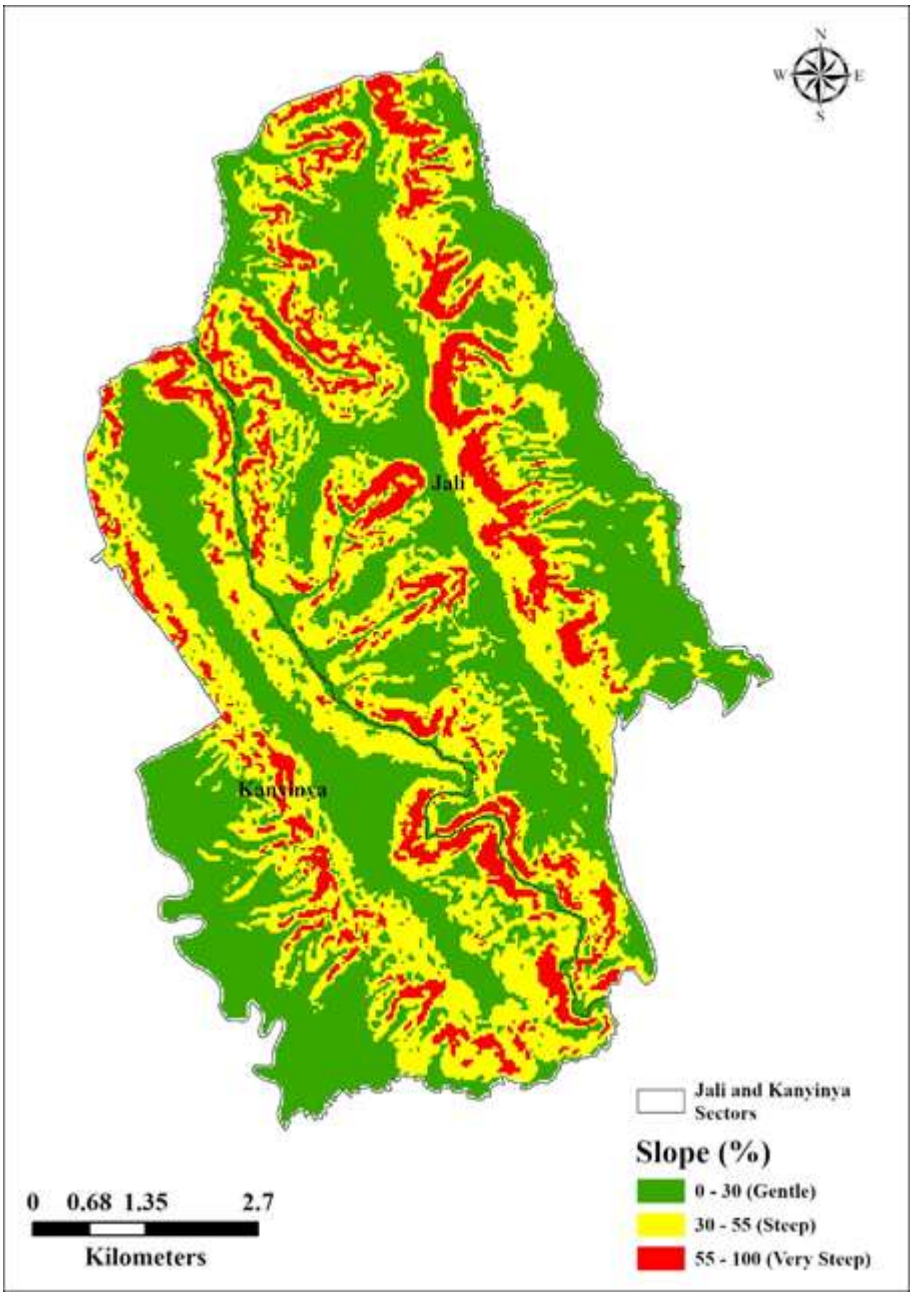

Figure 20: Slope of Kanyinya and Jali sectors (Source: USGS Explorer)

The slopes of Kanyinya and Jali were classified into three classes: gentle slopes, which are less than or equal to 30%; steep slopes, ranging from 30% to 50%; and very steep slopes, ranging from 55% and above. Gentle slopes cover 29.3 sqkm (including 3.1 sqkm of wetlands), steep slopes cover 23.6 sqkm, and very steep slopes cover 9 sqkm. However, the available land for the development of basic amenities is only 26.2 sqkm out of 62 sqkm

of the study area, resulting in an uneven distribution of basic amenities in Kanyinya and Jali Sectors.

4.5.1.2. Elevation

The land and infrastructure officers also highlighted another factor contributing to the uneven distribution of basic amenities in Jali and Kanyinya sectors: the high elevation of these sectors, with the highest point being 2075 m at Mount Jali and the lowest point at 1353 m. Elevation significantly impacts infrastructure development in various ways, including increased construction costs and complexity. Roads, utilities, and other infrastructure often require more extensive engineering and materials to navigate mountainous terrain, leading to longer project timelines and higher expenses. Additionally, elevated areas are more susceptible to natural hazards such as landslides and erosion, and require additional mitigation measures for infrastructure resilience and safety. Moreover, 154 respondents noted that elevation affects their accessibility, facing difficulties in accessing basic amenities and services due to limited transportation options and higher associated costs, especially at the those from the summit of Mount Jali. The figure 18 below represents the topography of the study area.

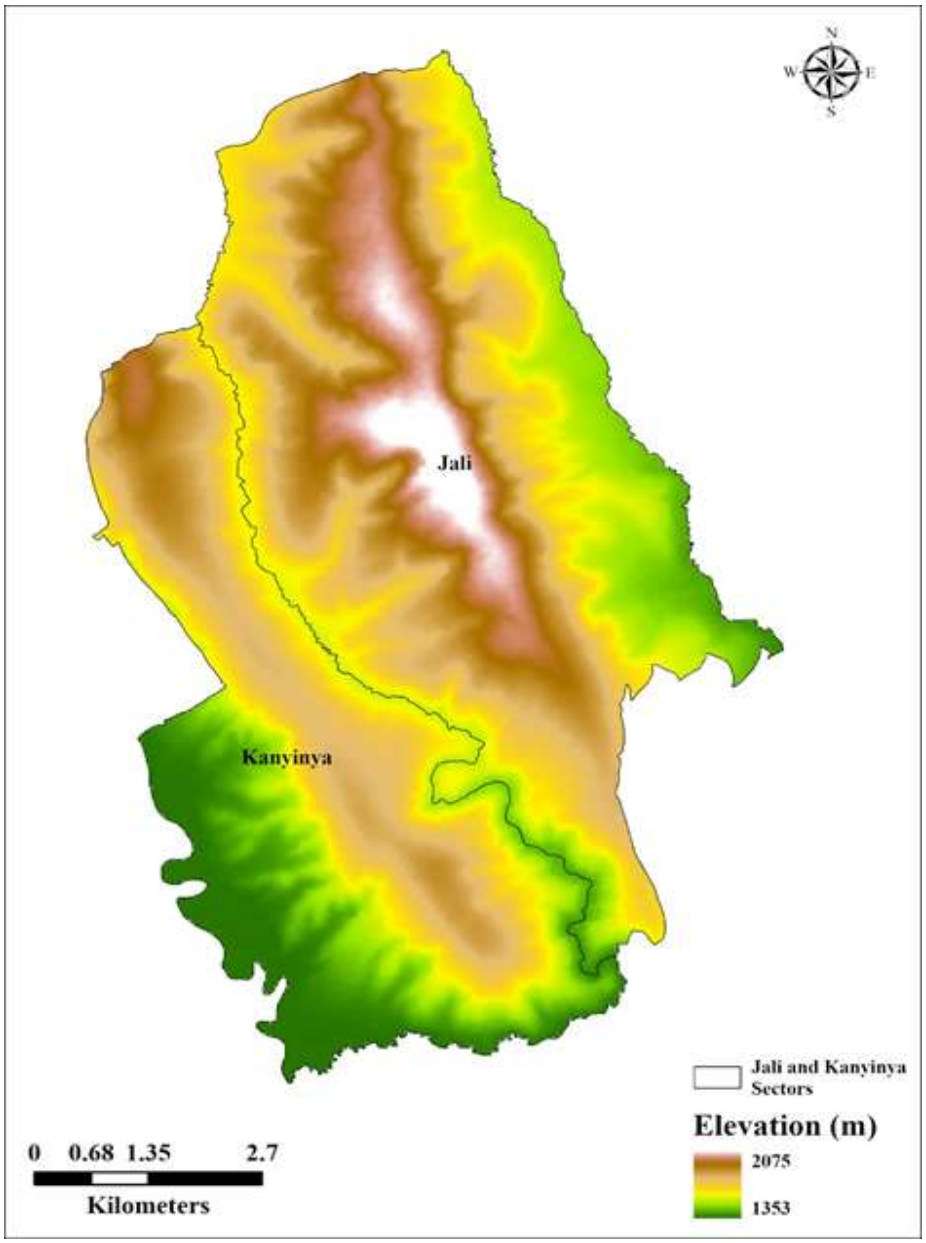

Figure 21: Topography of the study area (Source: USGS Explorer)

4.5.2. Environmental risk zones

The Ministry of Environment released data showing areas prone to flooding and landslides in 2019, including Kanyinya and Jali sectors. However, developing infrastructure in landslide-prone areas poses risks, and for this reason, Kanyinya and Jali sectors have uneven distribution of basic amenities. According to sector land and infrastructure officers, the main factor contributing to the uneven distribution of basic

amenities in Kanyinya and Jali sectors, especially health and education facilities, is the susceptibility of these regions to landslides. Additionally, the lower parts of the mountain around Nzove are prone to flooding, further exacerbating the uneven distribution of basic amenities. They noted that the increase in housing over the years, which began in 2013 after the implementation of the Kigali City Master Plan 2013, has led to deforestation, encroachment on agricultural land, and clearing associated with infrastructure development. These activities have removed vegetation cover, destabilized slopes, increased runoff, accelerated soil erosion, and heightened susceptibility to landslides. The figure 19 below illustrates areas at high risk of landslides, areas at very high risk of landslides, and areas prone to flooding.

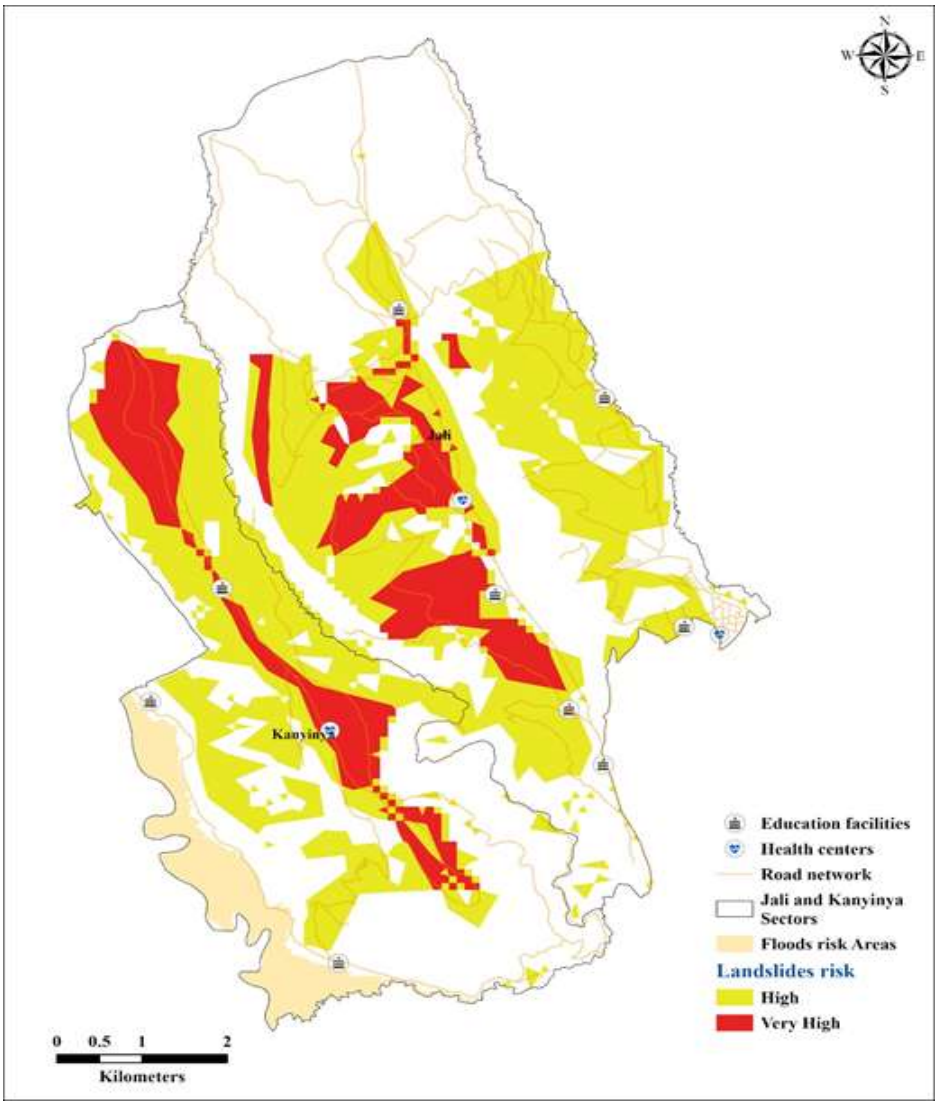

Figure 22: High risk mapping of the study area (Source: Ministry of Environment)

As shown in the figure 19, out of the total area of 62 sqkm of the study area (Kanyinya and Jali sectors), 20.7 sqkm was marked as highly prone to landslides, 6.9 sqkm is classified as very highly prone to landslides, and 2.5 sqkm is prone to flooding risk. This indicates that 31.9 sqkm (51%) of the area is not prone to such risks. However, this situation contributes to the uneven distribution of basic amenities in the study area.

Figure 23: Impact of landslides on the existing infrastructures in study area / Nzove cell (Source: Author)

4.5.3. Ongoing land use master plan

Out of the 402 selected respondents in the study area, 176 respondents stated that the main factor contributing to the uneven distribution of basic amenities in Kanyinya and Jali sectors is the implementation of the Kigali city master plan, these plans determined areas suitable for infrastructure and housing development while reserving remaining land for agriculture, forestry and other use. According to land infrastructure officers, as well as representatives from WASAC, REG, education, and health sectors, basic amenities

are provided in accordance with the ongoing Kigali city master plan 2020-2050, focusing on areas planned for development rather than agricultural and other environmentally related land uses. The figure 21 below illustrates the allocation of land in the study area, based on data extracted from the ongoing Kigali city master plan 2020-2050.

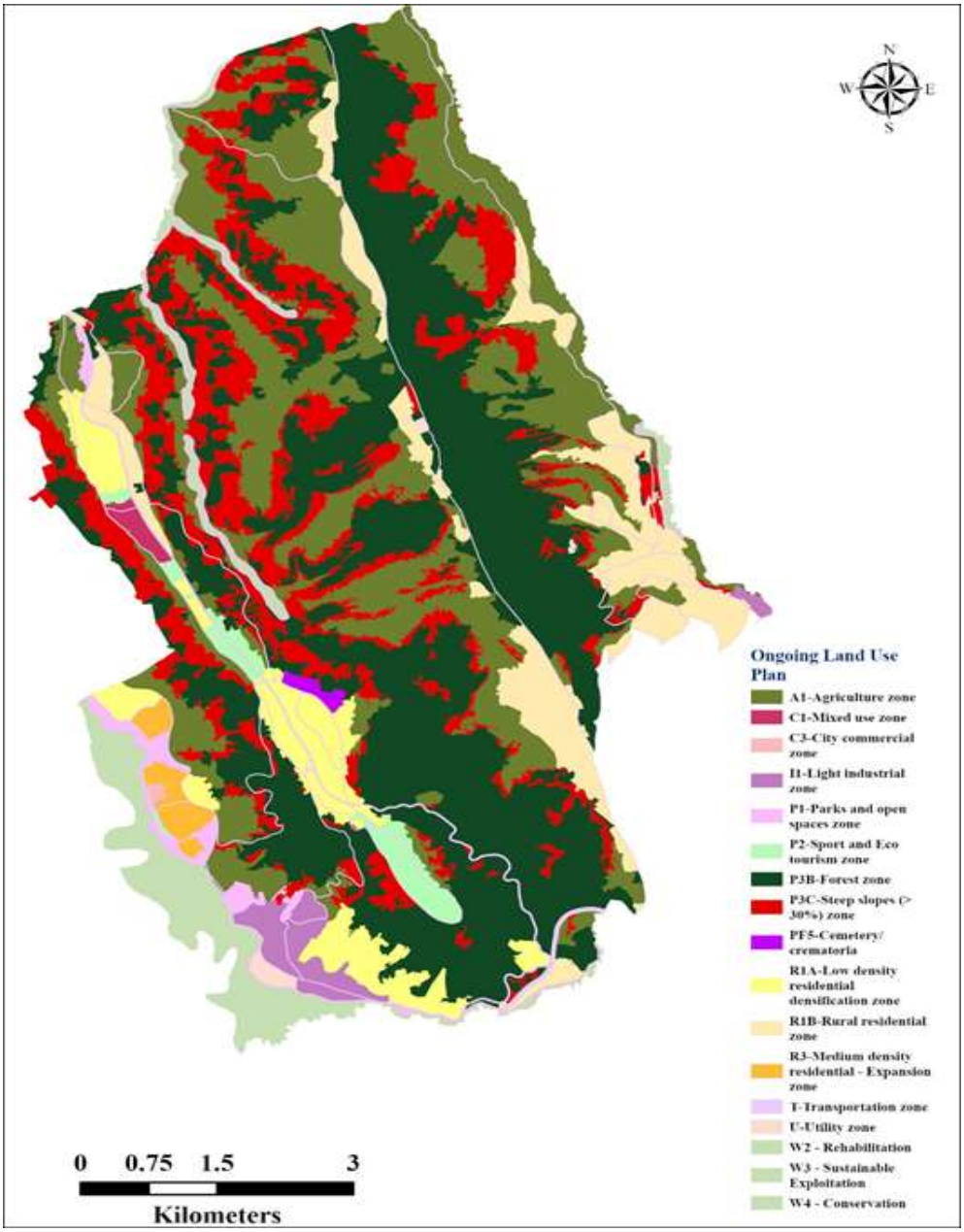

Figure 24: Allocation of land in the study area, based on data extracted from the ongoing Kigali city master plan 2020-2050 (Source: City of Kigali)

The dominant land use proposed by the Kigali city master plan 2020 is forest, covering 54.4% of the total area of Jali and Kanyinya. In these zones, there are 4,496 households. Agriculture follows, comprising 22.5% of the area with 5,337 households currently occupying agricultural land. Commercial zones make up 0.36%, accommodating 84 households, while industrial zones cover 1.39% and host 549 households. Public facilities cover 0.24%, with 54 households, and public utilities encompass 0.25% with 57 households. Residential areas cover 12% of the land, housing the highest number of households (5,717). Transportation zones cover 2.51%, accommodating 221 households, while wetlands account for 5% with 12 households. According to these statistics, only 17.11% of the total land in Jali and Kanyinya is available for the development of basic amenities (Commercial zone, residential zone, Industrial zone, public utility zone, public facility zone, and Transportation zone). However, out of the 16,527 households in the study area, 9,833 are located in areas proposed for agriculture and forest, where development of basic amenities is not permitted. This leads to uneven access to basic amenities for some households in the study area. The table 13 below shows the allocation of land per proposed land use zone and the households found in each zone.

Land use type	Area (ha)	Percentage (%)	Households
Agriculture	1398.58	22.55	5,337
Commercial	22.50	0.36	84
Forest and Open Spaces	3373.92	54.40	4,496
Industrial	85.92	1.39	549
Public Facility	12.42	0.20	54

Public Utility	15.28	0.25	57
Residential	776.47	12.52	5,717
Transportation	155.56	2.51	221
Wetlands	313.98	5.06	12
Total	**6201.80**	**100.00**	**16,527**

Table 13: Allocation of land per proposed land use zone and the households found in each zone (Source: City of Kigali)

4.6. Strategies for improving the spatial distribution of basic amenities in unplanned settlements in Kigali City.

4.6.1. Invest in infrastructure development to improve connectivity and accessibility to basic amenities in underserved areas and upgrading unplanned settlements in Kigali City.

Enhancing connection and accessibility to basic utilities in underserved areas of Jali and Kanyinya sectors, as well as other unplanned settlements in Kigali city, can be achieved primarily through investments in infrastructure development. Out of the 402 respondents who were chosen, 346 stated that they had limited access to basic facilities due to limited transportation options, forcing them to walk and take longer to get there. They also mentioned that several roads were in poor condition, which further restricted their ability to get basic amenities. However, the best course of action is to build or upgrade roads, bridges, and public transportation systems. Additionally, utility networks for electricity, water supply, and sanitation should also be built or expanded in order to guarantee dependable access to these basic amenities.

Upgrading unplanned settlements in Kigali City can significantly address disparities in the spatial distribution of access to basic amenities by introducing planned infrastructure, improving living conditions, and ensuring more equitable service delivery. Through targeted upgrades, essential services such as water, sanitation, electricity, healthcare, and education can be integrated into these areas, reducing the gap between planned and unplanned settlements. Infrastructure improvements, such as better roads and transportation networks, can enhance connectivity, making it easier for residents to access these amenities. Additionally, upgrading housing and public spaces can create safer, healthier environments, leading to better health outcomes and overall well-being. By systematically addressing these disparities, unplanned settlement upgrading ensures that all residents, regardless of their location, have equal access to the services and opportunities necessary for a better quality of life.

4.6.2. Establish partnerships with local communities, private sectors, and non-profit organizations to address specific needs and priorities.

Creating cooperation with non-profits, the commercial sector, and local communities is an integrated approach that can greatly increase the success and long-term viability of projects meant to improve the spatial distribution of basic amenities in Kigali's unplanned settlements.

First of all, collaboration with community groups ensures that projects of improving access to basic amenities are grounded in the specific needs, preferences, and cultural context of the local community. Participation and ownership are promoted through community interaction, which increases acceptance and use of the facilities provided. Involving community members in the process of decision-making also fosters social cohesiveness, accountability, and transparency. Furthermore, PPPs have the potential to simplify the planning, funding, construction, and maintenance of basic amenities in underserved communities by fostering collaboration among government agencies, corporations, and non-profit groups. This may lead to lower costs, better service quality, and more effective access to basic amenities in unplanned settlements.

Non-profit organizations are necessary for completing service delivery gaps and strengthening government initiatives. These groups frequently possess specific skills, contacts, and resources that can improve project results. They could concentrate on

particular themes like health, education, or environmental sustainability, offering creative solutions to difficult problems like poor access to basic amenities. Working together with non-profits can also help raise more money from sponsors, foundations, and business partners, enabling projects to take on a larger and more ambitious scope.

4.6.3. Implement zoning regulations and land use planning strategies to ensure the equitable distribution of basic amenities across different neighborhoods.

Zoning regulations and land use planning strategies are essential to ensure the equitable distribution of basic amenities across different neighborhoods in unplanned settlements of Jali and Kanyinya, as established by Kigali city in 2020. These regulations are crucial because they allocate areas for the development of basic amenities. When implemented effectively, they can significantly increase access to essential services. Zoning regulations propose zones such as residential, commercial, industrial, and recreational, specifying the permitted, prohibited, and conditional activities within each zone. However, the effectiveness of these efforts depends on their implementation. The Kigali city Master plan comprehensively addresses every sector, including basic amenities, by strategically allocating land for schools, healthcare facilities, and public spaces. By doing so, authorities can ensure that all residents have access to essential services regardless of their location. Moreover, factors such as population density, proximity to transportation networks, and existing infrastructure were considered to optimize the spatial distribution of basic amenities.

4.6.4. Relocating people from high-risk zones to planned residential areas

As a large part of Kanyinya and Jali is at high risk of landslides, with some areas being in very high-risk zones and others on steep slopes, it's crucial that competent authorities prioritize the provision of basic amenities in areas determined as suitable for infrastructure development by the Kigali city master plan. This may involve relocating people from high-risk zones to designated residential areas where essential services like healthcare, education, water, and sanitation facilities will be readily available. Such measures aim to enhance the safety and well-being of individuals and communities by

reducing their exposure to natural hazards and potential disasters. However, it's essential to conduct planned relocation initiatives in a participatory, inclusive, and rights-based manner, respecting the dignity, preferences, and needs of affected individuals and communities. Out of 402 respondents surveyed, 313 indicated that they do not require relocation unless fair expropriation is provided.

4.6.5. Enhancing Health Post Distribution and Building Capacity of Health Advisors

To reduce walking distance, travel time to health facilities, and the workload on existing health centers in Kigali City's unplanned settlements, a comprehensive strategy is needed. This strategy involves upgrading health posts with better diagnostic equipment, digitalizing communication between health facilities, and enhancing the capacity of health providers. Incentives for health workers, decentralization of healthcare facilities, and regular monitoring with feedback mechanisms will further ensure that health services are more accessible and efficient, reducing the burden on both residents and healthcare facilities. Additionally, leveraging the role of health advisors by providing them with basic training in health service provision can empower them to support residents in maintaining health and well-being. Community involvement, mobile health units, public-private partnerships, telemedicine, and decentralizing healthcare facilities are also crucial.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1. Recommendations

1. Recommendations for Objective One: To address the disparities in the spatial distribution of access to basic amenities, it is recommended that the National Government and International Organizations prioritize investment in infrastructure development. This includes improving road networks, water and sanitation systems, electricity provision, healthcare facilities, and educational institutions specifically in the unplanned settlements of Kanyinya and Jali sectors. Collaborative efforts among governments, international organizations, and private sector entities are essential to mobilize resources for these infrastructure projects, ensuring that residents have reliable access to essential services.

2. Recommendations for Objective Two: To mitigate the factors contributing to the uneven distribution of basic amenities, it is crucial for National and Local Authorities to implement targeted socio-economic programs that support low-income households. This could involve providing financial assistance, vocational training, and educational opportunities to enhance residents' capacity to access and utilize available services. Additionally, in areas prone to natural hazards or with inadequate infrastructure, relocating residents to planned residential areas may be necessary to ensure their safety and well-being. Comprehensive resettlement plans should be developed to provide alternative housing options, livelihood support, and access to essential services for affected communities.

3. Recommendations for Objective Three: Given the significant influence of socio-economic and demographic characteristics on access to basic amenities, it is recommended that the Ministry of Health and the Ministry of Education develop inclusive strategies that consider the diverse needs of residents. This includes engaging with community members to understand their specific challenges and incorporating their feedback into planning processes. The Ministry of Health should focus on developing and upgrading healthcare facilities to provide accessible and quality healthcare services, while the Ministry of Education should improve educational infrastructure to ensure access to quality education for children and adults.

4. Recommendations for Objective Four: To improve the spatial distribution of basic amenities, a multi-faceted approach is recommended. This includes establishing partnerships between government agencies, local communities, and private sector stakeholders to collaboratively address service delivery challenges. The Rwanda Transport Development Agency (RTDA) should invest in the improvement and expansion of road networks to enhance connectivity and accessibility in unplanned settlements. Additionally, the Water and Sanitation Corporation (WASAC) should ensure reliable access to clean water and enhance sanitation infrastructure to improve public health and hygiene.

Furthermore, the Rwanda Energy Group (REG) should ensure a consistent and reliable electricity supply to improve the quality of life and support economic activities in these areas. By implementing these recommendations, the overall living conditions in unplanned settlements can be significantly improved, promoting equitable access to basic amenities for all residents.

5.2. Conclusion

In summary, this study highlights the critical challenges faced by residents of unplanned settlements in accessing basic amenities in the Jali-Kanyinya sectors of Kigali City. Through a mixed-methods approach, the research has identified factors contributing to the uneven distribution of amenities, including infrastructure development patterns influenced by land use plans.

Conclusion for Objective One: The analysis of the spatial distribution patterns of access to basic amenities within the Jali-Kanyinya sectors revealed significant disparities in the availability and accessibility of essential services such as water, sanitation, healthcare, education, and road networks. Many residents in unplanned settlements face challenges in accessing these basic amenities, indicating that urban planning has not adequately addressed the needs of these communities. This finding underscores the necessity for targeted interventions to improve service delivery in underserved areas.

Conclusion for Objective Two: The study identified several key factors contributing to the uneven distribution of basic amenities within unplanned settlements. Socio-economic characteristics, including income levels, education, and occupation, were found to significantly influence residents' access to essential services. Additionally, inadequate

infrastructure and planning were highlighted as critical barriers that exacerbate these disparities. Understanding these factors is essential for developing effective strategies to address the challenges faced by residents in accessing basic amenities.

Conclusion for Objective Three: The assessment of the socio-economic and demographic characteristics of residents revealed that these factors play a crucial role in determining access to basic amenities. The findings indicated that lower-income households and those with limited educational backgrounds are disproportionately affected by inadequate access to essential services. This highlights the need for policies that consider the socio-economic context of residents when planning for service provision in unplanned settlements.

Conclusion for Objective Four: The proposed strategies for improving the spatial distribution of basic amenities emphasize the importance of strategic urban planning, community engagement, and the implementation of government programs. Recommendations include enhancing infrastructure development, fostering partnerships with local communities, and ensuring equitable distribution of services through effective zoning and land use planning. These strategies aim to improve living conditions in unplanned settlements and promote more equitable access to basic amenities for all residents.

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Appendices

Appendix 1: Socio-economic characteristics of respondents

I. Educational Levels of Respondents

Education levels	Number of respondents	Percentage(%)
Illiterate	43	10.70
Incomplete primary school	56	13.93
Primary Level	112	27.86
Vocational training	67	16.67
Incomplete secondary school	48	11.94
Secondary school	62	15.42
University	14	3.48
Total	**402**	**100%**

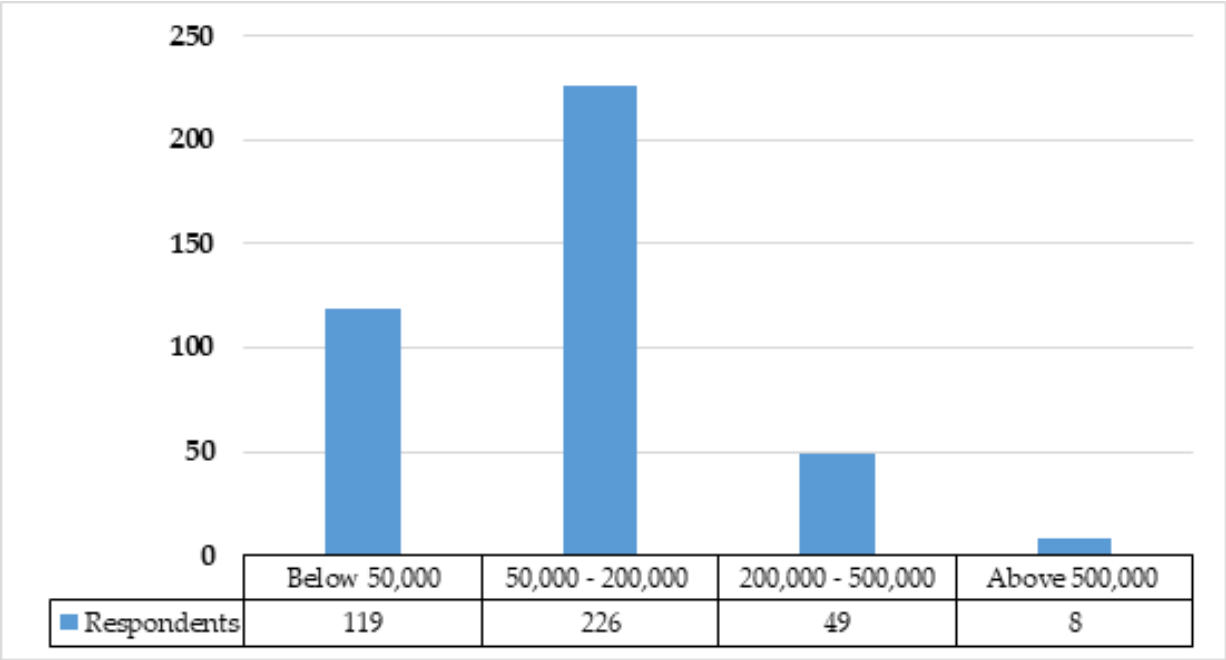
Source: Primary Data

II. Occupation of respondents

Occupation	Respondents	Percentage (%)
Agriculture sector	96	23.88
Government employees	17	4.23
Private sector	123	30.60
NGOs	8	1.99
Unemployed	46	11.44
Students	35	8.71
Other	77	19.15
Total	**402**	**100%**

Source: Primary data

III. Income of respondents (per month)



Source: Primary data

Appendix 2: Questionnaire survey

Topic: Spatial Distribution Pattern of Access to Basic Amenities in Unplanned Settlements in Kigali City: Case study of Jali-Kanyinya sectors.

These research survey questions will help me to gather information for my Master's degree final thesis conducted by Jean Damascene NDIKURYAYO with registration number of 221025212, essential for fulfillment of the requirements for the award of the MSc in Geo-Information Science for Environment and Sustainable Development (GIS-ESD).

Introduction: Hello, how are you and how is work? Hope everything is fine? I am a student from the University of Rwanda College of science and technology, offering a Masters's degree in Geo-Information Science for Environment and Sustainable Development (GIS-ESD). I am conducting a research on Spatial Distribution Pattern of Access to Basic Amenities in Unplanned Settlements. I am trying to know why it is very difficult to access to basic amenities in unplanned settlements like yours, I am looking forward to cooperating with you and I assure you that the information acquired will be kept confidential and will be used only for academic purposes.

Questions

1. Name…….

2.Sex:

a. Male

b. Female

3. Age Group:

a. 18-30

b. 30-40

c. 40-50

d. 50-Above

4. Marital Status:

a. Single

b. Married

c. Divorced

d. Widowed

5. Education Level:

☐ i. Illiterate

☐ ii. incomplete primary school

☐ iii. primary Level

iv. vocational training

☐ v. incomplete secondary school

☐ vi. Secondary school

☐ vii. University

6. If dropped out of school, what were the reasons?

a. Capacity issues

b. Distance to the school

c. Other (please specify) ……

7. Profession:

☐ a. Agriculture sector

☐ b. Government employee

☐ c. Private sector

☐ d. NGOs

☐ e. Unemployed

☐ f. Students

g. Other (please specify) _____

8. Income Bracket (per month):

a. Below 50,000 RWF

b. 50,000 - 200,000 RWF

c. 200,000 - 500,000 RWF

d. Above 500,000 RWF

9. Are you a resident of the Kanyinya/Jali sector?

a. Yes

b. No

10. If yes, were you born in this sector?

a. Yes

b. No

11. If no, where did you come from?

☐ Kigali city
☐ Country side
☐ Abroad

12. If no, what pushed you from other regions to Jali and Kanyinya sectors?
a. High cost of living in urban center
b. Relocation from unplanned settlements within the urban center
c. Expropriation
d. Other (please specify) _____

13. If no, what attracted you to come to Jali and Kanyinya sectors?
☐ a. Job opportunity
☐ b. Cheap land
☐ c. Cheap housing options
d. Other (please specify) _____

14. Do you have access to health facilities, educational facilities, water and sanitation, electricity, and road network?
a. Yes
b. No

15. If yes, can you rank the accessibility to those basic amenities within your neighborhood in the Jali/Kanyinya sectors?
a. Water and sanitation:
i. Very good
ii. Good
iii. Poor
iv. Very poor

b. Electricity:
i. Very good
ii. Good
iii. Poor
iv. Very poor

c. Health facilities:
i. Very good
ii. Good

iii. Poor
iv. Very poor

d. Educational facilities:
i. Very good
ii. Good
iii. Poor
iv. Very poor

e. Road networks:
i. Very good
ii. Good
iii. Poor
iv. Very poor

16. Can you rank the accessibility of those basic amenities within your neighborhood in the Jali/Kanyinya sectors based on distance?

a. Water and sanitation:
i. Within less than 1 km
ii. 1-2 km away
iii. 2-3 km away
iv. More than 3 km away

b. Electricity:
i. Within less than 1 km
ii. 1-2 km away
iii. 2-3 km away
iv. More than 3 km away

c. Health facilities:
i. Within less than 1 km
ii. 1-2 km away
iii. 2-3 km away
iv. More than 3 km away

d. Educational facilities:
i. Within less than 1 km
ii. 1-2 km away
iii. 2-3 km away
iv. More than 3 km away

e. Road networks:
i. Within less than 1 km
ii. 1-2 km away
iii. 2-3 km away
iv. More than 3 km away

17. Have you noticed any disparities in the distribution of basic amenities within the Jali-Kanyinya sectors?
a. Yes
b. No

18. If yes, what factors do you believe contribute to these disparities?
a. Poor enforcement in the distribution of basic amenities
b. Geographic conditions (topographic, high-risk zones)
c. Restrictions from government policies and regulations (Kigali city master plan, Rwanda building codes, etc.)
d. other (please specify) ……..

19. Which income level is mostly affected by poor access to basic amenities?
a. High-income households
b. Middle-income households
c. Low-income households

20. Are there any specific demographic characteristics within your community such as women, children, elders, or disabled individuals that are particularly vulnerable or marginalized in terms of accessing basic amenities?
a. Yes
b. No

21. If yes, which group is likely to be affected most?
☐ a. Women
☐ b. Children

☐ c. Elders

☐ d. Disabled

22. Have there been any recent changes or improvements in the distribution, availability, and accessibility of basic amenities in your neighborhood?

a. Yes

b. No

23. If yes, who were in charge?

a. Local community

b. Competent public institutions

c. Private institutions

d. NGOs

e. Other (please specify) _____

Appendix 3: Interview guide

1. **Proposed interview questions for competent institutions(English)**

Topic: Spatial Distribution Pattern of Access to Basic Amenities in Unplanned Settlements in Kigali City: Case study of Jali-Kanyinya sectors.

These research interview questions will help me to gather information for my Master's degree final thesis conducted by Jean Damascene NDIKURYAYO with registration number of 221025212, essential for fulfillment of the requirements for the award of the MSc in Geo-Information Science for Environment and Sustainable Development (GIS-ESD).

Introduction: Hello, how are you and how is work? Hope everything is fine? I am a student from the University of Rwanda College of science and technology, offering a Masters's degree in Geo-Information Science for Environment and Sustainable Development (GIS-ESD). I am conducting a research on Spatial Distribution Pattern of Access to Basic Amenities in Unplanned Settlements. I am trying to know why it is very difficult to access to basic amenities in unplanned settlements and to understand the processes of distributing those amenities. I am looking forward to cooperating with you and I assure you that the information acquired will be kept confidential and will be used only for academic purposes.

1. Institution:

    i. Rwanda Energy Group (REG)
    ii. Water and Sanitation Corporation
    iii. Cleaning companies

2. Position……..

3. Gender:

    1. Male
    2. Female

4. Do all unplanned settlements within Kigali have equitable access to water, electricity, and sanitation services?

    a) Yes

    b) No

5. If no, what plans are in place to ensure equitable distribution of these services in all unplanned settlements, including Jali and Kanyinya?

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6. What factors influence the allocation and prioritization of basic amenities within these settlements?

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7. How effective are current waste management practices within the unplanned settlements, and what challenges are faced in ensuring proper waste disposal and sanitation?

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8. Are waste collection services in Jali and Kanyinya sectors accessible with well-connected roads for easy transfer of waste to transfer centers and landfills?

    1. Yes
    2. No

9. What initiatives or strategies have been implemented to address waste management issues in these settlements, and what impact have they had?

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10. Do you collaborate with local authorities, community organizations, and other stakeholders to improve the distribution of basic amenities in unplanned settlements?

    a. Yes

    b. No

11. According to the distribution of water and electricity you have observed, how would you rank the access to water and electricity within informal settlements of Jali and Kanyinya sectors?

    1. Very well distributed

2. Well distributed
3. Moderately distributed
4. Poorly distributed

12. Do the distribution of water and electricity adhere to existing regulations like the Kigali City master plan and Rwanda Building Code to ensure the region is suitable for infrastructure development?

    1. Yes
    2. No

13. In the distribution of basic amenities, do you consider vulnerable and marginalized groups to ensure accessibility for everyone?

    1. Yes
    2. No
    3.

2. <u>Interview guide for local leaders</u>

1. Name……..
2. Position……
3. Gender
    1. Male
    2. Female
4. Marital status
    I. Single
    II. Married
    III. Divorced
    IV. Widowed
5. Can you provide an overview of your role and responsibilities as a local leader within the Jali-Kanyinya sectors?

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6. How do you collaborate with the Kigali City Council and other relevant authorities to address the needs of residents in unplanned settlements, particularly regarding access to basic amenities?

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7. What are the main challenges faced by residents in unplanned settlements within your jurisdiction in accessing basic amenities?

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8. What is the average distance that residents must travel and time they can use in order to access basic amenities in unplanned settlements within the Jali-Kanyinya sectors?
    a. Water and sanitation…….
    b. Electricity……
    ……
    c. Health facilities……..
    d. Educational facilities……..
    e. Road networks……
    ….

9. How do you prioritize the allocation of resources and services to improve access to basic amenities in unplanned settlements?

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10. Can you describe any community-led initiatives or projects aimed at enhancing access to basic amenities in unplanned settlements?

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11. How do you engage with residents and gather their feedback on the provision of basic amenities in unplanned settlements?

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12. Are there any specific policies or strategies implemented at the local level to address the uneven spatial distribution of basic amenities in unplanned settlements?

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13. What opportunities do you see for enhancing collaboration between local leaders, the Kigali City Council, and other stakeholders to improve access to basic amenities in unplanned settlements?

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14. In your opinion, what are the key areas that require attention or investment to address the challenges related to access to basic amenities in unplanned settlements within the Jali-Kanyinya sectors?

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