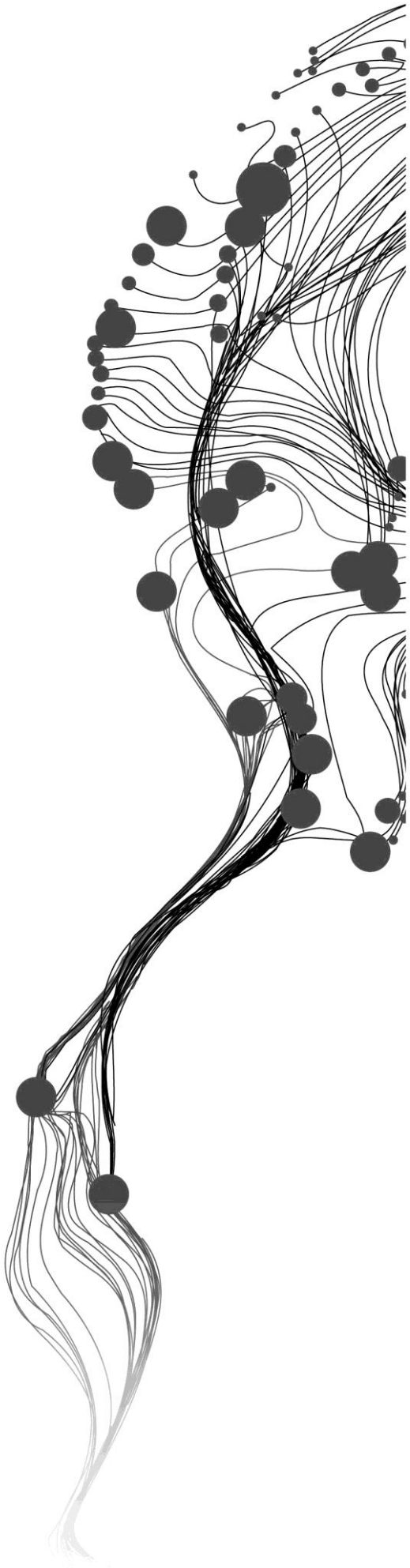
TOWARDS EQUITABLE URBAN RESIDENTIAL RESETTLEMENT IN KIGALI

NIKUZE ALICE
February, 2016

SUPERVISORS:
Dr. R.V.(Richard) Sliuzas
Dr. J. (Johannes) Flacke



TOWARDS EQUITABLE URBAN RESIDENTIAL RESETTLEMENT IN KIGALI

NIKUZE ALICE

Enschede, The Netherlands, February, 2016

Thesis submitted to the Faculty of Geo-Information Science and Earth Observation of the University of Twente in partial fulfilment of the requirements for the degree of Master of Science in Geo-information Science and Earth Observation.
Specialization: Urban Planning and Management

SUPERVISORS:
Dr. R.V. (Richard) Sliuzas
Dr. J. (Johannes) Flacke

THESIS ASSESSMENT BOARD:
Prof. Dr. P.Y. Georgiadou (Chair)
Dr. Ing. Arch. Genet Alem (External Examiner, Technische Universität Dortmund)
Dr. R.V. (Richard) Sliuzas (First supervisor)
Dr. J. (Johannes) Flacke (Second supervisor)

ABSTRACT

Rapid urbanization and frequent natural disasters substantially increase millions of urban poor households exposed to hazards, especially in developing countries. When the risk to which a population is exposed cannot be mitigated by any other measure, resettlement becomes the only option. The city of Kigali has initiated a relocation and resettlement program of households living in high risky steep slopes and wetlands. However, resettlement entails both the physical displacement of people and the disruption of their social, economic and cultural organization leading to various forms of impoverishment such as landlessness, joblessness, homelessness, marginalization, etc. The impoverishment of the poor population increases inequity or social injustice in the society. Due to that, this study is conducted to develop a methodology that can help to avoid or at least minimize the impoverishment risks induced by the resettlement of the households living in high risk zone of Gatsata in Gasabo, as a case study.

The key characteristic of resettlement requirements are identified with respect to the socio-economic and cultural characteristic of the households that need to be relocated and subsequently, the impoverishment risks those households are likely to face because of relocation. The results show that the resettlement program of the households from Gatsata requires a land ranging from 2.5ha to 11.5 ha depending on the type of houses development proposed in the land use master plan. However, the vertical construction typology would require less land compared to single family houses. Further, the program requires economic development which will ensure trading opportunities in the new settlement area. It requires also protecting the kinship groups and the connections between sellers and clients that were formed long time ago. Primary and secondary schools, markets and healthcare as universal basic human rights require the resettlement program to ensure the availability of these services in the resettlement site. With regard to impoverishment risks, the households that need to be relocated live in uncertainty and are likely to encounter the landlessness risk, homelessness, joblessness, loss of access to common property resources, marginalization, health risk, social disarticulation, the risk of inefficient public transportation. The landlessness and joblessness risks as a result of being resettled far from job opportunities and basic services are the core of that wide process of impoverishment.

Most of these impoverishment risks are linked to the location of a resettlement site and could be minimized by selecting a suitable site. Thus, from the indicators of impoverishment risks, risks reversal strategies are formulated. The risks reversal strategies include avoiding distant relocation with respect to job opportunities areas and basic infrastructure and services. Those strategies form a set of criteria that is used to analyze the suitability of identified potential resettlement sites as part of equitable resettlement modelling process. Two scenarios are constructed, the walking and public transportation mode as factors influencing the suitability. The result reveals that potential resettlement sites in both the walking and the public transportation scenarios have suitable areas in the southern part of the district where opportunities to jobs and basic services are much more developed. The public transport scenario would yield a large proportion of suitable land compared to the walking scenario. Therefore, a package of policies integrating the public transportation and land use in resettlement site planning is required. As part of risks reversal strategies, community participation and communication of resettlement guidelines with clear provisions regarding compensation is a good foundation towards equitable resettlement.
The findings of this research are specific to the households that need to be relocated from high risk zone of Gatsata. However, the benefit of the methodology adopted may well be substantial when applied in case of other communities living in hazardous areas.

Keywords: Equitable resettlement, impoverishment risks, risks reversal strategies, resettlement sites suitability, Kigali

ACKNOWLEDGEMENTS

I thank the Almighty God for keeping me healthy and strong during my stay. Without his favor and blessings, I would not have made it this far.

With sincere gratitude, I do acknowledge the excellence scholarship received from the University of Twente that enabled me to pursue my Master of Science Degree.

I am greatly indebted to my supervisors, Dr. Richard Sliuzas and Dr. Johannes flacke, for their guidance, advice and encouragement throughout this research. Without their deep concern and valuable comments, this thesis would have not been completed. Special gratitude goes to Ing. F.H.M van den Bosch for his generous attitude and willingness to help. His assistance helped me to a great extend in understanding properly and apply the cost distance analysis concept.

I would like to thank Prof. Dr. P.Y Georgiadou and Dr. D. Reckien. The valued comments on unclear aspects and advice they provided during the proposal and midterm assessment phases respectively have enhanced the quality of this work.

My gratitude is extended to all institutions that assisted me during the field data collection in Kigali: The city of Kigali, Gasabo district, Rwanda housing authority, Ministry of disaster and refugees affairs, Rwanda National Resources Authority. The information and documents they have provided contributed a lot to this research. To all residents of Bumbogo and Kinyinya resettlement sites and Gatsata high risk zone who contributed to this research through their willingness to participate in interview, I say thank you.

I would also like to thank my classmates in UPM 2014-2016 and all my friend in ITC for their support and encouragement throughout the wonderful 18 months period we have been together. The whole Rwandese community: many thanks to Maurice Muneza, Innocent, Janvier, Jean Baptiste, Eric, Ali Ahmed, Maurice, Aline, Marcelline, Providence, Honoré, Aphrodis, Crispin, Elias, Vestine, Ngabonziza's family and Olivier. I am proud of being part of the big family we created away from home. It was a nice and unforgettable experience we had together.

Last but not least, to my dearest and loving family, I express my deepest gratitude for your love, patience, support and for your prayers which sustained me and brought me this far. To you my beloved husband Emmanuel Nsabimana and my lovely son Ornan Mugisha Emmerick, words cannot express how grateful I am. I know it was not easy in my absence, I missed you every moment of it, but you remained strong and encouraged me to be even stronger.

God Bless You All

Alice Nikuze
February 2016

Dedicated

To

My beloved husband Emmanuel and my son Ornan

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

ADB	: Asian development Bank
CBD	: Central Business District
COK	: City of Kigali
GIS	: Geo-Information System
ha	: Hectare
HH	: Head of Household
IDMC	: Internal Displacement Monitoring Centre
IRR	: Impoverishment Risk and Reconstruction
ITC	: Faculty of Geo-Information Science and Earth Observation, University of Twente
KCMP	: Kigali City Master Plan
km/h	: Kilometre per hour
MIDIMAR	: Ministry of Disaster Management and Refugee Affairs
MINECOFIN	: Ministry of finance and economic planning
MININFRA	: Ministry of infrastructure
NISR	: National Institute of Statistics of Rwanda
REMA	: Rwanda Environment Management Authority
RHA	: Rwanda Housing Authority
RNRA	: Rwanda National Resources Authority
SMCE	: Spatial Multi-Criteria Evaluation
SPSS	: Statistical package for the Social Science
UPM	: Urban Planning and management

1. INTRODUCTION AND JUSTIFICATION

This chapter presents the research background and justification, problem statement, objectives and research questions. The conceptual framework of the research is also discussed as well as the research design, the benefit of the research and the structure of this research report.

1.1. Background and justification

Every year, development projects ranging from large scale infrastructural projects such as dams, roads construction to other initiatives like disaster risk prevention measures, urbanization and urban renewal induce displacement of millions of people, from their homes, livelihoods or communities (Satiroglu & Choi, 2015).The magnitude and frequency of these induced-displacements make resettlement, a problem of global relevance. In developing countries, resettlement is widely seen as either a policy measure to fight poverty, conserve the ecosystem, or a precondition for many development projects aiming at improving people's wellbeing (Takesada, Manatunge, & Herath, 2008). Thus, displacement in developing countries mostly affects people living in poverty. An example is a resettlement in 2001 in Mumbai which displaced about 60000 low-income people displaced for the railway tracks (Patel, D'Cruz, & Burra, 2002).

Kigali, the largest city and capital of Rwanda has experienced rapid urbanization since 1994. Although the level of urbanization in Rwanda is still among the lowest in the world, the average annual growth rate of urban population of 4.5% is above the global average (MININFRA, 2013). Most of Rwanda's urban population is concentrated in the city of Kigali and it is assumed that this concentration will increase at a growth rate of 4.1% from 2013 till 2025 under the low growth scenario. While the medium growth rate scenario assumes a growth rate of 5% and the high growth scenario assumes a rate of 5.8% till 2025 and 2.5% thereafter (Kigali city, 2013).

Previously the urbanization process in Kigali has happened in an uncoordinated manner leading to unplanned urban growth. Many of the urban poor constructed informal settlements on land that is considered hazardous and inappropriate for residential development like steep hills or wetlands (Manirakiza, 2014). Such unplanned urban development accompanied by poverty, high density, poor quality of dwellings, lack of basic amenities, uneven distribution of basic infrastructure and social services and residents vulnerable to natural disasters in hazard-prone locations increases injustice or inequity in the society (Dixon & Ramutsindela, 2006). This existence of informal settlements and their population located on high hazardous hilly and wetlands areas is considered as a great challenge to the economic development of the City of Kigali since it entails not only potential loss of life and property but also human activities may contribute to environmental degradation (City of Kigali, 2013a). Recently, Kigali city council adopted several measures to find sustainable solutions to informal settlements and urban inequity issues. The council views relocating and resettlement of people living in risk prone areas as a development opportunity for both the poor displaced and the city (City of Kigali, 2013a). However, population displacement and resettlement are widely recognized as causing various risks of deprivation to population affected by development projects. According to Cernea (1997) for example, the main risk in development-caused displacement is impoverishment (referred to the situation in which people's welfare and livelihoods is worsen) and is manifested through eight interlinked forms of risks(landlessness, homelessness, joblessness, loss of access to common property resources, marginalization, food insecurity, morbidity and mortality, and social disarticulation). If preventative or alternative counteractions are not initiated, these potential hazards become actual losses and the hard realities of impoverishment. Recent work of Patel,

Sliuzas and Mathur, (2015) moreover, has shown that feelings of uncertainty about displacement may also entail significant risks to the poor. The study of Patel, Sliuzas and Mathur (2015) clearly indicated that along with other factors, relocation distance was the most significant cause of impoverishment of poor people in Ahmadabad after displacement and thus must be adequately addressed in policy design and implementation.

In developing countries, development projects such as environment protection, slums upgrading, railways, roads and hospital construction are indispensable for improving people' lives and expand the national and local economies. Unfortunately, people displaced by these projects have shared more in the pains than in the gains caused by these projects raising issues of equity and social justice (Cernea, 1997). However, such inequitable distribution of benefits and losses is not mandatory. It should not be accepted as inevitable or justified. Planners should ask themselves if it is equitable to support programs that undermine the livelihood of people and have impoverishment consequences. According to (Cernea, 1998), resettlement guided by an equity compass is carried out without impoverishing displaced people. He argues that there are ways to avoid or minimize specific instances of displacement or their adverse impact on resettlers.

Understanding risks associated with resettlement is the first step towards drawing recommendations on how to minimize their effects on displaced people. Claudianos (2014) argues that a good planning for a resettlement process can help to minimize its associated risks and leads to positive development outcomes. Many studies that outline the difficulties created by the resettlement process in urban areas and possible measures to consider to address them, were done in different parts of the world (Quetulio-Navarra, Niehof, Van der Horst, & van der Vaart, 2014;Patel, D'Cruz, & Burra, 2002; Abebe & Hesselberg, 2015).Other works offer measures to reverse and reconstruct impoverishment risks caused by displacement for sustainable resettlement and rehabilitation in a global context (Modi, 2009). Most of these researches related to displacement and resettlement of population focused much more on infrastructural development projects than other development initiatives like urbanization related projects (Bose, 2007). Nowadays, urbanization displacement is an area of research that needs more contributions. Ongoing urban development and renewal is among the dominant cause of induced displacement in developing countries (S. Patel et al., 2015). Furthermore, the global trend of environmental change coupled by the fast population growth in African cities is increasing displacement of urban population (Parnell & Walawege, 2011). With regard to this, the resettlement of households that live in high risk zones in Kigali is an opportunity and an added value to the existing literature to bridge the gaps of the limited literature identified in displacement related to environment change and urbanization. The resettlement program in Kigali calls for research to anticipate its potential associated risks on the local population and propose ways to mitigate those risks. In addition, across the globe, potential risks inherent to displacement have been assessed on the base of eight forms of deprivation proposed by Michael Cernea (Quetulio-Navarra et al., 2014). These forms are currently being increasingly used in researches on impacts and formulate recommendations to mitigate those impacts. However, to date, none attempted to use this global framework to assess the impacts of resettlement interventions in Kigali in order to propose their mitigation measures.

1.2. Research problem

The recent high rates of urbanization of Kigali city have resulted in uncoordinated urban expansion and significant increase of urban population. The uncoordinated urban development has resulted in informal settlements occupied mostly by low income earners on land that is considered hazardous and inappropriate for residential development. This is considered as a great challenge to the societal and economic development of the City of Kigali because it does not only entail potential loss of life and property but also the human activities may contribute to environmental degradation (City of Kigali, 2013a). In addition, insufficient and uneven distribution of basic infrastructures and social services have increased injustice or inequity in the society. Among other strategies to address the challenges and negative consequences of informal settlements, it has recently been recommended by Rwanda Housing Authority (2013) that informal settlements in high risky areas such as those on steep slopes and wetlands, in three districts of Kigali City, should be given first priority for relocation. In this regard, to date, Kigali city council has started implementing a resettlement policy with hope to improve the wellbeing of urban poor. Even though such preventive resettlement of communities from extremely hazard prone areas is quite necessary, appropriate guidelines are needed for their successful implementation (Claudianos, 2014). Forecasting impoverishment trends and their main risk factors is crucial for adopting and implementing policies that counteract undesirable outcomes when resettlement is unavoidable. In this regards, this research is an attempt to anticipate the possible impoverishment risks induced by resettlement and propose how these can be minimized.

1.3. Research objectives

1.3.1. General objective

To develop a methodology for residential resettlement in Kigali city that seeks to minimize the risks of impoverishment induced by relocation.

1.3.2. Specific objectives and research questions

1. To describe the key characteristics of resettlement requirements
- Where are informal settlements located in high hazardous steep slopes and wetlands areas?
- How many households will be relocated?
- What are socio-economic characteristics of households to be relocated?

2. To develop indicators for assessing impoverishment risks associated with resettlement
- What are the resettlement impacts experienced by already resettled households?
- What are the type of impoverishment risks that can be caused by the displacement?
- What are the indicators explaining the identified impoverishments?

3. To develop a model for equitable resettlement sites selection
- How can the principle of equity be applied in resettlement sites selection?
- What are the relative importance of the impoverishment indicators in affecting the livelihood of the affected households?
- What are the potential resettlement sites that can help to minimize impoverishment risks?

1.4. Conceptual framework

The conceptual framework used to show the links among the concepts in this research is based on Cernea's (1997) Impoverishment Risks and Reconstruction (IRR) model. This is a model which helps to identify eight key processes of impoverishment (Figure 1) as well as the key processes that could counteract the impoverishment risks and lead to the economic and social reestablishment of the livelihood of the displaced. The processes to counteract the risks depend on local conditions and on the nature of the losses the displaced people faced. However it is mainly based on land and employment, restoration of access to social services such health and education, and on community organization reconstruction (Cernea, 2004), which in turn are determined by a suitable resettlement site. The IRR model has been applied in a number of studies and in some operational resettlement activities (Patel et al., 2015; Quetulio-Navarra et al., 2014; Hong, Singh, & Ramic, 2009). For many researchers, this is the most recent theory formalized that focus on involuntary development-induced resettlement. Although it has been criticized of being applied mostly in case of resettlement studies in rural areas, recently many studies proved its applicability in the context of urban areas with the possibility of emergence of new risks factors depending on the context (Patel et al., 2015). Since the objective of the study is to identify impoverishment risks and the ways to minimize those risks by identifying suitable resettlement sites, this framework is the most appropriate. The impoverishment risks model required to be tested in the context of Gasabo urban areas and when necessary identify new additional risk dimensions in that specific context and how they can be minimized. Such developed risks and reconstruction model can serve as a policy guideline for planning purposes of resettlement sites (Koening, 2002). In this regard, the developed model in the context of Gasabo was used to analyse the suitability of potential resettlement sites.

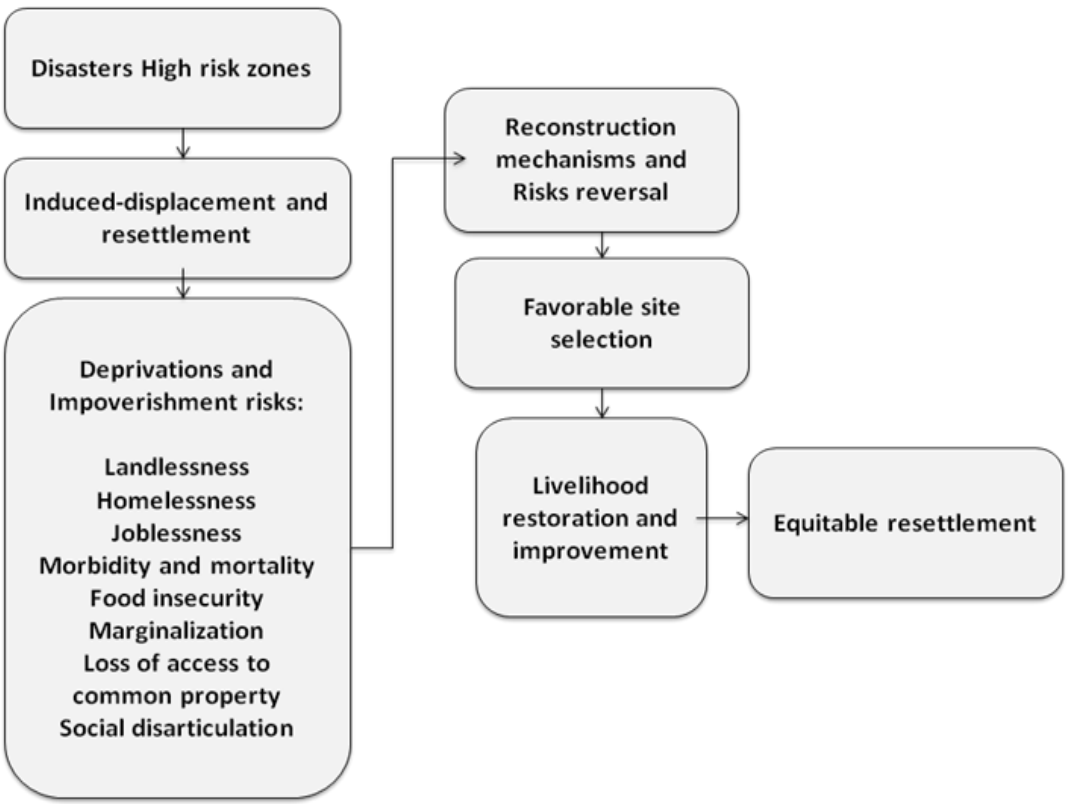


Figure 1: Conceptual framework adapted from (Cernea, 1997)

1.5. Research design

The research design presented in Figure 2 illustrates three main steps that were followed to carry out this research. The first step consists of a review of literature that served to scientifically define the research problem, objectives and methods to be used in order to answer the research questions. Further, this step assisted to ascertain the required data and the need for a fieldwork to achieve the objectives. The second step was dedicated to the fieldwork for primary and secondary data collection. In the last step, the resettlement requirements of households to be relocated and their impoverishment risks were identified; risks reversal strategies were proposed and suitable sites for equitable resettlement were identified. The research conclusion and recommendations were also included in the last step.

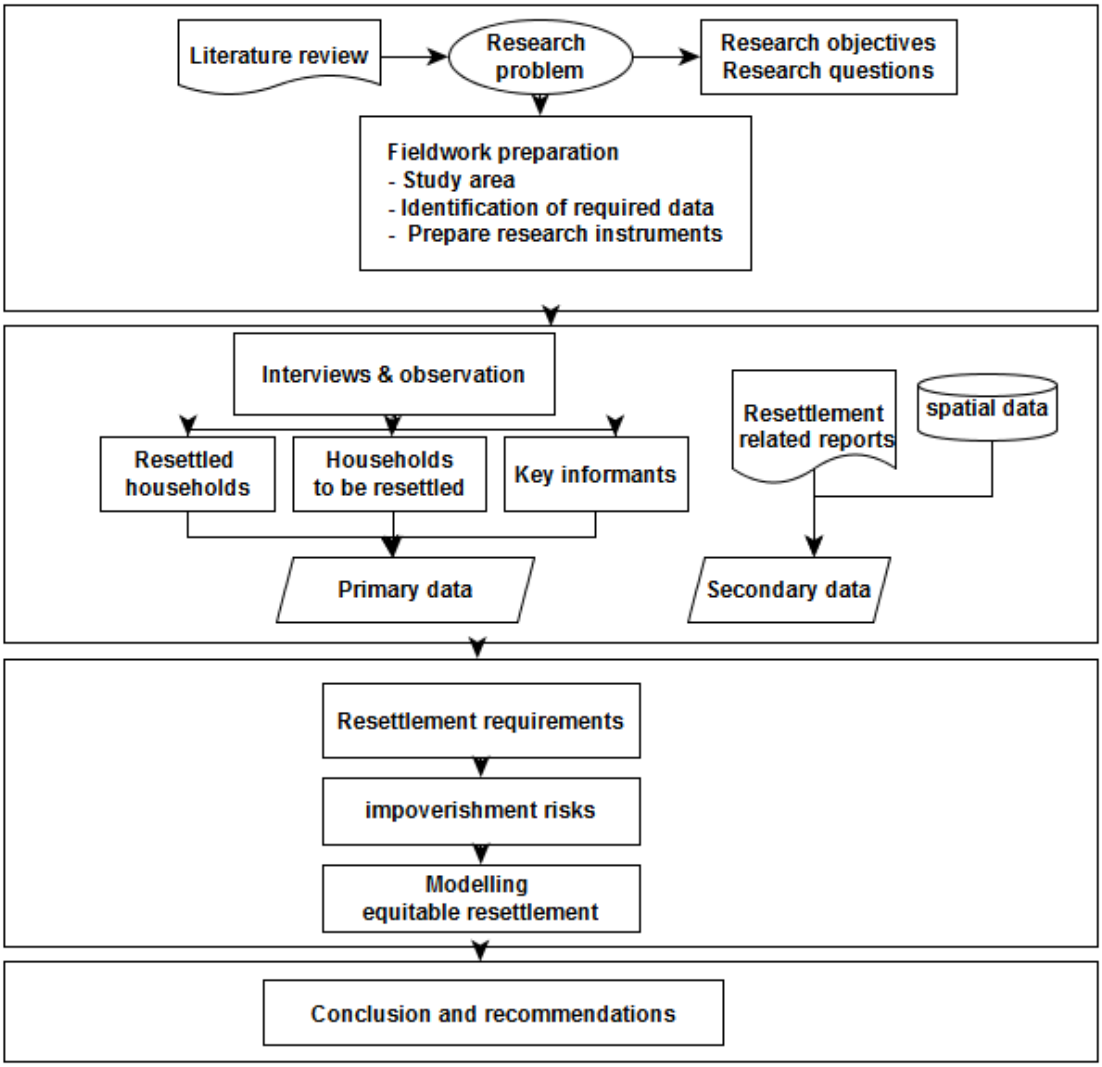


Figure 2: Research design

1.6. Benefit of the research

The findings of this research will benefit different individuals and institutions:

- It will provide an overview of socio-economic characteristics of households living in high risk zones in Gatsata and their potential resettlement requirements.
- It will provide an insight into potential impoverishment risks that might result from the relocation of people living in high risk zones.
- The risks reversal strategies proposed and the results of sites suitability analysis could guide future relocation actions and resettlement program of households living in high risks zones without inducing deprivations.

1.7. Thesis structure

The research work is reported in the following chapters:

Chapter-1 briefly outlines the background and justification of the research which led to the identification of the research problem, research objectives and conceptual framework of the research. The benefit of the research is also discussed in this chapter.
Chapter-2 defines the theoretical concepts that guide population induced-displacements and resettlement studies. The chapter also provides an overview of the theoretical model used to analysis impoverishment risks associated with resettlement. Furthermore, the method of analysing the suitability of potential resettlement sites is discussed.
Chapter-3 presents the study area description. It describes the detailed methodology of collection and data analysis adopted in this research.
Chapter-4 presents and discusses the results of key characteristic of resettlement requirements.
Chapter-5 presents and discusses the impoverishment risks the households that need to be relocated from high risks zones are likely to encounter.
Chapter 6 presents and discusses the model of equitable resettlement which covers the impoverishment risks reversal strategies and the suitability of potential resettlement sites.
Chapter-7 Summarizes and concludes the findings of the research. The chapter presents also the recommendations for further research directions.
Supplementary materials that are referenced in this thesis are provided in the appendices.

2. LITERATURE REVIEW

This chapter presents the theoretical foundation of the study. It briefly describes the underlined concepts and approaches related to resettlement studies that have assisted and guided the formulation of the conceptual framework of the present research. A brief review of analytical methods and techniques applied in resettlement studied is also given in this chapter.

2.1. Relocation and resettlement

Resettlement, alternatively known as relocation or development-induced displacement is a social process in which people leave their origin area of residence and settle in a new area (Dagnachew Shibru, Suryabhagavan, Mekuria, & Hameed, 2014). Relocation that occurs when the decision of moving is planned and imposed by an external agent and when there is no choice to stay its known as involuntary displacement. Involuntary relocation can be caused by environmental degradation, natural disasters, conflicts or development projects. Involuntary relocation is contrary to voluntary relocation such as rural-urban migrant which reflect people that are willing to pursuit for new opportunities. Relocation can sometimes be perceived to be the best option in one or more of the following cases: first, people have already been displaced by the disaster. Second, their current location is judged to be uninhabitable. Third, relocation is considered the best option to reduce vulnerability to the risk of future disasters. Brief, relocation may be appropriate when the disaster is the result of site-specific vulnerabilities. Informal settlements in urban areas, for instance, are often located on sites where topography makes the site's vulnerabilities impossible to mitigate (Ibrahim et al., 2015) and, in that case, requires relocation of people as a preventive measure.

2.2. Causes of urban relocation

2.2.1. Development project- induced relocation

Many governments have taken resettlement programs as the best strategy to address the multi-faceted socio-economic and lack of social amenities problems in areas with high population density and severe ecological degradation (Ibrahim et al., 2015). Cernea (1993) identified three major causes of people relocation in urban areas: 1) Urban economic growth: when relocation is used to make room for new industrial, transportation corridors, infrastructural development and other economic activities; 2) Environment improvement: when relocation is needed to make room for structural and infrastructural equipments for environmental services, health facilities, water supply systems, waste disposal and others to address the problem of environment deterioration; 3) Slum upgrading: when there is a need to address slum conditions for poverty alleviation and quality of improvement while sometimes slum areas can rarely be upgraded without population movement due to their location in critical areas. Worldwide, the major causes inducing residents displacements and resettlements are summarized as development projects, conflicts and wars, and natural disasters (Robinson, 2003).

2.2.2. Disaster-induced relocation

Relocation and resettlement policy is one of the alternative options to reduce the risk to natural hazards. It can be adopted both before and after a disaster. Global data shows that the number of natural hazard-induced disasters and the number of people affected by them are on the rise. In the context of climate change, this challenge is expected to continue to grow, as the frequency and intensity of extreme climate-related events increase (IDMC, 2011). In low and middle-income countries, one of the most visible consequences of rapid urbanization is the increasing number of informal settlements on fragile lands that

are highly prone to natural disasters. This shows a close link between poverty, land tenure security, housing and vulnerability to natural disasters. Due to lack of access to safe land, poor people often settle on highly vulnerable marginal lands. Disaster risks and lack of tenure security discourage people and local authorities from investing in safe housing and infrastructure, with the result that the poor regularly loose what little they have (El-Masri & Tipple, 2002). These factors explain why governments and international agencies are increasingly considering resettlement of vulnerable urban communities as a strategy towards reducing the risk of natural hazards.

2.3. Resettlement and risk of impoverishment

Relocation is often not the right solution as in many cases it entails numerous social, economic, environmental and cultural risks of deprivation. The most critical problem associated with urban displacement are the loss of housing, loss of employment or loss of site-related income sources and the uncertainty of finding new employment in the relocation area. The distance of the relocation site from the original place and jobs often become an obstacle to maintaining prior employment, the source of income (Patel et al., 2015). Thus, the resettlement process of the affected communities can raise the issue of inequity in the society.

2.4. Social justice and equity as applied in resettlement programs

According to Bala (2006), equity is one of the quality of being just. He argues that in the present market economy, a society which protects the rights and liberties of people and provides all the economic and social advantages to the greatest benefit of the least advantaged group in the society, could be considered just. In this respect, social justice and equity have their relevance to the concepts of induced displacement and resettlement, particularly when we argue reestablishment and fair allocation of resources among communities. Involuntary resettlement is a human right issue involving accountability, governance, participation, capacity building, relevant legal and policy framework.

Development projects such as upgrading slum areas in developing countries are essential to alleviate poverty by improving population livelihoods. However, such development projects, while resettling the population from one place to another, mostly induce deprivations and the new poor in the society. An example is the case of impoverishment of poor urban people displaced by the project of slum upgrading, transport and infrastructure development that happened in India (Patel et al., 2015; Patel et al., 2002). According to Cernea (1997), if development projects lead to impoverishment and create poverty it is a paradox situation that negates the very premise of social justice while moving on the path to developments. In this regard, in order to qualify as an equitable development project, a resettlement program must focus at restoring and improving social and economic opportunities of the affected population.

2.5. Compensation and rehabilitation

"Improve or at least restore resettlers' prior livelihoods and incomes" is one of the main objectives of involuntary resettlement policies as adopted by various governments and agencies such as the World Bank, the Asian Development Bank. Compensation has been the usual remedy universally employed as a means of restoring the loss of asset, economic resources disruption and income loss (Cernea, 2003). In many cases, cash or property such as land and house are used as compensation means. However, many researchers have criticised the efficiency of the "compensation principle" in situations of mass displacement. Such compensation alone as the only means of re-establishing livelihoods of the displaced population were found inadequate in dealing with losses caused by development induced involuntary displacement (Cernea, 2003). The purchasing power of cash compensation typically ends up being less than necessary to repurchase the assets lost. Full compensation for losses caused by involuntary

resettlement is very crucial and in many cases a legal entitlement to affected persons, but it is just only a repayment of what was visibly lost by people. It cannot produce an improvement in livelihood levels compared to pre-displacement level Cernea (2003) demonstrated that some losses and inequities might not be covered by compensation. They become only visible through their consequence which is the impoverishment of most resettlers. Resettlers' losses in income, assets, rights, are multifaceted in economic, social, cultural, in cash and in property, in opportunities, in power. Resettlers losses are not only natural nor man-made physical capital but also human and social capital they have constructed through social organizations and mutual help networks. The income lost is not only cash income, but also wealth that is psychological in nature, including culture, status, and identity (Cernea, 2003).

2.6. Factors to be considered in resettlement planning

2.6.1. Physical factors of the resettlement environment

Cash or house compensation alone cannot prevent the impoverishment of resettlers and cannot in itself restore and improve their livelihoods. According to Corsellis and Vitale (2005), the physical factors of the resettlement environment are considered to include the infrastructure, facilities, and social service buildings. Regarding the relevant elements of the community's infrastructure, transportation (roads and bridges); healthcare (clinics, hospitals and pharmacies); water and sanitation (water supply, surface-water drainage, sanitation in communal areas or for communal services); schools (crèches, primary, secondary, tertiary institutions); the generation and transmission of power; food production and food security (markets); police stations, prisons, courts, and places of worship (churches, temples, mosques, etc.) and must be intensively considered. As recommended by Cernea (1988) the setting of these elements in the new sites should be enhanced or, at least, match the previous site characteristics.

2.6.2. Socio-economic characteristics of people to be resettled

Background information about affected community in the form of their socio-economic characteristics is a vital element to be considered in a resettlement program. Sound baseline studies are important for the development of indicators that will allow assessing the impacts of the resettlement program on the social and economic aspects of resettled communities and their standards of living (Bartolome, de Wet, Mander, & Nagraj, 2000). The socio-economic factors focus on the impacts that tend to decrease the income of displaced people. This information is highly useful in evaluating vulnerability, defining mitigation measures and formulating the risk management strategies (Correa, Ramírez, & Sanahuja, 2011). Kinsey and Binswanger (1993) argue that resettle people into a new area without recognizing their origin settlement characteristics may lead to the failure of the program.

2.7. Theoretical models on resettlement

Over the years, scholars have proposed various frameworks to describe the process of resettlement. These theoretical frameworks were useful attempts to organize accumulated knowledge into patterns and conceptual models and have created intellectual tools that helped many researchers to interpret their particular field findings. For example Scudder (1981) offered one of the first theoretical models to describe resettlement process in four stages: 1) Planning, infrastructure and recruitment: the process of initial basic infrastructure development and selection of people for relocation; 2) Transition: the initial few years of adaptation to the new site. This is the period of stress; 3) Potential development: the period in which settlers begin to invest particularly in economic activities; and 4) Handing over and incorporation: the period when those relocated integrate with the hosts. The model focused on households which depend mostly on agriculture activity in rural areas and their behaviour at different stages of their resettlement process. It shows that resettled households might experience the socio-cultural stress in case they were not able to transfer their old agricultural practices. The reason could be the new physical

environment or the requirement of a different production system by the authority. However, due to appropriate policies and plans in place, during the 4th and 5th stages, these households could cope with the changes, use the newly acquired land and end up by redeveloping their economies (Scudder, 2012). The model was intended to apply to resettlement operations that complete all the four stages and which is supposed to be successful in that case. This could be the reason is criticized of confounding voluntary and involuntary resettlements. Historically, however, the majority of resettlements operations are involuntary and have been unsuccessful (Cernea, 1997). Specifically, resettlement of urban population requires land which is itself a scarcity. Furthermore, urban dwellers for their survival are involved in income generating activities that are not available in all part of the city. This raised the need of a model that would concentrate on how planners can achieve a successful involuntary resettlement by avoiding its negative impacts.

2.7.1. Impoverishment risks model

Michael Cernea developed a conceptual model he defined as Impoverishment Risk and Reconstruction model (IRR) which highlights eights interlinked deprivations risk forms associated with resettlement: landlessness, joblessness, homelessness, marginalization, food insecurity, increased morbidity and mortality, loss of access to common property and resources and social disarticulation, leading to impoverishment. Table1 below summarize the meaning of the eight risk forms.

Risks	Meaning
Landlessness	Contribute to impoverishment in that sense that its expropriation takes away the foundation upon which social and economic productive activities are constructed. According to Patel et al.(2015), the importance of land in the urban context is justified by its location with respect to opportunities for livelihoods and common facilities such as education, health facilities and markets. In urban areas, this form of decapitalization induces both losses of natural and manmade capital.
Joblessness	Shopkeepers, shop-workers, artisans and small businessmen experience stronger displacement effects through loss of job. Patel et al.(2015) argue that the increasing distance and cost to job location which reduce monthly earnings and the higher expenditure leads to impoverishment.
Homelessness	Loss of shelter is temporary for most of those displaced but for some families it may remain permanent due to high cost of reconstruction on a new site.
Marginalization	Marginalization occurs when families lose their economic powers, confidence in the society which leads to feelings of injustice.
Morbidity and mortality	People forced to relocate have a higher degree of exposure to stress, trauma, and other chronic illness. Patel et al.(2015) have shown that the health condition of displaced people may be affected by lack of safe drinking water, poor sanitation and waste management in the new site.
Food insecurity	Sudden drop out of income may lead to undernourishment. Re-establishing food or income may take longer period thus undernourishment becomes persistent.
Loss of access to common property	Lack of access to common property assets including burial grounds, open spaces, access to public services including schools and health services has adverse effects on the livelihood of displaced communities.
Social disarticulation	Relocation dismantles spatial, temporal and cultural organization patterns of communities. Leading to destruction of social organization and social ties including neighbourhoods networks and the networks of reciprocal help.

Table 1: Population impoverishment risks induced by displacement

Source: (Patel et al., 2015; Cernea, 1997; Cernea, 1999)

2.7.2. Risks reversal model

Before displacement actually starts, the social and economic risks of impoverishment are only a looming threat. When preventative measures are not initiated, these potential hazards convert into the discussed impoverishment processes (Cernea, 1997).

Cernea (1997) suggests that in order to prevent impoverishment, it is necessary to act and stop early on the looming risks from becoming into reality. i.e. during the preparation of a displacement project. He argues that in the same way in which IRR deconstructs the process of displacement into eight major risks of impoverishment, it also deconstructs the process of reconstruction into a set of risks reversal strategies. Table 2 below gives an example of risks reversal strategies.

Risk reversal	Strategy
From landlessness to land-based resettlement and joblessness to reemployment	Enabling displaced people to settle back in income generating employment is a significant component in resettlement programs. Various measures could be taken to ensure that people undertake their employment, including identification of suitable land that would enable people to maintain or resume their income generating activities.
From homelessness to house reconstruction	Better shelters is a relative easier improvement to achieve in reconstructing livelihoods of resettlers. In addition, various forms of improvements can take place such as more living space, good quality housing materials; connection to electricity, water and safer sanitation facilities; space for house gardens; and others. However, in urban areas, longer commuting distances and transportation costs were found to be the typical constraints. Thus, the best results are obtained when project compensation for housing is supplemented by other resources such as transport services.
From food insecurity to adequate nutrition and from increased morbidity to improved health care	Health status and nutrition level of the resettlers is determined in long term by the economic recovery (land, employment, income).
From loss of access to restoration of community assets and services; from social disarticulation to rebuilding networks and communities and from marginalization to social inclusion;	According to Cernea (1997) overcoming social disarticulation involves reconstruction of group structures in a community both formal and informal while overcoming marginalisation refers to individuals or households. Different approaches can be applied to overcome social disarticulation such as creating resettlement site as a new social unit that needs new community assets and public services or by reconciling resettlers with the existing communities and increasing pressure on existing services.

Table 2: Impoverishment risks reversal strategies

Source: (Cernea, 1997; Patel et al., 2015)

The above reconstruction directions indicate that the IRR model is not just a predictor of unavoidable risks; on the contrary, it helps to plan the way to restore and improve the livelihoods of the displaced. Like in the case of other models, the components of the IRR model can be adjusted upon and be influenced throughout the planning and resource allocation process, in order to mitigate or reduce the impact of one or several risks. Cernea (1997) emphasized on the interdependence of the impoverishment risks. Therefore, a reconstruction strategy can ideally pursue the dependence and integration manner. An example is to counteract health risk by addressing the risk of income loss.

Cernea (1999) argue that risks and reconstruction measures depend on the population context and mentioned the need for specific consideration in resettlement of people living in urban areas.
Social and economic rehabilitation programs are the backbone of sustainable urban resettlement. Location of the new settlement is a key element in restoring productive activities and ensuring income opportunities and access to services. However, financial burden, land and housing scarcity in urban areas are roots of difficulties in urban resettlement programmes. In many cases, the economic activities such as home-based businesses and other informal survival strategies of urban poor are linked to their living neighbourhoods. A case study on resettlement in urban areas in Latin America has shown that families before relocation mainly depended on the business of selling tortillas to workers in downtown offices. Their income was eroded due to additional cost of transport, additional expenditures and caused the rupture of community ties and interdependence that previously guaranteed services, such as child care and neighbourhood security (Cernea, 1999). Thus, it is important for urban displaced households to move the least distance possible from their original location. The limited budget forces many governments to relocate people in rural areas far from their origin sites. However, distance and transport cost to jobs opportunities areas are factors that pose a risk to urban households' income, economy and survival strategies. In addition to that, infrastructure and services such schools and hospitals leading to increased transportation costs and the scarce demand for labour in the area of the new settlement are other issues in resettlement of poor people living in urban areas.

2.8. Community participation

In densely populated and continuously growing cities, population relocation whether for infrastructure development or disaster prevention will always happen (Patel et al., 2015; Abebe & Hesselberg, 2015; Usamah & Haynes, 2012). Cernea's (1997) model for resettling displaced populations demonstrates the need to consider the risks associated with displacement and prevent or minimize them from becoming reality. A crucial step involved in this is the active involvement of the community in planning for their future, discuss their options and make informed decisions. Under such conditions, impoverishment is not an inevitability of relocation, particularly if such community participation is accompanied by a high degree of government commitment to adequate resource allocation. Consultation and involvement, of the community, can increase the overall efficiency of resettlement for all stakeholders (including donors, implementing agencies) and reduce the aforementioned socioeconomic implications traditionally associated with displacement. Abebe and Hesselberg (2015) discussed the relevance of community participation to the success of a resettlement program. Participation in resettlement programs can be broadly understood as possessing two meanings, firstly that of information exchange and secondly of varying forms of joint decision-making. The exchange of adequate information regarding resettlement processes involves the dissemination of information from project officials to the affected community. This serves as a cornerstone to the resettlement process as it forms the foundation for trust between the community and project officials, and provides the opportunity for community concerns to be voiced (Correa et al., 2011). The "authority to affected people" consultation process must be followed with the community participation which allows information to flow from "the people to the authority". This is an essential step as it encourages the planning and implementation of the resettlement by all stakeholders through identification and selection of alternative project designs. This process will not only allow issues of health, education, livelihood to be accounted for, but it should also ensure that residents are better able to negotiate favourable resettlement sites by considering their livelihood through involvement in the selection of relocation sites (Heming & Rees, 2000; Patel et al., 2002).

2.9. Resettlement sites selection

According to Asian Development Bank (1998), the location and quality of a new resettlement site are the most critical factors that should be considered during the resettlement planning process because they determine access to social, cultural and economic opportunities that can restore the livelihoods of the affected communities. For example, Ibrahim et al. (2015) conducted a suitability analysis of resettlement sites for flood disaster victims using environmental factors like climate, soil, slope, geology, socio-economic factors like accessibility to roads but they suggested that other socio-economic and infrastructural development have to be considered in evaluating sites for sustainable resettlement. Especially in the case of the urban relocation which is a complex process that affects every aspect of the life of affected people. Correa et al. (2011) in the resettlement guide of the population at risk, proposed a list of criteria (Table 3) to use in the selection of resettlement land.

Criteria	Meaning
Compliance with existing land use plans	Resettlement sites must comply with the land use plans, including the type of activity that may be pursued (residential, industrial, commercial, agricultural. etc.) and conditions of safety for human settlement.
Safety	The selected site should be free of hazard.
Location	The location that offers better access to workplaces, markets and transportation.
Access roads	The resettlement site should have access roads to allow the population to travel to workplaces and service centres.
Social service centres	Consideration should be given to the proximity of schools and health.
Access to public services	Consideration should be given to whether there are water supply, sanitation, and electricity networks to bring services to the new settlement.
Land value	The land value can influence the land selection

Table 3: Crucial criteria for the selection of resettlement land

Source:(Correa et al., 2011)

2.10. Resettlement and spatial analysis

Many researchers have studied in detail socio-economic problems associated with relocation and found that the social, economic problems faced by resettlement communities are linked with the spatial location of the resettlement areas (Corsellis & Vitale, 2005; Kinsey & Binswanger, 1993; Bartolome et al., 2000;). As mentioned early, often the livelihood issues faced by the resettled communities are linked with the poor selection of relocation sites. The spatial location of the resettles rise the problems linked with the provision of basic essentials infrastructures by the government in resettlement areas (Kinsey & Binswanger, 1993; Bartolome et al., 2000). Therefore, within a resettlement scenario, a clear link could be established between the socio-economic problems and spatial aspects of resettlement programme in its planning and management.

2.11. Spatial multicriteria evaluation(SMCE)

Resettlement in the case of natural hazards mitigation is sometimes unavoidable. However, it should be balanced with other risks that might be created through relocation. As mentioned early, relocation might reduce risks of disasters, but it also induce social disruption and impoverishments of the affected communities. When it is not possible to avoid displacement, planners need a model to conceive special measures against each of the predicted impoverishment risks. Therefore, relocation as a multidimensional, complex process is one of the main issues in planning that need to be supported by information technology tools. Population relocation is a decision-making process problem that includes multiple (spatial as well as non-spatial) criteria for which multi-criteria evaluation technique is an important component.

GIS in combination with Multi-criteria analysis tools are used in different studies for sites suitability analysis or selecting the appropriate spatial pattern for future land uses according to specify requirements, preferences, or predictors of some activity (Dagnachew Shibru et al., 2014; Zucca, Sharifi, & Fabbri, 2008; Ibrahim et al., 2015; Kumar & Biswas, 2013). It is the most preferred method to select suitable sites for various different activities (Malczewski, 2004). According to Zucca et al. (2008), the criteria structure defined for assessing site suitability depend much on the main objective to achieve. For instance, in their study to select a suitable site for a park, the objective was to protect and improve the environmental quality of Bergamo province in Italy. This was achieved by identifying relevant indicators, which means a need of developing of a conceptual framework with respect to protection and improving the environment. In this research, the conceptual framework is the IRR model. The objective of SMCE is to identify potential resettlement sites that would help to minimize impoverishments. In doing so, it is possible to generate compromise alternatives resettlement sites and rank their suitability levels. This can be explained as follow:

Assume (a,b,c,...,z) represents the alternatives potential resettlement sites and (1,2,3,...j) represents the criteria that have been identified to minimize impoverishment risks. ezj denotes the effect of the criteria j on the suitability of the alternative z. The evaluation matrix, E (zxj) contains the information of each ezj. The relative importances of the criteria form a weight vector W. To produce E and W as input to the model, four tasks need to be carried out.

1. Criteria, indicators and variables should be identified
2. Standardization of the criteria
3. The relative importance W_j for each criteria(weighting)
4. Aggregation of the criteria weights

2.12. Related works

The research literature on development-induced resettlement has increased over the last decade. Thus, there are many researches that focused on the impact of resettlement on socio-economic and cultural fabric of the affected communities. For example Schmidt-Soltau (2003) used IRR to identify the various risks and problems caused by the resettlement of inhabitants of national parks, and has outlined some possible methods to reduce these risks and impacts. Agba, Akpanudoedehe and Ushie (2010) investigated the socio-economic and cultural implications of resettlement and demonstrated how displacement induced the loss of income generating activities of people in Bakassi of Cross River State in Nigeria and proposed some mitigating measures. Patel et al. (2015) adopted also IRR in their study to analysis impact of displacement. Furthermore, they tried to discover the causes of impoverishments and they found that relocation distance was the most cause of post displacement impoverishment which shows how the site

location should play an important role in the process of resettlement. Spatial analysis has been used to solve numerous socio-economic and environmental issues associated with resettlement. Ibrahim et al.(2015) identified suitable sites for resettlement of flood disaster victims in Lokoja and environs. They used the bio-physical and socio-economic factors land use/land cover, slope, elevation and nearness to road to evaluate the environmental suitability of the resettlement site. These indicators were chosen because the majority of the people were agrarian and directly depended on the natural environment for their livelihood thus the environmental suitability analysis of the new resettlement site was necessary.

2.13. Summary

The literature review above shows that countries undertake resettlement programs for different purposes and objectives. In urban areas, infrastructural development projects such transport corridors, industries, health facilities construction, slums upgrading, etc are the root causes of population displacement. Moreover, the rapid growth of urban population coupled with current climate change issues increased the number of the population displaced under disaster risks reduction programs. Governments undertake the resettlement programs with hope to improve the life of vulnerable people and reduce inequity. However, if it is not properly prepared by identifying potential risks and develop risks mitigation measures, the resettlement process can worsen the life of poor hence increase social injustice in the society. Cernea risks and reconstruction model is used in resettlement researches and helps researchers to summarize their findings on impoverishments risks and how to restore the livelihoods of the displaced people and minimize the displacement risks. In most of the cases, livelihood restoration will be based on land and employment reestablishment. Literature shows that a resettlement site location should determine access to job opportunities and basic services such as schools, health facilities, etc that would improve livelihoods of displaced community. Hence, a suitable resettlement site can help to achieve equitable resettlement. GIS and multi-criteria analysis techniques can be used to analysis the suitability of a land with respect to a specific activity. Multi-criteria analysis involves decision makers to express their preferences. In resettlement programs, the community to be relocated should play an important role in resettlement site selection.

3. RESEARCH METHODOLOGY

The main objective was to develop a methodology for residential resettlement that seeks to minimize impoverishment risks. To achieve this objective, three interlinked objectives were formulated. The present chapter provides details on the research strategy adopted to address those objectives. Empirical data were required. Thus, various data collection methods that were applied to collect the required data are discussed. In addition, methods implemented for data analysis are also presented.

3.1. Research strategy

The study is a combination of descriptive and explanatory research. The research intended to identify the risks of impoverishments faced by displaced population from high risk zones in Kigali. It further identifies how those risks can be minimized through suitable resettlement sites identification. The study employed descriptive survey method combining both quantitative and qualitative data. Qualitative data helped to collect subjective information (perceptions, ideas and thoughts). A case study strategy was drawn as it allows a researcher to provide a detailed description of a real life problem. According to Kumar (2011), with the assumption that the case being studied is an unusual case, a single case can provide insight into current situations in a group from where the case has been drawn.

3.2. Selection of the study area

Kigali is the large city, the economic and political capital of Rwanda. It is located in the heart of the country. Kigali has three districts namely Nyarugenge, Kicukiro and Gasabo, the most densely populated in Rwanda. The landscape of Kigali is characterised by a series of hills which are separated by wetlands in between. It has a lower mid-altitudinal range of 1,300m in the wetlands and the peak at 1,850 m on the top of Mount Kigali. The steep slopes in hills inclines up to 45 or 50 percent while in valley wetland areas slopes are less than 2 per cent (REMA, 2013). About 66% of inhabitants of Kigali live in informal dwellings. This has lead to human activities such as settlement and industrial uses taking place in risk prone hills and wetlands areas which are inappropriate for development (REMA, 2013). This research was carried out in Kigali because recently, a study of slums identification and mechanisms to alleviate challenges associated with them was conducted on behalf of Rwanda housing authority. One of the outcome recommendations of that study was to give first priority for relocation of informal settlements in high risky areas such as those on steep slopes, wetlands and areas exposed to toxic waste in the three districts of Kigali City. This study selected one district in Kigali. Gasabo district was selected as the study area because of the following reasons:

1. Gasabo is the district in Kigali which still has a big number of people who need to be relocated from risk areas.
2. Gasabo district is the only district in Kigali having known resettlement sites which host households relocated from high risks zones in its urban sectors. This was necessary because the researcher wanted to have evidence of identified impoverishments risks from the already experienced resettlement impacts.
3. According to MIDIMAR, Gasabo has the most critical high risk zones in Kigali such as areas in Gatsata which need to be prioritized in relocation.

3.2.1. Gasabo district

Gasabo is one of the three districts of Kigali city, the capital of Rwanda. Gasabo is the largest of all of the three districts. It counts 15 sectors with a total area covering 429.3 km2, approximately 60% of the total area of Kigali city. Nine sectors namely Bumbogo, Gikomero, Jabana, Jali, Kinyinya, Ndera ,Nduba, Rusosoro and Rutunga occupy a large rural area and other six sectors namely Kacyiru, Kimihurura, Kimironko, Gisozi, Gatsata and Remera entirely cover the urban area. Approximately 46.8% of the total population of Kigali city today resides in urban and rural areas of Gasabo district. Large urbanized areas of Kigali city lie within Gasabo boundaries.

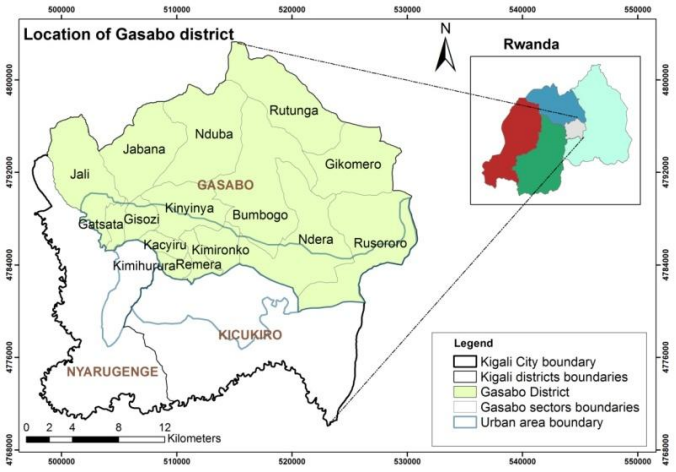


Figure 3: Location of Gasabo district in Kigali city

Demographic characteristics

The district has an overall population of more than 500000 inhabitants. The population density in 2012 was 1,234 inhabitants per km². Gasabo district population is predominantly urban. 69% of the residents live in urban areas while 31% of the population live in rural areas(National Institute of Statistics of Rwanda (NISR) & Ministry of Finance and Economic Planning (MINECOFIN), 2012). Urban sectors like Remera and Kimironko located around the core of Kigali city are facing higher development pressure due to existing facilities. Kinyinya, Gatsata and Gisozi, the neighbouring sectors are also witnessing residential developments pressure.

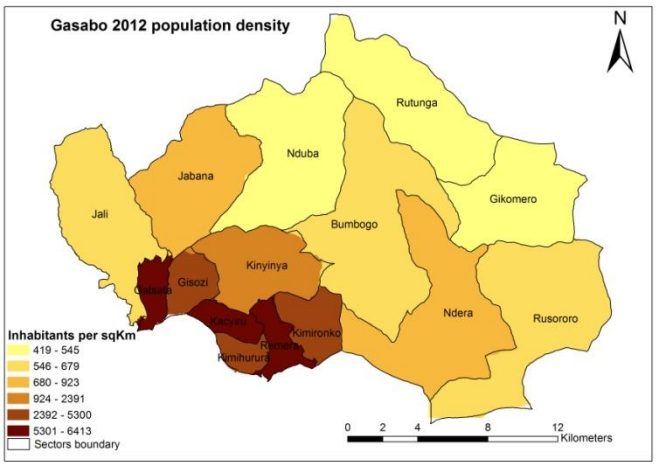


Figure 4: Gasabo 2012 population density

Land use

The land use in Gasabo district is predominately agriculture and residential uses. Large parts of Gasabo are not developed and consist of many natural features such as hills, forests, wetlands and watershed which are sometimes used also for agricultural purposes. Residential development in the three districts of Kigali are spread over 17 urban sectors which include among others Gatsata, Gisozi, Remera Kimironko and part of Kinyinya sectors of Gasabo district. Most of residential nodes are in the immediate areas around the Kigali CBD and other commercial areas and constitute large unplanned high density residential areas.

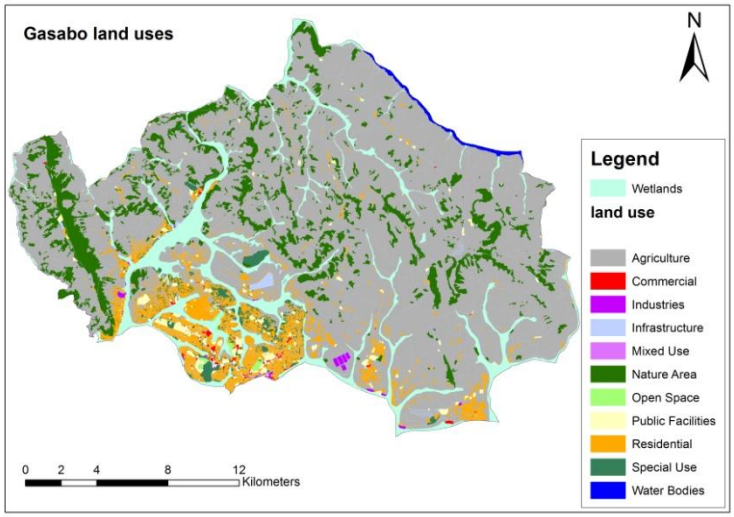


Figure 5: Main land use types in Gasabo district

Topographic characteristics of Gasabo

The district is characterised by sections of a ring of hills which surround the urban area of Kigali and rural villages to the north and east part of the city. The North part of Gasabo district has steep undulating terrain which is not far from the general landscape common to the entire Kigali city. 40% of land in Gasabo has slope above 20% and approximately 6% of the land has steep slopes above 40%, which is a constraint to residential and commercial development. 7 % of Gasabo is delineated as wetlands. Therefore, large parts of Gasabo are not developed due to hills, wetlands and watershed. The southern sectors of the district have flat terrain which is more suitable for development.

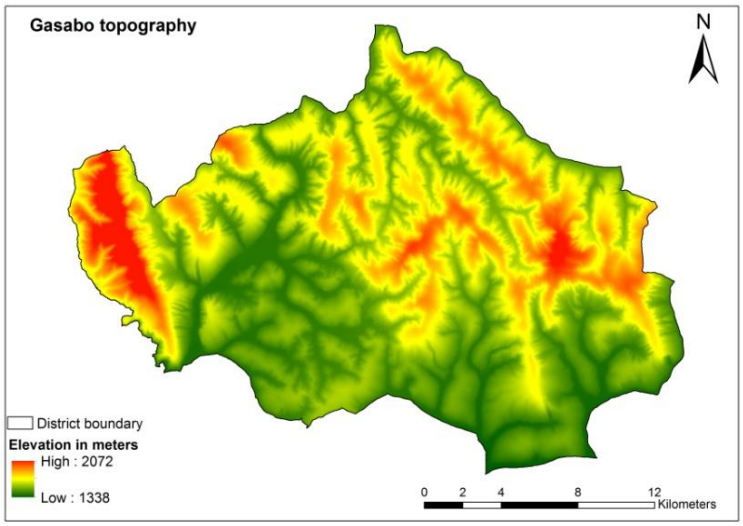


Figure 6: Topography of the study area

Resettlement for disaster risk reduction

The frequency, intensity and impact of natural hazard events are increasing. These hazards when coupled with inadequate coping capacities they cause disasters which impact on human life, economy and environment. Rwanda is vulnerable to a range of disasters. Landslides and floods are frequent hazards that affect localized areas in the country (MIDIMAR, 2012a).

In Gasabo district, the hilly topography, poor drainage system in high densely informal settlements on steep slopes and wetlands, old buildings constructed with non-durable materials and the heavy seasonal rainfall accelerate disaster risks. Every year during the rainy season, water related disasters cause loss of life of people and damages to property. Gatsata neighbourhood which typically consist of unplanned and densely low rise residential area concentrated along steep slopes is the most critical high risk zone found in Gasabo district. Currently, in line with the prevention and risk reduction policy, the government has started relocating the most vulnerable households from those high risk zones and a large number of households still need to be relocated.

Figure 7: Unplanned high density residential area on steep slope with houses vulnerable to heavy rain(Gatsata sector)

Source: Author

Urban development and land use planning in Kigali

Like most of other cities in developing, Kigali is facing many challenges related to urbanization such as unplanned urban growth and environmental degradation. For a better management of this urbanization, the government of Rwanda put in place various policies and regulations related to urban development and human settlement (MININFRA, 2013). The national land use master plan is on the top to provide guides on spatial and urban development in the country. Any land use plan must conform to this national plan. In line with the national land use plan, a master plan of Kigali city was elaborated. Kigali city master plan (KCMP) and its associated physical details plan for each of the three districts of Kigali city are key tools for the city's sustainable land use development. The KCMP presents a broad vision and guidelines for the entire city, serving as the basis for more specific planning at the districts level. This master plan contains detailed land use and zoning plans that guide physical developments. Specifically, zoning plans are intended to provide guidelines on what development type is allowed or prohibited on a particular land use.

3.2.2. Case study areas

Given the criteria for the study area selection, Gasabo district was selected because it would allow the researcher to form a case study including already resettled households and the households that need to be relocated. In that regard, two resettlement sites, one in Kinyinya sector, another in Bumbogo sector were selected to form a case of already resettled households. Gatsata sector was select as an area hosting households to be relocated in the future (Figure 8). These two communities allowed us to collect necessary information which served for two essential purposes: (1)to identify the impacts of relocation experienced by already resettled households; (2) to analyze the pre-resettlement conditions of the households and their likely impoverishment risks.

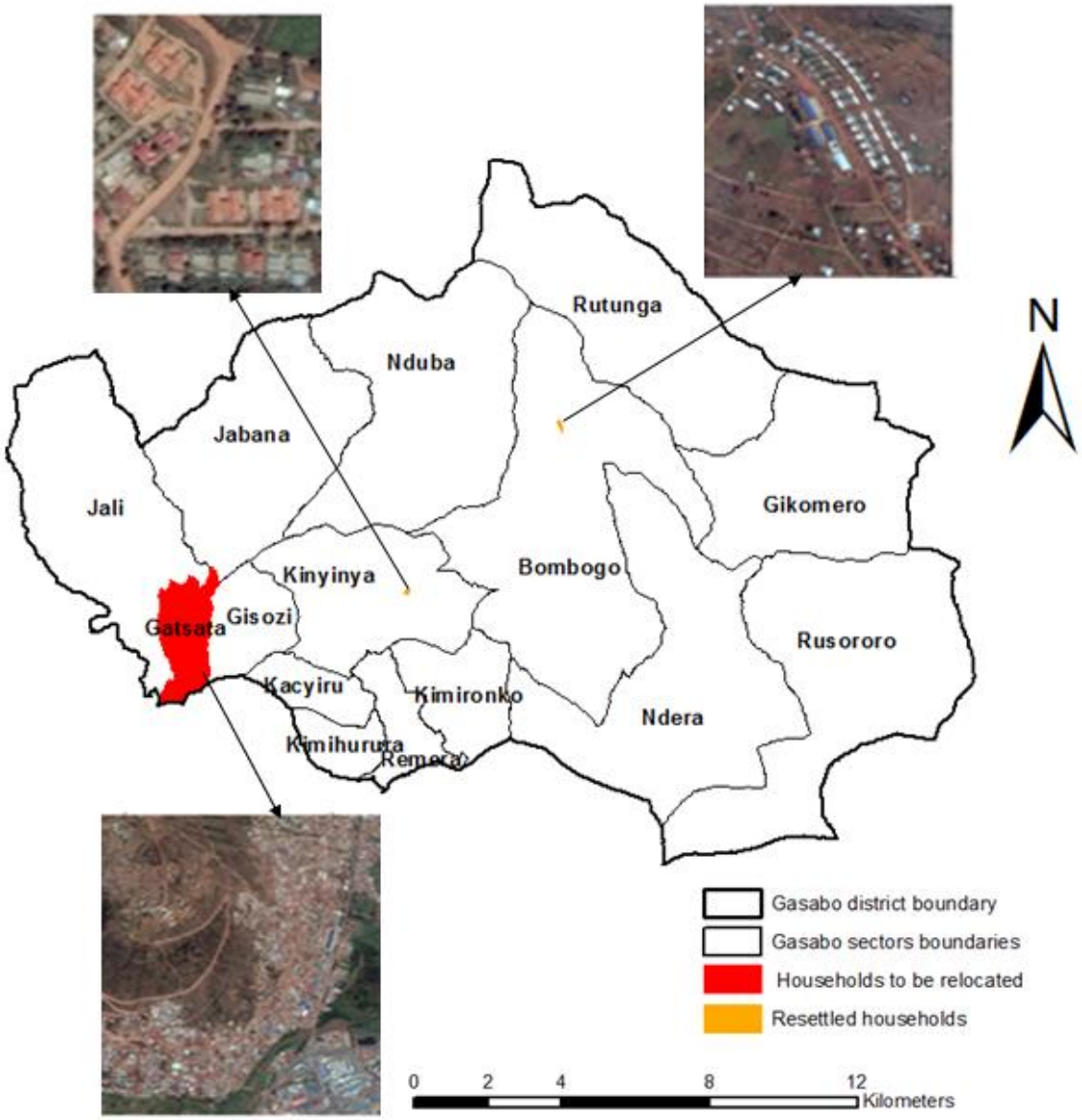


Figure 8: Research case study areas: Gatsata sector, Bumbogo and Kinyinya resettlement sites

Source of images: Google Earth, 2015

3.3. Data collection

This section gives explanations about the data source, the research population, the sampling techniques and the research instruments used to collect the required data.

3.3.1. Data source

Both secondary and primary sources were used to collect data which might help to develop a methodology that can be used for an equitable resettlement. Under the umbrella of the case study, primary data were collected through household survey, key informants interviews and field observation during a fieldwork which took place from 23 September until 12 October 2015. The interviews involved the technique of asking questions and eliciting information, beliefs or opinion from respondents. Observation was used to collect information by means of observing the physical environment in the study area. Kumar (2011) argues that field observation might complete information captured during interviews because some respondents may feel unwilling to provide full information. Secondary data were collected from different governmental institutions. The combination of household survey, key informants interviews and field observation was chosen to have a rigid data collection and have a chain of evidence (Yin, 2003).

3.3.2. Population and sampling techniques

This research has three categories of participants: all population living in high risk zones in urban areas of Gasabo district, resettled households from high risk zones in the district and key informants governmental officials. However, due to the limited time allocated to the fieldwork, Gatsata sector was selected purposively to form the case of households to be relocated. Gatsata is the sector in Gasabo which still has the highest number of households that need to be relocated. Therefore, it is the worthwhile area selected to study the pre-resettlement socio-economic characteristics and resettlement requirements of households that need to be resettled. Sample households in Gatsata for interview were selected using a cluster random sampling where the cell administrative units formed the clusters to eliminate any possible bias. A list of the total number of households identified as located in high risk zones was obtained from Gasabo district office. The list was from a survey of all houses in high risk zones which included also households that were renting in Gasabo district. In this study, the sample frame consists of only households that are living in their own houses in Gatsata sector.

To form the case of already resettled households, two resettlement sites namely Kinyinya and Bumbogo resettlement sites in their respective sectors were selected purposively. These resettlement sites were selected because according to information from the interview with a district officer, the sites were the host of households resettled under the program of relocating people living in urban high risk zones. Thus, the sites allowed interviewing already resettled households and identify the resettlement impacts they have encountered. In both resettlement sites, a systematic sampling was used to select already resettled households for interview. Where the first entered households was selected randomly and before selecting the next sample, one household was skipped.

Since resettlement is a national and local level agenda, government officials could provide adequate information about the issue of resettlement and the livelihoods restoration of the relocated households. This was also a go way to triangulate the information received from the community perspective. Thus, purposive sampling was used to select key informants from different government institutions.

Sample size determination

According to ADB (2012), household survey usually covering a 20% – 25% sample of households that need to be resettled are used to prepare a profile of those households; to identify their income generation activities incomes; to plan for restoration of income and other productive activities, and develop relocation options. Thus, 25% of the study population equal to 100 samples households in high risk zones were selected using cluster random sampling across three cells Nyamabuye, Nyamugali and Karuruma as

presented in Table 4. For already resettled households, the researcher selected 10 households in each resettlement site because of a small number of resettled households in the sites.

Resettled households				**Households in high risk zones**			
Sector	Resettlement site	Total* HHs in 2015	Sample	Sector	Cell	Total** affected households	Sample 25%
Kinyinya	Gasharu	16	10	Gatsata	Nyamabuye	308	77
Bumbogo	Nyagasozi	-	10		Nyamugali	36	9
					Karuruma	55	14
	Total		20			399	100

*** Total resettled households currently living in the resettlement site (Source: Field observation)**
**** Total household living in their own houses in high risks zones (Source: Gasabo district)**

Table 4: Households sample size in the different sites.

Table 5 shows the selected key informants and their respective institutions. These key informants are government officials who play different roles in the resettlement program. As it can be seen, an interview with at least one district planner in each of the three district of Kigali was carried out. Interview with district planners was important to know which district meet the criteria of the study area select.

Institution	**Respondent**
Rwanda housing Authority (RHA)	Head of rural settlement division
District office (Kicukiro, Nyarugenge and Gasabo)	District planner (1in each district)
Ministry of Disaster Management and Refugee Affairs(MIDIMAR)	Director of risk reduction and preparedness unit
Cell and Village administrative levels	In charge of social affairs, Nyamabuye cell In charge of social affairs, Nyamugali cell Executive secretary, Karuruma Head of village, Hanika Head of village, Gashubi

Table 5: Key informants sample size

3.3.3. Primary data

Most of the data required to answer the research questions were collected from primary sources. Primary sources in this research include a household survey, interview with key informants and field observations.

Household survey

One of the methods used for primary data collection was interview schedule with households. In this research, the pre-resettlement and post-resettlement characteristics of households played an important role. Thus, a total of two questionnaires were used for the household surveys. One for the already resettled households and another questionnaire for the households that need to be relocated.

Interview with already resettled households

Based on IRR model, a semi-structured questionnaire (See Appendix1) for an interview schedule with already resettled households was developed. The interview with already resettled people helped to identify the already experienced impoverishments. The questionnaire covered a wide range of information about the resettlement impacts those households faced, such as loss of jobs, income, land and housing, access to common property resources, social disarticulation. The information was useful to validate households' deprivation risks associated with resettlement. Since the targeted households were resettled from informal settlements, we expected to have a high number illiterate among the respondents. Thus, the scheduled interview was chosen. Furthermore, because of the sensitivity and complexity nature of the study, it was necessary to prepare the respondents before asking sensitive questions (Kumar, 2011). Therefore, the face to face delivery was the most appropriate method.

Interview with households that need to be relocated

To describe the key characteristics of resettlement requirements and identify impoverishment risks, primary data were collected through interview schedule in the selected high risk zone (Gatsata sector). The interview schedule was appropriate because of the same reason as discussed in the case of the interview with already resettled. A semi-structured questionnaire (See Appendix 2) was prepared based on IRR model of resettlement. A wide variety of information about socioeconomic and cultural characteristics of the households to be resettled including their physical, social, financial, human and natural assets (Baud, Sridharan, & Pfeffer, 2008) as well as their perceptions of potential risks that would result from relocation were collected. The questionnaire comprised mainly closed questions but also open-ended questions were included to capture the perceptions of respondents on possible impoverishment risks that might be induced by the resettlement program.

Interview with key informants

A key Informants' interview guide (Appendix 3) was prepared, based on IRR model. According to Yin (2003), key informants are most important source of information in a case study. The semi-structured interview was preferred because it can allow the researcher to bring up new questions were necessary. These interviews afforded the researcher the opportunity to obtain rich, deep and detailed information. Open-ended questions allowed the interviewees to express their opinions and also their perceptions and ideas on the negative impacts of resettlement on the livelihoods of the relocated households, the causes of impacts and possible recommendations for future relocations. This interview with key informant was a good way to corroborate impoverishment risks and their indicators revealed by the households.

Field observation

The researcher intensively observed the existing spatial location and conditions of physical elements that are important in the daily life of the households. The conditions of the infrastructure such as road, facilities and services such as transport services were observed throughout both in resettlement sites and the settlement area of households to be resettled. The researcher observed the social and economic dynamic in those settlement areas. As a means to corroborate the findings from other research

instruments, useful observed information was written down. In addition, geographic coordinates of all the areas of the case study were recorded for further analysis.

3.3.4. Secondary data

The secondary data in this research were mainly GIS data and other information on resettlement process in the study area. From Table 6 below it can be seen that the sources of secondary data were the government institutions. MIDIMAR, the City of Kigali, RNRA and RHA were the main providers of most of the secondary data collected. In addition, unpublished government policy documents in connection with resettlement program and a report of a committee appointed to identify households that need to be resettled from high risk zones were collected.

No	Data	Format	Source	Comment
1	Administrative (Districts, sectors, cells) boundaries of Kigali city	Shapefiles	COK	
2	Transport infrastructure: Road network, Bus routes, Bus stops	Shapefiles	COK	Existing development (2013) and the proposed developments in the master plan
3	DEM, 10 meters resolution	Tiff	COK	
4	Detailed land use and zoning, Townships boundaries, Some important places in Kigali	Shapefiles	COK	Existing developments(2013) and the proposed developments in the master plan(2025)
5	Social infrastructure: Trade centres, Markets, Schools, Health centres	Shapefiles	RNRA	Rwanda base map 2013
6	High risk slope, Wetlands, Informal settlements.	Shapefiles	ITC; RHA	Informal settlements identification project 2013
7	Field study report on Informal settlement, Case study: The city of Kigali	Word doc	MIDIMAR	Challenges originated from informal settlement and proposed immediate actions to address those challenges

Table 6: GIS data collected from secondary sources

3.4. General approach and methods of data analysis

Figure 9 below presents the general data analysis approach that was adopted to achieve the research objectives. With respect to the objectives of the study, the analysis consisted of three main steps: (1) describe key socio-economic and cultural characteristics of households that need to be relocated from Gatsata. Based on the socio-economic and cultural characteristics and planning information, their potential resettlement requirements were identified. (2) Identify impoverishment risks and their indicators with evidence of the impacts of resettlement experienced by already resettled households. (3) Based on the identified impoverishment risks, the risks reversal strategies were developed. Further, the risks reversal strategies and the preferences of the households were used to analysis the suitability of potential resettlement sites in terms of minimizing impoverishment risks. Qualitative analysis, descriptive statistics, GIS mapping technique and spatial multi-criteria are the analytical methods used to achieve the objectives.

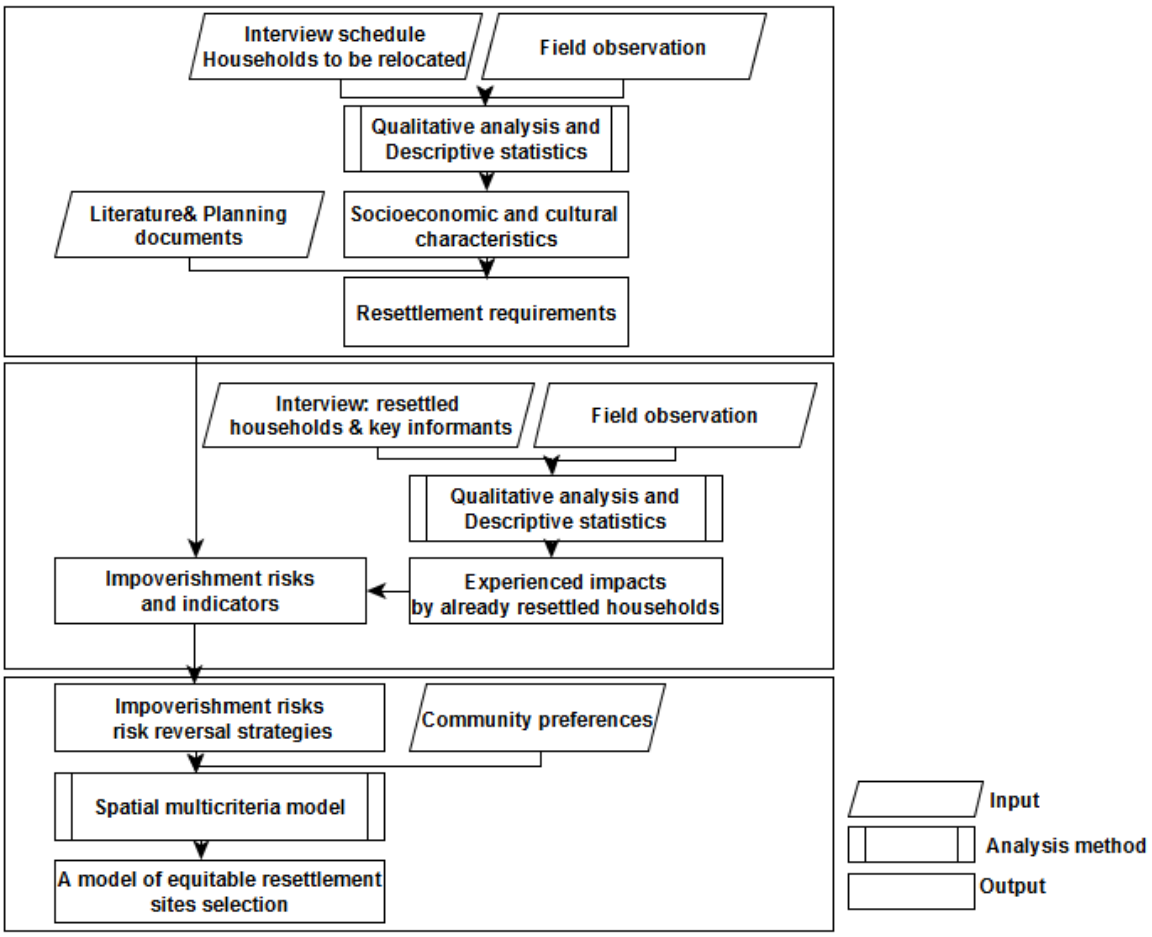


Figure 9: General data analysis approach

3.4.1. Key characteristics of resettlement requirements

The requirements in the context of resettlement are identified based on baseline data analysis. It means an inventory of persons to be relocated and their assets; an assessment of the income and livelihoods; and information pertaining to their economic and socio-cultural conditions. This information becomes the basis for impacts mitigating measures ADB (2012).

As defined by ADB (2012), the key elements of socio-economic data include demographic information, social organization, occupational structure, income level and assets, and access to public services. Brief, information to define which are the households that need to be relocated, what they do for living and what they are likely to lose due to displacement. Thus, indicators such as age, level of education, monthly household income, source of income, house and land ownership, type of employment or occupation, occupation sites, quality of their living environment, social organization, access to health care, access to schools, access to markets and access to transport were selected to analyze socio-economic and cultural characteristics of households that live in high risk zone of Gatsata. Descriptive statistics of those indicators were performed. Besides the data collected quantitatively, most of the data collected by means of the household survey through open-ended questions were coded by a categorical system and analyzed thematically together with the quantitative data. However, for some indicators, the researcher used narratives to describe the situation and other information linked to the characteristics of the households. GIS mapping techniques were used to visualize the results of spatial analysis. On the base of those characteristics and information from Kigali urban planning documents, human settlement and resettlement guidelines, the resettlement requirements were discussed.

3.4.2. Impoverishment risks forms and indicators

The potential impoverishment risks of households that need to be relocated from Gatsata were identified. The resettlement impacts experienced by already resettled households served as evidence. In fact, before relocation, all the resettled households were living in informal settlements located in high risks zones of Gasabo (See Figure7). Of the 20 sample resettled households, 6 were living in Gatsata high risk area and 14 others were living in the high risk zones of four sectors namely Kimihurura, Remera, Kimironko and Kacyiru. A study conducted by Rwanda Housing authority (Rwanda Housing Authority, 2013), revealed that even if the income of households living in informal settlements in Kigali city vary from an informal settlement to another, most of them depend on income from informal sector and more than 60% of these households earn below 50000Frw per month. That study assumed that the households which live in those informal settlements have almost a similar living standard. Therefore, the impacts that the resettled households have encountered helped the researcher to validate the risks of impoverishment of the households that need to be relocated from Gatsata.

Impoverishment risks model (landlessness, joblessness, homelessness, marginalization, food insecurity, morbidity and mortality, loss of access to common property and resources and social disarticulation risks) was used as a frame of analysis to summarize the identified impoverishment risks forms and their potential causes. These causes are named indicators.

3.4.3. A model of equitable resettlement site selection

Equitable resettlement requires the livelihood condition of the households to be improved or at least restored at the same level of wellbeing as it was before resettlement. In this regard, inequitable resettlement is conceived as the one which fails to benefit the displaced households and which causes their impoverishment. Cernea (1998) has demonstrated that equitable resettlement can be achieved when impoverishment risks are minimized or avoided. Under that principle of equity, this research has recognized two linked practices: 1) to describe the impoverishments risks as evidence of injustice. These are discussed in chapter 5. (2) to initiate good practices to minimize or avoid the causes of the identified impoverishment risks. This is what we called risk reversal strategies. In fact, after identifying specific indicators for each of the likely impoverishment risks, these were reversed into the strategies to minimize those risks. Furthermore, as it has been demonstrated in ADB (2012) resettlement guide, the location of a resettlement site is a key element in restoring productive activities and ensuring income opportunities and

access to services. In this regard, on the base of the developed strategies a site suitability analysis was performed to evaluate the level of suitability of potential resettlement sites. Where highly suitable land would restore the livelihoods and avoid impoverishment of the households than lowly suitable land. The suitability analysis involved two main steps: (1) to identify potential resettlement sites. (2) to develop a multi-criteria model for their suitability analysis.

3.4.3.1. Identify potential resettlement sites

Compliance with existing land use plans is an important criteria that should be considered in resettlement site identification. Resettlement sites must comply with the land uses master plan regulations as discussed in section 3.2.1, including the type of activities that may be pursued (residential, industrial, commercial, agricultural, etc.) and conditions of safety for human settlement against disaster risks (Correa et al., 2011). In this research three criteria guided the step of identifying potential land:

- Residential land use zones;
- Proposed for high density developments;
- Affordable by low income group.

In fact, as discussed in section 3.2.1, due to the topography and the rapid urbanization, Kigali faces the land scarcity and many other land related problems such as high land prices in urban areas. In line with sustainable land management, Kigali city master plan has proposed specific areas for high density residential developments. In addition, because most of the households that need to be resettled are classified in low income group which requires affordable land, within those proposed residential areas, candidate areas that could be affordable to low income people were identified. Based on the above criteria, a data layer including the potential land for resettlement sites development was created from the proposed land use zoning. This study considered the proposed land use plan for the year 2025.

3.4.3.2. Multi-criteria model for potential sites suitability analysis

A suitable resettlement site should determine access to workplaces, markets, social services, economic activities (ADB, 1998). Since relocation is a complex decision-making process with significant impacts on economic activities, social networks of a community, as well as its built up environment (buildings, infrastructure, and facilities), this requires dealing with various factors involving a multi-criteria decision analysis techniques to ensure the success of the planning in term of avoiding or minimizing those impacts. Indeed, a multi-criteria technique is a powerful tool for analysing the suitability of various areas with respect to one or more activities. Suitability analysis is similar to choosing an appropriate location however the purpose, in that case, is not to isolate the best site, but to map a suitability index of the potential land (Kumar & Biswas, 2013). A set of criteria for land suitability evaluation is required depending on the objective to achieve regarding the use of that land(Ibrahim et al., 2015; Zucca et al., 2008). In this study, the objective was to analyse suitable land for resettlement sites that would minimize the traditional impacts usually associated with relocation. The development of such multi-criteria model involved (1) the definition of evaluation criteria, (2) the weighting of each criteria and (3) the presentation of final suitability map. ArcGIS was used to prepare input maps of the model and the suitability analysis was performed using the GIS-based modelling platform of CommunityViz.

Criteria for site selection

Identification of criteria is a technical activity which may be based on theory, empirical research or experts knowledge. This research used empirical evidence to develop criteria for resettlement site selection. This evidence consists of the identified impoverishment risks and social disruption risk due to relocation of the households living in high risk zone of Gatsata. Those risks were converted through the risks reversal

principle into a set of evaluation criteria. Depending on data availability, only spatial criteria were used to develop a spatial multi-criteria model.

Generating factor maps

Having established a set of evaluation indicators, each indicator was represented as a map layer(factor map: Appendix 4) in GIS database. A factor can be a cost or a benefit depending on whether there is an inverse or a positive relationship with its values (Zucca et al., 2008). Ten cost factor maps defining accessibility to job opportunities, basic services and infrastructures (Table 11) were prepared using the accessibility model.

Accessibility model

Various accessibility models have been proposed and they differ depending on their degree of data requirements, operationalization and communicability (Geurs & van Wee, 2004). In this research, a location-based accessibility measure was selected because it is the one used to reflect accessibility to spatially distributed opportunities (Geurs & van Wee, 2004). Among the location-based measures, the most common used because of its simplicity is the straight line distance mode known as Euclidean distance. However this model fails to account for different topographical features such as rivers, slopes and roads that would not allow someone to follow a straight line. Karou and Hull (2014) highlighted that steep slopes are among physical features that negatively affect walking access to public transport. The steeper the slope, the less will be the walking speed and distance. Gasabo has a hilly topography characterized by steep slopes this requires a method which would consider the effect of the slope on accessibility. In addition to slope, the speed of a human being is also influenced by the travel surface (the land cover) such as the types of the roads. A paved road is more walkable than a road with potholes. The river and wetlands also act as barriers. In order to reflect the effect of those features on walking and driving to the services and facilities, Figure 9 below presents a more sophisticated accessibility model that was used in this study to define the proximity criteria for the suitability analysis of potential resettlement sites.

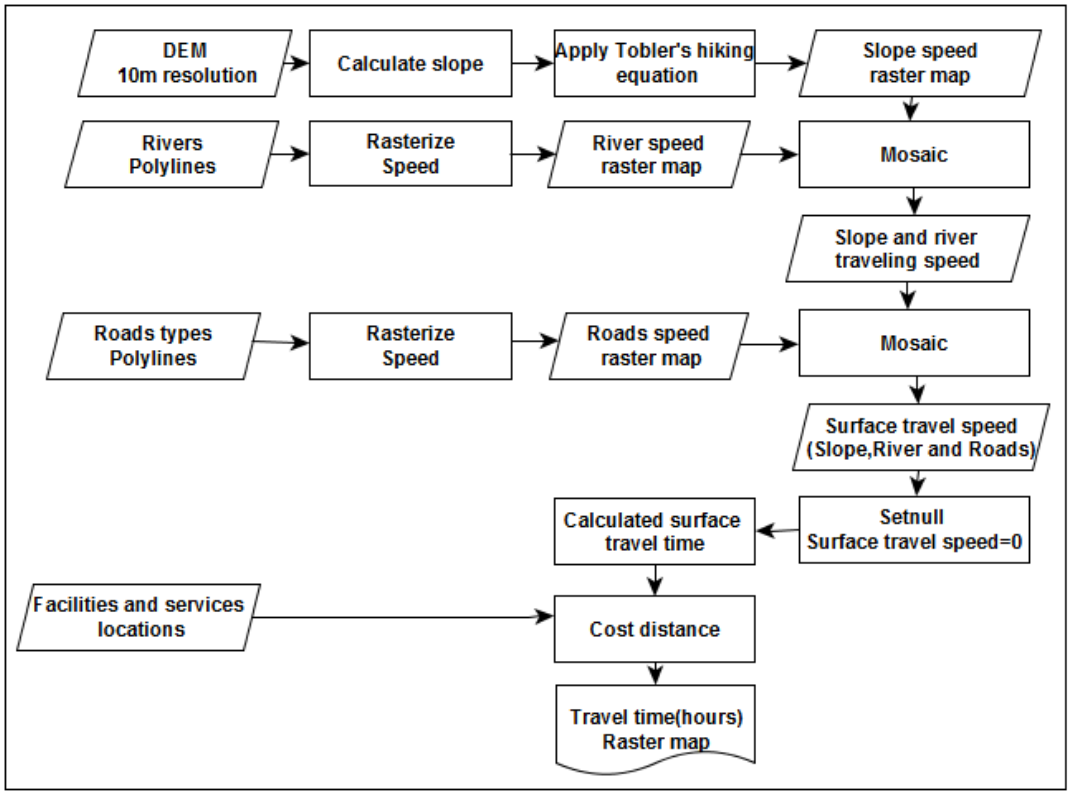


Figure 10: Accessibility modelling process

Scenario development

Two scenarios: walking and using public transport service were developed. According to Geurs and van Wee (2004), accessibility can be used as a social and economic indicator to show the availability and access to basic resources essential in the daily life. However, they highlighted that for the purpose of equity accessibility should be disaggregated in space to reflect the behavior of the concerned people. It is in that regard, a walking scenario and public scenario were developed since the targeted community mostly prefers the walking mode over the public transport. It was important to compare the suitability levels of the potential resettlement sites in both scenarios.

Speeds calculation

A surface travel time was derived by considering the speed with respect to (1) the slope, (2) roads and (3) rivers. Table 7 below gives a summary of the speeds that were used for each type of surface in both scenarios.

Surface type	Speed in Km/h	
	Walking scenario	**Public transport scenario**
Slope	Tobler's hiking equation	
Rivers	0	0
Paved roads	5	5
Unpaved roads	3	3
Public transport network	Not applicable	21

Table 7: Selected speeds according to the type of surface and scenario

The speed with respect to the slope was calculated using the hiking equation developed by Tobler (1993): V=6* exp(-3.5 abs[tan(slope in degree/57.296+0.05)], where V is the speed which is about 5km/h on flat terrain. The equation determines the walking speed of a normal human being which decreases with an increase in slope angle. A speed of zero was assigned to rivers assuming that none can walk or drive into the river.

With respect to roads, two roads classifications which consist of paved road and unpaved roads were used in both walking and public transport scenarios. A speed of 5km/h on paved road was used while for unpaved roads a speed of 3km/h was considered. For both scenarios, rivers overrule the slope while roads overrule the combination of slope and rivers. In the driving (public transport) scenario, the bus route network of 2012 was used as an extra factor which overrules the three others factors considered in the walking scenario. An average speed of 21km/h in Kigali city was considered in the public transport networks as it has been identified by Niyonsenga (2012).

Travel time calculation and cost distance analysis

After the combination of the speeds for each scenario, a surface of travel time was calculated. That surface has served as input to perform a cost distance analysis to calculate the least cumulative travel time from each cell of terrain to the nearest services and infrastructure location.

3.4.3.3. Indicators weighting

The next step in SMCE was to identify the relative importance of each indicator, the so called weights. There are various techniques for weighting (Voogd, 1982). For this study, the ranking method was used.

Ranking the indicators in order of the decision makers' preferences is a simple method for estimating weights. This research considered the preferences of the households that need to be resettled. The most important criteria means the one which was preferred the most (high frequency) by these households and was given a rank 1, the second was ranked 2 till the last criteria. Once the ranking was established, the rank sum weights were calculated using the formula below:

$$W_k = \frac{n-p_k+1}{\sum (n-p_k+1)}$$

Where Wk is the k^{th} criterion weight, n is the number of criteria under consideration (K=1,2,3,...,n), and pk the rank position of the criterion.

However, the preferences of the households to be resettled were collected in two separate subsets. The first most important subset includes the preferences about criteria that would define the location of a potential resettlement site and the second includes the preferences about the basic public services to be considered. Thus, a stepwise ranking method was adopted where the direct ranking was applied to both sets separately and bring them together for an overall criteria weighting.

3.4.3.4. Suitability map

The weighted summation method was used to aggregate the criteria maps and create the overall suitability map. All the created criteria maps, for instance, the distance to health schools, the distance to the city centres, etc. were brought together to have one final map. Further, in order to be able to rank the resulting suitability scores, these were classified into 5 clusters: Very lowly suitable, lowly suitable, moderately suitable, suitable and highly suitable. The K-means clustering tool in SPSS was used to classify the suitability levels, because once the number of levels was fixed, k-means clustering produced a classification which ensures that there is a significant difference between the classes (suitability levels). The defined clusters were joined again to the potential land to visualize their suitability levels.

3.4.4. Limitations

The limitation of the general methodology can be classified into three categories.

The first is related to data collected from the household survey. Because of the sensitivity of the topic and information this study was interested in, the data collected may have been subjected to exaggeration, overestimation or underestimation by the respondents. It is important also to highlight that in the case of Gatsata households, 10 out of the 100 selected households did not participate in the interview. The reason is because, after the identification process of households living in high risk zones, the owners shifted to other places and rented their houses.

The second limitation lies in the model of accessibility analysis. In fact, the households that need to be resettled and other walkers in the city use predominantly and prefer walking through the short paths to and from their homes to main roads or their destination. However, it was no possible to find a more disaggregated road data set which includes also those short paths. Further, the analysis assumed that accessibility is equal throughout gender, age groups, income groups. However, the travel speed of children is different from those of young people and old people. In the public transportation scenario, the assumption was that everyone is using the public transport. However, this may not be the case. All the households do not have equal income and ability to use the public transport. Another limitation lies in the Tobler's equation. When using the equation, the assumption was that on flat slopes, downhill speeds are faster than their uphill equivalents and they are slower at steep slopes. However, moving downhill in some case may be dangerous than climbing and this may reduce the speed. In addition, of considering the asymmetry of uphill and downhill, the model considered only one-way travel to the facilities and services location.

The third limitation is that the sites suitability analysis was performed using only spatial factors while the concept of access is not limited to geographic accessibility. In addition, the suitability assumes that people will always travel to the nearest facilities for related services. However, they might be inclined to use more

distant facilities and services thought to provide good quality services based, for example, good quality of teaching in case of schools, cheap price in case of markets, etc.

3.5. Summary

Under this chapter, an explanation of the research strategy adopted is provided including the case study selection. This is followed by a brief description of demographic, topography and land use characteristics of the selected study area. Detailed techniques and methods of data collection and analysis applied in this research are presented and their limitations. The research was conducted as a case study in Gasabo district. Two group of population are involved in the case study: already resettled households and households that need to be resettled. Primary data have been collected through interview schedule within these communities. Interview with key informants was conducted to triangulate information from the perspective of the communities. Secondary data, mainly composed of GIS data were collected from MIDIMAR, the City of Kigali, RNRA and RHA. In general, all the data required to answer the research questions have been successfully collected. Data analysis was done using descriptive statistics, qualitative analysis technique in form of narratives used to describe the living environment conditions. A literature review was done to identify the requirements of the resettlement process. Spatial multi-criteria analysis was used to analyze the suitability of potential resettlement sites. The next three chapters will provide the findings of the research. Respectively to the objectives of this study, chapter four presents the characteristics of resettlement requirements. Chapter five presents the impoverishment risks. Chapter six presents the risks reversal strategies and potential sites suitability analysis.

4. CHARACTERISTICS OF RESETTLEMENT REQUIREMENTS: RESULTS AND DISCUSSIONS

This chapter presents the findings and answers to the research questions of the first objective. It includes two sections: Section 4.1 presents and discusses the results regarding the location and number of households that need to be relocated. Section 4.2 presents and discusses the socio-economic and cultural characteristics of those households. Background information in form of socio-economic and cultural characteristics of households that need to be relocated is a vital element to be considered when analyzing the requirements and potential impacts of a resettlement program. Correa et al., (2011) have demonstrated that the resettlement requirements in terms of land area, type of activities to re-establish the income, access to public and social services, rebuilding social networks can be identified on the base of socio-economic and cultural characteristics.
In this regard, indicators such as the education level of the head of the household, source of income, workplaces, children enrolment in schools, accessibility to public service such as markets, health facilities, schools, quality of their living environment etc., to describe the socio-economic and cultural characteristics of households that need to be resettled from Gatsata high risk zone. The results of this analysis allowed to identify the resettlement requirements in connection to land area, type of activities required to re-establish the income, the access to basic public services and rebuilding the social and economic networks. These requirements are discussed in section 4.3

4.1. Location and number of households to be resettled

4.1.1. Households located in risk zones

The city of Kigali in collaboration with its stakeholders undertook the activity of identifying areas prone to disaster risks. Under the same activity, a technical team was formed to conduct a field study and identify households living in disaster risks zones of Kigali city (MIDIMAR, 2012b). This team used the following criteria to determine the risk zones:

- Informal settlement,
- Location on steep slope: 1) Slope beyond 40%, 2) Slope between 20% and 40 %; 3) Slope between 10% and 20%,
- Lack of rainwater collection and drainage systems in case there is no water channels in the considered zone and individual rainwater system in less than 60% of household in that zone,
- Low vegetation cover in 60% of individual plots with at least 40% vegetation cover in the plot,
- High density of households when the average size of each household is below 300 m^2 and there are no side setbacks between households.

On the base of the criteria above, any informal settlement located on a slope beyond 40% was classified as a very high risk zone. The combination of a slope between 20% and 40% and the last three criteria determined a high risk zone. And the last class is the moderate risk zone which was determined by the combination of a slope between 10% and 20% with the last three criteria.

4.1.2. Households located in wetlands

Human activities including informal settlements that encroached the wetlands also need to be relocated (City of Kigali, 2013c). This is because they are exposed to flood and other disasters. In addition, the households located in wetlands will be relocated as it was required by the Rwandan Environment Management Authority(REMA) in its initiative of protection, conservation and promotion of environment (Government of Rwanda, 2005).

Figure 11 shows the informal settlements located in high risky zones and wetlands areas in Gasabo district. As it can be seen, those informal settlements are mostly found in five urban sectors among fifteen sectors of the district.

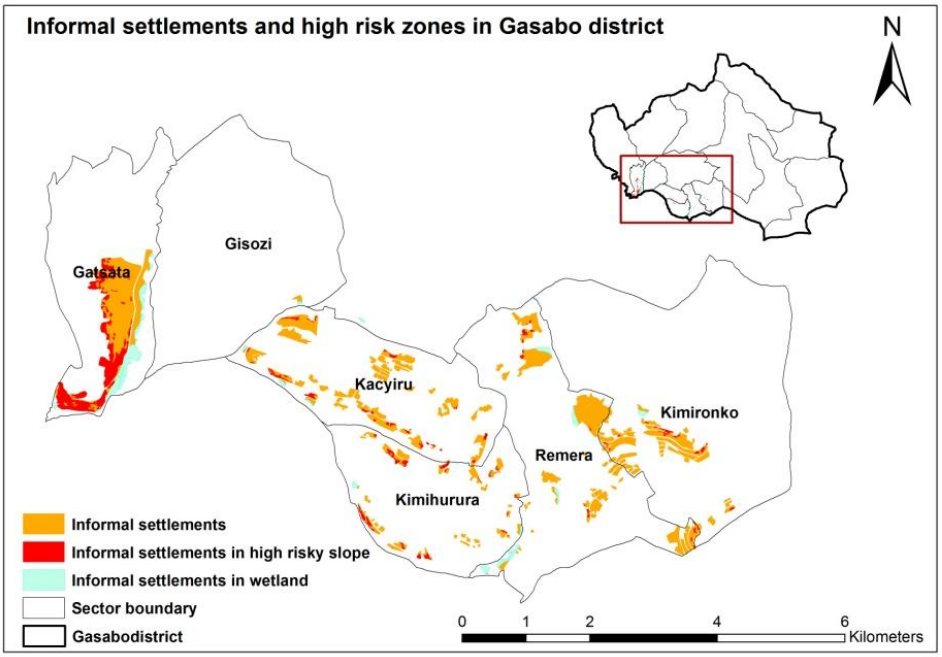


Figure 11: Informal settlements in high risk zones in Gasabo district

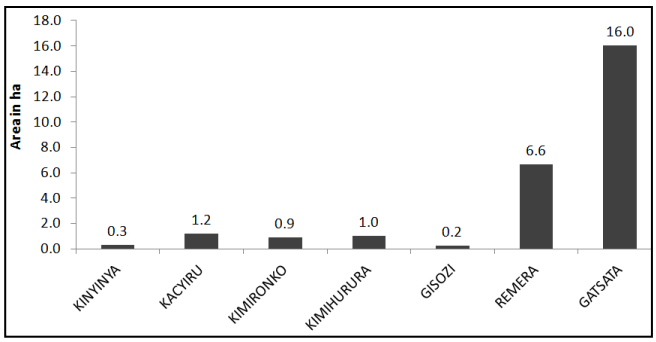


Figure 12: Area in ha occupied by informal settlements

Figure 12 presents the area occupied by the informal settlements. Compared to other sectors, Gatsata has only one compact informal settlement while other sectors have various scattered areas identified as informal settlements. In addition, Gatsata informal settlement is relatively big compared to other informal areas in Gasabo. The proportion of informal settlements located on steep slope and wetlands in Gatsata is large compared to other informal settlements in Gasabo.

Table 8 below summarizes per income group category the households which are living in high risk zones and need to be relocated as identified in 2014 by the district of Gasabo.

Sector	Cell	Number of households per income category (Ubudehe category)					Total
		I	II	III	IV	V	
Remera	Rukiri I	1	2	60	0	0	63
	Nyabisindu	0	3	28	0	1	32
Subtotal		**1**	**5**	**88**	**0**	**1**	**95**
Kimihurura	Rugando	0	0	16	0	0	16
	Kimihurura	3	12	23	0	0	39
Subtotal		**3**	**12**	**39**	**0**	**0**	**54**
Kacyiru	Kamatamu	0	1	6	0	0	7
	Kamutwa	0	9	31	0	0	40
Subtotal		**0**	**10**	**37**	**0**	**0**	**47**
Gisozi	Ruhango	**8**	**8**	**28**	**0**	**1**	**45**
Gatsata	Nyamabuye	0	59	260	16	0	335
	Karuruma	1	2	32	16	1	52
	Nyamugali	0	14	54	0	0	68
Subtotal		**1**	**75**	**346**	**32**	**1**	**455**
Total		**13**	**110**	**538**	**32**	**3**	**696**

Table 8: A summary of households in high risk zones of Gasabo district

(Source: Gasabo district, 2015)

The income categories classification is a program launched in 2001 to classify residents into six categories according to their living standards and wealth. These categories are used to identify poor residents who need specific support from the government in the program of poverty eradication. Recently the government updated this classification to four categories. However, in the process of identifying households living in high risk zones (Table 8), Gasabo district used the former classification which consist of six categories:

Category I: Umutindi nyakujya (those in abject poverty)
Category II: Umutindi (the very poor)
Category III: Umukene (the poor)
Category IV: Umukene wifashije (the resourceful poor)
Category V: Umukungu (with abundant food) and
Category VI: Umukire (the rich).

In comparison to Kacyiru, Kimihurura, Remera and Kimironko, Gatsata sector has a high number of households to be resettled because of its hilly topography which has steep slopes and a high population density. The summary shows that a large proportion of households to be resettled is classified in the categories I, II and III, which include households in extreme poverty, the very poor households and the poor households respectively. This finding is similar to previously reported data which highlight that the

informal settlements in most of developing countries provide shelter to millions of poor urban dwellers to allow them to access to urban opportunities (Wekesa, Steyn, & Otieno, 2011). Since most of the households located in high risk zones are classified as poor, a proper planning of the resettlement process of these households is required to avoid their impoverishment.

4.2. Socio-economic and cultural characteristics of the households and access to basic services

The present section describes the socio-economic and cultural characteristics of the households to be relocated from Gatsata. A deep knowledge of socio-economic characteristics and conditions of the households that need to be resettled is a fundamental pillar for appropriate resettlement planning. Correa et al., (2011) in their resettlement guideline highlighted that socio-economic and cultural information including assets that must be replaced, the economic activities, access to social and public services and more generally the social organization and cultural patterns that must be re-established are required so that the resettlement process can be adapted to the characteristics of displaced households. For instance, they argued that it is important to know public services and infrastructure that the population to be relocated has so that these can be restored or improved. In addition, the knowledge of the sources of income of households to be relocated allows to analyse whether and how their income will be affected as a result of resettlement and what income restoration strategy can be adopted.

4.2.1. General characteristics of the households

Table 9 below summarizes the general demographic characteristics of the households that need to be resettled.

Socio-economic factor	Percentage (%) (n=90)	Socio-economic factor	Percentage (%)(n=90)
Age		Marital status	
21-35	25.6	Married	68.9
36-50	46.7	Single	2.2
Above 50	27.8	Divorced	6.7
		Widowed	22.2
Education level of heads of households		Education level of spouses (Married families)	
Illiterate	14.4	Illiterate	7.8
Primary school level	50.0	Primary school level	42.2
High school level	34.4	High school level	17.8
Graduate level	1.1	Graduate level	1.1
Household monthly income(in Frw)			
Below 10000	21.1		Mean value
10000-30000	20.0	Households size	5.18
30000-50000	22.2	Number of descendants in Kindergarten	0.07
50000-100000	22.2	Number of descendants in primary school	1.48
100000-200000	6.7	Number of descendants in secondary school	0.67
200000-500000	7.8	Number of descendants in university	0.09

Table 9: Socio-economic factors of the sample households to be resettled

(Note: exchange rate 1Euro=810Frw)

As can be seen from Table 8, the heads of the households form three slightly different age groups. About 50% of the selected heads of households are active people having between 36-50 years old. Married and widowed are two marital status categories that are predominantly represented. Most of the heads of

households, as well as their spouses, are educated up to the secondary school level. This low level of education influence the type of job they are able to do, which in many cases provides a low wage as it has been illustrated by Hunter and Posel (2012) in their study. Further, the study reveals that most of the households have a low income below 50000Frw and very few earn more than 100000Frw. This is also confirmed by their income categories as discussed is section 4.1 The household size ranges from 1 to 12 persons with an average of about 5 persons per household. This average is above the average household size in Gasabo (NISR, 2011). The variables above together with the one that will be discussed in details below define the characteristics that require special attention so that the resettlement can be tailored to the characteristics of the affected households.

A household as a group of individuals who are living together in the same housing unit will require a new housing unit. Scholars have demonstrated that the age of household members, the household size, marital status, the education and income are among various factor that affect the housing preference (Beamish, Carucci Goss, & Emmel, 2001). Among these characteristics some define the qualitative requirements others the quantitative requirements. For instance, the household size would define the quantitative requirements. Thus with the household size ranging between 1 and 12 members, it can be seen that there is a need to differentiate the small size and the large size households when determining the living space size and designing the dwelling units.

4.2.2. Main sources of income

The results show that the households to be resettled from Gatsata mainly depend on two types of income sources: 1) occupation and 2) renting houses.

1) Occupation of head of households and spouses

The selected households indicated that they earn income mainly from working in informal sector (wage-employment and self-employment). Figure 13a below shows that, of the samples households to be relocated, 19% of the heads of households work as merchants are men and 11 % are women. Their trades are based on selling food products, clothes and other products needed by their customers. 12% of men and women heads of households do small scale businesses. 18% of heads of households work as casual and daily labourers in their neighbourhoods and nearby areas. The number of labourers women is relatively small compared to men. While the proportion of artisans women is larger compared to artisans men. Figure 13b shows that for married families, the spouses mainly earn income as merchants, artisans and small business owners. The spouses are women since in the Rwandese culture, the man is the head of the household. It can be seen that in general the households that need to be resettled are mainly engaged in trade and small business and casual jobs. The majority of working spouses are merchants. Previous works have reported similar findings that most of the inhabitants in informal settlements in Kigali are engaged in informal employments (Rwanda Housing Authority, 2013).

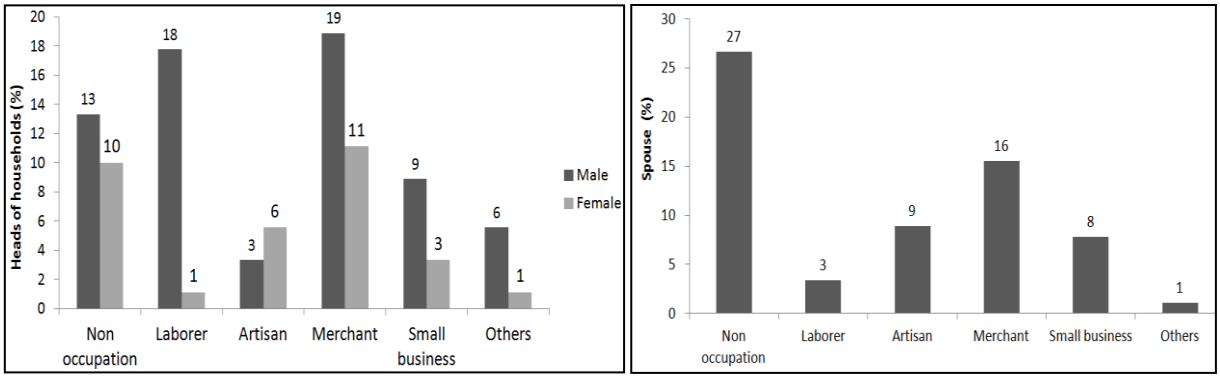


Figure 13: a) Occupation of head of households in Gatsata; b) Occupation of spouses

2) Renting houses

Renting houses is the second main source of income of households that live in Gatsata high risk zone. Figure 14 below shows that more that 75% of the sample households have on average at least one to three small houses for renting.

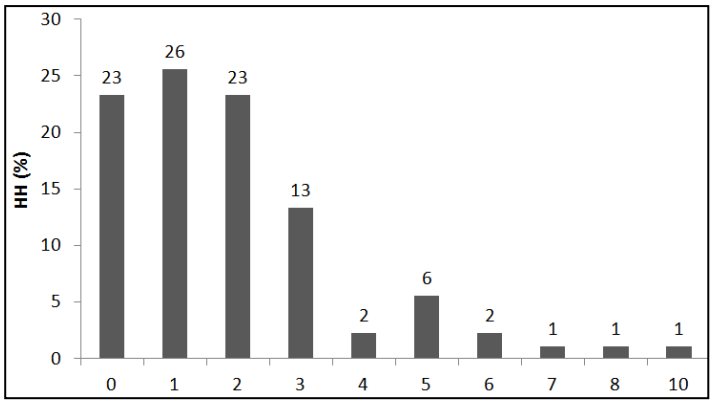


Figure 14: Number of houses for renting per household

4.2.3. Jobs location

Workplace plays an important role in choosing settlements for low-income families. It would be worth to consider this when planning for relocation. The issue of job locations of heads of households that need to be resettled was also addressed during household interview. Figure 15a shows that of the samples, about half of working heads of households work within Gatsata sector and Nyabugogo area. Few respondents indicated that their jobs are located in Kigali CBD area which is also within the close proximity to Gatsata. Other occupation sites mentioned by the heads of household are located in the areas close to Gatsata such as Gisozi and Nyamirambo. From Figure 15b, the distance to occupation sites for most of the respondents is within one to five kilometres from their homes where 30% of the samples population work within 1km from their homes. This clearly shows how much Gatsata residents rely on their surrounding environment. The results reveal also that some residents of Gatsata high risk zone work outside Kigali city. Few of the labourers works in agriculture either in Kigali city or in other parts of the country. However, because Nyabugogo bus park is the main bus stop in the city and the country, people working outside the city still find the area much more strategic as they do not use extra transportation cost to reach this inter-regional bus stop. This kind of location attachment has been reported in various studies on socio-economic characteristics of urban informal dwellers.

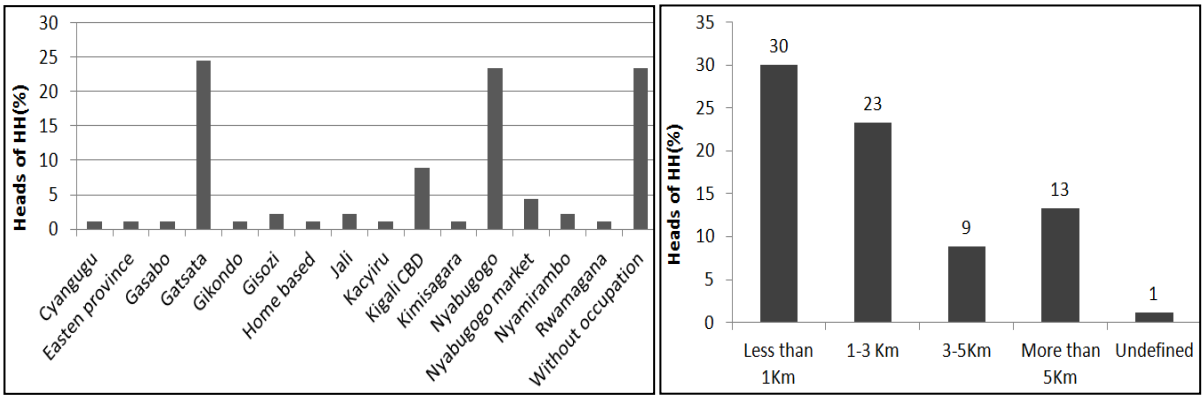


Figure 15: a) Occupation sites of HH from Gatsata high risk zone; b) Distance to occupation sites

4.2.4. The quality of Gatsata living environment

Gatsata sector is a location which has a lot of opportunities because of its proximity to Nyabugogo transport hub and market. Nyabugogo area is a key area in the land use planning of Kigali city because of its vibrant character (Kigali city, 2013). The area accommodates the regional bus interchange and a commercial area with a market. All kind of formal and informal economic activities can be found there. Most of the households prefer to visit Nyabugogo market for shopping food and clothes because on the average this market is located in less than 5km from all households in Gatsata. Being among the largest market in Kigali, Nyabugogo market provides access to varieties of commodities at cheaper prices and make the cost of living affordable to many low income households located in Gatsata. Nyabugogo market offers opportunities to merchants and retail sellers to do business by buying commodities from there and resell these to make a profit in local shops located within their neighbourhood. Most of the daily merchants, labourers and small businessmen and women from Gatsata households work in Nyabugogo area. Because of that, Nyabugogo is an important area for households located in its nearby neighbourhood including those who live in Gatsata sector. Moreover, Gatsata area is closer to Kigali CBD. Most of the people from Gatsata especially in Nyamugali cell can walk to important places and access services in the CBD. In addition, the transport service in Nyabugogo and surrounding areas is easily accessible both temporally and spatially comparatively to other parts of the city. This shows how much Gatsata area allows residents to easily access their jobs and benefit from job opportunities available in the inner city of Kigali.

4.2.5. Social organization in Gatsata

Social networks can influence the choice of a household regarding where to live. People choose to settle close to their relatives and close friends from whom they can get some assistance such as watching over children when someone is not around. People may depend on financial assistance from these social networks. The time spent in place is one of the factors for the formation of such networks. Figure 16a shows that 52.5% of the interviewed households came to settle in Gatsata more than ten years ago and around 25% households have been living there for more than 5 years. The study also reveals that, of these households more than 60% have relatives in the same settlement and nearby neighbourhoods (Figure 16b).

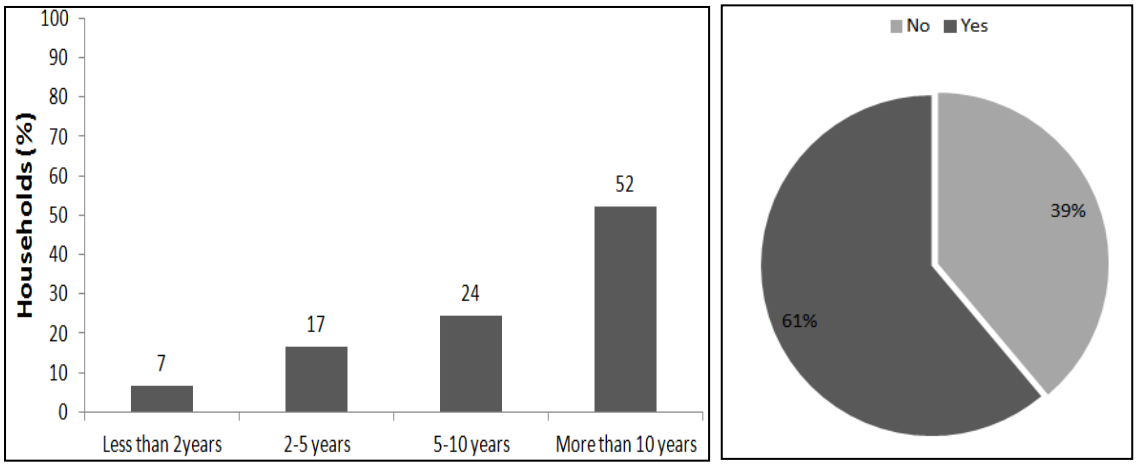


Figure 16: a) Time spent in Gatsata high risk zones; b) Households having relatives in the same neighbourhood

Figure 17 below presents how often households that need to be resettled are willing to visit their relatives after relocation. In fact, when the households in Gatsata sector were asked how often after relocation they think they will visit their relatives and friends who will not be relocated, 59% replied that they plan to visit relatives sometimes. This shows that even if they do not know where they will be resettled they need to maintain their social networks whatever the cost.

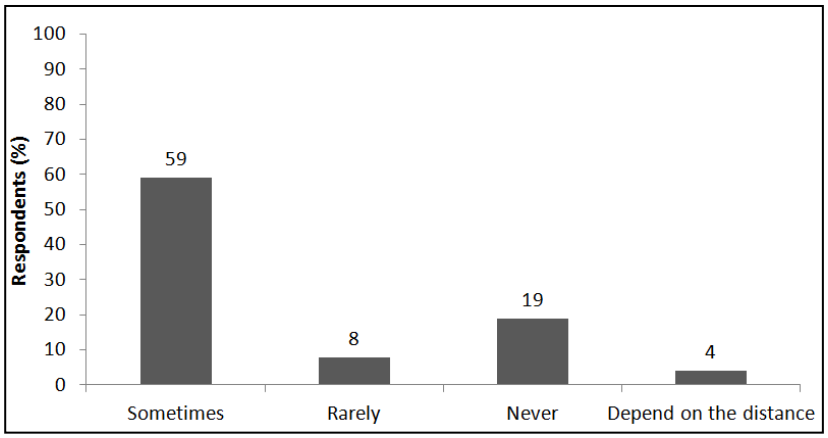


Figure 17: Willingness to visit relatives and closer friends after relocation

4.2.6. Access to basic public facilities

The basic public facilities considered in this research are schools, health facilities and markets. As discussed in section 4.2.1, the majority of children in households to be resettled are enrolled in primary and secondary schools. Children in both primary and secondary level study in public schools. Figures 18a and 18b below present the estimated distances to primary schools and secondary schools with respect to the selected households. Of the 62 households having children in primary schools, more than 70% are located in a distance ranging from one kilometer to three kilometers to schools and the majority of children in secondary schools travel a distance of three to more than five kilometers. Distance to primary schools is shorter than the distance to secondary schools.

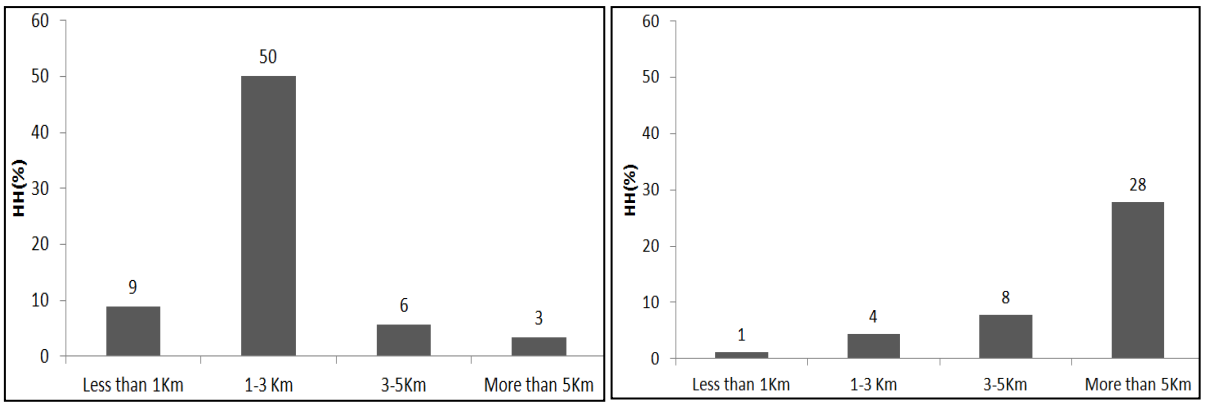


Figure 18: a) Estimated distance to primary school; b) Estimated distance to secondary schools

Regarding health facilities, the households use public health facilities such as Muhima, Biryogo and Gatsata health centers. Most of these households reported that they reach those health facilities by walking because the distance from their homes is relatively fair. Regarding accessibility to market, most of the households from Gatsata use the Nyabugogo market which is located on average in less than 5 kilometers from their houses. In general, because Gatsata is located in the inner city part, it is clear that households to

be resettled take the maximum advantages of basic public facilities which are much more developed in the inner city than in other parts of the district. This was confirmed in the national statistics which revealed that in Gasabo accessibility to basic those basic services is higher in urban areas than in rural areas (NISR, 2011).

4.3. Discussions on resettlement requirements

Preventing impoverishment risks is the central requirement in resettlement. This is achieved by improving or, at least, restoring the living standard of the households to the condition where it was before relocation. The above analysis of the households that need to be relocated and their current situation provides a useful summary of key characteristics that would define the requirements for the successfulness of their resettlement. As discussed in the literature, the impoverishment risks are multifaceted in economic, social, cultural, in property, in opportunities and power with respect to what the affected households had before relocation. In this research, potential resettlement requirements could be grouped into four categories: land required, infrastructure and services, economic development and social development. These categories are defined according to the general resettlement guide of the population at risk of disaster that was elaborated by Correa et al., (2011) on behalf of the World bank and Global Facility for Disaster Risk and Recovery (GFDRR). In addition to the above resettlement guide, the research considered the general provisions of the Rwanda national housing policy and the Kigali city master to identify the requirements.

4.3.1. Land required

Any resettlement will require land for houses construction. From the socio-economic characteristics, it has been found in general that the households that need to be relocated constitute a low income group. The national housing policy under its neighborhoods and human settlement development principles recognizes the need of affordable houses for low income urban population. The provision of those houses should confirm with the land use master plan. The district master plan (City of Kigali, 2013c) propose four types of residential developments: single family residential, low rise residential, medium rise residential and high rise residential and their respective densities (Table 10). Since the number of households that need to be relocated from high risk zones (Table 8) and the recommended houses density are known. The land required per each development type to accommodate those households was estimated as follow:

Type of development	Stories	Dwelling unit density	Estimated required land	
			Gasabo	Gatsata
Single family residential	Single family housing - villas, cluster housing	40 du/ha	17.4ha	11.4ha
Low rise residential	Single family and 2-4 storey apartments	90 du/ha	7.7ha	5ha
Medium rise developments	4-8 storey apartments/ estates	160 du/ha	4.4ha	2.8ha
High rise developments	>8 storey apartments/ estates	>200 du/ha	3.5ha	2.3ha

Table 10: Estimated required land for resettlement from high risk zones

Source: Adapted from City of Kigali (2013c)

Table 10 shows that the low rise residential zones can also permit development of single family houses. Thus, in case of development of single family houses to resettle affected households, the low rise residential zone would require relatively less land of about 5ha compared to the single family development zone which requires 11.4 ha. In general, it can be seen that construction in height including the low,

medium and high rise developments would require less land compared to single houses construction. Vertical constructions were also proposed by Buckley (2014) as an opportunity for Kigali city to overcome the challenge of limited affordable housing in Kigali.

4.3.2. Economic development

The main objective of economic development is to re-establish economic activities and income of affected households. Correa et al., (2011) has demonstrated that when income generating activities of the households to be relocated are related to their housing or surrounding environment, the resettlement will not require only new houses but also the reestablishment of those income generating activities. The socio-economic characteristic discussed in previous sections highlight a link between income of the households and their surrounding environment. Most of the active persons are self-employed as merchants or small business owners within the nearby commercial areas such as Nyabugogo. The education level among the workers revealed that they do not possess any special skills except the one which allow them to work in informal economic activities. Therefore, the resettlement program should ensure that those type of jobs are available for them in new resettlement areas. Specifically, for merchants, the resettlement planning should ensure that their clientele is re-established for them to survive in the new settlement. This requirement is also recognized in the national housing policy which encourages the access to housing for low income urban population by supporting their housing within or near economically viable neighbourhoods (MININFRA, 2014).

4.3.3. Infrastructure and access to basic services

Access to markets, schools, health, sanitation are universal basic human rights. The households that need to be relocated are living in an informal settlement and high risk zone. This shows that there is a need of improving their general living environment. On the hand, because of the location of their settlement, these households benefit of available opportunities in their surrounding environments. The socio-economic analysis reveals that most of the school age children are enrolled in public primary school. In addition, those children walk to school since they live close to their schools. Likewise, as discussed in section 4.2.6, the households have a relatively good accessibility to healthcare as well and other basic services such as public transportation.

Thus, in the line with the principle of improving or at least give what they had before, maintaining or improving the availability of those services is a requirement for their resettlement program. There is a need to ensure that the availability in terms of quality and quantity of these services in the resettlement area can meet the demand. Whether the children will continue their studies and continue to use the walking mode within acceptable distance. Likewise, healthcare as a basic service should be accessible within 1hour travel time as it has been proposed by Ministry of Health (2009).

4.3.4. Protect social networks

According to Correa et al., (2011), one of the social development requirement is to support and promote existing formal and informal social organization of resettled households. The characteristics of households to be relocated show that most of those households have spent more than 10 years in their settlement. They were able to construct social as well as economic networks. The study shows strong social and economic networks based on community financial organization (Ibimina) and their trade system as well. It would be worth to avoid destruction of those key ingredients for their socio-economic development.

5. IMPOVERISHMENT RISKS AND RISKS REVERSAL STRATEGIES: RESULTS AND DISCUSSIONS

This chapter presents, in the first section, the results of resettlement-induced impoverishment risks the households that need to be relocated from Gatsata are likely to face. Respectively to the research questions of the second objective, each of the sub-sections presents simultaneously an impoverishment risk, its indicators and the resettlement impacts experienced by already resettled households which were used as evidence. The impoverishment risks model developed by Cernea, (1997) is adopted to summarize the findings. The second section comes with discussions by comparing and contrasting the identified impoverishment risks with previous studies.

5.1. Impoverishment risk forms and indicators

5.1.1. Landlessness (placelessness) and Joblessness risks

According to Cernea (1997) "*land is the foundation upon which the people productive activities, commercial activities, social networks and livelihoods are constructed on and its expropriation is a form of impoverishment*". Patel et al.(2015) discovered that the importance of land in the urban context is justified by its location with respect to opportunities for livelihoods and common facilities such as education, health facilities and markets.

The previous chapter discussed the quality of Gatsata location in terms of providing access to opportunities for income generation and access to basic services. It is in this regard that, the households to be relocated are likely to face the landlessness as a result of distant relocation with respect to Gatsata area. This study reveals that there is a very little distinction between the risk of landlessness and the risk of joblessness for the community of Gatsata. A remarkable link between Gatsata area and income generation activities of the households that need to be relocated was highlighted. Due to that, the landlessness would result into loss of access to job opportunities and other basic services such as markets in resettlement areas. In fact, Gatsata settlement is located near an economically vibrant area such as Nyabugogo. The majority of households to be resettled from Gatsata depends on income from economic activities in Nyabugogo and its surrounding areas. Therefore, when those households are relocated far from these areas they may risk to lose accessibility to income opportunities. As evidence, the households resettled in both Kinyinya and Bumbogo sites encountered the placelessness risk because of being resettled far from the inner city and other opportunities areas. Further, the study reveals that these resettled households faced the risk of joblessness because of the risk of landlessness (loss of access to urban job opportunities). Figure 19a and 19b below show the impact of resettlement on jobs of heads of households resettled in Kinyinya and Bumbogo.

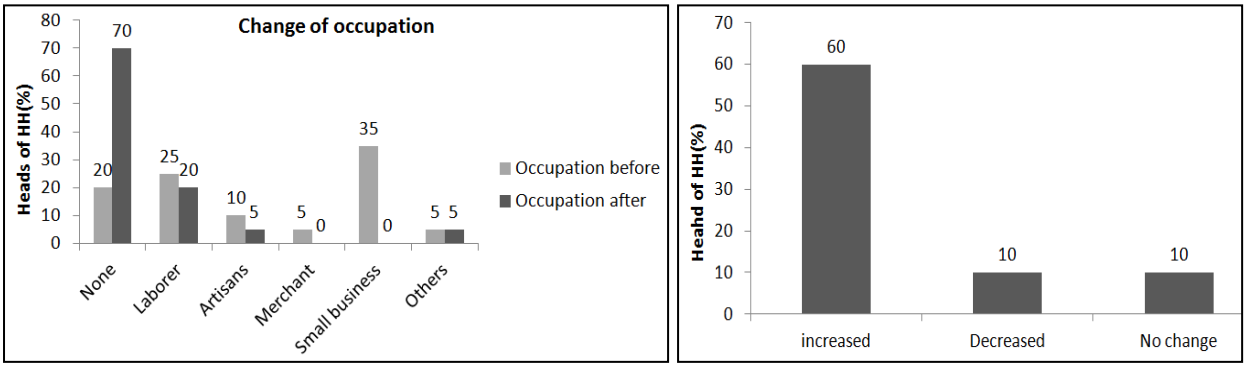


Figure 19: a) Change of occupation for heads of HH; b) Change in distance to work place

As it can be seen, the number of heads of households without occupation before relocation increased from 4 to 14 after resettlement. The number of labourers and artisans before relocation has decreased after resettlement. The heads of households who were merchants and small business owners before relocation completely stopped those occupations after resettlement. These changes in occupations are attributed to increased distance to place of job opportunities, lack of job and business opportunities in the new area, increased distance to market places, being far from their customers, unfamiliar community, transport cost to job opportunities areas and loss of capital through reconstruction

Before resettlement, most of the heads of households in Kinyinya and Bumbogo sites were labourers, artisans, merchants and small business owners. This could be the reason these resettled households are claiming the lack of daily jobs opportunities, access to markets, access to customers in the new settlement sites within their new settlements. Other scholars reported similar findings regarding the landlessness and joblessness risks in slum dwellers relocation. Hunter and Posel (2012) highlighted that households displaced from urban informal settlements mostly face the risk of the loss of job and access to their livelihood strategies. These informal settlements mainly accommodate immigrants who came to seek for jobs and other income opportunities in urban areas. Because of their low wage they prefer to live closer to their jobs location and their income generating activities areas to avoid the cost of transportation to and from their workplaces. Therefore, relocation far from those origin informal settlements and other urban job opportunities areas, for those households, means far from their workplaces and other income generating activities which lead to loss of income.

5.1.2. Loss of income from houses for renting

This study reveals that households that need to be resettled from Gatsata have a risk to lose income from renting houses. As discussed in section 4.2.2, a large proportion of these households depends much on income from renting small houses. For some households, those houses for renting secure the capital for doing small businesses or becoming merchants. Therefore, the loss of their houses for renting has serious financial complications since the loss of those houses for them means loss of income.

5.1.3. Homelessness risk

96% of the samples households that need to be resettled from Gatsata own a house with a title deed. These households have a high probability to become homeless. This study reveals that each of the households resettled in Kinyinya and Bumbogo received a house as a means of compensation. However, some of the beneficiaries of those houses closed their houses and returned back to the city to look for jobs opportunities. Because they could not afford the cost of transport, these people went back in the city and rent houses in areas near jobs opportunities while they left their own houses closed. Thus, distant relocation with respect to job opportunities may allow the homelessness risk to become a grim reality also in the case of households to be resettled from Gatsata. Cleary, the risk of homelessness shows that compensation in land, cash or houses only cannot adequately deal with the losses caused by displacement as it has been demonstrated by other scholars (Cernea, 2003).

5.1.4. Marginalization

Households to be displaced from Gatsata are likely to face marginalization in case they are not able to use their previous skills and regain their full economic strength. It means, in case they will not be able to maintain their income generating activities as discussed above in sections 5.1.1&5.1.2. Evidence of the already resettled households shows that 18 heads of households out of 20 were not able to use their previous skills after resettlement. The resulting impact was the loss of income. The loss of income reduced the economic power of these households. During household interview, those households were asked the types of job opportunities they can find in their resettlement sites. The majority replied that in general they do not find any job opportunity unless someone runs his own business such as small shop and become a

merchant. However, this was not possible for them because their income has decreased after relocation. In Bumbogo resettlement site which is a rural area compared to Kinyinya site, respondents mentioned that working as a daily labourer in agriculture is the only available job opportunity in the area. However this opportunity is available during few months throughout the year (cropping season). Moreover, that opportunity does not fit the skills of most of the resettled heads of households and spouses who were familiar with different jobs types in urban areas.

5.1.5. Loss of access to common facilities (common property resources)

Access to common property was interpreted in the context of Gasabo as access to facilities such as public primary schools, public health centres and public hospitals. Loss of access to such facilities may lead to significant deterioration of the wellbeing of the resettled people. The study reveals that 18 households out of the 20 sampled households have children studying in primary and secondary schools. 7 of these households were obliged to transfer their children studying in primary schools to new schools closer to their resettlement sites. Unlike to Kinyinya site, most of the households resettled in Bumbogo site complain that the distance to primary schools has increased compared to their previous location. In both Kinyinya and Bumbogo sites, children in secondary schools and university require the transport cost because most of secondary schools and universities are concentrated in the inner city.

About geographic accessibility to health facilities, the government of Rwanda has a goal that none should travel more than 5 km to a health facility. Bumbogo resettlement site is located in direct vicinity to a health centre. In Kinyinya site, most of the respondent reported that there was no change in distance to health centre compared to their previous settlements. In general, the study reveals that the households resettled in Kinyinya and Bumbogo sites did not experience impacts of increased distance to health facilities. However, households to be resettled perceive that they might experience the loss of accessibility to health facilities after relocation since Gatsata is a strategic area which provides them the maximum advantage of basic services that are much more developed in its surrounding built up.

5.1.6. Health risk (morbidity and mortality, food insecurity)

This study reveals that the drop in income, the increased distance to main and fair markets and the change in monthly expenditure are indicators for health risk that may be induced by relocation of households from Gatsata high risk zone. In fact, Nyabugogo is the main wholesale market for food crops in Kigali followed by Kimisagara, Kimironko and Nyarugenge markets. In these markets, people can find fresh vegetables and fruits at low price. As discussed before, households to be relocated are likely to lose their income. In case their accessibility to fair markets is reduced while their income has decreased there is a risk of undernourishment.

The evidence from already resettled households reveals that monthly expenditures in 9 of the selected 20 resettled households have increased while 10 households reported a decrease in monthly expenditures. By trying to understand the causes of these changes, on one hand, households replied that their expenditures decreased because they do not have money anymore. On the other hand, the increase in monthly expenditures was associated with expensive life due to expensive commodities found in local shops. There is no market near the resettlement sites where they can find the fresh and cheap vegetables. The cost of locally supplied food is high due to the cost of transportation. In both cases, because of loss of income and the expensive life due to lack of market, the resettled households were deprived some type of foods they used to eat before relocation and in some case, they can eat once a day which lead them to undernourishment.

The increase of expenditures for them, means a change in living condition which has negatively impacted their health. This shows how the health risk is linked to the landlessness and joblessness risks in the context of Gasabo resettlement program.

5.1.7. Social disarticulation risk

Resettlement studies have shown that population displacement causes destruction of existing patterns of social organization. The production systems of people are dismantled. Informal social networks that provide mutual help are destroyed or scattered. Trade linkages between sellers and their customers are interrupted. Long-established residential communities and settlements are disorganized, while family and friendship systems are often scattered (Cernea,1997; Robinson, 2003). In this study, households that need to be resettled from Gatsata are likely to face similar risk of destruction of their social and economic organization. Given the time they have spent in that area, they were able to construct social and financial community organization (called Ibimina) as discussed in section 4.2.5. The majority of those households lives with their relatives in the same neighbourhood. Shops owners have particular customers in the same neighbourhood. However by looking at what happened to the resettled households in Kinyinya and Bumbogo sites, 14 households indicated that they could not maintain those social and economic networks simply because of the increased distance from their origin settlements. The distance involved a cost of transportation while their income has decreased. Only 6 respondents out of 20 replied that were able to maintain their contact with relatives and friends only through telephones. The study reveals also that, those resettled households experienced the joblessness risk because of being resettled far from their customers. This shows how in their case, the risk of social disarticulation was associated with the joblessness risk and vice versa. Similar findings were reported by Patel et al.(2015) in their study, who found that in Ahmedabad resettlement, shops owners, artisans and small businessmen experienced stronger displacement effects through loss of customers.

5.1.8. Transportation problem

Inefficient transport system is a new form of impoverishment risk that was identified in the case of Gasabo resettlement program. Households that live in Gatsata are likely to face the problem of transportation after relocation. The evidence reveals that the resettled households in both Kinyinya and Bumbogo need to travel to their workplace, the city centre, market, secondary school, and other places. This requires the allocation of a budget for transportation. Moreover, in Kinyinya site, resettlers walk between 15-20 minutes to reach to the bus stop. Students commuting to their schools and other people who commute to work in the inner city have reported that they leave their homes as early as at 4:00 am to queue up for the bus. This waiting for buses has induced stress among commuters. Figure 20 shows that 8 out of 10 respondents in Kinyinya reported that the distance to bus stop has increased compared to the situation in their origin sites. On the other hand, the study reveals also that the resettlement site in Bumbogo does not have a bus stop in its proximity. All respondents in Bumbogo reported that they use a motorbike for 2000Frw to travel to the nearest bus stop. Which is very expensive compared to what they earn per day (5000frw for a labourer). In few words, the problem of poor accessibility to bus stop in Bumbogo induced not only stress among commuters but also it involved high costs of transportation and reduced the monthly income. Besides the long distance to the nearest bus stop, through observation the researcher found that the presence of unpaved dead roads is the main cause of the limited availability of public transport service leading to expensive transportation cost. This was also confirmed by Niyonsenga (2012) in his study that some part of Kigali city are deprived of public transport because of the limited extent of bus route networks. In addition, the district development plan 2013-2018 discussed the need to improve the transport system in the district because it has a low rate of public transport usage compared to other districts in Kigali city(Gasabo district, 2013). According to this district plan report, the reasons of a low rate are two:(i)Around 67% of residents do not need to use the public transport; (ii)30% of residents need to use it. However, the later reported that the bus stops are far from their houses.

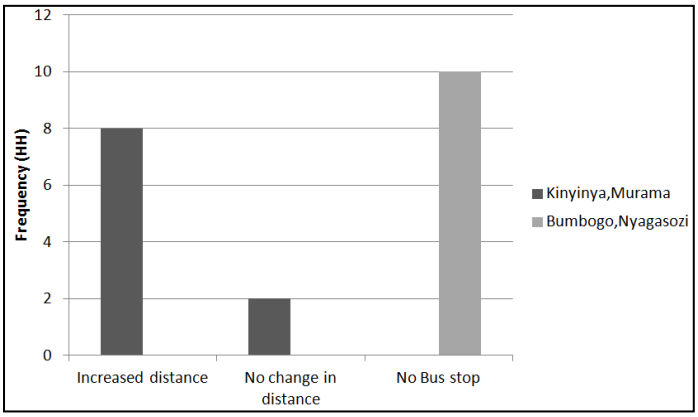


Figure 20: Accessibility to the nearest bus stop after resettlement in Kinyinya and Bumbogo

This research reveals that the problem of transportation faced by the resettled households has affected negatively the households income and their social organization. Some households in Bumbogo site reported that due to the high transportation cost, their children who are in secondary schools stay in the families of relatives and friends in the city. Similar findings of limited access to schools in resettlement site leading to separation of children and parents were discussed by Takesada et al., (2008).

5.1.9. Uncertainty

Uncertainty is also an extra impoverishment risk identified in case of Gasabo resettlement program. As it has been argued by Patel et al. (2015), this risk is mainly due to the lack of participation of the community in the resettlement planning. According to Patel et al. (2015), this form of impoverishment in Ahmedabad was indicated by the distraction of the community from pursuing their income generating activities and a strong perception of negative impacts. This argument can be reaffirmed in the case of the households to be relocated from Gatsata. The lack of information regarding the resettlement program such as where the households will be resettled and what compensation will be offered enhanced the perception of negative impacts. The uncertainty is high especially among the households which have the small houses for renting. This is a form of insecurity in which the households that need to be relocated already live. This lack of information could also be attributed to the absence of a policy guideline of their resettlement program.

5.2. Discussions

Cernea (1997) has demonstrated that during relocation and resettlement, households encounter eight forms of impoverishment. In most of previous studies, the eight forms were identified in the context of resettlement in rural areas (Schmidt-Soltau, 2003). In this research, the IRR model was adapted in the context of our study area (urban area) to analysis impoverishment risks of the households that need to be relocated. This chapter presented the relation between socio-economic and cultural characteristics of households that live in high risk of Gatsata and the impoverishment risks those households are likely to face when relocated. Empirical evidence of resettlement impacts collected from the already resettled households was used to validate the findings. As the results show, in general, all impoverishment forms proposed by Cernea could emerge as illustrated in section 5.1. Uncertainty among the households due to lack of information on their compensation entitlement was identified as an additional impoverishment risk form. This risk form has its particularity to lead to impoverishment before the relocation. The inefficient public transportation system emerged as a new additional risk form specific to the context of Gasabo. This risk form is indicated by the limited spatially and temporally availability of bus in some part of the district.

The landlessness and the joblessness are the central risks those households that need to be relocated are likely to face. In fact, the study reveals that Gatsata area has a good quality in terms of providing those

households access to basic services. Being located in the inner city, Gatsata community take advantage of the basic services that are more developed in its surrounding areas than in the rest parts of the district. Moreover, Gatsata provides easy access to income opportunities in the closest commercial areas such as Nyabugogo and the CBD. In addition, the study reveals that the choice of those households to settle in Gatsata was mainly linked to their workplaces. Therefore, their relocation far from Gatsata would induce the landlessness and joblessness at the same time. These two risks are the core of the wide process of all impoverishment risks discussed in this chapter. The findings disclosed clear links among the identified impoverishment risks forms. Figure 21 shows that other forms of impoverishment risks are mostly linked to landlessness and joblessness risks. Similar findings were reported in previous literature. Hunter and Posel (2012) found that the low wage and involvement in informal employment hinder redevelopment of informal settlement dwellers when they are relocated far away from urban centres. Patel et al., (2015) demonstrated that distant relocation resulted in loss of jobs expressed as a loss of working days, long distance to work, increased monthly expenditure because of the cost of transport, etc. May and Norton, (1997) demonstrated that unemployment and the lack of income have negative consequences associated with family stress, deteriorated quality of life, lack of food, undernourishment, etc. It can be seen that, for all impoverishment risks identified in this research, the main indicators are the distant relocation with respect to opportunities areas, to basic public services such schools and the limited spatial and temporal availability of public transport. Thus, the argument that the social, economic problems faced by resettlement communities are linked with the spatial location of the resettlement areas (Corsellis & Vitale, 2005; Kinsey & Binswanger, 1993 ; Bartolome et al., 2000) is confirmed in case of Gasabo resettlement program as well. Therefore, an appropriate site which provides a good access to all amenities and services discussed above is crucial to minimize impoverishment risks induced by resettlement.

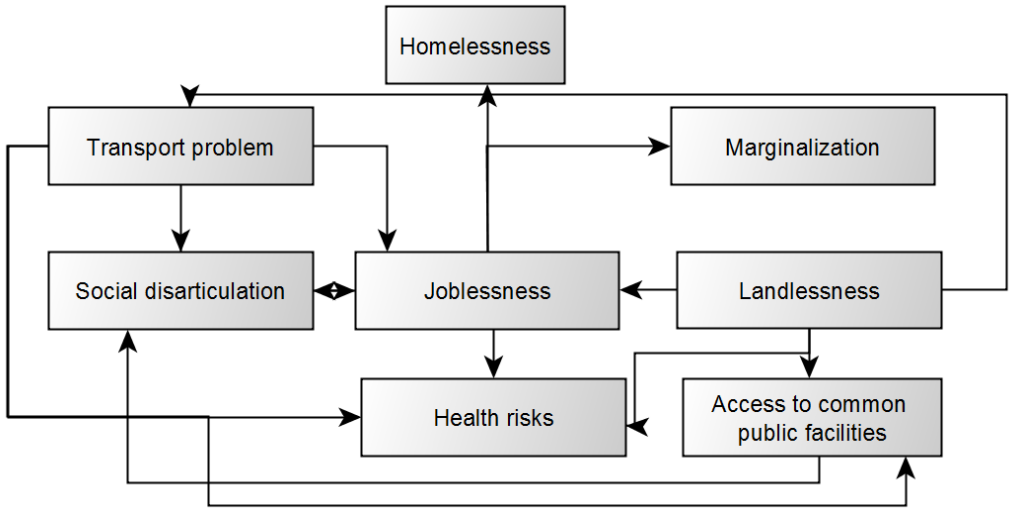


Figure 21: Interdependence of impoverishment risks of households to be relocated from Gatsata

6. TOWARDS EQUITABLE RESETTLEMENT

The previous chapter presents the impoverishment risks that might be associated with resettlement of households living in Gatsata high risk zone. In this chapter, a model of equitable resettlement that could minimize those impoverishment risks will be developed. It includes risks reversal strategies and a spatial multi-criteria analysis of potential resettlement sites suitability. In the first section, the risks reversal strategies are presented. As discussed in chapter 5, the wide process of impoverishment is linked with the spatial location of a resettlement site with respect to livelihood opportunities. Thus, a suitable resettlement site could minimize impoverishment. In that regard, the second section presents and discusses the results of suitability analysis of potential resettlement sites. The important steps followed in spatial multi-criteria model include defining criteria, determining the criterion weights, present the suitability of the identified sites. To conclude the chapter, a summary of key discussions is provided.

6.1. Impoverishment risks reversal strategies towards equitable resettlement

Preventing or mitigating the impoverishment risk problem, protecting and reconstructing the livelihoods of displaced population is the central requirement for equitable resettlement programs (ADB,1998; Cernea, 1997). According to Cernea, the risks mitigation measures can be developed on the basis of the identified impoverishment risks. He highlighted what is required to minimize the risks can be obtained by simply reversing the matrix of risks indicators into positive actions to be taken. This study followed the same principle. Chapter four of this study discusses the forms and indicators of impoverishment risks the households that need to be resettled from Gatsata might face when displaced. This section presents the risks reversal strategies that can be adopted in order to minimize and avoid impoverishment of those households. Respectively to the identified impoverishment risks, risks reversal strategies namely *from landlessness to land-based, joblessness to job opportunities, homelessness to home ownership, health risk to better healthcare, loss to restoration of access to schools and health facilities, marginalization to social inclusion* and *social disarticulation to social networks* are discussed.

6.1.1. From landlessness to land-based resettlement and joblessness to job opportunities

Maintaining or restoring livelihood and the ability of resettled households to earn income is central to the success of any resettlement process. The impoverishment risks analysis showed that there is a strong link between the landlessness and the risk of joblessness. The indicators of landlessness are distant relocation to urban job and basic services opportunities. In case of Gatsata, most of the heads of households and their spouses works in the close proximity of their settlement. Therefore, the strategies proposed in this research to mitigate loss of income because of landlessness and joblessness risks of Gatsata residents include avoiding distant relocation with respect to their origin settlement. Resettlement of households in an area close to Gatsata could minimize the effect of increased travel distance and travel cost to their workplaces and their livelihood opportunities. However, since most of the workers are employed or self-employed in commercial activities, relocation close to commercial centres would also allow them to settle back in trading and small business activities.

6.1.2. From homelessness to home ownership

In the context of households to be resettled from Gatsata, the homelessness risk can be minimized by relocating people near jobs opportunities areas such as Nyabugogo area, Kigali CBD, and other vibrant commercial areas. Interview with key informant revealed that in Rwanda two different types of compensation are being used in resettlement programmes induced by land acquisition for projects in public interest. Relocated households are either compensated in cash or are offered a house. In case of

house compensation, the district identifies resettlement site where those houses are constructed while for cash compensation the relocated households will find themselves the land to construct their houses. The overall process of resettlement site selection is guided by the limited budget. Land scarcity is an issue in Kigali urban areas leading to high land prices. This is the reason why most of the resettlement sites are selected in the peripheries of the city where the land price is comparatively low. The selection of distant relocation site with respect to job opportunities in the city centre had induced homelessness risk to resettled households. As discussed in section 5.1.3, evidence from already resettled households shows that some people decide to leave the resettlement sites located in rural areas (Bumbogo) and the peripheries of Kigali city (Kinyinya) to go back to the city for job opportunities. They prefer to rent a house instead of staying in a house without something to eat. This was found in other available studies. For example in South Africa the study of Hunter and Posel (2012) about socio-economic characteristics of informal settlements, found that the involvement of informal settlements dwellers in low wage employment was a challenge to the relocation of those communities to sites that are further away from urban centres. People fear the cost of commuting to and from their workplaces. Therefore, relocation near their job opportunities could be a sustainable solution to the risk of homelessness.

6.1.3. From health risks to improved healthcare

Accessibility to markets, accessibility to bus stop and availability of buses are the appropriate strategies to minimize the identified health risks that can be associated with resettlement process of households from Gatsata high risks zone. In Kigali, commodities in wholesale markets are very cheap compared to their prices in small markets and shops located in neighbourhoods. All farmers bring their food production in those wholesale markets while in remote areas without markets, the cost of transportation of the food products from the market is charged to the buyer. Moreover, the resettlement planners should consider a good accessibility to bus stop and availability of buses to avoid stress associated with transport among the resettlers.

6.1.4. From loss to restoration of access to schools and health facilities

The strategy to restore access to schools and health facilities of the relocated households requires the relocation sites to be in the closer proximity to public schools and public health facilities. This research revealed that households to be relocated use those public services because they are affordable than the private services. Furthermore, the minimum distance to those facilities is required to allow people use the walking transport mode and avoid additional monthly expenditure through the cost of transportation.

6.1.5. From marginalization to social inclusion

This research revealed that marginalization induced by resettlement of households living in high risk zone of Gatsata will be linked to the loss of jobs and decline in income which will reduce the economic power of these households. Thus, minimizing the loss of jobs can prevent marginalization.

6.1.6. From social disarticulation to social networks

The strategies proposed to minimize social disarticulation induced by resettlement program of households that are living in high risk zone of Gatsata include resettling all these households in one neighbourhood close to their origin settlement (Gatsata area). This will help resettlers to resume the networks with their customers for those who do business in Nyabugogo and maintain their kinship networks. The students could continue to go to the same schools. Moreover, the study revealed that the problem of long distance to bus stop and lack of transport system in resettlement zones affects resettled households in various ways such as inducing socio-disarticulation. Thus, the availability of bus route, bus stop and more generally an efficient public transportation system in the resettlement areas could be a good action to minimize social disarticulation.

6.1.7. Improved public transport

Limited availability both spatially and temporally of the public transportation service in peri urban and rural areas should be seen as an additional form of impoverishment. Recognizing this issue in resettlement planning constitutes a risk mitigation measure.

6.2. Suitability analysis of potential resettlement sites

Available literature highlighted that the location and quality of a new resettlement site are the most critical factors that should be considered during the resettlement planning process. A suitable location should determine access to social, cultural and economic opportunities that can restore the livelihoods of displaced households and minimize their impoverishment (ADB, 1998). As discussed in chapter 5, the impoverishment risks in case of Gasabo are linked with the location of the resettlement sites. It is in that regard, the proposed risks reversal strategies were used to form a set of criteria to analyze the suitability of potential resettlement sites in terms of minimizing and avoiding impoverishment of the displaced households.

6.2.1. Residential land use and potential resettlement sites

The aim of suitability analysis is to identify the best areas for a specific land use activity from a set of potential areas. In Kigali city, all land use developments should comply with Kigali city master plan. For each of the three districts a detailed master plan in line with KCMP was developed. In this research potential resettlement sites were identified from the proposed residential land use in Gasabo. The land utilisation strategy for Gasabo district proposes three broad categories of residential land use: low density residential development, medium density residential development and high density residential development. Given that the households to be resettled are part of low income group as discussed in their socio-economic characteristic and the scarcity of land in urban areas, the high density residential area was considered as the potential land for future resettlement sites development. High density residential areas are encouraged in Kigali in order to support the agenda of sustainable housing development in Kigali (MININFRA, 2014). With respect to criteria of selection, potential residential areas in high density typology identified from the master plan (City of Kigali, 2013b), are shown in Figure 22 below:

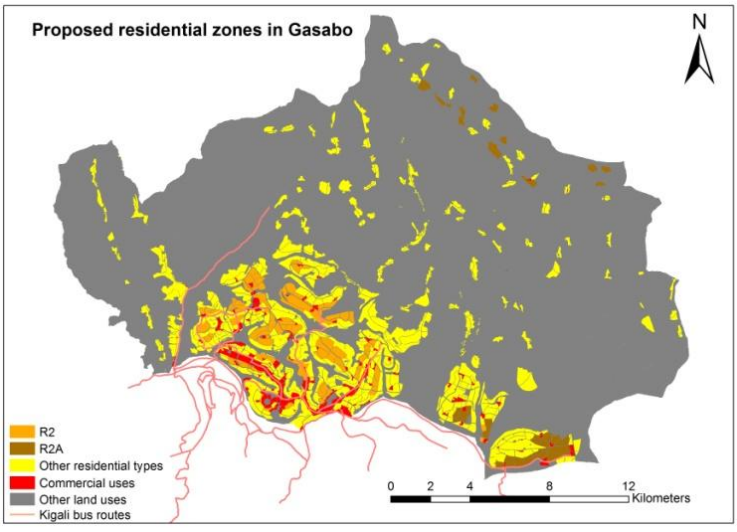


Figure 22: Proposed residential types in Gasabo

Source: (Kigali city master 2025 : data from the City of Kigali)

Low Rise Residential District (R2)

The low rise residential district (R2) is a zoning district established to allow for intensification, redevelopment and improvement of existing informal housing areas. This land use is expected to be developed in areas with variety in the housing types, higher building coverage and building height to stimulate the redevelopment and intensification with hope to improve the overall physical condition of the informal housing areas in the city.

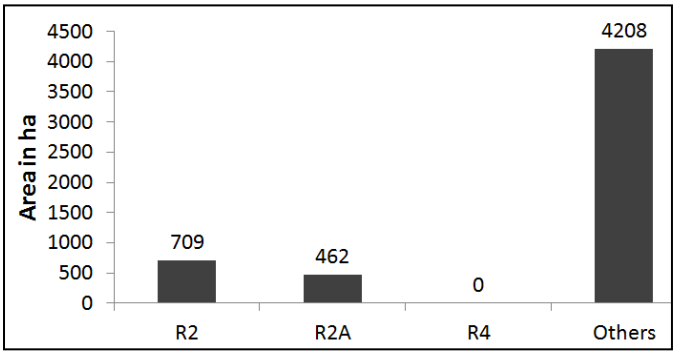


Figure 23: Area of the proposed residential types in Gasabo

Low Rise Residential District (R2A)

The purpose of R2A district is similar of R2 district. Particularly, according to the master plan this area is expected to create an affordable low rise housing area by allowing higher building coverage and higher intensity low rise development in suburban new towns.

High rise residential district (R4)

The high rise residential district R4 was also considered as potential area for resettlement site development. This is a district to be established in the CBD of Kigali, and adjacent areas. It is a high density living environment for those who desire an urban lifestyle. However, this zoning is not available in Gasabo district as can be seen in Figure 23.

The high density residential typology would be appropriate to accommodate households from high risk zone of Gatsata because of its characteristics. Residential zones in this category are expected to provide affordable housing by allowing higher building coverage as the minimum of 90 dwellings units can be accommodated in one hectare compared to low density zones which require a large plot size (City of Kigali, 2013c).

6.2.2. Defining criteria for site selection

Table 11 below presents the selected criteria to analysis the suitability of potential resettlement sites.

Goal	Criteria	Indicator	Impact	Requirements
Improved livelihood	Job opportunities	Distance to city centre Distance to commercial centres Distance to origin settlement	Reduce travel time and cost of transport	Minimum distance, time and cost
	Social facilities	Distance to health Distance to education Distance to market	Reduce long distance and cost of transport	Minimum distance, time and cost
	Public transport	Distance to bus route Distance to bus stop	Reduce long distance and cost of transport	Minimum distance, time and cost

Table 11: Criteria for resettlement site suitability analysis

Resettlers need to maintain income and livelihoods which in case of majority of Gatsata households are clearly tied to the location such as proximity to jobs, customers, and markets they are likely to lose. Thus, potential residential sites that can help to minimize such losses associated with resettlement are required. For that, a set of criteria to analyse suitability of potential resettlement sites was developed on the base of the of the above elaborated risks reversal strategies. Community preferences regarding the relocation sites were considered in criteria development. In fact, this study adopted a participatory problem-solving method which gave the households to be relocated a chance to participate in the process of resettlement site selection. From a direct consultation through a household survey, 90 samples of households to be resettled were asked to address the criteria that should be used for the selection of their resettlement sites so that impoverishment risks are minimized. Thus, in line with the risks reversal strategies with respect to

identified impoverishments, three criteria namely near the city centre, near the origin settlement and near any other commercial centre were emphasized by the households to be resettled. The households were also asked to prioritize the basic services that should be considered in resettlement site identification.
Table 12 summarizes the criteria and the impoverishment risks that are minimized by each of the criteria.

		Impoverishment risks addressed									
Objective	**Criteria**	Landlessness	Joblessness	Homelessness	Health risks	Loss of access to common facilities	Marginalization	Social disarticulation	Loss of income from houses for renting	Uncertainty	Public transportation problem
Access to job opportunities	Distance to city centre	✓	✓	✓	✓		✓	✓			✓
	Distance to commercial centres	✓	✓	✓	✓		✓	✓			✓
	Distance to origin settlement (Gatsata area)	✓	✓	✓	✓		✓	✓			✓
Access to social services	Distance to markets	✓	✓	✓	✓	✓	✓	✓			✓
	Distance to health facilities	✓			✓	✓					✓
	Distance to primary schools	✓				✓		✓			✓
	Distance to secondary schools	✓				✓		✓			✓
	Distance to universities	✓				✓		✓			✓
Access to public transportation	Distance to bus route	✓	✓	✓	✓	✓		✓			✓
	Distance to bus stop	✓	✓	✓	✓	✓		✓			✓

Table 12: Summary of criteria for site suitability analysis and the impoverishment risks addressed

6.2.3. Determining criterion weights: The relative importance

As discussed in literature review, site selection and basic infrastructures provided at the new sites should reflect the preferences of displaced people (Heming & Rees, 2000). In this research, the relative importance of each indicator was derived from the direct ranking of households' preferences. The preferences of households were collected in two separate subsets. The first was to determine preferences about criteria that would define a site with job opportunities and the second subset consist of criteria to determine the preferences about basic public services to be considered. Thus, a stepwise ranking method was adopted. Table 13 presents the relative importance of the selected criteria.

Rank	**Weight**	**Sub-set**	**Indicator**	**Rank**	**Partial Weights**	**Overall weights**
1	0.667	Site location preferences	Distance to city centre	1	0.5	0.33
			Distance to commercial centres	2	0.33	0.22
			Distance to origin settlement (Gatsata area)	3	0.167	0.11
2	0.33	Social and public services	Distance to markets	1	0.33	0.11
			Distance to schools	2	0.267	0.089
			Primary schools	*1*	*0.133*	*0.045*
			Secondary schools	*2*	*0.09*	*0.029*
			Universities	*3*	*0.044*	*0.015*
			Distance to health facilities	3	0.2	0.067
			Distance to bus route	4	0.133	0.044
			Distance to bus stop	5	0.067	0.022

Table 13: Indicators weights

The ranks show that households think about the location of the resettlement site which offer access to job opportunities before the basic infrastructure to be provided. The CBD is preferred the most to determine the resettlement site location. This is because the majority of households to be relocated depend on income they earn from informal employments and income generating activities which are mostly found in vibrant areas like a city centre. The distance to commercial centres including Nyabugogo centre and Gatsata (their current occupation sites) is the second priority. Finally, the distance to Gatsata area is also preferred because of its proximity to their jobs location and the Nyabugogo main bus stop. Regarding basic public services they need, the markets take the first place. This is because family members in some households to be resettled are merchants selling mainly food products and other commodities in Nyabugogo market. Thus, they fear to lose their income. On the other hand, compared to other indicators these households do not give much consideration to accessibility to bus route and bus stop. The reason is that they believe that the proximity to city centre and other vibrant areas will offer accessibility to transport facilities such as bus routes and bus stops. The criteria were ranked with respect to the order of the impoverishment risks and their level of affecting the livelihood of the households. The job is the most priority factor which is common for all households. Another noticeable finding is that the market service is a common criteria for most of the households. This could be attributed to two reasons: 1) the basic need of food and 2) involvement in self-employment based on trade and commercial activities. The criteria for access to schools and health care were influenced by the individual household characteristic. This means, for instance, a household which has many young children, the schools were a priority over the healthcare. While a household which has a household member with a chronic illness, the priority was the healthcare over the schools.

6.2.4. Suitability with respect to jobs opportunities

Figures 24 shows the suitability levels of potential resettlement sites with respect to job opportunities in walking and public transport scenario respectively. It shows five classes of suitability scores namely the highly suitable, suitable, moderately suitable, lowly suitable and very lowly suitable. Figure 25 presents the land area that can be found in each suitability class for both scenarios.

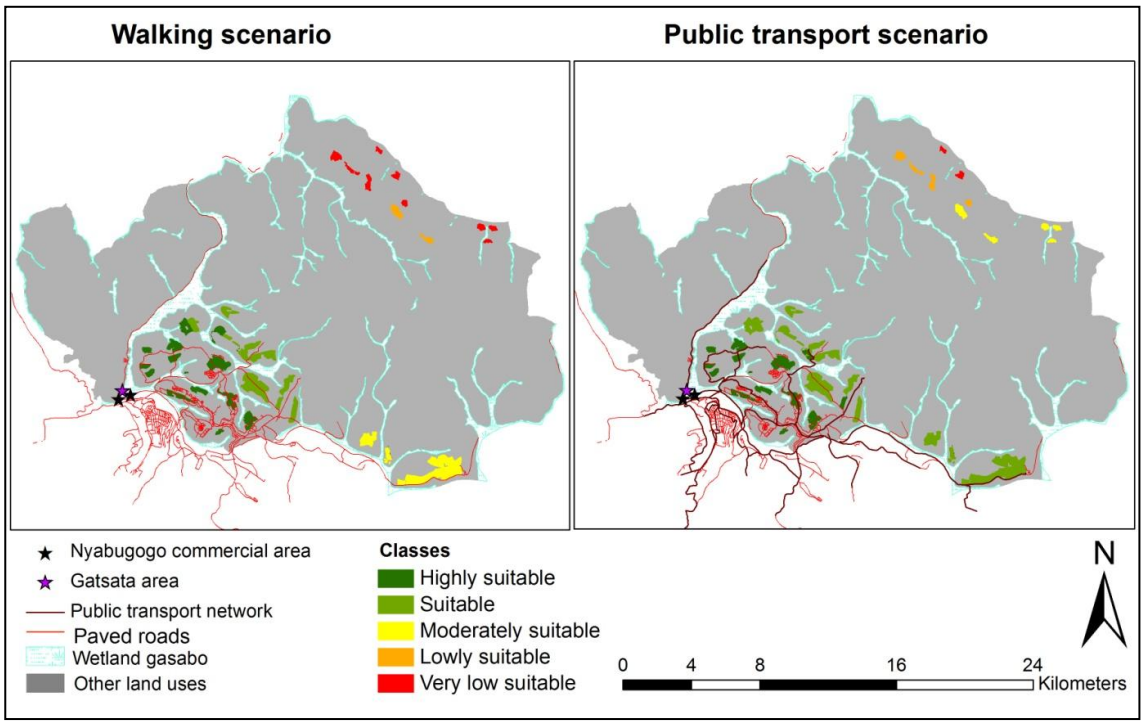


Figure 24: Sites suitability levels with respect to job opportunities.

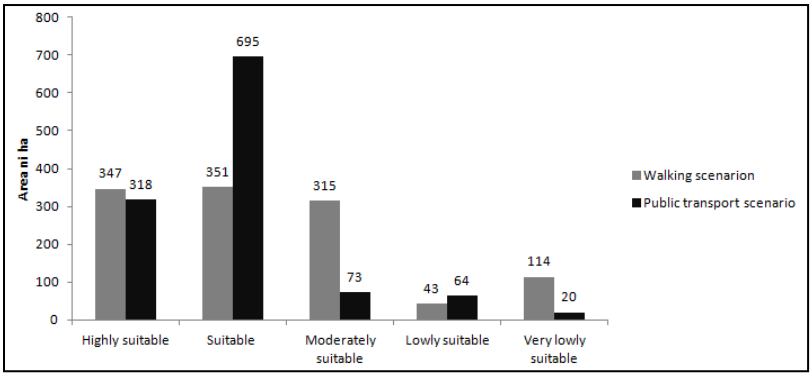


Figure 25: Area of potential sites suitability levels with respect to job opportunities

As it can be seen, the sites with the highest suitability in both scenarios are located in the southern parts of the district whereas the sites with lowest suitability are roughly located in the north. The results show a clear pattern of suitability levels which decrease from highly suitable areas in the southern part (near Kigali city center) to very lowly suitable areas in the north and outskirts part of the district. That sequence from most suitable to least suitable is because the job opportunities areas that were considered are concentrated in that same region (see appendix 4). Both scenarios have almost equal highly suitable land which is around 300ha. Nevertheless, the public transport scenario has more land in the suitable class than the walking scenario whereas the walking scenario has more moderately suitable land compared to the public transport scenario. The reason of this difference is that these moderately suitable areas (in yellow) are located a bit away from the city center, Nyabugogo and the origin site (Gatsata) by walking. Using the public transport those areas might become much more accessible to the job opportunities areas than in walking scenario. The findings of suitability to job opportunities are in line with the master plan which has proposed that the Nyabugogo regional bus park will be part of a CBD called Muhima which will be located near the existing CBD (City of Kigali, 2010).

6.2.5. Suitability with respect to basic services

Figure 26 shows the results of suitability analysis with respect to basic services in both walking and public transport scenario.

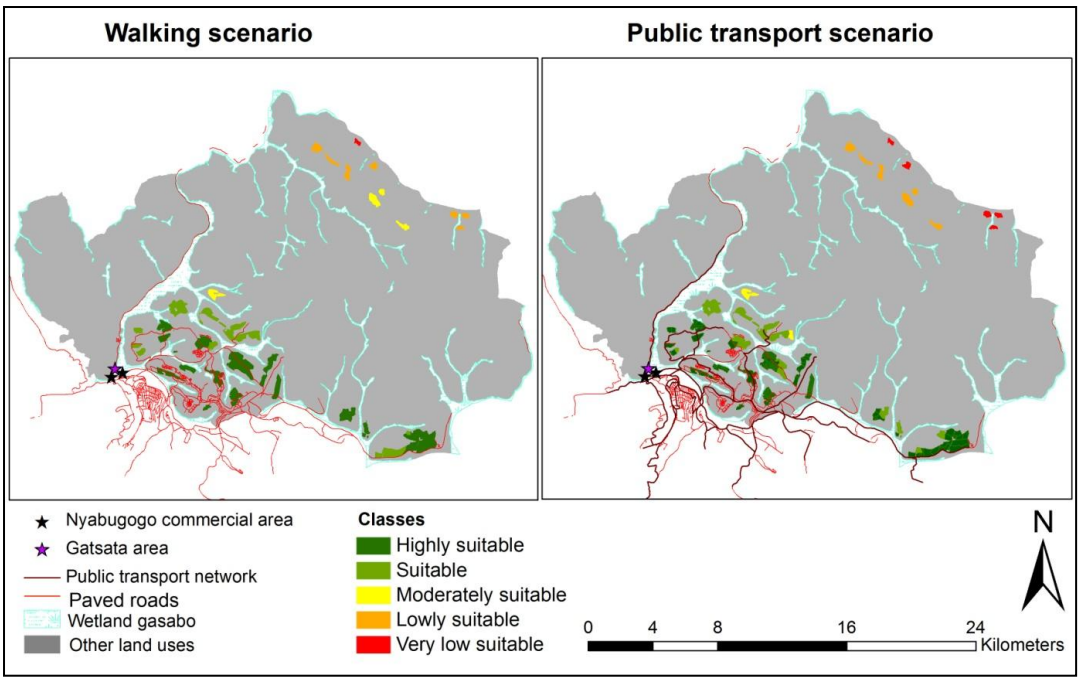


Figure 26: Sites suitability levels with respect to basic services.

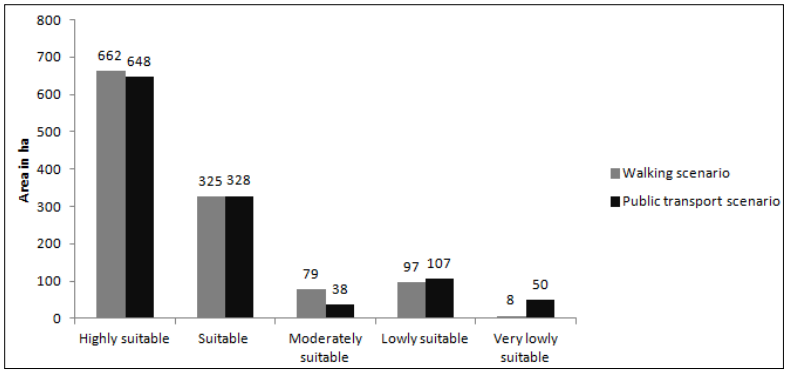


Figure 27: Area of potential sites suitability levels with respect to basic services

According to Figure 26, in both scenarios, the most suitable land are located in the south region of the district towards the eastern part. As can be seen, the suitability with respect to markets, schools, health facilities, bus route and bus stop facilities gives a mixture of highly suitable and suitable patches of land in the southern part. This is different from the suitability with respect to job opportunities which has a clear pattern of a sequence from most suitable to least suitable land. Figure 27 above shows the area in each suitability level for both scenarios. It can be seen that more than 50% of the potential land is highly suitable. In the southern part, accessibility to basic services is relatively good either by walking or using public transport. The result can be attributed to the high number of basic services distributed in that areas. This is one of the reasons, the households that need to be relocated use predominantly the walking mode to access to their basic services as it has been discussed in their socio-economic and cultural characteristics. The basic services are much more developed in the south eastern part compared to other parts of the district. The National Institute of Statistics reported similar findings, that accessibility to schools and health is higher in urban areas of Gasabo compared to rural areas (NISR, 2011). The public transport scenario has much lowly and very lowly suitable land with respect to basic services compared to the walking scenario. This is because large proportion of the north part does not have public services even where the basic services are provided as it has been confirmed by Niyonsenga (2012).

6.2.6. Overall sites suitability

Figure 28 presents the overall result of potential resettlement sites suitability in both the walking and public transport scenario respectively. This is a result obtained by considering all the criteria at the same time.

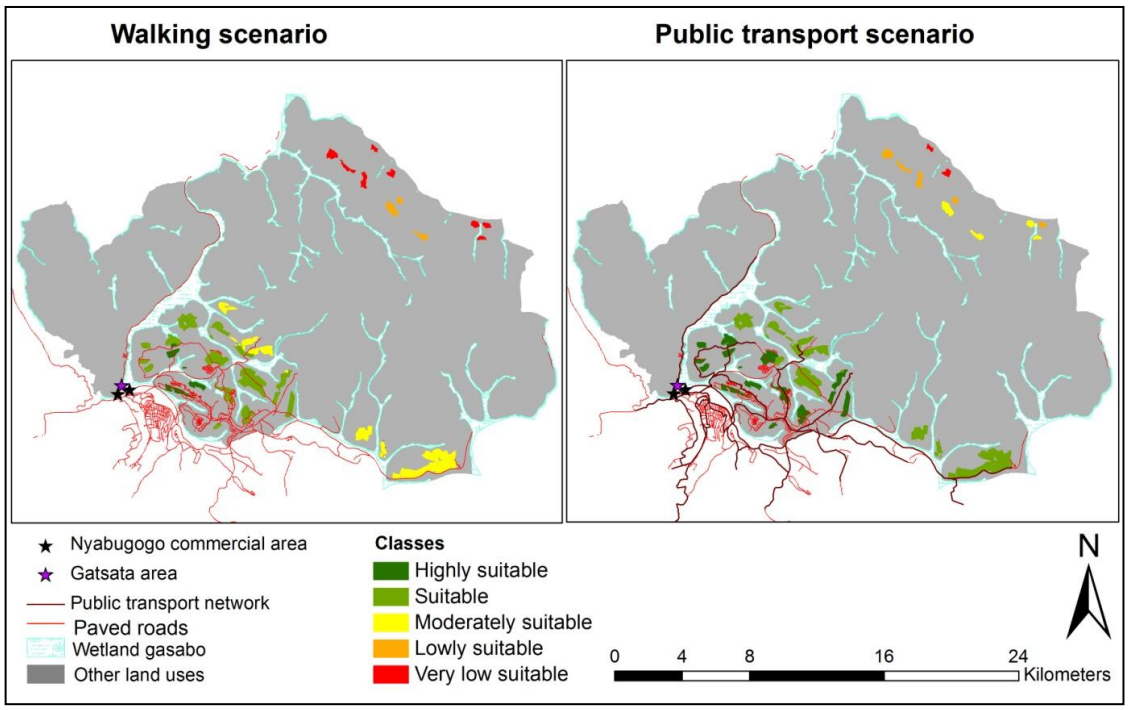


Figure 28: Overall potential resettlement sites suitability levels

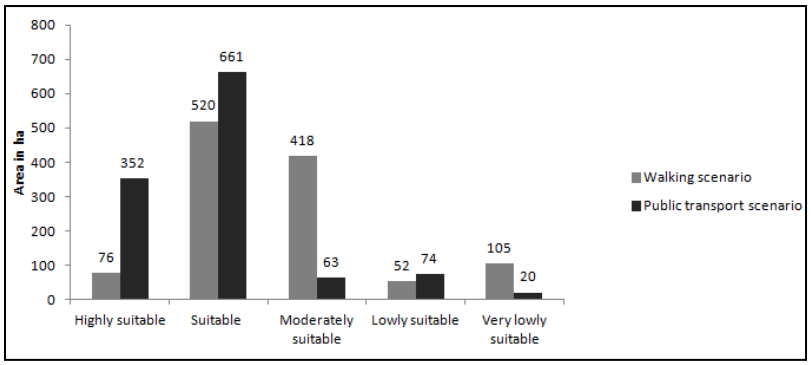


Figure 29: Area of potential sites suitability levels

From Figure 29, it can be seen that a significant proportion of the potential land is covered by the highly suitable and suitable in each of the scenarios. Compared to walking scenario, the public transport scenario has more highly suitable and suitable land. As it was discussed for the suitability with respect to job opportunities and basic services, the analysis shows that significant amount of highly suitable and suitable land are found in the southern part of the district around the core of Kigali city. In the walking scenario, the moderately suitable land is found in the south eastern part of the district and on the extremity of the bus network towards the north. This amount of moderately suitable land is converted into suitable land due to increased accessibility in case of public transport scenario. This shows that the transportation service could improve the suitability of potential areas for resettlement site development. Similar finding was reported in other studies which confirmed that besides other factors such as income, neighborhood quality, the transportation has a great influence on residential locations (Weisbrod, Lerman, & Ben-Akiva, 1980). In addition, Teunissen, Sarmiento and Brussel (2013) have demonstrated that when affordability for the poor is not a matter, the public transport can improve access to basic services and promote social equity. In both scenarios, the southern region of Gasabo is more suitable than the north part because the former is part of the urban areas of Kigali city and is directly adjacent to the city core. In this part of the district, the basic facilities are well distributed compared to rural areas. In addition, the southern part takes advantage of its location and benefits from those basics facilities in neighboring districts (Nyarugenge and Kicukiro) of the Kigali city.

Compared to the south part, the northern part of the district is lowly suitable to accommodate resettled households from Gatsata. Not only the north part does not provide good accessibility to opportunities and services but also it is located far from the urban core and has a limited extent of public transportation network.

6.3. Sensitivity analysis

Sensitivity analysis was used to explore and understand the uncertainty that might be present in the model. It has been demonstrated in previous studies that among other reasons, this uncertainty more often arises from the criteria and the instability of human preferences with respect to those criteria (Ligmann-Zielinska & Jankowski, 2008). The uncertainty from a criteria may be related to evaluation scores associated with that criteria (Voogd, 1982). Normally, for spatial criteria expressed by the proximity indicator, some areas might score higher than others depending on whether they are located within the acceptable standard distance. In addition, the amount of spatial available opportunities constitutes an uncertainty that would affect the outcomes of the suitability model. Thus, it was worthwhile to perform the sensitivity to these parameters.

6.3.1. Sensitivity to thresholds distances to opportunities

In this study, there is a lack of sufficient information on acceptable distances. The maximum acceptable distance to health facilities in Rwanda was the only information at hand. This was used to check whether and how specific standards or agreements regarding the acceptable distance would change the outcomes of the suitability model. In Rwanda, the standard of geographic accessibility states that none should travel

more than 1hour seeking for healthcare (Ministry of Health, 2009). Therefore, areas within 1 hour travel time to health facilities score higher than the rest of areas.

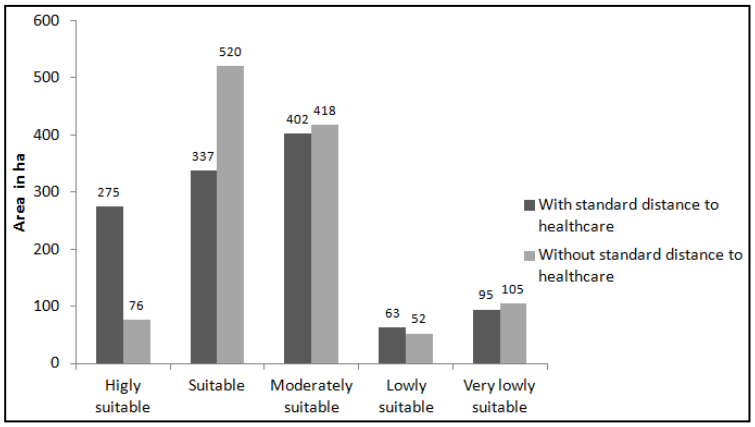


Figure 30: Sensitivity to standard distance to health facilities

Figure 30 shows the changes that were induced by considering areas located within one hour travel time to health facilities as the most suitable than other areas. As it can be seen, the introduction of that criteria in suitability analysis in the walking scenario has reduced the suitable land from around 520ha to 337ha. This shows how much, depending on the standard distance or distance fixed by agreement, the amount of initially suitable areas might reduce. Furthermore, the sensitivity analysis shows that the black box practice where planners consider only "the closer the better" as sufficient for suitability analysis should be avoided. Specific standards and agreements should be followed when performing the suitability analysis. In that way, the community could voice its need and preferences.

6.3.2. Sensitivity to available infrastructure and basic services

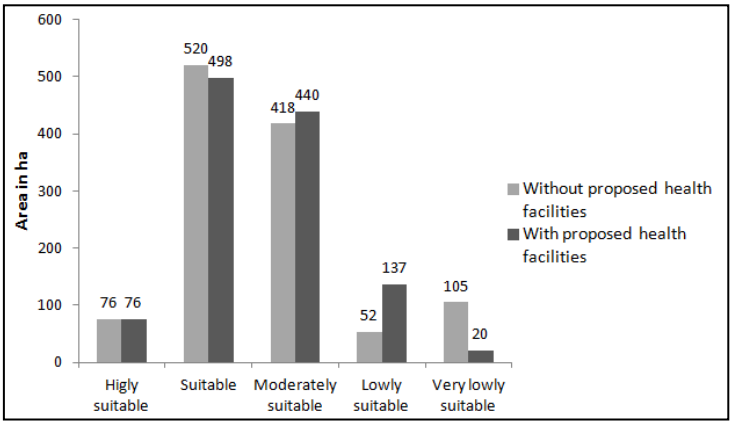


Figure 31: Sensitivity to new health facilities

Figure 31 shows the result of sensitivity analysis performed to explore the change in case the proposed health services are provided. It can be seen that increasing health infrastructure has decreased about 85ha from very lowly suitable class to only 20ha very lowly suitable area.

The findings of sensitivity analysis demonstrate that the high suitability for a resettlement site will be defined by the present services and infrastructure. This concludes that if a site does not possess the required services and infrastructure, they should be provided before relocation.

6.3.3. Sensitivity to CBD

The CBD is the most sensitive criteria. In the driving scenario, by removing this criteria and consider the remaining criteria for suitability analysis, there is a clear sudden decrease of highly suitable and suitable land. According to government officials, households are resettled in rural areas because currently the price of land in the urban areas are high. However, the sensitivity analysis shows that the CBD plays an important role in determining the suitable resettlement sites. This is because it provides access to job opportunities for the households that need to be relocated.

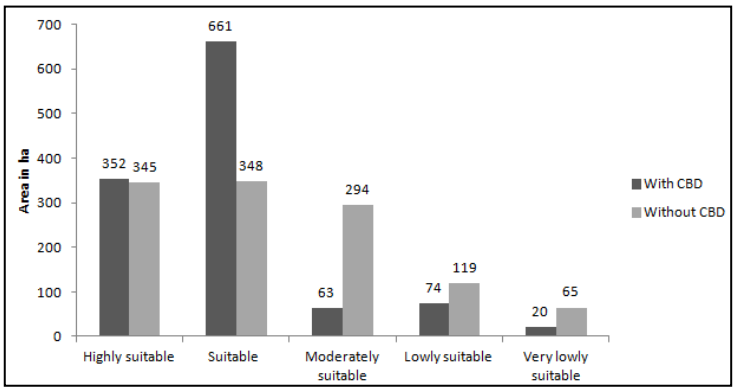


Figure 32: Sensitivity to distance to CBD criteria

6.4. Summary

Based on the results of impoverishment risks identified in chapter 5, this chapter presented the strategies which could be adopted to minimize those risks. The risks reversal were developed by simply reversing the impoverishment risks that were indicated in general by the loss of access to urban job and basic services opportunities. In this regard, relocation near commercial areas would allow the households to resume their economic activities and minimize the joblessness risk. This is an appropriate strategy since the households depend on income from their employment in trading and small businesses. The households support this strategy when expressing their preferences regarding the location that would provide access to job opportunities. Among the commercial centres, the CBD was preferred the most because of it vibrant character in providing access to job opportunities. Moreover, the productive activities, the social networks and the livelihood of the households from Gatsata are linked to their settlement and its surrounding environment. Therefore, avoiding relocation far from their origin settlement would reverse the risks of landlessness and joblessness. At the same time, this strategy could minimize the travel distance and the loss of income because of the travel cost to workplaces and livelihoods opportunities. This strategy is also supported by the households to be relocated as an option to allow them to maintain access to their job opportunities. This dependency was reported by other scholars. Usamah and Haynes (2012) have demonstrated that resettled households have a high tendency to depend on livelihood at the original settlement especially when there is a lack of opportunities in the new settlement. In addition, it is undeniable that the households find it difficult to cope with total change. Furthermore, resettlement of all households in one neighbourhood close to their origin settlement would minimize the risk of destruction of their social and economic networks. Minimizing the joblessness risk would prevent the homelessness risk well as. Avoiding the loss of job and income would prevent the risk of marginalization and also the health risks. It can be seen that in the same way the impoverishment risks are interdependent, the risks reversal strategies pursued that dependence aspect as well.

The study reveals that the impoverishment risks are linked with the spatial location of the resettlement areas. In this regard, the strategies to minimize the risks were mostly the spatial factors. Therefore, these strategies were used to analyse the suitability of potential resettlement sites. The suitability analysis was mainly based on community preferences and on the influence of the proposed master plan 2025. Involving the community in potential resettlement site evaluation is a positive aspect towards equitable resettlement as it has been recommended by other scholars (Abebe & Hesselberg, 2015). This method applied allowed enhancing the role of affected in minimizing impoverishment risks induced by resettlement. The results of suitability analysis reveal that both the walking and public transportation scenario could give a large proportion of highly suitable and suitable land in the southern part of the city around the core of Kigali city. In addition, efficient public transport would increase the level of suitability of the potential resettlement sites located in the peripheries of the urban area.

As discussed in the literature review chapter, resettlement site selection involves a number of criteria including compliance with land use plans, safety, location with respect to workplace and services opportunities, access to public services and land value (Correa et al., 2011). This study did not include the land value and land tenure issues due to lack of related data. However, land value and tenure are also essential criteria in site selection. The current owners of suitable land need to be involved as stakeholders in the process of final site selection. Due to possible resistance from the private land owners which are the basis of high prices, the public land might be recommended. Appendix 5 shows that most of the highly suitable areas located in already built up areas (urban areas). Suitable and moderately suitable vacant land is mostly found in Kinyinya and Rusororo sectors. Therefore, there might be a trade-off decision between adopting for redevelopment of existing housing areas (as per the master plan) or acquiring available vacant land since. However, in all the cases, areas close to the origin site could be the potential candidates since they can reduce indirect resettlement effects such as increased travel cost to opportunities. Ensuring an efficient public transportation service in Kinyinya and Rusororo can increases the suitability level of the suitable and moderately suitable land. Otherwise, the sensitivity analysis highlighted that for a site to be suitable to accommodate the displaced households, it should provide access to basic services and job opportunities before the households are relocated. Sensitivity analysis reveals also that consideration of acceptable distances for accessibility to those opportunities and services is essential because they influence the suitability level of a potential sites.

Despite those further considerations that are required for the final resettlement site selection, the results from the model which is developed in this research are very useful and have a great potential towards equitable resettlement since they might be the basis for evaluation of the final resettlement site.

As it can be seen, the majority of impoverishment risks could be minimized by a selection of a suitable resettlement site. However, the loss of income from renting small houses and the uncertainty require other interventions. Therefore, communication of resettlement guidelines with clear provisions regarding compensation will help to minimize these two form of impoverishment. It is important to highlight that, participation of the households during the definition of compensations and entitlements would be a good foundation.

7. CONCLUSION AND RECOMMENDATIONS

The empirical findings highlighted the characteristics of resettlement requirements and impoverishment risks of households that need to be resettled from high risks zones in Gasabo in general, and specifically from Gatsata sector. The research also discussed how those impoverishment risks can be minimized by selecting a suitable resettlement site. To conclude the study, this chapter summarizes the characteristics of potential requirements and the identified impoverishment risks of the households that need to be relocated from high risk zones of Gasabo. In addition, it highlights which suitable sites would help to minimize the impoverishment of the displaced households to achieve equitable resettlement. Further, the chapter briefly discusses the relevance of these findings for the implementation of the Gasabo resettlement policy and suggests directions for further research.

7.1. Conclusion

This research was conducted in order to know who will be relocated from high risk zones of Gasabo, (ii) what livelihoods they have and are likely to lose and, (iii) what are the causes of impoverishment risks (iv) how those risks can be minimized or avoided. The main objective of the study was to develop a methodology for residential resettlement in Kigali that can minimize the risks of impoverishment due to relocation. The assessment of the likely impoverishment risks and multi-criteria analysis methods played an important role in the development of such methodology.

Sub objective 1: To describe the key characteristics of resettlement requirements

This objective had three guiding questions: The first question is "Where are the informal settlements located in high risk zones and wetlands?". The second question is "How many households will be relocated by the resettlement program in Gasabo?". This information is important to be able to estimate the land required to accommodate the relocated households. The required land was estimated with respect to four residential typologies that are proposed by the master plan till the year 2025. It was found that the vertical constructions would require less land (about 5ha) when compared to the development of single family houses. The third guiding research question was "What are the socio-economic and cultural characteristics of households that need to be relocated?". With regard to this question, characteristics such as the education level of the head of household, the source of income, job location sites, access to basic public services and social networks of households were discussed. The results show that the work and renting small houses are important sources of income for households that live in high risk zones of Gatsata. However, the heads of households have a low level of education (up to secondary schools level) which implies their participation in informal employment that requires low skilled people. The jobs held by the members of households in high risk zones of Gatsata are based on casual employment (labourers) and self-employment mostly as merchants, and owners of small businesses. These small businesses are also linked to wholesale and retail trade. The employed persons carry out their job activities mostly in their neighbourhoods, in the nearest market (Nyabugogo) and in the CBD of Kigali city.

The study reveals that the choice of households to settle in Gatsata area was linked to their workplaces namely Gatsata, Nyabugogo commercial centre and CBD. Workers avoid the cost of transportation to and from work because of their low wages. In addition, casual labourers need to live near to be able to move door to door, looking for work or to respond to the locally found work opportunities. With regard to social organization, the study reveals that the majority of households to be relocated from Gatsata have relatives in the same area and close neighborhoods. In addition to relatives, important trade relationship exist, between merchants and owners of small businesses and their customers that were formed over the years (more than 10 years). Regarding access to basic services, the majority of children in households that

need to be relocated from Gatsata are in primary and secondary schools. The distance to primary school ranges from one to three kilometres. This enables students to walk to school. Residents have positive perceptions with respect to the distance to health facilities and market facilities (mostly Nyabugogo) which does not involve the cost of transportation because they can walk when seeking related services. In case the public transport is required, the households benefit from living close to the main bus park where the transport service is efficient. Further, being located in the inner city, the Gatsata community is able to take maximal advantage of the basic public services that are much more developed in the city than in the peri urban and rural areas of the district. In conclusion, all of the characteristics including the social organization, good access to job opportunities including trading and basic services that are discussed above define the requirements and should be at least restored or improved to help the households to survive after resettlement.

The second objective was to develop indicators for assessing impoverishment risks associated with resettlement.

To achieve this objective three guiding questions: "*what are the resettlement impacts experienced by already resettled households"; "What are the type of impoverishment risks that can be caused by the displacement" and "What are the indicators explaining the identified impoverishments"* were answered simultaneously. The Cernea's risks and reconstruction model was used to summarize the identified risks forms and their indicators. The impacts of resettlement experienced by already resettled households in Kinyinya and Bumbogo were used as evidence. The study reveals that because of its location near Nyabugogo market, Nyabugogo main bus park and other commercial activities in Nyabugogo, Gatsata area is a foundation of the livelihood of households to be relocated. This is the reason why the households to be relocated perceived the risk of *landlessness* as a result of being resettled far from these places. Specifically, the majority of these households to be relocated depend on income from economic activities they carry out in Gatsata, Nyabugogo main bus park and market. Thus, the landlessness risk and the risk of joblessness are linked. The evidence from households resettled in Kinyinya and Bumbogo shows that these risks came into reality after relocation. Most of the heads of households before resettlement were involved in the informal trade. Therefore, the increased distance to the city centre, increased distance to markets and other economically vibrant areas induced the *joblessness* risk. This is shown by the change of occupation and loss of job for some heads of households. This study revealed that relocation far away from job opportunities might induce *homelessness* risk. Low wages earners avoid expenditure on transportation to and from work and prefer to live closer to their workplaces. The evidence from Kinyinya and Bumbogo shows that some resettlers closed the houses they received as compensation and went back to the city to rent houses near their workplaces. Further, the households that need to be relocated are likely to face *marginalization* in case they will not able to resume their income generating activities and hence lose their economic strength. The distant relocation with respect to their workplaces and the loss of job would reduce their income and induce marginalization. In this research, food insecurity, morbidity and mortality risks were analysed under the *health risks*. The findings highlighted that the change in monthly expenditure, drop in income, increased distance to main markets induce food deprivation leading to undernourishment. On the other hand, the inefficient public transportation is one of the reasons of stress among the resettlers. Regarding *access to common public facilities*, the study found that most of the students in primary school have a good accessibility to public schools because the majority can walk between one to three kilometers to school. Likewise, most of the households when seeking healthcare and market services, use the walking mode because they find the those services closer to them. Moreover, for some who use buses to such common facilities, the transport service is relatively good in term of availability and the price is low as the distance is short. Thus, relocation far from primary and secondary schools, health facilities and markets would induce the risk of loss of access to such common facilities. Resettled households are likely to lose their social networks. The

reason is the high cost of transport due to the poor public transport service and long distance from their origin settlement. Separation of descendants and their family was a specific risk of *social disarticulation* faced by the households resettled in Bumbogo. The long distance through a dead road to the nearest bus stop and the cost of transport are a constraint for students in secondary schools to go to schools every day from their resettlement site. Thus, they prefer to stay in families of relatives or friends living in the city where the transport will be easily accessible and cheap. The study found that the inefficient transport system is a new and specific impoverishment risk form in the resettlement process of Gasabo. Limited availability of public transport both spatially and temporally in some part of the district, increased distance to the nearest bus stop and bus roads are indicators of the risk of inefficient public transportation system. Clear links among the above impoverishment risks were identified. The landlessness risks and joblessness risks are the core of that process of visible and invisible impoverishment risks. Therefore, while designing any risks mitigation initiative, the program should give much attention to those two risk forms. Uncertainty is another risk of impoverishment which is induced by the lack of information on modalities of compensation.

The third objective was to develop a model for equitable resettlement site selection.

For an equitable resettlement site, the first question was "*how can the principle of equity be applied in resettlement site selection"*. The answer to this question is that the equitable resettlement will be achieved when the identified impoverishment risks are minimized and avoided as much as possible. Risks reversal strategies which could help to achieve that objective were developed. The strategies were used to analysis the suitability of potential resettlement sites. Spatial multi-criteria analysis technique (SMCE) was used to analyze the suitability of those sites. Thus, after identifying the potential sites and developing the criteria for their suitability analysis, the next step was to know " *What are the relative importance of the impoverishment indicators in affecting the livelihood of the affected households*?*",* the so called indicators weights. Two subsets of indicators were considered including criteria for access to job opportunities and access to basic services. The findings show that the households give more importance to job opportunities restoration than the basic services that should be provided in the new site. According to community preferences, resettlement sites closer to the CBD were the most preferred. The reason is that the majority of households to be relocated depend on income from informal employments and other income generating activities which are mostly found in vibrant areas like a city center. This was followed by the distance to commercial centers including their current occupation sites Nyabugogo center and Gatsata. Finally, the distance to Gatsata area was also preferred because of its proximity to their jobs location and the Nyabugogo main bus stop. The required basic services were ranked in this sequence: markets, schools, heath facilities, bus route and bus stop. While the preferences of the criteria defining access to job opportunities were common across most of households, the preferences regarding basic infrastructure are different in those households. The last question was *"What are the potential resettlement sites that can help to minimize impoverishment risks?"*. Five suitability levels of potential resettlement zones including the very highly suitable, suitable, moderately suitable, lowly suitable and very lowly suitable levels were defined in two scenarios namely walking scenario and public transport scenario each scenario. A large proportion of highly suitable land is found in the southern part of the district with a clear pattern around the urban core. The moderately suitable land is found in the south eastern part of the district. The southern region of Gasabo is more suitable than the north part because of its proximity to the city core and take advantage of its location to benefit from basics facilities in neighboring districts (Nyarugenge and Kicukiro) of the Kigali city. The public transport scenario has more highly suitable and suitable land compared to the walking scenario. Sensitivity analysis shows that the suitability results might be influenced by the thresholds distance to opportunities and the development of new job and basic services opportunities. The site suitability analysis provided valuable

insight of where candidates resettlement sites might be selected. However, additional factors such as land value and land tenure may influence the final site selection.

7.2. Recommendations

The research was able to link the socio-economic characteristics of the households that need to be relocated with their impoverishment risks and how these can be minimized through the selection of suitable resettlement sites. However, on the base of gathered data, the methodology adopted and based on the findings, the following recommendations are advocated:

To researchers:

- This study considered only the impoverishment risks of displaced people and how this can be minimized. A study which includes the resettlement impacts on the host community could help to decide on the balanced strategies to achieve equitable resettlement where everyone affected by the program will gain rather than losing. For instance, the evaluation of impacts on the host community will help to avoid the competition for which the present study did not consider.

- This study recognizes that strategies for a resettlement process to overcome impoverishment risks need more than just spatial factors. Other non-spatial and dimensions of access such as availability, affordability, accommodation (Obrist et al., 2007) should be considered in impoverishment risks reversal strategies. For instance, availability would include the extent to which available opportunities and services correspond with the needs of people. In addition, the size of the population in the settlement and the quantity of resources available for delivering a service could be considered to avoid the problem of competition for jobs and other basic resources opportunities. In addition, the cost of spatial accessible services such as schools, health, markets, transport etc compared to the income of the household should be considered. This refers to the affordability dimension which defines the degree of fit between the full costs and individual's ability to pay, in the context of the household budget. Days and hours of operation of the public transportation and markets services should also be taken into consideration. This is an accommodation dimension which shows the relationship between the manner in which the supply resources are organized to accept clients and the clients ability to accommodate to that organization.

To planners:

- Communication of the type "Authority to affected people" of clear information is a cornerstone to achieve the overall efficient in impoverishment risks mitigation. It is a foundation of trust which allow the households to rise their voices.

- Resettlement should be conceived as a development program aiming at improving the living standard of the households rather than the mere relocation from high risk zones. By thinking in this way, resettlement could be an opportunity to boost the economy of the city.

- Efficient public transport will increase the suitability level of potential sites. Therefore, decision makers should be aware that a coordinated group of policies involving public transportation services in resettlement planning will have a great influence on the suitability of potential resettlement sites than any other single action.

- The site suitability analysis has been limited to Gasabo district where all potential resettlement zoning were not available. It would be better to identify potential resettlement sites at the level of the city of Kigali.

To citizens

- It is important for the citizens to recognize that a resettlement program might have its benefits and costs in terms of impacts. Therefore, as stakeholders, their contribution should focus on providing positive solutions to avoid their impoverishment rather than perceiving the negative consequences only. This engagement will allow them maximizing the benefits and minimize the costs.

LIST OF REFERENCES

Abebe, G., & Hesselberg, J. (2015). Community participation and inner-city slum renewal: relocated people's perspectives on slum clearance and resettlement in Addis Ababa. *Development in Practice*, *25*(4), 551–562. http://doi.org/10.1080/09614524.2015.1026878

ADB. (1998). *Handbook on Resettlement: A Guide to Good Practice*. Manila,Philippines: Asian development bank.

ADB. (2012). *Involuntary Resettlement Safeguards: A Planning and Implementation Good Practice Sourcebook*. Retrieved from http://www.adb.org/documents/involuntary-resettlement-safeguards-planning-and-implementation-good-practice-sourcebook-d

Agba, A. M. O., Akpanudoedehe, J. J., & Ushie, E. M. (2010). Socio-Economic and Cultural Impacts of Resettlement on Bakassi People of Cross River. *Science*, *1*(2), 50–62.

Bala, M. (2006). Theory of Social Justice and Involuntary Resettlement. *Indian Journal of Human Development*, *2*(2). http://doi.org/10.2139/ssrn.939689

Bartolome, L. J., de Wet, C., Mander, H., & Nagraj, V. K. (2000). *Rehabilitation , Reparation , and Development*. WCD thematic review I.3 prepared as input to the World Commission on Dams,Cape Town.

Baud, I., Sridharan, N., & Pfeffer, K. (2008). Mapping Urban Poverty for Local Governance in an Indian Mega-City: The Case of Delhi. *Urban Studies*, *45*(7), 1385–1412. http://doi.org/10.1177/0042098008090679

Beamish, J. O., Carucci Goss, R., & Emmel, J. (2001). Lifestyle influences on housing preferences. *Housing and Society*, *28*(1-2), 1–28.

Bose, P. S. (2007). Chris de Wet (Ed.), Development-Induced Displacement: Problems, Policies and People. *Journal of International Migration and Integration / Revue de L'integration et de La Migration Internationale*, *8*(2), 243–244. http://doi.org/10.1007/s12134-007-0020-1

Buckley, R. (2014). Affordable housing in Rwanda: Opportunities,Options and Challenges: Some perspectives from the international experience. In *The Centre for International Growth Conference, Rwanda national Forum on sustainable Urbanization*. Kigali. Retrieved from http://www.theigc.org/wp-content/uploads/2014/08/Buckley-2014.pdf

Cernea, M. (1997). The risks and reconstruction model for resettling displaced populations. *World Development*, *25*(10), 1569–1587. http://doi.org/10.1016/S0305-750X(97)00054-5

Cernea, M. (2004). Impoverishment Risks, Risk Management, and Reconstruction: A Model of Population Displacement and Resettlement. In *UN symposium on Hydropower and sustainable development*. Beijing.

Cernea, M. M. (1988). *Involuntary Resettlement in Development Projects: Policy guidelines in World Bank-financed projects* (Vol. 80). Washington DC: World Bank Publications.

Cernea, M. M. (1993). *The urban environment and population relocation. World Bank Discussion Papers* (Vol. 152).

Cernea, M. M. (1998). Impoverishment or social Justice? A Model for Planning resettlement. In H. M. Marthur & D. Marsden (Eds.), *Development Projects and Impoverishment Risk.resettling Project-Affected people in India.* Delhi: Oxford University press.

Cernea, M. M. (1999). *The economics of involuntary resettlement: questions and challenges*. Washington DC: World Bank Publications.

Cernea, M. M. (2003). For a new economics of resettlement: a sociological critique of the compensation principle. *International Social Science Journal*, *55*(175), 37–45. http://doi.org/10.1111/1468-2451.5501019_3

City of Kigali. (2010). *Detailed Master Plan and Urban Design Report for CBD1,CBD2 and Kimicanga*. Retrieved from http://www.masterplan2013.kigalicity.gov.rw/downloads/Docs/RWF0801-Central Business District.pdf

City of Kigali. (2013a). *City Development Plan(2013-2018)*. Retrieved from http://www.kigalicity.gov.rw/IMG/pdf/Final_Report_KCDP.pdf

City of Kigali. (2013b). *Gasabo District zoning plan*. Retrieved from http://www.masterplan2013.kigalicity.gov.rw/downloads/Docs/RWF1101_11_Gasabo_Zoning Report_04062013-s.pdf

City of Kigali. (2013c). *Gasabo district: Detailed master plan report*. Retrieved from http://www.masterplan2013.kigalicity.gov.rw/downloads/Docs/RWF1101_05_Gasabo_Detailed Master Plan Report_03062013-s.pdf

Claudianos, P. (2014). Out of Harm's Way; Preventive Resettlement of at Risk Informal Settlers in Highly Disaster Prone Areas. *Procedia Economics and Finance*, *18*, 312–319. http://doi.org/10.1016/S2212-5671(14)00945-9

Correa, E., Ramírez, F., & Sanahuja, H. (2011). *Populations at Risk of Disaster A Resettlement Guide*. Washington, DC: The World Bank:GFDRR (Global Facility for Disaster Reduction and Recovery).

Corsellis, T., & Vitale, A. (2005). *Transitional settlement: displaced populations*. Cambridge: Oxfam. Retrieved from http://sheltercentre.org/library/transitional-settlement-displaced-populations-tsdp

Dagnachew Shibru, M., Suryabhagavan, K. ., Mekuria, A., & Hameed, S. (2014). Application of AHP for Environment Suitability Analysis of resettlement Site Selection: Chawaka District,Wesrern Ethiopian. *International Journal of Geoinformatics*, *10*(2), 63–72.

Dixon, J., & Ramutsindela, M. (2006). Urban resettlement and environmental justice in Cape Town. *Cities*, *23*(2), 129–139. http://doi.org/10.1016/j.cities.2005.08.003

El-Masri, S., & Tipple, G. (2002). Natural Disaster, Mitigation and Sustainability: The Case of Developing Countries. *International Planning Studies*, *7*(2), 157–175. http://doi.org/10.1080/13563470220132236

Gasabo district. (2013). *Gasabo District Development Plan 2013-2018*. Retrieved from http://www.gasabo.gov.rw/uploads/media/Gasabo_DDP_2013-2018.pdf

Geurs, K. T., & van Wee, B. (2004). Accessibility evaluation of land-use and transport strategies: review and research directions. *Journal of Transport Geography*, *12*(2), 127–140. http://doi.org/10.1016/j.jtrangeo.2003.10.005

Government of Rwanda. (2005). *Official Gazette of the Republic of Rwanda No . 04 / 2005 of 08 / 04 / 2005 Organic Law Determining the Modalities of Protection , Conservation and Promotion of the Environment in Rwanda*.

Heming, L., & Rees, P. (2000). Population displacement in the Three Gorges reservoir area of the Yangtze River,Central China: relocation policies and migrant views. *International Journal of Population Geography*, *6*(6), 439–462.

Hong, P. Y. P., Singh, S., & Ramic, J. (2009). Development-induced impoverishment among involuntarily displaced populations. *Journal of Comparative Social Welfare*, *25*(3), 221–238. http://doi.org/10.1080/17486830903189972

Hunter, M., & Posel, D. (2012). Here to work: the socioeconomic characteristics of informal dwellers in post-apartheid South Africa. *Environment and Urbanization*, *24*(1), 285–304. http://doi.org/10.1177/0956247811433537

Ibrahim, I., Muibi, K. H., Alaga, A. T., Babatimehin, O., Ige-Olumide, O., Mustapha, O.-O. O., & Hafeez, S. A. (2015). Suitability Analysis of Resettlement Sites for Flood Disaster Victims in Lokoja and Environs. *World Environment*, *5*(3), 101–111.

IDMC. (2011). *Displacement due to natural hazard-induced disasters: Global estimates for 2009 and 2010*. Retrieved from http://reliefweb.int/sites/reliefweb.int/files/resources/Full_Report_1079.pdf

Karou, S., & Hull, A. (2014). Accessibility modelling: predicting the impact of planned transport infrastructure on accessibility patterns in Edinburgh, UK. *Journal of Transport Geography*, *35*, 1–11. http://doi.org/10.1016/j.jtrangeo.2014.01.002

Kigali city. (2013). *Kigali city master plan*. Retrieved from http://kcps.gov.rw/index.php?id=44

Kinsey, B. H., & Binswanger, H. P. (1993). Characteristics and performance of resettlement programs: A review. *World Development*, *21*(9), 1477–1494. http://doi.org/10.1016/0305-750X(93)90128-V

Koening, D. (2002). *Toward local development and mitigating impoverishment in development-induced displacement and resettlement*. Washington DC. Retrieved from http://www.rsc.ox.ac.uk/files/publications/working-paper-series/wp8-development-induced-displacement-resettlement-2002.pdf

Kumar, M., & Biswas, V. (2013). Identification of Potential Sites for Urban Development Using GIS Based Multi Criteria Evaluation Technique . A Case Study of Shimla Municipal Area, Shimla District, Himachal Pradesh, India. *Journal of Settlement and Spatial Planning*, *4*(1), 45–51.

Kumar, R. (2011). *Research Methodology: a step-by-step guide for beginners* (3rd ed.). London: SAGE Publications Ltd.

Ligmann-Zielinska, A., & Jankowski, P. (2008). A framework for sensitivity analysis in spatial multiple criteria evaluation. In T.J. Cova et al. (Ed.), *Geographic Information Science* (pp. 217–233). Berlin Heidelberg: Springer.

Malczewski, J. (2004). GIS-based land-use suitability analysis: a critical overview. *Progress in Planning*, *62*(1), 3–65. http://doi.org/10.1016/j.progress.2003.09.002

Manirakiza, V. (2014). Promoting inclusive approaches to address urbanisation challenges in Kigali. *African Review of Economics and Finance*, *6*(1), 161–180.

May, J., & Norton, A. (1997). "a Difficult Life": The Perceptions and Experience of Poverty in South Africa. *Social Indicators Research*, *41*(1), 95–118. http://doi.org/10.1023/A:1006844300934

MIDIMAR. (2012a). *Disaster high risk zones on floods and landslides*. Kigali. Retrieved from http://www.preventionweb.net/files/28208_highriskzonesreportfinalpublication.pdf

MIDIMAR. (2012b). *Field report on informal settlement: Case study: The city of Kigali*.

MININFRA. (2013). *Urbanization and rural settlement sector: strategic plan 2012/13-17/18*. Retrieved from http://www.rha.gov.rw/fileadmin/user_upload/Documents/Final_Urbanization_Sector_Strategic_Plan_131210_.pdf

MININFRA. (2014). *National housing policy*. Kigali. Retrieved from http://www.housingfinanceafrica.org/wp-content/uploads/2015/07/Housing-Policy.pdf

Ministry of Health. (2009). *Health Sector Strategic Plan: July 2009-June 2012*. Retrieved from http://www.internationalhealthpartnership.net/fileadmin/uploads/ihp/Documents/Country_Pages/Rwanda/Rwanda Health Sector Strategic Plan 2009-2012%5B1%5D.pdf

Modi, R. (2009). *Beyond Relocation: The Imperative of Sustainable Resettlement*. Sage Publications India.

National Institute of Statistics of Rwanda (NISR), & Ministry of Finance and Economic Planning (MINECOFIN). (2012). *Rwanda Fourth Population and Housing Census. District Profile: Gasabo*.

NISR. (2011). *EICV3 district profile: Kigali-Gasabo*. Kigali. Retrieved from statistics.gov.rw/system/files/user_uploads/files/books/Gasabo.pdf

Niyonsenga, D. (2012). *Assessing Public Transport Supply for Kigali, Rwanda (Msc Thesis Dissertation)*. University of Twente, Faculty of Geo-Information Science and Earth Obervation (ITC). Retrieved from http://www.itc.nl/library/papers_2012/msc/upm/niyonsenga.pdf

Obrist, B., Iteba, N., Lengeler, C., Makemba, A., Mshana, C., Nathan, R., … Mshinda, H. (2007). Access to Health Care in Contexts of Livelihood Insecurity: A Framework for Analysis and Action. *PLoS Medicine*, *4*(10), e308. http://doi.org/10.1371/journal.pmed.0040308

Parnell, S., & Walawege, R. (2011). Sub-Saharan African urbanisation and global environmental change. *Global Environmental Change*, *21*, S12–S20. http://doi.org/10.1016/j.gloenvcha.2011.09.014

Patel, S., D'Cruz, C., & Burra, S. (2002). Beyond evictions in a global city: people-managed resettlement in Mumbai. *Environment and Urbanization*, *14*(1), 159–172. http://doi.org/10.1177/095624780201400113

Patel, S., Sliuzas, R., & Mathur, N. (2015). The risk of impoverishment in urban development-induced displacement and resettlement in Ahmedabad. *Environment and Urbanization*, *27*(1), 231–256. http://doi.org/10.1177/0956247815569128

Quetulio-Navarra, M., Niehof, A., Van der Horst, H., & van der Vaart, W. (2014). Short-term risk experience of involuntary resettled households in the Philippines and Indonesia. *Habitat International*, *41*, 165–175. http://doi.org/10.1016/j.habitatint.2013.07.013

REMA. (2013). *Kigali state of environment and outlook*. Kigali. Retrieved from http://na.unep.net/siouxfalls/publications/Kigali_SOE.pdf

Robinson, C. (2003). *Risks and Rights: The Causes, Consequences, and Challenges of Development-Induced Displacement*. Washington DC. Retrieved from http://www.brookings.edu/fp/projects/idp/articles/didreport.pdf

Rwanda Housing Authority. (2013). *Profiling and providing indication of the status quo and trends in informal seetlement and propose mechanisms for their upgrading in Kigali city*.

Satiroglu, I., & Choi, N. (2015). *Development-Induced Displacement and Resettlement: New perspectives on persisting problems*. Hoboken: Taylor and Francis.

Schmidt-Soltau, K. (2003). Conservation-related resettlement in Central Africa: Environmental and social risks. *Development and Change*, *34*(3), 525–551. http://doi.org/10.1111/1467-7660.00317

Scudder, T. (1981). What It Means to be Dammed:the anthropology of large-scale development projects in the tropics and subtropics. *Engineering and Science*, *44*(4), 9–15.

Scudder, T. (2012). Resettlement outcomes of large dams. In A. K. B. Cecilia Tortajada, Dogan Altinbilek (Ed.), *Impacts of large dams: A global assessment* (pp. 37–67). Berlin Heidelberg: Springer.

Takesada, N., Manatunge, J., & Herath, I. L. (2008). Resettler choices and long-term consequences of involuntary resettlement caused by construction of Kotmale Dam in Sri Lanka. *Lakes and Reservoirs: Research and Management*, *13*(3), 245–254. http://doi.org/10.1111/j.1440-1770.2008.00374.x

Teunissen, T., Sarmiento, O., & Brussel, M. (2013). Mapping Equity in Access: The case of Bogota's Sustainable Transportation Initiatives. *Intrnational Journal of Sustainable Transport*, *9*(7), 457–467. http://doi.org/10.1080/15568318.2013.808388

Tobler, W. (1993). *Three presentations on geographical analysis and modeling:Non-Isotropic Geographic Modeling; Speculations on the Geometry of Geography;Global Spatial Analysis*. *National center for geographic information and analysis*. Retrieved from http://www.geodyssey.com/papers/tobler93.html

Usamah, M., & Haynes, K. (2012). An examination of the resettlement program at Mayon Volcano: What can we learn for sustainable volcanic risk reduction? *Bulletin of Volcanology*, *74*(4), 839–859. http://doi.org/10.1007/s00445-011-0567-8

Voogd, H. (1982). *Multicriteria Evaluation for Urban and Regional Planning (Doctoral dissertation)*. Delftsche Uitgevers Maatschappij, Delft.

Weisbrod, G. E., Lerman, S. R., & Ben-Akiva, M. (1980). Tradeoffs in residential location decisions: transportation versus other factors. *Transport Policy and Decision Making*, *1*(1), 13–26. Retrieved from http://www.edrgroup.com/images/stories/Transportation/tradeoffs-tpd.pdf

Wekesa, B. W., Steyn, G. S., & Otieno, F. A. O. (2011). A review of physical and socio-economic characteristics and intervention approaches of informal settlements. *Habitat International*, *35*(2), 238–245. http://doi.org/10.1016/j.habitatint.2010.09.006

Yin, K. R. (2003). *Case study research: Design and methods* (3rd ed.). London: Sage Publications.

Zucca, A., Sharifi, A. M., & Fabbri, A. G. (2008). Application of spatial multi-criteria analysis to site selection for a local park: a case study in the Bergamo Province, Italy. *Journal of Environmental Management*, *88*(4), 752–69. http://doi.org/10.1016/j.jenvman.2007.04.026

APPENDICES

APPENDIX 1: INTERVIEW GUIDE WITH RESETTLED PEOPLE

I. General information

1. Name of the respondent:
2. Current address (cell, village):
3. Previous address (cell, village):
4. Age:
5. Sex: Male Female
6. Religion:
7. Marital Status:
   Married Single Divorced Widowed

Family members	Sex	Age	Education level	Occupation/employment	
				Before	After
1.					
2.					
3.					
4.					

Education level: Illiterate, Primary school, High School, graduate, others

Occupation/employment: Laborers, artisans, merchants, small business, others

II. Home ownership

1. How have your land/ home ownership changed after resettlement?

Before **After**

Owner

Tenant

III. Ability to use skills

1. Have you been able to utilize your previous skills after shifting to this area? Yes / No
2. Have you changed your job since you came in this area?
   Yes No
   If yes, why?

3. Did the displacement had any negative effect on accessing your job?
   Yes No
   If yes which?

IV. Children education

1. Were your children studying before coming here
2. Are they still studying? if yes where?
3. If no, why (have they finished or stopped?)
4. If they have stopped, why?
5. Did you transfer your children to another school?

Distance to school Less than 1 Km, 1-3 Km, 3-5km, More than 5Km		Transport mode By Foot, Bus, Car, Motorcycle, others		Cost of transport	
Before	**After**	**Before**	**After**	**Before**	**After**

V. Family income and expenditure

	Before	**After**
Income generating activities		
Monthly income (increased, decreased, no change)		
Monthly expenditure(increased, decreased, no change)		

VI. Job opportunities and income

1. In comparison to the previous settlement how is it easier to get job here?
   Very difficulty, difficulty, easy ,very easy
2. What kind of job opportunities exists?
3. How did moving to the resettlement sites affect your savings?
4. How did moving to the resettlement sites affect your ability to access credit?

VII. Distance to work place

1. How far is the resettlement site from your place of employment?
2. How did moving change the accessibility to your employment?

Distance to work place		**Transport mode**		**Cost of transport**	
Before	After	Before	After	Before	After

VIII. Housing

1. How did the resettlement change the following services in your house?

Dwelling standards and services availability

Dwelling and available services	**Before**	**After**
Water source(**large distance, small distance, no change to the source)** Source type **(Public or home-based tap)** Availability: **Improved** **Deteriorated** **No change**		
Electricity Availability **(improved, deteriorated, no change)**		
House size **(number of rooms) Satisfied, dissatisfied, don't know)**		

IX. Social status

1. Have you been able to maintain your previous social networks? Explain
2. How did the project separated you from your friends/ relatives?
   Increased distance Increased cost of transport
3. Did moving affect your connections with associations and community groups that financially supported you?
   Increased distance Increased cost of transport
4. Have your social networks been affected in any other way? Explain

X. Accessibility to amenities and services

1. How did your moving to the resettlement site changed your access to common property?

Accessibility to amenities and services	**Before Increased, Decreased No change (Distance, travel time, cost of transport)**	**After Increased, Decreased No change (Distance, travel time, cost of transport)**
Accessibility to nearest bus stop		
Health facilities		
Schools		
Markets		
Churches or mosque		
Proximity to city center		
Access to transport services		

2. Do you think moving to the resettlement sites have changed your affordability of services?
3. How do you think moving to the proposed resettlement sites has affected your access to healthcare?

XI. Share of expenditure

Items	**Expenditure (Increased, decreased, not changed)**	**% of income Before**	**% of income After**
Food			
Clothing			
Transport cost			
Water			
Electricity			
Health			
Education			

1. Are you satisfied with the compensation package offered? Explain
2. Do you think the resettlement process covered your requirements? Explain

APPENDIX 2 : INTERVIEW GUIDE WITH AFFECTED HOUSEHOLDS/RESETTLEMENT REQUIREMENTS AND PERCEPTIONS ON IMPACTS

I. General information

3. Name of the respondent:
4. Current address:
5. Age:
6. Sex: Male Female
7. Religion:
8. Marital Status:
   Married Single Divorced Widowed

II. Household information

Household members	Sex	Age	Highest education level	Occupation/employment
1.				
2.				
3.				
4.				
5.				
6.				

Education level: Illiterate, Primary school, High School, graduate, others

Occupation/employment: Laborers, artisans, merchants, small business, others

III. Education and Accessibility to schools

1. How many of your children are studying in:
2. What is the distance from your house to school
3. What mode of transport do children use to go to school ?
4. Do you incur any transport costs for your children to go to school? If yes how much per day/month?

No	Current enrollment	Number of children	Private/Public	Location /Name	Distance to school: Less than 1 Km, 1-3 Km, 3-5km, More than 5Km	Transport mode: By Foot, Bus, Car, Motorcycle Other	Cost of transport
1.	Kindergarten						
2.	Primary schools						
3.	Secondary						
4.	University						

IV. Health facilities

1. What is the nearest health facility do you visit when you are sick?
2. Are the health facilities do you use to visit private or public?
3. How far are they from your home place?
4. What mode of transport do you use to go to the health facility ?
5. Do you incur any transport costs to go to the health facility? If yes how much per travel?

No	Nearest health facility used	Type: Private/Public	Location / Name	Distance to the HF: Less than 1 Km, 1-3 Km, 3-5km, More than 5Km	Transport mode: By Foot, Bus, Car, Motorcycle Other	Cost of transport
1.	Hospital					
2.	Heath center					
3.	Clinic					
4.	Traditional					
5.	Other:					

V. Land and house ownership

1. What is your house ownership?
2. Owner
3. Tenant
4. What is the type of the dwelling unit?
5. How many sleeping rooms per house?

House type:	**Number of sleeping rooms**
1. Detached	1.One room
2. Multifamily house	2.Two rooms
3. Several separate buildings	3.Three rooms
4. Several connected buildings	4. More than three

1. How long have you been living in this house?
2. Less than 2years 2-5 years 5-10 years More than 10 year
3.
4. Extent of the land on which the house is located/plot size

VI. Income generating activities

1. What do the heads of the house do for income earning?
2. Wife:
3. Husband:
4. How many jobs do you have?

5. Is your job temporary or permanent?
6. How far is your work place from home?
7. What mode of transport do you use to go to your work place?
8. How much do you pay for transport to your work place every day/ month?

Heads	Jobs:	Place/ Location	Distance to the work place: Less than 1 Km, 1-3 Km, 3-5km, More than 5Km	Transport mode: By Foot, Bus, Car, Motorcycle Other	Cost of transport
Husband					
Wife					

1. What is your average monthly income?
   (A) Below 10,000 (B) 10,000-30,000 (C) 30,000-50,000 (D) 50,000-100,0000(E) 100,000-200,000 (F) 200,000-500,000 (G) more than 500,000 Rwandan francs

2. Apart from this job, do you have any other source of income? If yes which?
   Hair salon Couture Welding others:

3. Do you have any home-based income activity? Which one?
   Cooking for restaurant Livestock Others:
4. Do you own any house for residential or business purpose for renting? How many? How much on average does each cost?
5. Do you have any personal savings? If yes, how much per month
6. Are you a member of any saving group in the settlement?

VII. Physical infrastructure: Access to water, sewerage, electricity, road, transport and other amenities

1. What is the source of power/light?
   Electricity Generator Solar energy Candle Others:

2. What is the main source of water for your household uses?
   Home tap Public tap Spring/Well Any other:

3. If not home tap, how far is located the water source from your house?
   Less than 1 Km, 1-3 Km, 3-5km, More than 5Km

4. How do you dispose of your liquid waste?
   Pit latrine Gravity Septic tank Others:

5. How do you dispose of your solid waste?
   Municipal collection Burn Dump in the drainage Others:

6. Toilet facilities available

Toilet Type	Individual	Shared with others
Water seal		
Pit latrine		
Any other		
No facility		

7. How far is it from your house to the nearest bus stop?
   Less than 1 km, 1-3 km, 3-5km, More than 5km

8. How far is it from your place to your church?
   Less than 1 km 1-3 km 3-5km More than 5km

VIII. Market places

1. How far is it from your place to the city centre?
   Less than 1 km 1-3 km 3-5km More than 5km

2. What are the markets do you use for buying needed items?
3. How far is it your preferred market places?

No	Markets they like to use	Items looking for	Name/ Location	Distance from home : Less than 1 Km, 1-3 Km, 3-5km, More than 5Km	Transport mode: By Foot, Bus, Car, Motorcycle Other	Cost of transport
1.						
2.						
3.						
4.						
5.						

IX. Job opportunities in the settlement area

1. What kind of professional skills do you have?
   Moto drivers
   Car drivers
   Masonry /Carpentry
   Mechanic/Electrical/ Electronic
   Others:
2. What types of job opportunity do you find in this area?

3. When you shift from this area, do you think you will still be able to use your skills?
4. When relocated, what kind of job would you like to do? The same you're doing now or something else? Specify

X. Social status

1. Do you have any other family members, relatives and friends living in this village settlement ?
2. Will you be resettled together?
3. Are you involved in any associations/ groups in this area? (formal/informal)
4. When you will shift from here, will you continue to participate in those associations? Yes or No
5. After shifting to the new site how often do you plan to meet your relatives and friends living in this village?
   Often Sometime Rarely Never

XI. Awareness and community participation

1. Have you been informed about the resettlement project
2. When were you informed about the resettlement project?
3. How were you informed?
4. Were the project details made clearly available to you?
5. Were you involved in making decisions regarding the project? If yes, How?

XII. Perceptions of affected households on possible impacts of resettlement

1. Will the resettlement project give you land/ home ownership? What is your income category?
2. How will you be able to reconstruct a house?
3. Very difficult Difficult Easy Very easy Don't know
4. Do you often use to discuss resettlement with your family members or friends?
5. Do you feel that you're going to lose something because you will be displaced?
6. What do you think you will lose because of displacement? explain how
7. Can you make a distinction between material and non material losses?
8. How your moving to the proposed resettlement sites will change your access to common property? Such as Market place Schools Hospitals
9. How will the project separate you from your friends/ relatives?
10. How will moving affect your connections with associations and community groups that supported you?
11. How will the project affect access to education of your family members?
12. How do you think moving to the proposed resettlement sites will affect your health?
13. How will the project change the accessibility to your employment?
14. How moving to the proposed resettlement sites will affect your savings
15. Can you rank the losses by their importance in affecting your living conditions
16. What would you like to receive in exchange of having to leave your house and your current settlement when relocated somewhere else?
17. What location do you prefer to be your resettlement area?
18. Near origin, Near the city, Near commercial area,
19. What public facilities do you think the government should provide in the new settlement to be able to improve your living conditions?
20. How would you prioritize the following facilities in the new village (sector)?
21. Schools, Markets, Health facilities, Water, Electricity, Road, Bus stop, Job opportunities, Cooperatives

APPENDIX 3: INTERVIEW GUIDE WITH KEY INFORMANTS

Institution:

I. General information

Current occupation:

1. What is your role/responsibilities in Kigali resettlement program of people living in wetlands and steep slopes

II. Perceived capacity of compensation to improve livelihood and risks of impoverishment

2. What is the compensation package given to the displaced households?

3. What are the resettlement sites has the program provided?

4. Which factors were considered in designing and choosing resettlement options?

5. Do you think the resettlement options and compensation provided to the displaced people were enough to restore and improve their livelihoods?

6. Can you please justify your answer?

7. In what ways do you think the displacement has affected the livelihoods of the households?

8. What do you think are the main impoverishment risks faced by the displaced people? Multiple answers are possible.

   Landlessness
   Joblessness
   Homelessness
   Marginalization
   Food insecurity
   Morbidity and mortality
   Less access to common property
   Others, Specify please.

9. Can you please justify your answers?

10. Can you list by order to show how important are the impoverishment risks forms as considered in the resettlement program of people from wetlands and steep slopes?

III. Consideration on resettlement options to minimize impoverishment risks

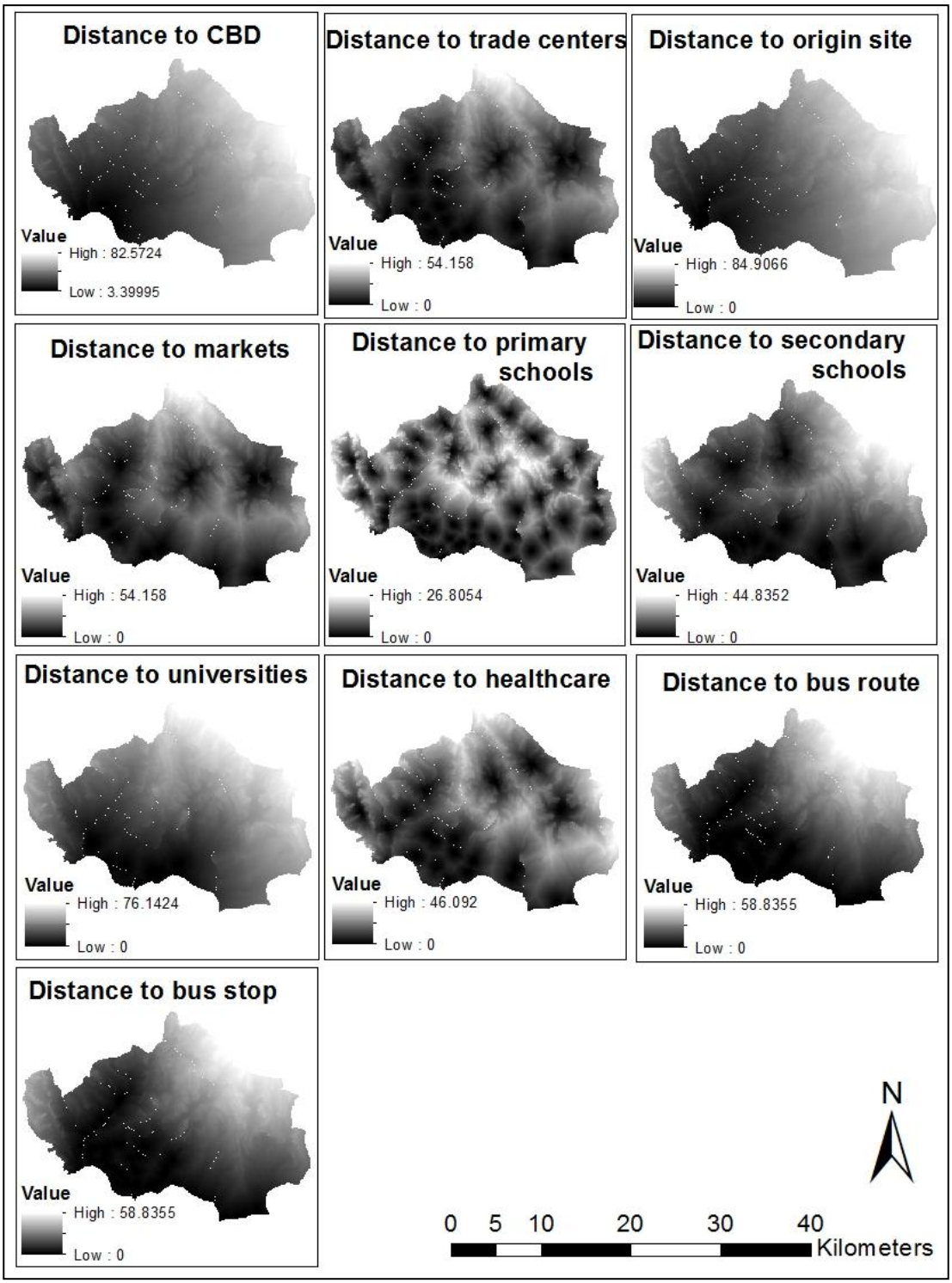
11. What strategies do you think could be appropriate in addressing displacement induced deprivations?

12. What challenges (if any) did the government face in implementing the reestablishment of the livelihoods of displaced households?

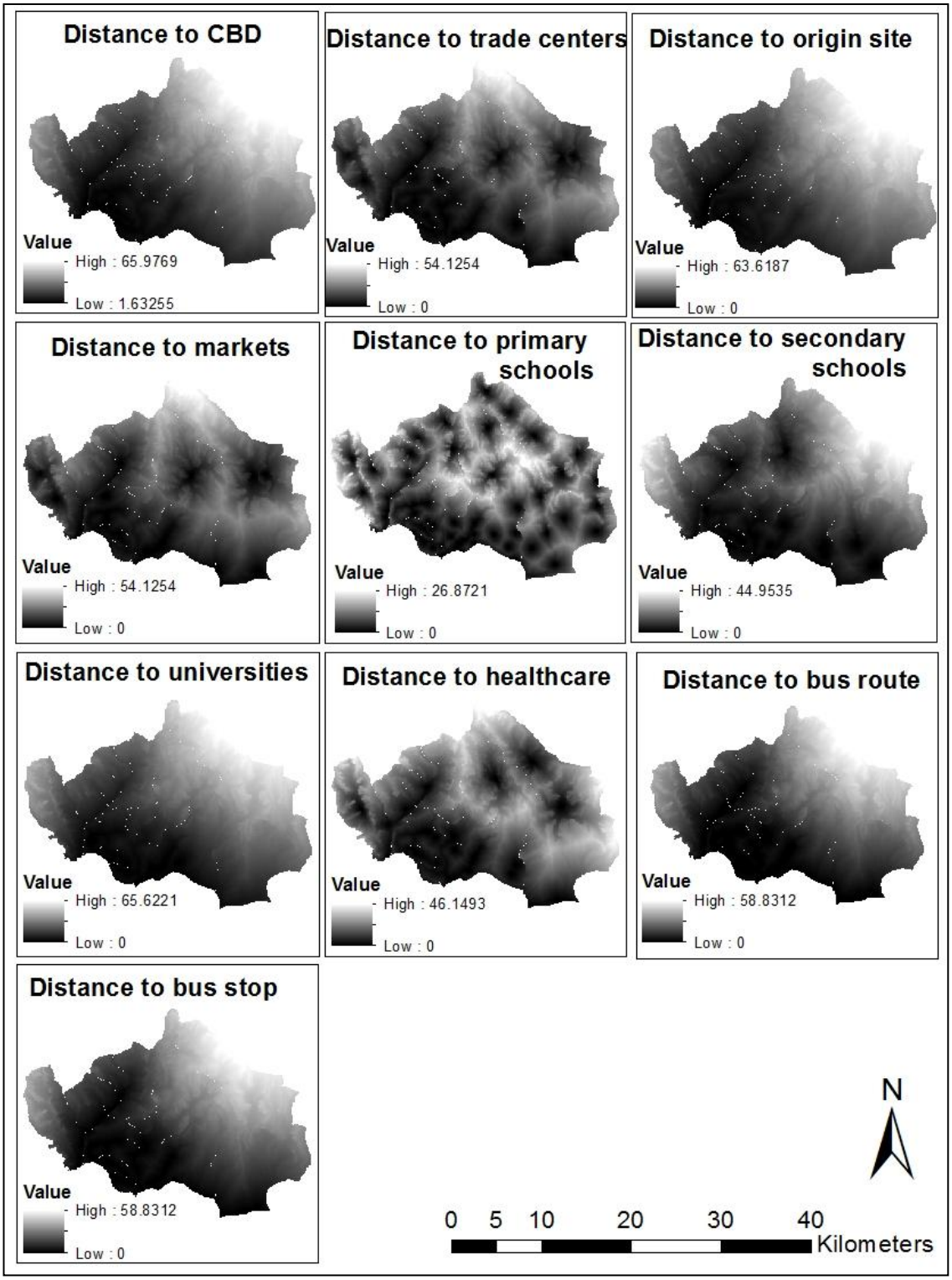
13. Recommendations for future resettlement programs: what innovative schemes do you think could be appropriate in addressing displacement effects on livelihoods

APPENDIX 4: FACTOR MAPS

Walking scenario



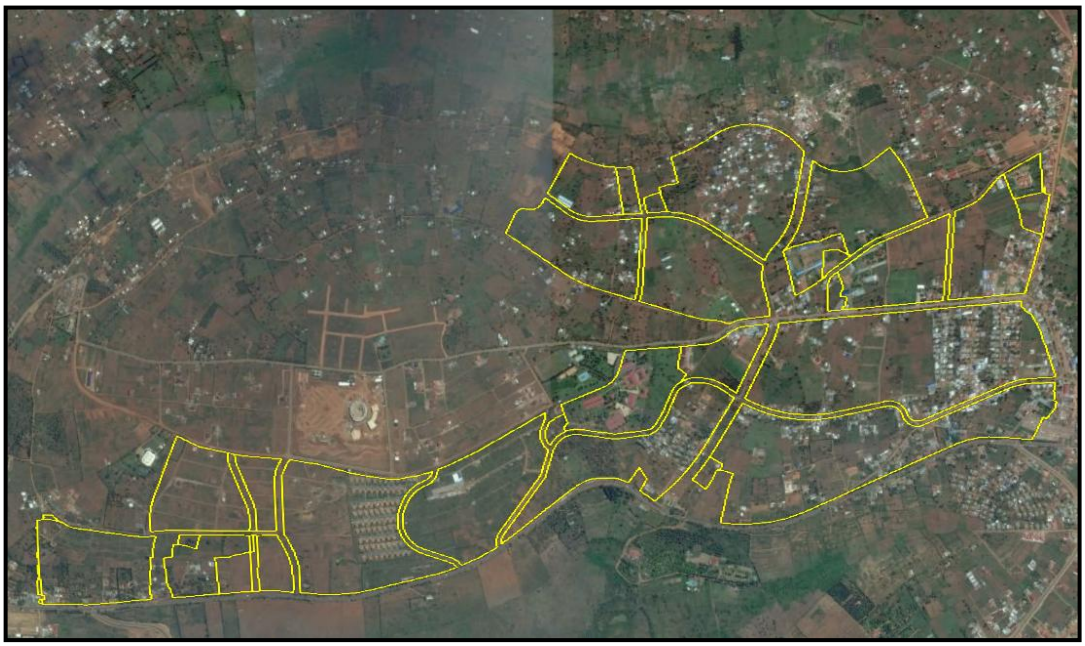
Public transportation scenario



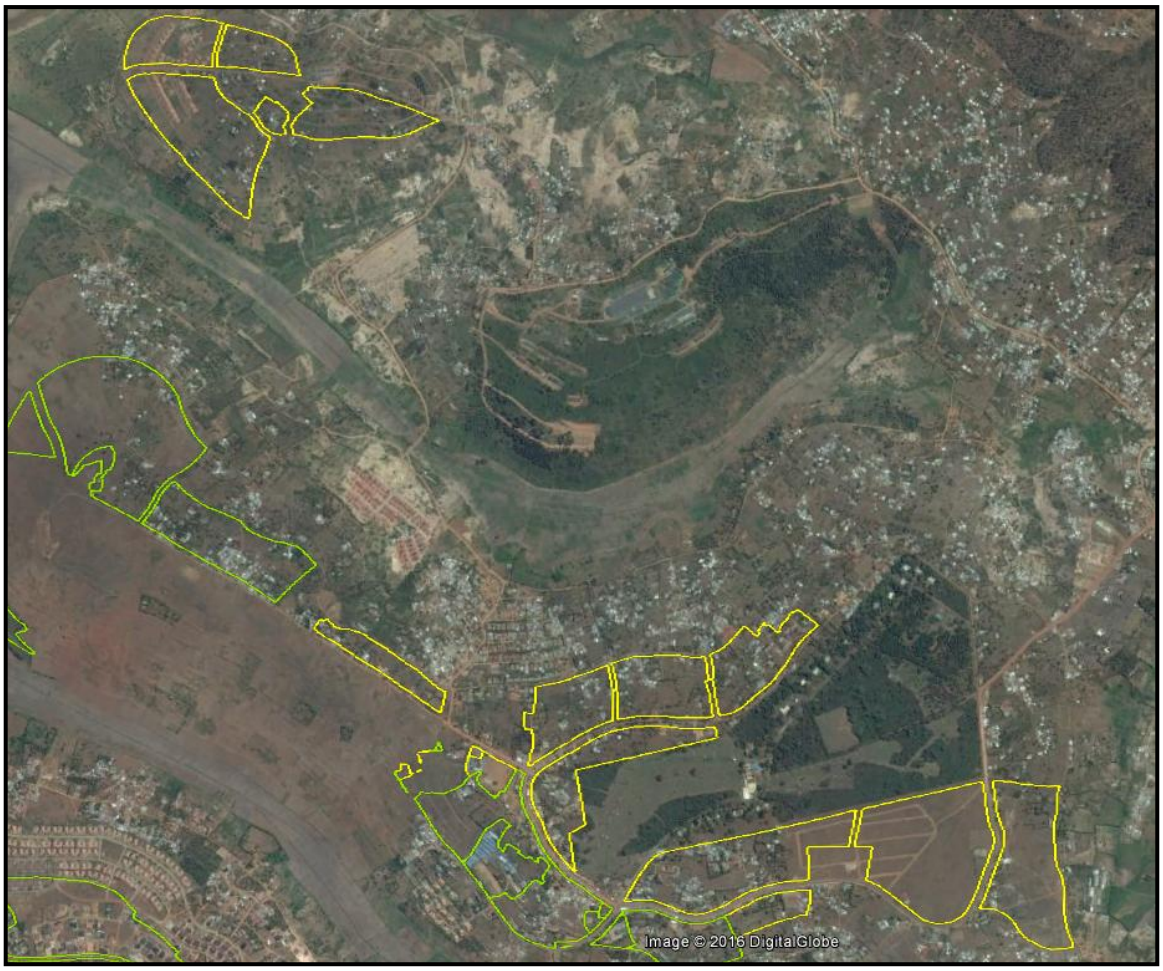
APPENDIX 5: SOME OF POTENTIAL RESETTLEMENT SITES HAVING VACANT LAND

Satellite image of 2016 showing potential suitable areas having vacant land in Kinyinya sector in the walking scenario (Source of image: Google Earth 2016).

Satellite image of 2016 showing potential moderately suitable areas having vacant land Rusororo sector in the walking scenario (Source of image: Google Earth 2016).



Satellite image of 2016 showing potential suitable and moderately suitable areas having vacant land in Kinyinya sector in the walking scenario (Source of image: Google Earth 2016).



Satellite image of 2016 showing potential highly suitable areas without vacant land in Kacyiru sector in the walking scenario (Source of image: Google Earth 2016).