



College of Science and Technology

School of Architecture and Built Environment

Department of Architecture

Thesis for Graduation in Bachelor of Architecture

Housing typologies for the middle income of Kigali

Case Study: Nyarugenge District

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ABSTRACT

The goal of this thesis is to improve the well-being of the Nyarugenge people especially those from Mumena cell by providing them adequate architecture for their housing. Its objectives is to find how through architecture and better housing we can improve the quality of life the middle income people.

There is lack of proper housing in Mumena. The housing facilities of middle income people are not of an acceptable quality for a country with a vision like Rwanda. There is evident need of upgrading the quality of housing of Nyarugenge. There is also lack of housing typologies for the middle income population of Nyarugenge. This thesis aim to provide housing typologies that satisfies the needs of the middle income of Nyarugenge

This research was done using both qualitative and quantitative methods, where the qualitative methods emphasize on the quality of housing middle income people of Nyarugenge need in this time and in the future. The research was done by asking several questions to randomly chosen people found on site. It was be emphasized on the area of Mumena because that is where there is a potential of upgrading of existing housing, and is the area currently known being resided by the middle income.

The criteria that was based on used in this research were the elements of housing, either as a unit or as a group of units. These criteria include the form of the houses itself and the form of the houses as an ensemble. The other criteria is the materials used in the construction of these houses because they affect the design and the cost if the house. The last criteria was the size of the houses.

The data was collected in this research by first observation. The object of the observation was first the typologies of the houses that people live in at the moment. The other data collection method used in this research is the interview method. In sampling the people that would be interviewed the random method was used.

After collecting all the data through the above mentioned methods and analyzing them, the data analyzed provide meaningful relation between data and results and the statistics which in turn give another image to the data. Hence, this provide a new perspective or view that did not exist before the research.

Rwandese people need good and proper housing. It is important to provide solution to this issue of housing, especially among the middle income population.

DEDICATION

This work is dedicated to my family especially my mother and my sister who have supported me financially and mentally through it all. It is also dedicated to my friends and my classmates with whom we've been through this academic journey.

CERTIFICATION

This is to certify that this thesis entitled “**Housing typologies for the middle income of Kigali**” was done by Mbonabihama Christophe in partial fulfilment of the requirement of the 5th year dissertation, in the Architecture department, at University of Rwanda in the College of Science and Technology, during the academic year 2015-2016.

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TABLE OF CONTENTS

ABSTRACT.....	i
DEDICATION	ii
CERTIFICATION.....	iii
ACKNOWLEDGEMENTS.....	iv
TABLE OF CONTENTS.....	v
TABLE OF FIGURES	viii
LIST OF MAPS	viii
LIST OF TABLES.....	ix
DEFINITIONS OF TERMS	10
LIST OF ABBREVIATIONS	12
CHAPTER ONE	1
1.1. Introduction	1
1.2. Background of the problem	1
1.3. Architectural Statement of Problem.....	2
1.4. Thesis Assumptions.....	4
1.5. Background of Studies	5
1.6. Architectural Questions	7
1.6.1. Main question	7
1.6.2. Subsidiary questions	7
1.7. Architectural Goals and Objectives.....	7
1.7.1. Architectural goals	7
1.7.2. Architectural objectives	7
1.8. Significance of Thesis	8
1.9. Scope Study:.....	9
1.10. Architectural Methodologies	11
1.11. Limitations for the Thesis:.....	11
.....	11

CHAPTER TWO	12
2.1. LITERATURE REVIEW	12
2.1.1. Middle Income	12
2.1.2. Housing	14
2.1.3. Precedents	26
2.2. THEORETICAL FRAMEWORK	36
2.2.1. Criteria for designing	37
Amos Rapoport,	42
House Form and Culture	42
CHAPTER THREE	44
3.1. METHODOLOGY	44
3.2. AREA OF STUDY	45
3.2.1. Introduction	45
3.2.2. Chronological Process	47
3.2.3. Physical Development Process	51
3.2.4. Importance of specification	53
3.3. RESEARCH DESIGN	54
3.3.1. Primary data	55
3.3.1.1. Observation	55
3.3.1.2. Interview	55
3.3.2. Secondary data	56
3.3.2.1. Documents analysis	56
3.3.2.2. Mapping	56
3.3.4. Expectations of findings	57
3.4. Specification of data	57
3.4. Validity and reliability	59
CHAPTER FOUR	60
4.1. Data collection	60
4.2. Results of data	61
4.2.1. Site analysis	61
4.2.2. Observation results	68
4.2.3. Interview results	75

CHAPTER FIVE	84
5.1. Introduction	84
5.2. Findings	85
5.2.1. Form	85
5.2.2. Materials	86
5.2.3. Size	86
5.2.4. Other findings	87
5.2.4.1. Findings from Observation.....	87
5.2.4.2. Findings from Interviews	88
5.3. Design Framework	90
5.4. Design concept.....	93
CHAPTER SIX.....	97
6.1. Summary of research	97
6.1.1. Chapter One	97
6.1.2. Chapter Two.....	97
6.1.3. Chapter Three	97
6.1.4. Chapter Four	98
6.1.5. Chapter Five	98
6.2. Answering and obtaining to the research questions	98
6.2.1. Answering and obtaining to the research question 1.....	98
6.2.2. Answering and obtaining to the research question 2.....	99
6.2.3. Answering and obtaining to the research question 3.....	101
6.2.4. Answering and obtaining to the main question and objective.....	101
6.3. Conclusion.....	102
6.4. Recommendations	103
APPENDIX 1.	105
APPENDIX 2.	107
REFERENCES.....	119

TABLE OF FIGURES

Figure 1. 8 Tallet bird view	27
Figure 2. 8 Tallet program arrangement and program layers.....	28
Figure 3. 8 Tallet courtyards	29
Figure 4. 8 Tallet circulation.....	29
Figure 5. 8 Tallet row houses exploded plan and front garden	30
Figure 6. 8 Tallet penthouse and apartment exploded plan	30
Figure 7. 8 Tallet green roof.....	31
Figure. 8 Les Nids	32
Figure 9. Les Nids site plan.....	32
Figure 10. Les Nids Elevation	33
Figure 11. Monterrey Housing	34
Figure 12. Monterrey Housing modified unit	35
Figure 13. Monterrey Housing Parking	36
Figure 14. Kigali in 1912	48
Figure 15. Kigali in 1968	49
Figure 16. Site photo 1&2 showing the state the houses are in at the moment.....	69
Figure 17. Site photo 2&4 showing materials used for buildings.....	69
Figure 18. Site photo 5&6 showing renovations.....	70
Figure 19. Site photo 3&8 showing the tallest buildings Mumena	71
Figure 20. Site photo 4 showing the density of houses in one plot.....	72
Figure 21. Typical floor plan	72
Figure 22. Site sketch 1 showing the type of roofs found in the area.....	73
Figure 23. Site sketch 1 showing the outdoor raised platform where people sit and talk	73
Figure 24. Site photo 5 showing the outdoor area	74
Figure 25. Site photo 6 showing different materials for the facades	75
Figure 26. Current situation: Moving families	94
Figure 27. Adaptive apartments.....	94
Figure 28. Typical layout of a Traditional Rwandan residence	100

LIST OF MAPS

Map 1. House/plot proportion	3
Map 2. Nyarugenge Built area	4
Map 3. Nyarugenge district administrative map	10
Map 4. Nyarugenge District on Rwanda map	46

Map 5. Nyarugenge District on Kigali map.....	46
Map 6. Kigali Growth and expansion	51
Map 7. Kigali city highways	52
Map 8. Site location	62
Map 9. Site Size	62
Map 10. Site Topography	63
Map 11. Proximity to surrounding facilities.....	65
Map 12. Circulation and accessibility	65
Map 13. Land use	66
Map 14. Sun Path and Wind Movement.....	66
Map 15. Drainage.....	67
Map 16. Views and Vista.....	68

LIST OF TABLES

Table 1. Background of studies.....	6
Table 2. Household Income distribution in Kigali	14
Table 3. Theoretical framework.....	43
Table 4. Specification of data.....	58
Table 5. Research design.....	58

DEFINITIONS OF TERMS

Middle-income, is defined as 'of or relating to people or groups whose income falls in the middle of the range for an overall population.'(Merriam-Webster Dictionary, 2001)

In case of Kigali, the middle income falls in between people who earn monthly between 200001 Rwf and 900000 Rwf. But for the purpose of this thesis the middle-income class is narrowed to the people who have a monthly income that falls between 300001 Rwf and 600000 Rwf.

Typology (in urban planning and architecture) is the taxonomic classification of (usually physical) characteristics commonly found in buildings and urban places, according to their association with different categories, such as intensity of development (from natural or rural to highly urban), degrees of formality, and school of thought (for example, modernist or traditional). Individual characteristics form patterns. Patterns relate elements hierarchically across physical scales (from small details to large systems). (Merriam-Webster Dictionary, 2001)

Standard of living, is defined as 'a grade or level of subsistence and comfort in everyday life enjoyed by a community, class, or individual. Different people in different societies have different standard of living. What a poor person considers as an acceptable standard of living is very different from what a middle-class person considers it. (Dictionary.com)

Adequate housing, in 1991, in its General Comment No. 4, the UN Committee on Economic, Social and Cultural Rights defined "affordable housing." Paragraph 8 provides the definition stating "Thus the concept of adequacy is particularly significant in relation to the right to housing since it serves to underline a number of factors which must be taken into account in determining whether particular forms of shelter can be considered to constitute "adequate housing" for the purposes of the Covenant. While adequacy is determined in part by social, economic, cultural, climatic, ecological and other factors, the Committee believes that it is nevertheless possible to identify certain aspects of the right that must be taken into account for this purpose in any particular context. They include the following: Legal security of tenure; Availability of services, materials, facilities and infrastructure; Affordable; Habitable; Accessibility; Location; Culturally Adequate.

In the case of Rwanda or Kigali more specifically we can say that adequate housing is a shelter or dwelling that has basic infrastructures like access to clean water and electricity, that is physically accessible at the very least.

Market demand, is defined as 'the aggregate of the demands of all potential customers (market participants) for a specific product over a specific period in a specific market.' In this case, the thesis is focusing on housing demand which is the amount of dwelling units needed in a given amount of time. (Dictionary.com)

Low-rise, is defined as 'relating to or being a building of low height, usually with three or fewer stories and no elevators. (Dictionary.com)

Mid-rise, is defined as 'relating to or being a building of moderate height, having usually more than three stories but less than eight stories.' (Dictionary.com)

High-rise, is defined as 'relating to or being a tall building that is equipped with elevators and usually has at least six stories. (Dictionary.com)

Row house, is defined as 'one of a series of houses, often of similar or identical design, situated side by side and joined by common walls. (Dictionary.com)

Apartment building, is defined by The Merriam-Webster Dictionary as 'a building containing a number of separate residential units and usually having conveniences (as heat and elevators) in common. (Merriam-Webster Dictionary, 2001)v

LIST OF ABBREVIATIONS

Rwf, Rwandan Francs

Sqm, Square meters

RHA, Rwanda Housing Authority

UN-HABITAT, United Nations Human Settlements Programme

UNCHS, United Nations Centre for Human Settlements

RSSB, Rwanda social security board

REMA, Rwanda Environmental Management Authority

CMC, Concrete masonry construction

RIBA, Royal Institute of British Architects

CHAPTER ONE

1.1. Introduction

Shelter is a human basic need and adequate housing is a right for everyone as stated by the United Nations. 'International human rights law recognizes everyone's right to an adequate standard of living, including adequate housing. Despite the central place of this right within the global legal system, well over a billion people are not adequately housed.' In Rwanda country, which is a developing country there is lack of proper housing for the middle income people in many areas because these people cannot afford the cost of building such houses.

1.2. Background of the problem

Kigali City is a remarkable and special case because it houses the most targeted population, which is middle income population. The Kigali city council ranks households in categories where the lower income household is where households earn RWF 300,000 (approx. 385 USD)/month and less, the middle income range is where households earn between RWF 300,001 and 600,000 (approx. 385 and 770 USD).

According to the "HOUSING MARKET DEMAND, HOUSING FINANCE, AND HOUSING PREFERENCES FOR THE CITY OF KIGALI" Report there is a very high housing demand in those two categories of people in the city of Kigali. It is estimated that the housing demand of those two categories is a staggering 91% of all the housing demands because the majority of the population is in those two classes.

From the same report also it is found that there is a shortage in housing and that the target of dwelling units needed in years to come is very high. Total housing requirements in Kigali by 2022 are projected to be 458,265 dwelling units (DU). These requirements could be met by maintaining part of the existing housing stock that is in good condition or upgradeable (114,197 DU) plus building of new dwellings (344,068 DU).

But as Rwanda has a program called VISION 2020 that has the main objective of transforming Rwanda into a middle income economy by the year 2020, one might assume that even the middle income population is expected to raise also. The population develops as the country develops, this means the people are likely to be in a different categories than they are in now. The middle income population is increasing at a high rate, but not their housing.

The thesis aim to address the issue of housing for the middle income which is in short supply at the moment. In the above mentioned report, the mid-range housing is among those that needs the most units only second to affordable housing with more than 1 12 000 dwelling units needed. The lack of enough houses for the middle income even make houses that are of the mid-range standard are being sold on the higher income market.

Rwanda is one of the smallest country in the world (147th biggest) but with one of the most fast growing economies with a predicted 7 percent economic growth (year-on-year) from 2015. But as the country develops its area does not expands. That means that the price of the land is increasing very much and quickly. That challenged can be overcome by building vertically instead of horizontally, that means building high rise buildings. As Rwanda president said: "land is expensive but the sky is free." Especially in the targeted sites where the Kigali Master Plan required to build high rise buildings.

1.3. Architectural Statement of Problem

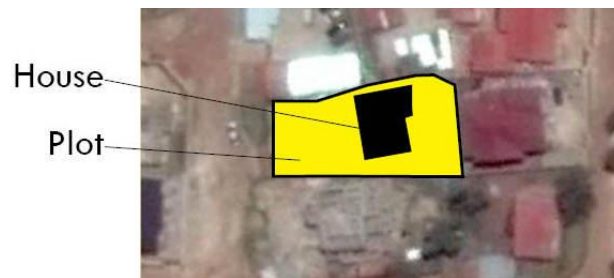
The middle income housing emerged and came before the emergence of architects in Rwanda. The people were arranging themselves and other few unqualified people to provide the design of their houses. This led to housing that were not well designed and that have some flaws in the way they were responding to the site, the climate and so on. The architecture of the houses were not responding to the situation of the middle income in Kigali. The sustainability, endurance, functionality, and all the elements of good architecture were not found in the housing for the middle income of Kigali.

Apart from the architecture design that is not adequate, the other problem of the housing in Kigali is the cost of housing. The rising cost of housing is in some way by the shortage of dwelling units in Kigali City as stated above, when the demand is higher than the supply it pushes up the prices of housing, hence making the houses unaffordable for the middle income of Kigali. Apart from the demand-supply balance, the cost of building the houses itself is high comparing to the income of people and the lifestyle they want to live.

The reason behind the high construction cost of the houses is the material and techniques used in construction. In the construction industry in Rwanda, many of the material used are imported which means they are expensive than the ones that are local. An example can be taken of steel which is

used in the construction and is mainly exported that makes the construction very costly hence driving up the price of the house.

The other reason that takes up the cost of housing is the price of the land. There is a scarcity of land in the Kigali and especially in the inhabitable part of Nyarugenge District. It is not easy to find an empty land. This is because it is where the city started and which means it is inhabited for a very long time. The price of the land in this area is very high and make the housing not affordable to the middle income.



Map 1. House/plot proportion

The way also land is used is not efficient, as in the individual size of a plot is very big which increase the problem, because if we have small land and we use it inefficiently, we are causing more problems. Many of the plots have a main house, then the kitchen is on the outside which eats up space. And they have a front yard and a backyard, this uses a lot of land where a good design would use the space economically in order to get the most of our small land.



Map 2. Nyarugenge Built area

The transformation of public housing will necessarily have profound effects on the lives of thousands of very vulnerable families. A substantial proportion of the residents still living in these developments will not fit easily into existing relocation options, particularly traditional vouchers or new mixed income communities with strict screening criteria. Many of the families awaiting relocation will need special assistance that goes beyond the typical package to help them move from their current units into safe and stable housing. For these families, housing stability may be a more realistic goal than self-sufficiency, at least for the short term. (Cunningham, 3)

1.4. Thesis Assumptions

The thesis will be mainly focused on the population that are considered as middle income, this means that the targeted group is the people that earn between 300 000 Rwf and 600 000 Rwf. As the country is on a very quick development trajectory, the number of people earning the above mentioned amount will have raised considerably in the years to come.

The thesis is solving the existing issue but also keeping in mind of the future and projecting the income level of the population in at least five years from today. As reported earlier, the vast amount of the population earns less than 300 000 Rwf, to be precise, 78 percent of the population, as per the report of the research done in 2012. It is assumed that this number is getting smaller day by day as the population and the country as a whole develops.

The targeted group of the thesis was 13 percent of the entire population of the City of Kigali, as per the report of the research done in 2012, by 2020 which is five years from 2015. That portion is supposed to increase, and maybe double in that time, considering the growth rate Rwanda is on, which means that the middle income population will be needing proper housing that deserves people of their stature.

Needed to be designed are houses for the future, houses for where the people are aiming to be living in, this in other words mean that the low income people of today are probably the middle income people of the future. And as per Vision 2020, Rwanda is meant to move from poor countries to the middle class countries.

1.5. Background of Studies

Year	Name of author(s)	Name of references	Issue	Findings	Relevant with research
2015	Litman, Todd	Affordable-Accessible Housing In A Dynamic City	Housing	Why and How To Increase Affordable Housing Development In Accessible Locations	It goes in detail on how to increase affordable housing development
2014	Chen, Jie Zan, Yang Wang, Ping Ya	The New Chinese Model of Public Housing: A Step Forward or Backward?	Public housing	An assessment of public housing in China.	It deals with the same issue as my topic about housing many people.
2014	Talen, Emily Konschisky, Julia	The Neighborhood Quality of	Subsidized Housing	It is important to replicate a normal	It deals with the same issue as my topic

		Subsidized Housing		neighborhood characteristics in a housing project.	about housing many people.
2012	Goetz, Edward	The Transformation of Public Housing Policy, 1985–2011	Public housing	The evolution of public housing policies in the United States	Deals with housing many people.
2012	Vale, Lawrence Freemark, Yonah	From Public Housing to Public-Private Housing	Housing	The sharing of accountability on the issue of Public Housing	Shows what should happen after the project
2011	Talen, Emily Konschisky, Julia	Is subsidized housing in sustainable neighborhoods? Evidence from Chicago	Subsidized housing	Subsidized housing can create a sustainable neighborhood when well taken care of	It deals with the same issue as my topic about housing many people.
2010	Popkin, Susan Cunningham, Sam Burt, Martha	Public housing transformation and the hard-to-house	Housing	How the public housing evolved in sheltering the poor people	Shows how to transform housing with time
2009	Cousins, Matthew	Design quality in new Housing: Learning from the Netherlands	Housing	Example of contemporary housing in the Netherlands	Show how to design housing in modern era

Table 1. Background of studies

1.6. Architectural Questions

1.6.1. Main question

What is the architectural typology appropriate for the housing of the middle income?

1.6.2. Subsidiary questions

How can the design of middle income housing improve?

How can through architecture can the size and land be used efficiently for middle income housing?

How can materials be architecturally used in order to have good housing that are affordable to the middle income?

1.7. Architectural Goals and Objectives

1.7.1. Architectural goals

The main goal of the thesis is to find the architecture intervention that would be appropriate for the middle income population of Kigali. The thesis results will be leading to a design that would be a benchmark for all those who want to design for the middle income by creating housing typologies that are adequate to the middle income needs. The typology would aim to provide the architectural solution that is affordable to the middle income but that is architecturally superior to the existing housing. This housing also would be cost effective in a way that it would use as little money as possible to produce in order to be affordable to the middle income.

1.7.2. Architectural objectives

The objectives of the thesis are to find out how the design of the houses for the middle income people of Kigali can be improved from the existing housing. The thesis will help raise the standard of the housing in Nyarugenge District, Mumena cell. The design of the housing would be reflecting the lifestyle of the middle income and design accordingly. The other objective of this thesis is to find ways to use land efficiently and creatively in having housing units and typologies that can be accessible and comfortable while using the available space in an efficient way. Seeing the way people use their space and how the space is expensive, there is a need of using the space to maximise the use of the resources. It will provide the prototype on how to use the space available in the best way. The thesis also will research on what materials and how can they be used in

providing affordable housing for the middle income in a creative and aesthetical way. Considering the materials are one of the main reasons why the cost of housing is high, it is important to use materials that are inexpensive. The materials that helps in reducing the cost and that are sustainable are of priority in this case. They should be incorporated with the design of the housing.

1.8. Significance of Thesis

The thesis will provide new housing developments and typologies that are not common in our country, but that would be very helpful. The Rwandan society through history is considered as one of the most reserved society in the world. Every family used to have its own plot, fenced with the house completely inside the fence. Though they met at a public space in front of the house or at the king's place, after everything everyone went home in his private area.

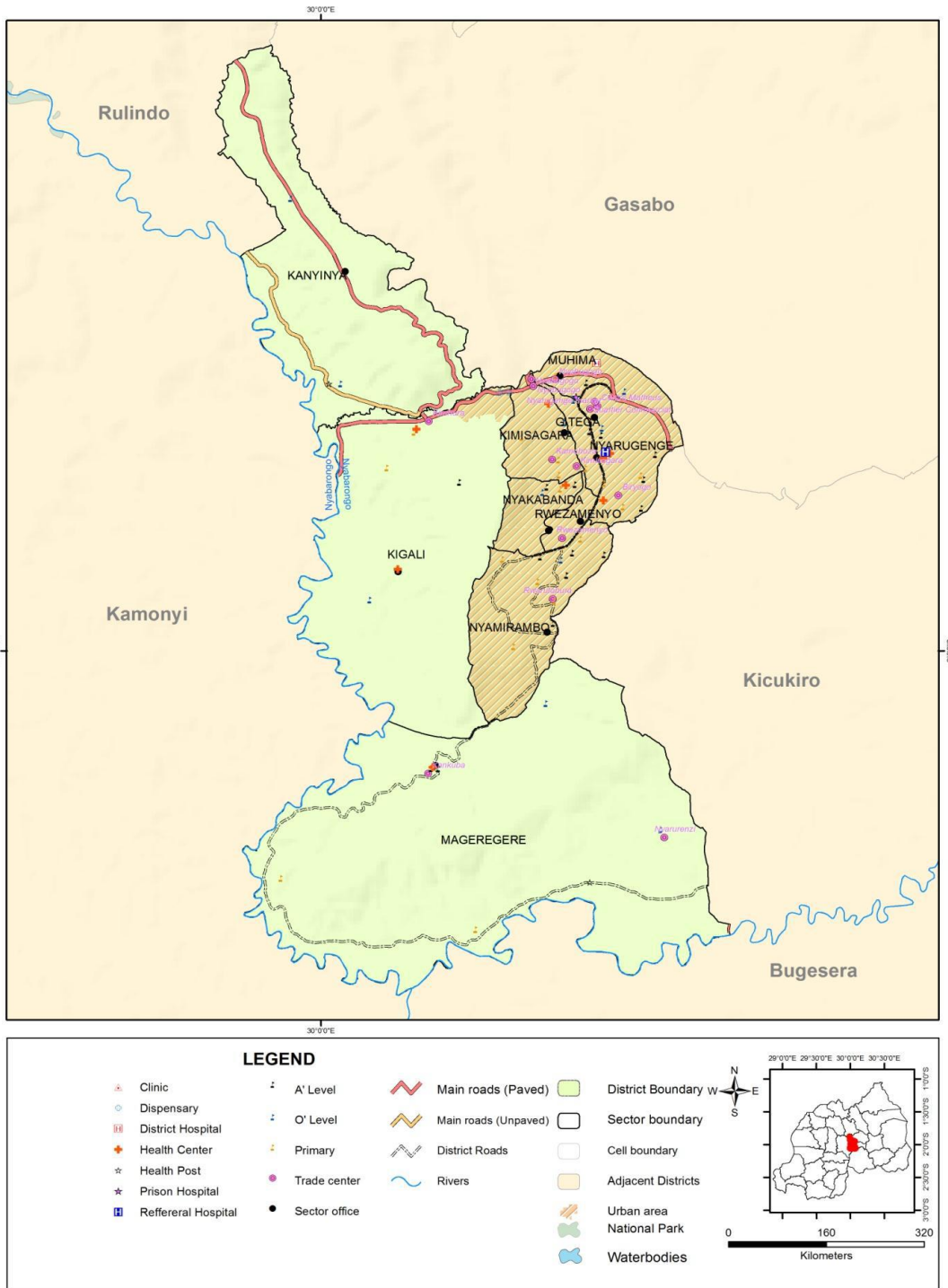
However the Rwandan society though living in different private plots used to live close to each other and as the country continue to develop one type of housing typologies emerged that was called "UMUDUGUDU" or village where it was a group of dwellings that are close to each other. Usually the village had shared farms and the reason they usually lived in one community is to have large lands where they could cultivate efficiently. The Umudugudu style created some type of community where people knew each other and helped each other. In the modern days the government through its policies of decentralization brought back the umudugudu model where now they have a leader and meet at least once a month in community service or umuganda. The thesis will provide enough information to show the people the importance of change in how people reside in modern times through different type of settlements than the one they were used to.

The thesis also will show the importance of using land efficiently in the context of the developing countries or countries that are getting urbanized quickly. After the genocide the time where the country really took off economically and started urbanizing there was housing development in the country of varying design and prices. But the land especially in Kigali started getting filled. Rwanda as one of the smallest countries in the world does not have excess of land of other countries for instance its neighbour Democratic Republic of Congo. This leads to high price of land in the urban area especially in urban areas. The need of additional houses in the country does not correlate well with the country's total area. The thesis will analyse how to efficiently use land through mainly building vertically as the building footprint is very small in this case. That will provide the platform for future development of housing blocks as vision 2020 envisages the number of housing developments to increase dramatically in few years to come.

1.9. Scope Study:

Nyarugenge is one of the three districts of Kigali city. Its heart is the city centre of Kigali (which is towards the west of the urban area and the province), and contains most of the city's businesses.

Nyarugenge was chosen as the study area because it is the area in Kigali that has many middle income population and that needs new prototypes and typologies of the modern because many of their models are outdated. Some of them work there and live in other parts of the city, and others live and work there. New housing would help people who are not living near their workspace by providing housing in the area.



Map 3. Nyarugenge district administrative map

Source: Rwanda 4th Population and Housing Census, 2012 (NISR)

1.10. Architectural Methodologies

The methodologies that will be used in the thesis are first, the observation method. With this method I will observe the lifestyle and existing housing in Nyarugenge district. The housing of the today low income people that have the potential of being middle income people in few years to come.

The other method that was used and will be used in the thesis is the interview method where I will ask the people on how they feel about their housing conditions and where they would like to live. The typologies they would like to live in to have a participatory design.

Finally, the other method is by doing research from the books and internet. From this I will get the different ways social or mass housing is done in other countries and regions, from this we can consider on how to implement it in our country. Also, information has to be taken from our Government bodies like Rwanda Housing Authorities (RHA) and The Kigali City to get information on how housing policies are applied here in Rwanda.

1.11. Limitations for the Thesis:

Since the thesis is about the areas around Nyarugenge Campus would not be very hard to access the sites. But the access to some information can be problematic for instance on some private questions and some interviewees who are not simply willing to reveal some information.

Accessing government records comes with a lot of bureaucracy and considering the duration of this thesis, time will be a constraint.

CHAPTER TWO

2.1. LITERATURE REVIEW

This part of the book is basically a detailed version of the chapter one part of 'preliminary literature studies. It reviews in details the themes of the topic, to understand more the elements.

2.1.1. Middle Income

Defining the middle-income class depends on the economic, cultural, and social context of a country, and no standard definition or universal system of defining the middle-income group exists. An individual in the developing world is considered to be in the middle-income group if he is not poor based on his country's standards, but that individual may still be poor based on a developed country's standards. *The middle-income class can be defined either in absolute or relative terms based on income, expenditure, or consumption level. This class can also be defined from a sociological point of view.* (Chowdhury and Md Zaber Sadeque, 2013:34)

The rise of the emerging countries has been accompanied by a sociological phenomenon: the creation of a middle class. The importance of this new stratum of society goes beyond their economic role as consumers. People in this group are also seen as representing new values, new types of behavior and new ideas. There is also the hope that these people will start to demand some form of political and social participation and thereby contribute to a democratization of the often authoritarian regimes in their respective countries. (Hefele & Dittrich, 2011:1)

There is a global definition this definition is for countries, or economies of countries, although not official, of the classes as they are classified by the World Bank. Shaida Badiie wrote a paper reviewing the system in 2012 called "**A Review of the analytical income classification**".

Although this analytical income classification is used to describe economies of nations, it important in many ways as it is used to summarize trends across a wide array of development indicators. But this classification is only used for analytical conveniences not for the World Bank's operational guidelines. (Shaida Badiie, 2012)

However, this system has its flaws because of the way it is calculated. The classification is based on gross national income per capita which really doesn't describe that well the situation of the population of a certain country. Because the thresholds are frozen in real terms while real incomes have risen, the number of countries in the low- and lower-middle-income groupings have decreased and poverty rates have declined, even as hundreds of millions of people remain in absolute poverty.

This means that when the economy of the country is rising like for instance China and India, this might be due to high exportation or even the high exchange rates, the country might be classified from the low-income or middle-income and all of its population might be considered middle-income population which is essentially not that true because the economy might be increasing while the number of people who are in the deep end of the poverty hole are still increasing too. A classic example is India where there are people who are very poor, but the classification of the country is middle class while the majority of the people of the country is poor or has a low-income.

The real issue is that the threshold of classifying low-income which is 1.25\$ per day has been frozen for a long time while the currencies and exchange keep on changing with time. This means that even if the people are earning comparably more than they were earning years ago does not mean that they are way off better than they were at the time because for instance 10 years ago a small house in Nyamirambo that would be rented at 20000 Rwf would now be rented nowadays at 50000 Rwf, it has more than doubled. This shows that also the threshold of low-income and middle-income must also vary with time, not stay steady because it is not in accordance with the outside market.

In another decade it is likely that no country will remain below the current low-income threshold, even though absolute poverty, whether measured by dollars or life expectancy or education levels, will certainly persist. This calls into question the usefulness of the current classification scheme.
(SHAIDA BADIEE, 2012)

A focus on the middle class does not exclude a focus on the poor but extends it, including on the grounds that growth that is good for the large majority of people in developing countries is more likely to be economically and politically sustainable, both for economic and political reasons”.

From the economic point of view the importance of the middle-income group in the economy of a country is multifaceted. It is believed that the middle class is an important prerequisite for stronger, more sustainable economic growth and development of a country. Alesina (1994) argues that the presence of a larger middle class makes for a less polarized society where consensus on a broad range of issues and decisions related to economic development can be obtained much more easily (ADB, 2010).

It is expected that the presence of a bigger and stable middle class will help in fighting against poverty as the middle class is considered as the source for fostering entrepreneurship and investment that creates employment and productivity growth in a society. It is evident that a stable

middle-income class is required for the sustainable economic and social development of a country and for this purpose the government has to formulate and implement policies which are conducive to the rise of the middle income group. Hence, proper research and investigation is required to understand the problems of the middle income group.

For the purpose of this thesis, considering the income groups that are in considered in Kigali, which are divided in 5 quintiles as shown in the following table, the group chosen was from quintile 2 (Q2), this means households who earn between 300,001 Rwf and 600,000 Rwf.

Quintile	Segment	Monthly Salary Range in Rwf		Annual Salary Range in Rwf		Estimated % of HH	Cumulative	Total % per Quintile
		From	To	From	To			
Q1	1	<	100.000	<	1.200.000	54,92%	54,92%	81,03%
	2	100.001	200.000	1.200.001	2.400.000	18,28%	73,20%	
	3	200.001	300.000	2.400.001	3.600.000	7,83%	81,03%	
Q2	4	300.001	400.000	3.600.001	4.800.000	5,47%	86,50%	11,25%
	5	400.001	500.000	4.800.001	6.000.000	3,46%	89,97%	
	6	500.001	600.000	6.000.001	7.200.000	2,32%	92,28%	
Q3	7	600.001	700.000	7.200.001	8.400.000	1,88%	94,17%	4,17%
	8	700.001	800.000	8.400.001	9.600.000	1,35%	95,52%	
	9	800.001	900.000	9.600.001	10.800.000	0,94%	96,45%	
Q4	10	900.001	1.000.000	10.800.001	12.000.000	0,68%	97,13%	2,41%
	11	1.000.001	1.100.000	12.000.001	13.200.000	0,53%	97,66%	
	12	1.100.001	1.500.000	13.200.001	18.000.000	1,20%	98,87%	
Q5	13	1.500.001	2.000.000	18.000.001	24.000.000	0,52%	99,38%	1,13%
	14	2.000.001	2.500.000	24.000.001	30.000.000	0,23%	99,61%	
	15	2.500.001	<	30.000.001	<	0,38%	100,00%	

Table 2. Household Income distribution in Kigali

Source: Housing market demand, housing finance, and housing preferences for the city of Kigali. Planet Consortium, 2012.

2.1.2. Housing

Housing is an important and very broad theme for this topic because it is where all the thesis revolves around. As stated earlier housing that this thesis is going to focus on is more than just a shelter or a dwelling, separately. It is about providing the houses for an income group or a community. The group that we are dealing with in this case is the middle-class or the middle-income population.

Housing provision is generally a social problem, the solution of this problem is to ensure that members of the society have a home in which to live. And many governments have a department that deals with housing, such as Rwanda Housing Authority (RHA), in the case of Rwanda.

Housing is important, the Rwandan Government recognizes that housing is a basic right for its citizens as stated in international declarations such as the Istanbul Declaration of June, 1996, the Millennium Development Goals (February, 2002), and the World Summit on Sustainable Development (July-August, 2002). In this context, it aims to facilitate access to decent housing and basic infrastructure facilities for its population. (National Urban Housing Policy for Rwanda, 2008).

2.1.2.1. Housing concepts

The evolution of Human Sciences has accelerated as a result of the information revolution. It has spread across the world because of the ease of communications. Concepts of housing policy have been a part of this phenomenon. Housing concepts have seen much development over the last two decades, passing through various phases (Durah, 1988). It has changed from being a fairly simple concept to one that is more complex, moving beyond the basic need for the development of housing. The world, especially in developing countries in recent years, has witnessed many changes as a result of economic and political events. Such circumstances have led to a number of studies on the concept of housing (David, 1987). These studies have concentrated on three different trends used to consider the concept of housing, these being: the Marxist trend; the Liberal trend; and the Temperate trend (Soliman, 1996).

For the **Marxist trend**, Burgess and Castells (1932) adopted a definition of housing and its application according to a Marxian approach, where, the Marxian philosophy regarded housing as an essential and fixed commodity. They present two viewpoints of housing, according to this approach.

The first approach is where housing is considered as an essential commodity. Marxist theory is loosely based on the work force, taking into account everything that will create the appropriate climate for the worker to be able to complete the production process. A house is regarded as an essential commodity for the work force and should be near the production location. (Florida Statutes, 2006)

The second approach is where housing is considered as a fixed commodity. Houses are a long life commodity, and have generally fixed specifications. This means it is very difficult to vary or remove it through time. Since it must be built in a fixed location it becomes virtually impossible to subsequently change this location. Generally, land dedicated for housing is not permitted for real estate speculation in most socialist countries, and the land price is controlled by government, since

the government is the rightful owner of all the land in the region. This Marxist concept has gained support from both attributes; long life and constancy.

Liberalism has a different viewpoint based on an alternative ideology that takes the overall welfare of humans as the first priority. Turner (1972) confirmed four principal approaches in his analysis of the liberal trend in housing as follows:

(Sheibani, 2008:63,64)

Contrary to what was previously introduced in the Marxist selection it can be noted that this trend focuses predominantly on the role of the private sector and the housing policy is the burden of the private sector and personal initiatives.

The **temperate trend** is the analysis of the definition of housing in accordance with three inter-related aspects: the economic status of the family; the state of houses; and the method of allocation of housing (Nientied and Van der Linden, 1987)

(Sheibani, 2008:64)

Due to the differences in political beliefs existing in different countries there are different policies from one country to another. Since each trend adopts special policies to achieve its objectives, countries can choose one or more of the policies to enable them to achieve the goals of their housing plans. These policies can come from within one political trend or there can be a composite from a mixture of trends.

From the trends identified, housing can be defined as the final outcome from variant capital entering in the housing market mechanism, by construction, distribution, or managing the market.

2.1.2.2. Housing affordability

However in this program of providing shelter for all, there are many challenges about affordability of the houses because they are expensive to the majority of the population. Governments actually try to provide guidelines or housing for the less privileged that cannot afford a shelter. But that also has its challenges. **Rosten Woo** and **John Mangin** analyzed the subject in their book “**What is affordable housing**” (2009).

The term ‘affordable housing’ is often used but begs explanation. When it is used to describe for instance a project or a development it should be followed with more details. It is important to ask ‘affordable to whom?’ because sometimes it is called affordable house but many people cannot

afford it which would be a contradiction. Conversely, you might be even earning too much to qualify for these housing developments. (Rosten Woo and John Mangin, 2009:8)

And as many of the affordable housing development are government sponsored or managed, families or people have to satisfy some criteria to qualify for the development and the way they regulate the prices or the rents of those housing. For instance UN-HABITAT says a house is 'affordable' if a family spends no more than 30% of their income to live there. But this definition has its limitation because this threshold is fixed but when you put it in practical terms it becomes difficult because 30% of someone whose income is 100,000 rfw is very different from 30% of someone whose income is for instance 5 million rfw.

In fact, the term of 'affordable housing' is now being used as an alternative to terms such as 'public', 'social' or 'low cost' housing (Gabriel et al 2005, p6). However, in international context, there is no single accepted definition of what constitutes affordable housing. Which type of housing is affordable to which income group depends on a number of issues such as the prevailing social context, norms, housing quality and living environment. The housing which are affordable to a specific income group in terms of price but may not be suitable for them to live at due to social norms, living environment, housing quality or any other local social issues.

The existing conventional/traditional housing affordability methodologies and indicators with their empirical limitations need to be improved upon. They inherently tend to emphasize particular aspects of housing affordability, which often fails to capture the multi-dimensional nature of affordability. The continuous use of these indices as analytical tools limits the scope and quality of analytical insights they provide. (Ndubueze, 2009:7)

The main factor that influences the affordability of housing is the housing market because it plays a very big role in the cost of the houses on the market. When the housing market is being publicly sponsored, there is a fair pricing on the housing. This works mainly for housing for the low-income people because they are the government priorities.

But the international community encourages the governments to enable markets to work. The consensus of enabling markets to work is based on the notion that it is more efficient to deliver adequate housing through a properly functioning housing market than through the public agencies

or the non-profit non-governmental agencies. The Habitat conference (UNCHS, 1997a, p.42) observed that:

"In many countries, markets serve as the primary housing delivery mechanism; hence their effectiveness and efficiency are important to the goal of sustainable development.

It is the responsibility of Governments to create an enabling framework for a well-functioning housing market. The housing sector should be viewed as an integrating market in which trends in one segment affect performance in other segments.

Government interventions are required to address the needs of disadvantaged and vulnerable groups that are insufficiently served by markets."

It then declared in paragraph 9 that "we shall work to expand the supply of affordable housing by enabling markets to perform efficiently and in a socially and environmentally responsible manner." This provision in itself encapsulated the central problem of relying on market mechanisms to pursue an egalitarian goal as housing for all. Markets have never been known to function in a socially and environmentally responsible manner. And they are not fundamentally designed to do so.

The situation is even worse within the housing market with its inherent and embedded large scale market imperfections largely driven by supply constraints and sustained speculative tendencies. This problem is arguably worse in developing countries with a high incidence of poverty, massive levels of unemployment, highly-skewed income distributions, restricted purchasing power and huge gaps between what most people can afford to pay and the market price that could attract private initiatives to invest in, especially, in the lower-end of the housing market. It is common experience that the fundamentally profit-driven formal housing market has always been attracted to much bigger return on investment prospects of higher-end housing that satisfy only the privileged few. (Ndubueze, 2009:44,45)

This is where the middle income are trapped then. Because actually the governments are more concerned by the low income people and the market because of its profit-driven nature always end up serving the high income people. The middle-income falls between two stools, they are not qualified to the government sponsored or non-profit organization aided 'affordable housing' and neither can they afford the private owned housing development.

The obvious major implications of the consensus to 'enable markets to work' are that the housing markets must be managed; security of tenure should be guaranteed; action on the supply side of markets should be emphasized; and easy entry into the housing market should be guaranteed.

However, these provisions have been used increasingly by influential and dominant pro-market international institutions (such as the World Bank and the International Monetary Fund - IMF) to justify sustained pro-market housing reform campaign especially in developing countries. In its major housing policy paper, *Enabling Markets to Work* (World Bank, 1993, p.38), the World Bank insisted that;

“If the interests of all participants in the housing sector are to be served, and if the interest of the broader society are to be served, housing policies must be crafted in a way that draws on and uses knowledge about the way markets work and that address the causes rather than symptoms of policy failures. Too often housing policies are based on either misunderstanding or wishful thinking about the market”

According to this pro-market perspective, government interventions are seen as ‘distortions’ that impede market efficiency and since it is the poor that are most disadvantaged in a poorly functioning housing market, limiting government interventions to the barest possible minimum to ensure its ‘market efficiency’ actually serves the housing interest of the poor (World Bank, 1993). (Ndubueze, 2009:51)

But taking a look at the interest of both parties and expertise, genuine public/private partnerships should be struck in shelter provision. In fact the central element in redefining the role of government in shelter provision is based on the need to link the private (commercial), the non-governmental non-profit sector and the public sector in new ways that would ensure that their respective strengths and capabilities are taken full advantage of and brought to bear on the shelter development effort. The envisaged principal role of partnerships in housing provision is based on the, perhaps, optimistic notion of the immense ‘comparative advantage’ which public/private partnership offers. It is assumed that the mechanism would enable each sector to use its ‘comparative advantage’ in a complementary manner, which would ensure overall capital gains and spillover within the housing sector and beyond. In providing access to each other’s skills and resources, it is expected that the arrangement would provide a viable mechanism to mutually minimize and share risks and thus not only guarantee return on investments but also maximize them. It is also assumed that this sort of partnership would provide the framework “for resolving the ‘needs/demand gap’ in shelter provision between what people can afford and what the market can provide” (UNCHS, 1993, p.viii).

This partnership would be the one to yield results that would be for the middle income population because the government would be helping the private sector to protect their investment in a way that the housing that they provide would be affordable to the people that are underserved in the today market.

The government also has a role to play in making housing affordable in some cases not just for the interest of the private developers but the population too. For instance on the matter of land. The classic difficulties in making urban land easily accessible to potential developers have entrenched systemic urban land speculation, which often drives up land prices beyond the reach of an average household.

2.1.2.3. Mass Housing

Daniel Adeniyi Alao in his thesis “A Review of Mass Housing in Abuja, Nigeria” stresses on the importance of housing in the recognition of society’s success among nations. Housing provides a link between the physical development of a city, and its social and economic outcomes. The availability of decent housing for each family defines the level of development which the country has reached. This is because the social and economic wealth of the country can only co-exist with good housing.

In a city like Kigali where the population is rising very quickly due to urbanization it is important to react this phenomenon in the housing level too. One of the ways to deal with it is by providing mass housing, not just for the low income, but for the middle income too because it is a way to shelter many people on a relatively small space. Mass Housing would come to be an important and essential development in most developing countries because of the amount of people moving from rural parts of the country to the urbanized and developing parts.

Mass Housing, generally, is a term most people use to describe a cluster of high rise, low cost residential buildings. This is usually not always the case. Mass housing is the construction or springing up of a relatively high number of residential buildings in an area in a relatively short period of time due to high demand. And as demand is very high in Kigali, it is an important housing alternative to consider.

2.1.2.4. Design considerations in housing

The design of housing and neighborhoods has a very big impact in the user's everyday life. Simple, affordable environmental improvements can make a more contented, secure community. Good design and maintenance of neighborhoods also can help bring together potentially divided communities. The link between poor housing and poor health is well established.

Good design can help build strong communities Well-designed neighborhoods are where people feel safe, included and at home. They are where residents can feel a sense of social identity and civic pride, where they are encouraged to interact with their neighbours in ways that help to strengthen the community. In such places, there are, in turn, benefits to people's health, prosperity, good will, morale and self-esteem. New neighborhoods like these, with well-designed homes, spaces and facilities, can retain and improve the appeal of an existing area.

Good design create spacious, flexible homes that keep their value. We all need the space to live our lives. In family homes, kitchens with the space for a table can bring family members together, over meals, homework, games or around a computer. Homes should be flexible, too, to adapt to a household's changing needs over time. Is there room for a stair lift or a downstairs bathroom, for example?

Good design also reduce crime. The natural surveillance provided by passers-by, or by windows and balconies overlooking streets and open spaces, is enough to deter most crime and vandalism. Well-designed neighborhoods promote this casual policing, which can work alongside more formal schemes for watching over one another's homes. Thoughtfully sited car parking and bicycle storage, as well as well-integrated refuse and recycling bins, contribute not only to a sense of order but also reduce litter, vandalism and theft.

The ingredients of good design are considered as delivering what the client has asked for; inclusiveness and accessibility for all; fitness for purpose, without expensive add-ons; sustainability, integrated into the fabric and use of the building; low-as-possible running and maintenance costs; delivering a return on investment; having a positive impact on the environment; completion on-time and on-budget; providing the flexibility for a future change of use; cost-effectiveness: in the long term, good design always costs less than bad design; delivering value over the whole life of the building. (RIBA, 2010)

Strange as it may seem, architectural and cultural sterility of production housing appears to be a global phenomenon. Across the vastly different housing delivery processes prevalent in developed

capitalist, socialist and developing countries, the characteristics of the product are very similar. Architects detest its tedious repetitiveness, dreary architectural language and cultural inappropriateness. (Mahmood, 1995:14)

Pandya (1996) speaks of builder housing in India as the "monotonous concrete boxes littered everywhere." Huth (1992) describes mass produced housing in China produced by the *danwei* as a "sea of identically boxy, grey and boring high rises" and the Beijing press frequently publishing articles and cartoons about the difficulty residents and visitors often experience in finding a particular apartment and/or building.

One of the issues that the designers of mass housing or one of the problems of mass housing in general is what is seen as designing one unit and repeating it to have the amount appropriate for whatever number of people you are designing for. It is a challenge in designing because the designer has to design multiple units but at the same time make sure the design satisfies the needs of every one of the people the design is meant for.

Reed (1998) narrates the perception of production housing by architects in the United States, most of whom "decry the destructive planning models, mindless building designs and lowest common denominator construction." Rouda (1999) writing in the monthly magazine *Architectural Record*, reflects on design of most of America's new homes, "Product houses, subdivision houses, spec houses, merchant-builder houses - no matter what they are called, developer built houses are a product, sold on the open market just like cars and shoes. And like other products. The design of speculative housing is a function of marketing. Design mistakes are perilous, and risk must always be managed... The market builders pay so much attention to repeatedly reminds them of something few architects like to hear: low-dollars-per-square-foot and big backyards will almost always out-sell creative and innovative design. Product? Dollars per square foot? Outsell? Listening to the market? As an architect you either understand it or you don't, and either way it's still frightening. After all, what's this got to do with architecture?" (Mahmood, 1995:22)

This shows the pressure the designers are under when designing large housing complex or dealing with many people, mainly coming from the market because all the market cares about is reducing the price-per-area. This sometimes leads to a design that is not appropriate, or creating a space that is not comfortable for certain kind of activities.

While one can criticize mass produced apartment housing for regarding the end-users as an anonymous homogenous entity, the standard typology of cellular organization of multiple stories is unavoidable to a certain level. It is difficult to individualize apartment design to the extent of

recognizing many different tastes and preferences of occupants living in one block, given the requirement of efficient and cost effective planning.

Public housing supply approach in Japan during the mid-80s described by Fukushima *et al* (1991) provides an interesting example of a method to overcome these disadvantages and introduce more flexibility in apartment design to meet the dwellers needs.

Design outcomes in a condition of housing shortage, as is the case in Karachi, demonstrates unconcern to these aspects. Whatever is produced would sell - or more precisely, has sold before it is produced. By looking at the range of apartment housing produced in the city for middle and lower middle classes in Karachi, one realizes that aesthetic questions probably begin to acquire lesser importance in comparison to grave functional problems in planning and poor management leading to dilapidated structures and unhealthy living conditions. Dominant design trend since the last three decades is the outward oriented 'block' planning, in contrast to the earlier *chaivl* model enclosing a central courtyard around apartment units. The 'flipping out' of apartment planning took place due to Western influences in design, in addition to byelaws that do not favour the courtyard planning, and render it a less profitable type. (Mahmood, 1995:).

2.1.2.5. Housing Policies

The **Rwanda Housing Authority (RHA)** has laid down a **National Housing Policy** that deals with issues of housing in Rwanda. The biggest challenge that Rwanda is facing is the continuously growing demand for housing in urban areas, coupled with slow and expensive formal housing supply in urban areas, and by the simultaneous sprawl of unsustainable house construction in rural areas. Most urban residents still access housing with the help of the informal sector or also through unofficial building permits from authorities in rural sectors, because the formal sector cannot offer affordable housing access schemes.

This document gives guidelines in the development of different kind of housing in the country, but it emphasizes more on low cost housing or affordable housing. In one of the projects that the Government sponsored through Kigali City, RSSB (at the time Caisse Sociale) and former Rwanda Housing Bank which is the Batsinda 2008 in the Kigali-Gasabo District where 250 low cost houses have been built. From this project some praise can be showered to the government due to the fact that they got to tackle different issues in a sustainable manner. First, they responded to the scarcity of land in this country by reducing the size of the plots.

The document highly recommends and implements the construction of low cost housing and promotes the use of local materials and renewable energies. This is the case for private or non-governmental construction initiatives, but also for the Umudugudu improvements. Considerable advancements were made in the discussion and application of green building principles and technologies. The technologies are not only an integral part of the government policies and strategic documents. Green construction materials are starting to be developed by both domestic and foreign investors and a number of companies established or explore establishment of factories and/or production operations in Rwanda that will help achieve the dual goal of economic development through urbanization.

The document was written following the objectives of Vision 2020 and EDPRS 2 (Second Economic Development and Poverty Reduction Strategy), one of the priority problem is the shortage of decent housing which is affordable and accessible through the formal market. The problem is coupled with the current inability of the private sector to satisfy the current and growing demand for housing. The supply of housing according to demand is challenged by predominantly low income levels, resulting in a low purchase power for conventionally constructed housing units.

But this problem cannot be only solved by the reduction of the construction cost and interest rates alone, although those two are the major constraints on affordability of houses in Rwanda. Therefore, a much wider approach of cost-efficiency in design and construction, including its management and resource-availability require to be addressed.

The priority targeted group as mentioned earlier in the chapter are the vulnerable people or low income people. The government emphasis is on the issue of affordable housing. Even though the Rwanda National Policy states that decent housing should be available to everyone, they provide only details in how they deal with people with low income. But as argued, the middle income need as much help as the low income and other vulnerable groups.

Policy statement #11 and #12 deal with the public-private partnership that proved very successful in many of other countries such as seen in the case of Nigeria (Ndubueze). They are stated as follow *“The government supports private housing development projects under clearly defined conditions, with the objective that housing is proven to a) be accessed by low income households, b) use local natural and produced resources efficiently, c) have an extended impact on the local economy, d) create a well-planned livable environment, and d) mitigate all social and environmental risks related to massive and accelerated development. “* , and *“The framework*

regulating the approval of use of public finances to support housing projects shall apply to any housing development project independent of the initiator, with the objective of using public resources responsibly and effectively.” respectively.

However government support housing development is reserved for housing neighborhood development projects with fulfill cost-efficiency and affordability criteria, and criteria of targeting underprivileged groups of residents. This means, to get government support there are many criteria to follow which is in contrast with the independence that goes with the market. The projects has to be approved by government agencies such as One Stop Center and the National Board. Some of the criteria that has to be fulfilled are for instance, The cost per square meter as offered as the purchase price of a square meter of one housing unit, excluding cost of public service infrastructure, is below a value set by the Minister in charge of housing on an annual basis; The developer offers a payment scheme which is affordable to the targeted beneficiaries and enables the beneficiary to purchase one of the offered housing units; The developer is a cooperative which has been formed by the individual land holders of the housing neighborhood planning area themselves.

Policy statement #13 also talks about the government partnership with the private sector. It states

“Efforts to jointly work shall be increased between the Government and the private and the banking sector, to succeed in the establishment of a variety of financing scenarios adapting to the financial situations of any housing access group, and to ensure that not any existing legal provision counteracts supply of and access to affordable housing.”

But as we can see in the aforementioned statement, it shows that even these partnership schemes in Rwanda is more inclined to affordable housing. However, RHA also describe middle income housing as affordable housing.

Affordability –in general terms– means, to create economically and socially accessible housing neighborhood schemes in the local context. Affordability depends on a) the income available per household for different segments of the population, b) the cost of a housing unit, and c) on the funding and financing models for both, public infrastructure and building construction, and for end user finance.

A development is called affordable housing when its total construction cost is between 5 million Rwf and 15 million Rwf, when it exceeds that amount it is no longer called an affordable housing development. However, on the outside market to build house on a budget of less than 15 million Rwf and have a decent house is difficult. And as I stated earlier in RHA affordable housing is also for middle-income population. This means that middle income population is also expected to live in that house of 15 million Rwf.

That affordable housing threshold is set in the whole country, while we might not find the same quality of housing for the same amount of money in different areas. A 15 million Rwf house near the city centre is very different from a 15 million Rwf house in the outskirts for instance Kabuga.

The government intervention in private properties is however not in the project itself, it is a help hand. Government support to affordable housing neighborhood development concentrates on the provision of public infrastructure -such as road to and through the site, electricity and water- to a project, after verification and approval of a project. It just stopped to that, they don't do a partnership in the financing of a whole project. Because of this, the government has little say on the pricing of the apartments and the houses.

Such partnership where the government and the public sector are both involved in the project through the whole duration of the project would help in creating a fair price for the population of housing and would help create decent housing for a fair price.

As the vision of the National Housing Policy is "Access to safe and decent housing is a right for everyone independent of income, base of subsistence, and location. The housing policy framework shall therefore cater for the entire variety of income groups, and groups with different employment status in all areas reserved for habitation in Rwanda. ", there should be more emphasis on other income groups other than the low income because almost all the policies in the documents goes back to the low income population. There is very few mention to the middle income population which is worrying because there should be also policies regarding their housing so that the market doesn't take advantage of the situation.

2.1.3. Precedents

This part of the thesis analyses other housing projects in other parts of the world that are dealing with the same problem. The focus of the precedents is architecturally where the research used the precedents to get inspiration and example to help design future projects.

2.1.3.1. 8 Tallet

8 tallet (8 house) is a large residential and commercial building located in the southern part of a new suburb, Orestad at the periphery of Copenhagen. It was designed by BIG (Bjarke Ingels Group). It got the name 8 house from its shape because it is an 8-shaped building.

This huge 8-shaped building consists of 50000sqm of three different types of residential spaces and 10000sqm of commercial activities that include retail shops and offices. This house was built between 2006 and 2010.



Figure 1. 8 Tallet bird view

Source: Archdaily.com

The design of the building was first dictated by the plot they had. The arrangement of programs was made by taking into account the need for each program which includes, the light, ventilation, views and accessibility. The idea was to emulate the formal design of Denmark where programs are arranged vertically. But the issue was that with this design all the programs would be looking the same while their use is very different. That's why they opted to use the arrangement in layers, horizontal layers. So every program would have its layer.

The first layer was the commercial part which was on the ground level, then followed the three other layers for residential activities. Apartments, row houses and penthouses were stacked respectively.

The offices and retail shops were laid to the ground level because they have to be in direct contact with customers and street activities. And also they like daylight but hate direct sunlight because it can cause discomfort when people are busy working. On top were apartments and row houses which on the other hand hate direct street life because you don't want anyone to walk around looking in your house but like direct sunlight and nice views.

The master plan required a direct passage through the building and a knot was tied in the middle of the rectangular block that turned it into an 8-shaped building. However this shape comes with its flaws .Here one can cite for example that it blocks sunlight for the parts trapped in the inside and also that space is not well ventilated which may cause the use of artificial lighting, ventilation hence rising the cost of living in the building. So, to deal with this challenge they lifted the row houses on the south-western part so that they can get sunlight. On the other corner they recessed it almost to the ground so that the middle part would get enough sunlight and could be well ventilated.

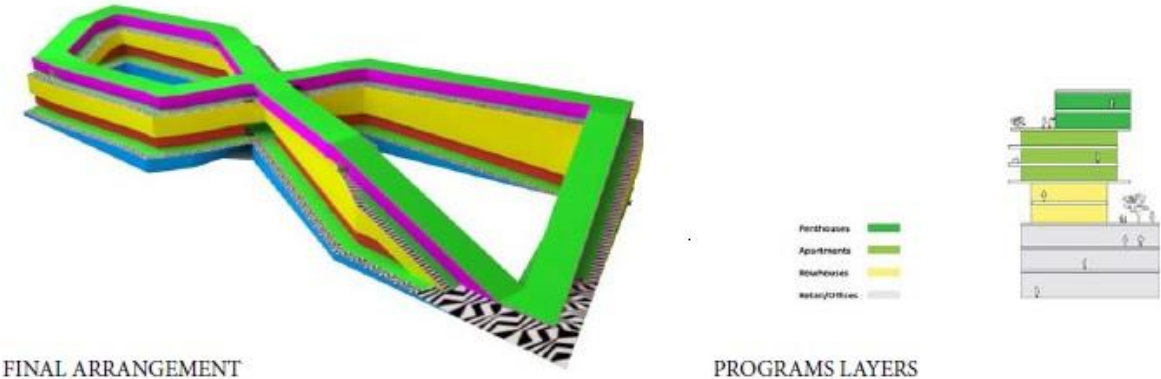


Figure 2. 8 Tallet program arrangement and program layers

Source: Archdaily.com

To complement this design they designed two courtyards inside the space created by the building. These courtyards may be used as even public spaces, and that's where people pass by when they are moving through the building.



Figure 3. 8 Tallet courtyards

Source: Archdaily.com

To facilitate the circulation there were designed a 1 km long ramp that goes all around the building from the roof level to the ground. It goes from up to down and up again. This big ramp can be used by pedestrians as well as those who use the bicycles. They are made using a black and white pattern to resemble Nyhavn streets that also have black and white patterns. And to mark important entrance golden colored clad was used.

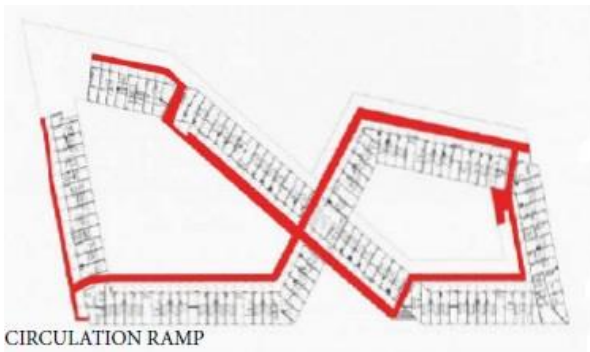


Figure 4. 8 Tallet circulation

Source: Archdaily.com

The design of row houses was inspired by the traditional Nyhavn houses where every house had a small garden in front and then a street or a road. So this traditional way of designing was somehow integrated in this house on the part of the row houses. They have a small garden just in front of the row house and then in front of that is the ramp talked about earlier, this represents the road on the Nyhavn houses.



Figure 5. 8 Tallet row houses exploded plan and front garden

Source: Archdaily.com

These small gardens were also applied on the penthouses. These penthouses had a garden at the entrance and at the roof. They are designed in way that you can even access the roof where you could enjoy some nice views. The apartments also like the above mentioned residential spaces are equipped with basic functional spaces of a residence like a living room, dining room, bedroom, kitchen, and bathroom. These apartments have balconies so that one can have a very nice view of the marshlands near the area. They vary in size and are designed differently. Each residential unit has between 60 and 144 sqm.



Figure 6. 8 Tallet penthouse and apartment exploded plan

Source: Archdaily.com

Other communal functions other than the 8tallet café which is found at the lowest end of the building, are all located at the center where the number 8 crosses. These include a common room, lounge, guest apartments, and cinema.

They are connected by a common staircase because they are arranged vertically. This building is also an example of one of the most sustainable buildings because it has a very big green roof of about 17200 sqm. This helps regularize the heat inside the building, thus reducing the cost of cooling or heating and make it a very efficient building despite its size. There is also use of skylight on the staircase at the center of the building that reduces the use of artificial lighting at daytime thus reducing electricity cost. The green roof also is seen as a continuation of the green marshland around that building. To give the feeling that it is connected to the ground.



Figure 7. 8 Tallet green roof

Source: Archdaily.com

This precedent was chosen for its sustainability with the extensive use of greenery and the way the sociability of the place was encouraged by creating spaces that are mainly for the residents of the housing to socialize. Also this precedent is important in the way every unit has its own garden, just like the way Rwandese do, where everyone likes to have his own garden.

2.1.3.2. Les Nids

Les nids is a residential complex build in 2010 designed by KOZ Architectes. The complex comprises 28 apartments, a shop, a business premises and a basement for parking. Reinforced concrete structural system. Coloured high-density laminated panels. Rain-water collection, planted roof, heated flooring, external wood/aluminium joinery, loggia and private walkways for all apartments.



Figure. 8 Les Nids

Source: Archdaily.com

In 2007, Groupe 3F and the Courbevoie Town Council launched a competition for a social housing project on the last remaining plot in the urban development zone of Les Fauvelles. The instructions given to the teams were as follows: “the project must present new approaches for social housing in densely occupied urban settings”

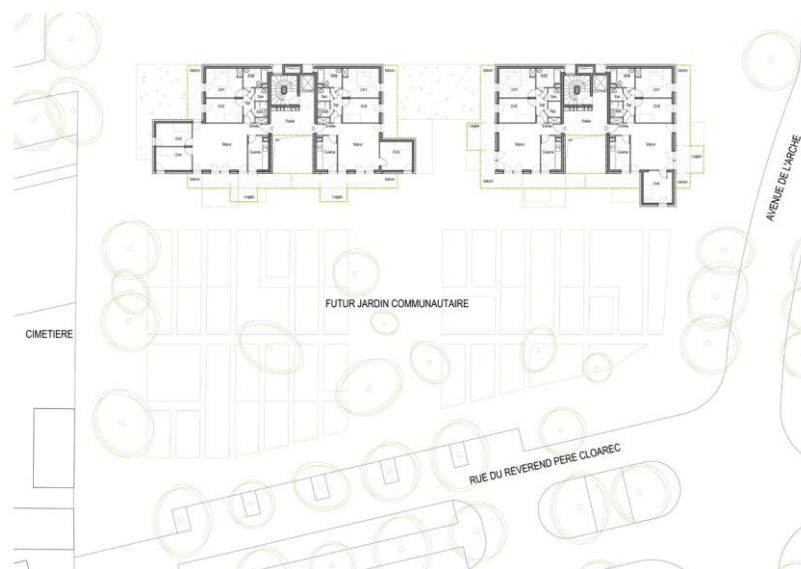


Figure 9. Les Nids site plan

Source: Archdaily.com

From the start, the exercise involved defining the intrinsic qualities of individual housing, with a view to adapting them to collective living. Four such qualities seemed to be essential:

Quality of use, Circumnavigability, Individualization, Neighborliness

Once this initial exercise had been carried out, the aim was now to apply these 4 cardinal virtues of the individual house to a collective housing project. The building forms part of the urban development zone called Les Fauvelles in Courbevoie, a stone's throw from the skyscrapers and frenzied activity of the La Défense business district. All around, the 12-storey residential buildings in the Faubourg de l'Arche development zone form both a skyline and an urban clearing. Behind it stands a building belonging to a French car manufacturer.

The project consists of two units with rather undefined outlines, further blurred by the crisscrossed green strengthening rods that have been used as sculptural guardrails for the various walkways and loggias. Opting for two buildings instead of one enabled the architects to increase the surface area of the façades, to give an enhanced feeling of transparency, to ensure a variety of orientations and views, and also to get closer to the more intimate qualities of use and scale characteristic of individual houses. Both units are built on a sculpted base and stand out against the sky like a pair of funny giants reaching out to each other.



Figure 10. Les Nids Elevation

Source: Archdaily.com

2.1.3.3. Monterrey Housing

ELEMENTAL Monterrey housing consists of a three-story continuous building that in section superimposes a home (first floor) with a two-story apartment above (2nd and 3rd story). Both units are designed to technically and economically facilitate the final middle class standard of which will be handed over the “first half” (40 sqm). In this sense, the difficult parts of the house (bathrooms, kitchen, stairs, and dividing walls) are designed for the expanded scenario, that is, for a home of more than 58 sqm approx. and an apartment of approximately 76 sqm.



Figure 11. Monterrey Housing

Source: Archdaily.com

Secondly, given that almost 50% of the m² of the complex will be self-built, this building is porous so that the growth can occur within the structure. On one hand the designer wanted to frame and give rhythm (more than control) to the spontaneous construction so as to avoid deterioration of the urban environment over time, and also make the process of expansions for each family easier. The proposed continuous roof above the volumes and voids protects the expansion zones from rain and ensures a definitive profile of the building toward the public space.



Figure 12. Monterrey Housing modified unit

Source: Archdaily.com

Third, experience tells that in lower class neighborhoods the green spaces tend to be “earth spaces,” due to the scarcity of maintenance and the distance that exists between green space and the home that makes it difficult for neighbors to take care of. What the designers did in this case was to surround the green space with building, reducing the distance between communal space and the home to a minimum. This permitted them to define a collective space with secure Access that gives space to the social network and generates favorable conditions for maintenance and care.

All the apartments have direct Access from the public space and parking, a condition especially relevant in a country where every family can have access to an automobile.



Figure 13. Monterrey Housing Parking

Source: Archdaily.com

2.2. THEORETICAL FRAMEWORK

The criteria that are going to be focused on in the research are form, size, and materials. As stated above these are the most important features of the design of housing. The first thing that one notices when sees a house is its form first.

The form of a housing can either be looked at individually or as a group of houses, or a housing complex. For an individual house, the form of the house is indicated by its shape, the shape can be rectangular, spherical, oval, and so on. Alone also the building can be indicated by its height, where some are considered low rise, mid-rise, and high rise, depending on the number of stories. As a group of building one can analyse the organization of all the buildings and their density.

The other criteria that is very important in this research is “materials”. The materials have an impact on all elements regarding housing, from the cost to the look and aesthetics, endurance and sustainability. The research will look for all information regarding materials that can have an impact architecturally on the housing of the middle income.

The last criteria the thesis is focusing on is the size. This is related to the scarcity of land that our country experiences.

2.2.1. Criteria for designing

2.2.1.1. Form

2.2.1.1.1. Shape

The building shape is the spatial attribute that defines the outline of the building. It affects the areas and sizes of the vertical components such as external walls and associated finishes, windows, partitions and associated finishes, etc., as well as the perimeter detailing such as ground beams, fascia, and the eaves of roofs. The key factors influencing decisions on the outline of a building shape for a proposed project include the shape of the site (plot); functional requirements such as natural lighting and good views; and manner of use such as coordination of manufacturing processes, and the forms of machines and finished products in a factory building. (Ibrahim, 2007)

As a rule, standard textbook analyses suggest that, “the simpler the building plan shape, the lower will be its unit construction cost” (Seeley, 1996). This is based on the knowledge of building morphology and geometrical characteristics. This lacks any empirical support. The reason adjudged for this by Seeley is that the perimeter required to enclose the same floor area is less for simple plan shapes. This implies reduced amount of perimeter elements such as external wall and associated finishes. It can therefore be inferred that since exterior walling system is a cost significant item, the building, having the smallest perimeter for a given amount of accommodation, will be the cheapest as far as these items are concerned (Ferry and Brandon, 1991).

But Ferry and Brandon further argued that although circular shapes produces the smallest perimeter in relation to area, they do not provide the cheapest solution. The reasons advanced for this include difficulty in setting out the building; high cost of achieving curved surfaces; standard joinery and fittings based upon right angles which will not fit against curved surfaces or acute-angled corners, since non-right angled internal arrangements are generated; and inefficient use of site space. Ferry and Brandon (1991) provided several analytical plan shape indices, which Chau (1999) criticized as being only a function of the plan geometry without reference to empirical data.

Chau proposed a new approach which involves empirical estimation of a Box-Cox cost model. His results suggests that it is better to build a regression model that predicts how much floor area can be built with a fixed sum of money than to predict how much money is required to construct one unit of floor space. Ibrahim (2004) used regression analysis to develop such predictive models for assessing the effect of variation in building plan shape on unit construction cost. However, contrary to Chau’s conclusions, Ibrahim’s results confirmed the predictive powers of the existing plan shape indices and that of using some of the building parameters, especially the building perimeter and floor area and the perimeter-to-floor ratio.

2.2.1.1.2. Height

Today, the world's tallest building proposals are of concrete construction and of residential or mixed-use functions (Oldfield, 2007). High-rise residential building developments have become the main focus of high-rise construction, due to the constraints of high-density, shortage of land, and lack of space in many of the world leading cities.

Over the years, various studies have been conducted to examine the height-cost relationship, mainly sourcing data in western countries. However, having examined the wider research carried out in other aspects of high-rise buildings (for example, the technologies involved), there appears to be a dearth of investigations looking at the relationship between height and cost in high rise buildings. (Blackman, Picken, Liu, 2008)

Tregenza (1972) carried out a height and cost analysis based on 10 different office buildings, from one to eighteen storeys high. The research found that tall building costs were greater than a low compact building having the same internal floor area. He suggested that the low compact building would give better value for money than a tall building unless the land cost is high. A linear regression line was implied.

Around the same time, Steyert (1972) made a similar study in the USA. He applied a dynamic model instead of a statistical model to analyze the relationship. He concluded that different elements of a building would have different responses to the cost, when the height changed.

He also suggested that the cost of some element might decrease with height. Steyert summarized two reasons for cost reduction. Firstly, there would be a learning curve effect. Secondly, the total cost of some items would increase less than proportionately with gross floor area, such as the roof and foundations.

Jong *et al* (2007) studied the economic context of high-rise office buildings in the Netherlands by interviewing experts working on high-rise projects and cost modelling techniques. They analyzed seven elemental costs and total construction cost against increases in height.

Structure, installations (building services), and elevator costs were the main factors contributing to the total cost increase with an average of 16%, 25% and 3% respectively. Site costs were also heavily influenced by height. The research discovered that eight storeys is the height of the lowest cost per square meter of the facade structure of the category 'high-rise' building in the Netherlands. From all these study, the study of Jong *et al* (2007) provided the satisfactory results to the height relation to cost, this means that the most effective height of the buildings that have the lowest price per square meter average is eight storeys. In effect, the lowest point of their u-curve, where the curve goes down till the 8th storey and the price starts going up due to the above mentioned factors.

2.2.1.1.4. Density

Density is generally defined as the amount of residential development permitted on a given parcel of land (USA-LGC, 2003). It is typically measured in dwelling units per acre – the larger the number of units permitted per acre, the higher the density; the fewer units permitted, the lower the density. Urban land use density is a measurement of the ratio of the intensity of use of land- use features for a geographic area. It may include the measure of the intensity of dwellings, structures or ground surface cover. Forsyth (2003) defines density as a number of units –people, dwellings, trees, square feet of buildings in a given land area and it varies greatly depending on the base land area used in the density calculation. Obateru (2005) refers to density as the number of persons or object per unit of space such as the number of persons or houses per acre or hectare. In its simplest form, residential density can be described as some numerical measures of the extent to which land is occupied by buildings or people (Evans, 1973).

Looking at the impact of density on the use of urban land, there are many elements that skew the favor to high density residential. Higher density development expands transportation choices by making it easier to use non-automobile transportation – walking and bicycling by locating activities closer together. Studies indicate that the average resident in a compact neighborhood will drive to 20 to 30 percent less than residents of a neighborhood half as dense (LGC, 2003). High density has also been found to cut infrastructure costs. A report by the U.S office of technology assessment (OTA) found that it cost a western city ten thousand dollars more to provide infrastructure to a lower density sub urban development than to a more compact urban neighborhood.

Residential density is an indicator that low intensively land is being used to provide housing. Decker (2009) arguing for high residential density posits that it creates a range of housing choices for people of different incomes, ages, and household characteristics; support efficient delivery of transit service and preserve open space, agricultural land and natural systems by using land efficiently. (Azizi, 2005) examined the challenges of urban development and density in Tehran and argued that by increasing density, land would be used and infrastructure would be provided efficiently. Moreover, the per capita cost of land per dwelling will tend to decrease as the density is increased, based on the economies of scale in the use of materials and other resources. The author however argues further that if density is increased disorderly and unplanned, its negative effects would be alarming. The costs of services such as provision of roads, water, drainage and sewerage lines tend to decrease with more compact development but once density is increased beyond a certain level,

the cost of development begins to rise sharply. Therefore, an optimum density should be considered resulting in savings in the cost of development.

From these literatures it can be found out that high residential density has many advantages economically and in terms of provision of infrastructures. However these advantages occur only when the densification is controlled and planned, providing higher density residential spaces would be a way to use Rwanda's and especially Kigali's land efficiently and reduce the cost of individual houses.

2.2.1.2. Materials

For materials if concrete is looked at for instance and analyze both pre cast and in situ concretes because they are mostly used in the construction industries here in Rwanda.

According to Frederick Raina (2001), precast refers to the process of construction in which a concrete element is cast somewhere other than where it is to be used. The other place may be somewhere else on the building site or away from the site, probably in a casting yard or factory. The precast element may be pre-stressed, may be of ordinary reinforced concrete, or may even be without reinforcement. The single precast elements may be component of a general precast concrete system, or may serve as singular purpose in a construction system of mixed materials or types of elements. In this project, I am going to research on advantage and disadvantage of precast and cast in situ concrete elements and the problems encountered in designing precast element. Precast concrete framed buildings are a factory produced alternative to casting concrete in-situ. This has several advantages in the effects of the weather. Structural improvement using pre-stressing techniques is also possible. On site concrete production plant, handling equipment, formwork and associated labour are unnecessary, saving considerable construction costs. Additionally, semi-skilled labour may be employed for the relatively simple bolted assembly.

Design flexibility is restricted to the manufacturer's specifications for span, height, spacing of units, etc. but most systems incorporate sufficient variables to comply with the relatively regular structural form expected of this types of construction. The most common examples of precast the structural frame is in portal construction, although precast columns, beams, and floor sections may be applied to multi-storey building.

In-situ concrete construction dates way back to the discovery of concrete by the Romans. It involves the use of large quantities of water on a building site because fresh concrete cannot be workable if it loses moisture (Allen, 1985). Concrete masonry construction (CMC) also falls under this category of in-situ construction. Taylor (1977) describes concrete blocks as precast members and goes on to

say these can be factory manufactured or site-cast. Despite this argument concrete masonry construction involves large quantities of water on site. Allen (1985) explains that mortar is as much a part of masonry as the masonry units themselves. It accounts for 20% of the masonry work and it can only be used when it is wet and fresh. This statement confirms that CMC is a 'wet system'.

Over the years in-situ concrete construction has evolved from plain and reinforced concrete in the last half of the nineteenth century (Allen, 1985) to pre-stressed concrete in the first half of the twentieth century (Taylor, 1977). Despite having undergone such an evolution in-situ construction has had to adapt to various changes in order to compete with other systems of construction such as steel and precast construction. There has been an extensive prefabrication of reinforcing steel, mechanization of finishing operations, reusable formwork and many other techniques (Allen, 1985). The importance of in-situ concrete construction can be well looked at by considering the effects it has on a particular project. The fluidity of in-situ concrete offers unlimited sculptural possibilities on site. Examples of such sculptural works are Le Corbusier's Chapel of Notre Dame at Ronchamp du Haut in France and the J.F. Kennedy airport in New York (Allen, 1985). However, since concrete has to be cast in place it involves large volumes of formwork so that it stays in place. There is also the cost of release agents to be considered. Release agents are coated to the inner faces of formwork so that concrete does not stick to it (Monks, 1984). In fact formwork on most construction projects costs more than concrete, and sometimes even more than concrete and reinforcing steel combined together (Peurifoy, 1976). Hartland (1990) confirms that formwork is one of the most expensive elements in concrete construction. However, latest report statistics have shown that the cost of formwork varies between 35% and 38% that of concrete (Pallett, 1994).

In general in-situ construction rather has a very long construction process as compared to precast construction whose construction process is shortened by the fact that production of elements is done in factories and just assembled on site.

In-situ construction is known for its flexibility which enables it to enjoy quite a number of advantages. However, there are some disadvantages too associated with the nature of in-situ concrete and these add up to the increased costs, delayed production and times as well as compromised quality. Precast construction embarks on the advantages offered by its repetitive production of factory modular standardized and prefabricated elements. These include reduced costs of production and erection, guaranteed quality of building elements and speed of construction. Nonetheless, not all is green for precast concrete because it is not as flexible as in-situ concrete construction hence resulting only in standardized structures. Structures also lose their structural rigidity due to the absence of monolithic construction.

CRITERIA	INDICATORS	MESURABLES	REFERENCES
Form	Shape	Rectangular, round, irregular, triangular	Amos Rapoport, House Form and Culture
	Organization	Stacked, linear, radial, disorganized	
	Height	Number of stories	
	Density	Distance between buildings	
Materials	Pre-fabricated	Local, imported	Kevin Mc Cloud, The best of grand designs
	In-situ	Processed, non-processed	
	Total area of the house	Area of individual rooms	
	Number of rooms	Number of bedrooms, toilets, kitchens, living rooms	

Size			Avi Friedman, Narrow Houses: New Directions in Efficient Design
	Proportions	Size of the rooms comparing to the activities.	
	Opening sizes	Size of windows, and doors	

Table 3. Theoretical framework

CHAPTER THREE

3.1. METHODOLOGY

This section represents the method used by researcher to conduct the investigation as the way to reach the solution of research questions. Referring to the method that others have used, researcher will come up with his method which is appropriate to the data analysis. The information will be gathered according to the method that led the authors to the good output. By focusing on theoretical framework of study, researcher will come up with method to use for data collection which will not compromise the element mentioned in theoretical framework. These indicators for design are ceremonies, landscape of cemetery, administration, memorials, burials and gatherings. Elaborative methods to use during research will be primary data collection and second data collection. The primary data collection will help the second method as proof that method is adequate in the area of research.

Every research follows appropriate design and well defined procedures. Such research designs and procedures aim at providing answers the research questions and/or testing the validity of stated hypotheses, as well as assessing the cause and effects being estimated (Oloyo, 2001). This part of the thesis therefore discusses the procedures and methods adopted in the research design, data collection, processing and analysis as well as presentation and interpretations of results and findings.

There are many methods used in the research about housing. As this thesis is about research of housing for the middle income, the methods used should be relevant to the topic. The one used for this thesis was the “survey” method. The term ‘survey’ is commonly applied to a research methodology designed to collect data from a specific population, or a sample from that population, and typically utilizes a questionnaire, an interview or observation as the survey instrument (Robson, 1993).

Surveys are used to obtain data from individuals about themselves, their households, or about larger social institutions (school boards). Sample surveys are an important tool for collecting and analysing information from selected individuals. They are widely accepted as a key tool for conducting and applying basic social science research methodology (Rossi, Wright, and Anderson, 1983).

Surveys are very important especially to assess issues or project trends: marketing researchers use surveys to study consumer preference and shopping patterns (Leary, 1995). Selected television

viewers participate in surveys, designed to estimate the size of various television program audiences for the purpose of establishing advertising rates. Such sample surveys are comprised of standardized methodologies designed to gather information by examining systematically identified population samples. Social scientists rarely draw conclusions without disaggregating the sample population into various sub-groups. For example, the Gallup polls typically examine issues disaggregated by gender, ethnicity, education and region of the country (Rossi, Wright and Anderson, 1983).

According to Leary (1995), there are distinct advantages in using a questionnaire vs. an interview methodology: questionnaires are less expensive and easier to administer than personal interviews; they lend themselves to group administration; and, they allow confidentiality to be assured. Robson (1993) indicates that mailed surveys are extremely efficient at providing information in a relatively brief time period at low cost to the researcher.

3.2. AREA OF STUDY

3.2.1. Introduction

Nyarugenge is a district (akarere) in Kigali Province, Rwanda. Its heart is the city centre of Kigali (which is actually towards the west of the urban area and the province), and contains most of the city's businesses.

Nyarugenge district is divided into 10 sectors (imirenge): Gitega, Kanyinya, Kigali, Kimisagara, Mageragere, Muhima, Nyakabanda, Nyamirambo, Nyarugenge and Rwezamenyo

This district is located towards the west of Kigali as said above and is where the city of Kigali started.

The district was inhabited by 284,561 by the census of 2012. It occupies a total land mass of about 2.1 square kilometers, and is bounded by Gasabo and Kicukiro.

In the heart of Africa, fractionally south of the equator, Rwanda's relatively high altitude provides it with a remarkably pleasant tropical highland climate, albeit also with plenty of rain. Temperatures vary considerably between locations depending on their altitude, but very little from month to month in the same place. In the capital, Kigali, the average daily temperature is about

21°C.

Rwanda's long rainy season lasts from about March to May, when the rain is heavy and persistent. Then from June to mid-September is the long dry season.

October to November is a shorter rainy season and it's followed by a short dry season from December to February.

During both of Rwanda's dry seasons, there is often light cloud cover. This helps to moderate the temperatures, but also occasionally brings light rain showers.



Map 5. Nyarugenge District on Kigali map

Source: Wikipedia



Map 4. Nyarugenge District on Rwanda map

Source: Kigali city Website

Among the population of Nyarugenge about 49% are aged 19 years or younger. People aged 65 years and above make up 2% of the population. About 52% of the population is constituted by female individuals and the majority is young, with about 87% still under 40 years of age.

This shows how much of youth we have in this district. Which is the most vibrant District in the country because of this youth.

About 90% of the population in Nyarugenge district is identified as non-poor, 6.5% as poor (excluding extreme-poor) and only 3.6% as extreme-poor. Compared with other districts of Kigali City, Nyarugenge district comes second for nonpoor after Kicukiro district, which has 2.8% of extremely poor, 5.5% poor and 91.7% non-poor.

Nyarugenge has the highest population density with 2,149 inhabitants/km² and is the most populated district in Kigali city.

3.2.2. Chronological Process

Nyarugenge is located at the area where Kigali started as a city. Next is the history of Kigali throughout different times.

3.2.2.1. Pre-Colonial History of Kigali

Originally in the geographical ritual realms, Kigali was among the various lands along the Nyabarongo River that included Bumbogo, Buriza and Banacyambwe, where the "cattle kings" of first regnal name, (CYIRIMA/MUTARA) presided over complex rituals of magical renewal.

It is however not surprising to see Kigali among those lands where great kings presided over complex rituals of magic renewal because King Kigeri Mukobanya conquered Buliza and Bumbogo and was awarded Mount Kigali as the seat of his residence by the King of Bugesera. His successor Mibambwe I Mutabazi, annexed the Bugesera and the then natural region of Bwanacyambwe-sud was added to Rwanda. (Kigali city Website)

Usually this time there was little to no permanent housing facility in Nyarugenge because the inhabitants of that time were nomads who just were moving where they found prey and reside for a short time.

3.2.2.2. Colonial History of Kigali

In 1885 European representatives met in Berlin to carve Africa up for colonialization. Rwanda and Burundi were given to Germany, and were administered as a joint colonial territory of Deutsch Ost Afrika. Germany did not intend to colonize Rwanda and Burundi or European habitation, and to adopt a form of indirect rule with a very small European presence.

One of the first European accounts of Rwanda was by Duke Adolphus Frederick of Mecklenberg who said of Rwanda, “It is a land flowing of milk and honey where breeding cattle and bee culture flourish and cultivated soil bears rich crops of fruit. A hilly country, thickly populated, full of beautiful scenery and possessing a climate incomparably fresh and healthy in the heart of Africa.” (National Geographic 1912).

In 1907, Germany, under the Advice of Dr. Richard Kandt, the first European resident of Rwanda, set up an administrative residence in Kigali very close to the current market of Gakinjira in Cyahafi sector. In 1909, 20 commercial houses were built on the lace of the Nyarugenge market and military camp was built at the current site of the 1930 prison. At this time a small village occupied only a part of what is now the field hospital complex of Kigali.



Figure 14. Kigali in 1912

Source: Karahanyuze.com

Kigali remained a small colonial outpost with little link to the outside world until World War I. On May 6, 1916, Belgian troops entered Kigali and declared victory over the Germans. The Belgians criticized the choice of the site of Kigali and decided to create another administrative residence in Nyanza —the traditional residence of the King of Rwanda. After the war ended in 1919, Rwanda became a mandate territory under the League of Nations and continued to be administered by Belgium. In 1921, Kigali again became colonial administrative center for Rwanda, but the main administrative center for Rwanda/Burundi was located in Bujumbura, the present-day capital of Burundi.

The growth of Kigali under Belgian rule was very slow, and was contained primarily in the top of the Nyarugenge hill. When Rwanda gained its independence on July 1st, 1962, Kigali remained a

small village with primarily administrative functions. In 1962 the population was 5,000 to 6,000 people and the urban area of Kigali was approximately 3 square kilometres. (Kigali city Website)

It is when housing started properly in Kigali city and more specifically in Nyarugenge where Richard Kandt build one of the oldest buildings in Kigali that is still standing now. The people started building houses because that is when commerce started and people needed somewhere permanent to live. They started building in the area now known as Biryogo some informal settlements because that area was the one near where European and their markets were.



Figure 15. Kigali in 1968

Source: infratv.wordpress.com

3.2.2.3. Post-Colonial History to 1994

Soon after independence, the Rwandan republic decided to Make Kigali the capital of Rwanda. This designation as capital of Rwanda and the relocation of all national ministry functions to Kigali fuelled growth of Kigali beyond the Nyarugenge hill to five neighbouring hills: Nyamirambo, Gikondo, Kimihurura, and Kacyiru.

From 1962 to 1984, the population and the built area of Kigali expanded rapidly. The population grew at around 16% from round 6,000 people to over 150,000. The built area expanded over 12 square kilometres. Kigali continued to expand until the genocide of 1994.

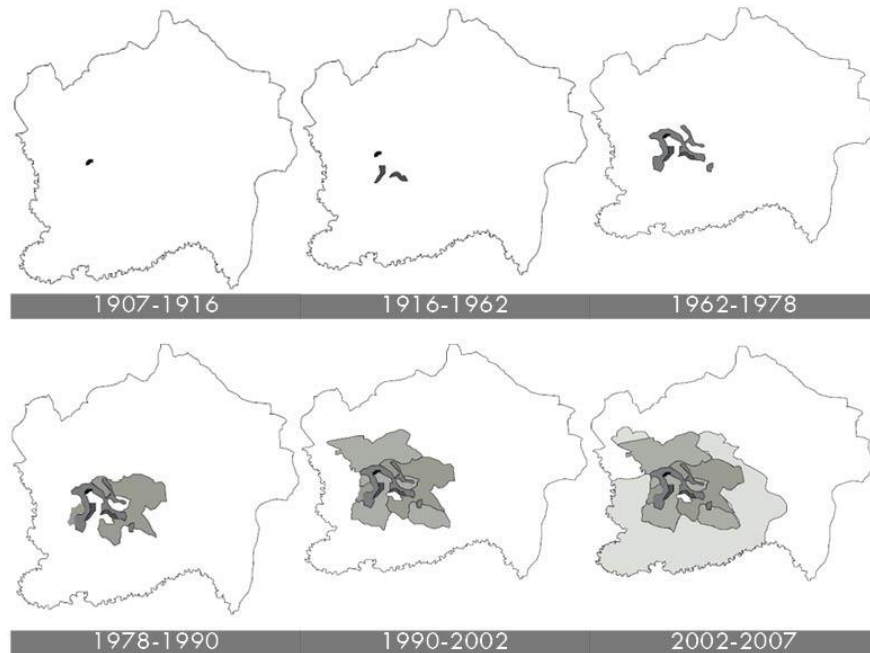
When the population grew rapidly there were obviously a need for housing and people started building quickly without compromising the quality, all they wanted is somewhere to call home in many of these areas especially in Nyamirambo. The area of Kacyiru and Kimihurura was inhabited by the people who occupied higher position in the government of the time because many of the government entities headquarters were located in those area but the modest ones lived in Nyamirambo (Nyarugenge) and Gikondo. (Kigali City Website)

3.2.2.4. Post Genocide Period

During the 1994 genocide, Kigali experienced a massive population loss but relatively minimal damage and destruction to the built environment. Only in 1999 did the population of Kigali exceed its pre-genocide level. Since 1999, the population and the built area of Kigali has continued to grow at a rate around 6%.

The city has made great strides in its recovery from the devastation of the 1994 war and genocide. Although damaged, the city's structure has considerably recovered, today forms a unique strategic site for its inhabitants, investors and tourists from all over the world. (Kigali City Website)

This period is when truly development really took off and came a reform and the informal settlements would be replaced by higher quality housing.



Map 6. Kigali Growth and expansion

Source: Surbana (KCMP)

3.2.3. Physical Development Process

3.2.3.1. Accessibility and connectivity

Nyarugenge is very accessible because that is where we have the entrance to the city of Kigali which is the international Nyabugogo bus park. Except from the Eastern Province anywhere else you are coming from the country you enter through Nyarugenge. This means that Nyarugenge is connected and is somehow an integral and central part of the city of Kigali. The streets in Nyarugenge are generally well made and in good condition, except in the CBD where it is currently chaotic.

A national highway connecting the Nyarugenge district to the CBD, Kigali International Airport and the eastern parts of the City runs eastwest between the Kanyinya and Kigali Sectors. Another national highway connecting the District to the town of Ruhengeri and other northern parts of the country passes through Kanyinya Sector. Another important road runs along the western and

southern edge of the District, parallel to the Nyabarongo River, offering connections to western towns such as Butare and the future City Centre in the east. However, this road is unpaved and in bad condition. Major paved roads only occur in the urbanized areas of the District. The rural areas have roads mostly in the form of mud tracks.

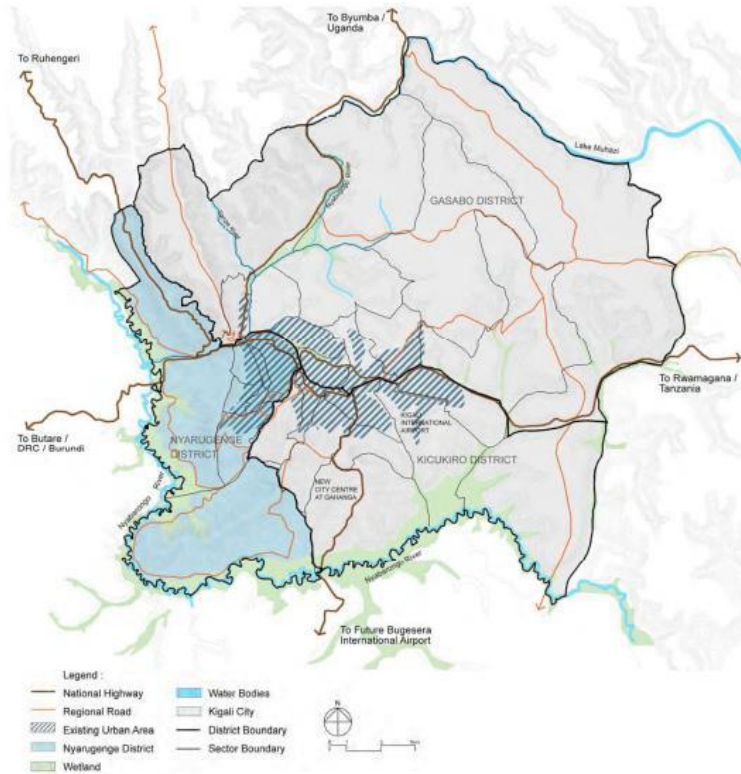


Figure 2.1: Nyarugenge District - Location and Connectivity.
Source: Surbana

Map 7. Kigali city highways

Source: Surbana (KCMP)

3.2.3.2. Topography and natural environment

Nyarugenge has the most undulating terrain, being made up of a series of ridges and valleys. The KCMP stipulates a slope gradient cut-off value of 20%, beyond which no buildings are allowed to be constructed. Based on this, 48% of land within the District lies in areas of steep slope.

15% of land within the District falls within the wetland boundary, as delineated by Rwanda Environmental Management Authority (REMA). However in many areas, especially those abutting Muhima Sector, the wetland has been encroached or built up for industrial, housing or agricultural uses. As such the boundary delineated by REMA does not correspond with the on-ground situation

where the actual marshland cover is much smaller than the wetland boundary. Hence, it is critical to reclaim the lost wetlands and restore them, as much as possible, to their natural conditions.

Besides this, due to the undulating topography, there are numerous natural drainage channels and adjoining shrubbery which need to be reserved and managed as part of the City's storm water management system.

Despite the large-scale deforestation, which the City witnessed in the last few decades, there are still pockets of dense and sparse forests identified within the City limits. 6% of land within Nyarugenge District is in the form of forest, which needs to be preserved and revitalised.

3.2.3.3. Type of habitat

The most common type of habitat in Nyarugenge district is spontaneous/squatter housing (76.1%) followed by dispersed/isolated housing (17.8%).

The type of habitat varies slightly across sectors. The percentage of spontaneous/squatter housing is more than 75% in all sectors except Kanyinya (45.2%), Kigali (36.9%) and Mageragere (33.9%).

Kigali (59.4%), Mageragere (58.5%) and Kanyinya (51.2%) sectors have high percentages of dispersed/isolated housing in Nyarugenge district.

The type of habitat varies according to the area of residence.

In urban areas, the predominant type of habitat is spontaneous/squatter housing with 90.8% and with 3.4% of planned urban housing.

In rural areas, the predominant type of habitat is dispersed/isolated housing with 60.6% and spontaneous/squatter housing with 34.2%.

3.2.4. Importance of specification

This area was very important to the research because it is the area that need an overhaul in housing. The area also is one of the area that has an already developed masterplan, so there is need to move from the spontaneous/scattered to a more organized way of housing. And as the government is putting the eviction signs on houses that are not on the standard. This research will find the solution for this people in the best way possible.

3.3. RESEARCH DESIGN

The research design refers to the overall strategy that you choose to integrate the different components of the study in a coherent and logical way, thereby, ensuring you will effectively address the research problem; it constitutes the blueprint for the collection, measurement, and analysis of data.

Apart from review of literature on the subject of housing in general, the thesis analyses design aspects of housing schemes. This roots the research in the prevalent situation and provides a clearer understanding of design and quality and housing on offer.

Case examples are a source for examining the multi-disciplinary factors that affect the design process and the build product, and help to shape the direction for suggesting changes and alternatives. The study looks at program guidelines, cost analysis, method and process of design, to mention a few. Such an integrated approach is geared towards conceptualizing of housing in accordance with the realities of the process.

The information presented in this research is based on combining two sources. First, a number of secondary sources, i.e., reports, publications and proposals of the public and private sectors and housing professionals. Second, primary sources, i.e., feedback of residents. Middle - income apartment dwellers are interviewed as a part of to get feedback from the population.

The research in this thesis is qualitative with emphasis on the quality of housing middle income people of Nyarugenge need in this time and the future too. The research will be done by asking several questions to ask to randomly chosen people found on site. It will be emphasized on the area of Rwezamenyo because that is where there is a high of middle income people.

This also is much related to the theoretical framework where the main emphasis of the research is not the quantity of housing but the quality of those houses, though in some occasions the quantity affects the quality in one way or the other.

This thesis will use three methods. First, for primary sources, semi-structured interviews will be used to get information from the residents of the study area. The second method that is used to get primary information is the observation method. For secondary sources, there will be used analysis of documents.

3.3.1. Primary data

These data are the one to be collected at first time by research during the time of being in the area of research. The data collected during primary data are original direct information. These information did not been shared in any other resources. In order to get this information during primary data, researcher will use quick interview with people found in the study area as a normal conversation. The conversation was open to everyone found during this time and respondents provide their information in way that they feel. This interview was not complete interview; its structure was a half oriented structure. Researcher tries to interact with the people of this neighbourhood and converse with them.

The primary data was obtained through survey of housing units in the selected area (Mumena Cell) and interviews conducted with selected people from the area. These were complimented with physical observation of the characteristics of the houses.

3.3.1.1. Observation

Observation method was used to get the information on the site by looking the features of housing in the area, how people interact and their activities. The researcher visited the area several times at different times of the day to see how the people of Mumena live their life and the relationship that they have with the area and their everyday routines.

The other element that was observed was how the people of the area interact with other people and the relationship they have with each other and the relationship that they have with the people from the neighbourhood, which can be called the neighbourhood quality of the space and the sociability of the area. To collect this information, notes and photographs were taken.

3.3.1.2. Interview

There will be collection of information based on the interview, where researcher will conduct the conversation with the respondents face to face. There will be the survey form where the respondents

will be responding to the questions prepared by the researcher but using their own words which might bring other questions and information to light. Because the majority of people speak Kinyarwanda; the interview will be conducted in Kinyarwanda and the researcher will translate the conversation in English.

The interview method was used because that is where you get to see what people really think and feel about the questions and answers they are giving from that, then conclusions would be taken about the correctness of the answers gathered. The interview would be made by these following questions and many more or even less depending on who will be being interviewed.

3.3.2. Secondary data

The secondary data was derived from multiple sources such as published and unpublished materials in books, journals, encyclopedias, magazines, research works, conference/seminar and working papers. Others were housing programme brochures, review of government's official documents and statistics, as well as web pages from the internet.

3.3.2.1. Documents analysis

There will be an analysis from different kind of documents that reveal information about different housing aspects. From the analysis of these documents more information will be got on how to deal with housing issues that are being faced in other parts of the worlds that can help solve the issues we have in Rwanda. Also added knowledge will be found on how to raise the standards of the housing qualities. Information also will be found on how to minimize the costs of houses that are going to be built.

3.3.2.2. Mapping

Another method that will be use in data collection is mapping method where the researcher uses the Google Earth maps to record or analyse information found on the site. This include the site analysis where the researcher analyses the accessibility and other public facilities that are around the site that can be well described on maps.

This method will be concerned with the map from Google earth which researcher will use to record and analyse the information found on site. This method was also used to record the relevant information about natural features such as topography, location of greenery and other natural elements. The method will consist of having printed Google earth photo and contours map so that the over layering of maps can give the correlation of information with its real location.

The information about accessibility facilities such as roads and paths will be recorded through mapping; Where all roads will be shown on the map, as well as paths. The combination of road map and path will be used as a technique to get information about accessibility of the site and the proximity of the site with other facilities.

The information got from these Google Earth images will be transformed into base maps that will provide the basis to make maps that show different information such as land use, traffic, sun path and similar information.

3.3.4. Expectations of findings

From the above question which might all or not all be asked to interviewees, the expected findings are about the quality of life that these people live in. These findings also will show more about the neighborhood quality of the area. After analysis of the answers, the research gives the platform on which the design of housing blocks of the low to middle income would be designed and the neighborhood quality it will require.

3.4. Specification of data

METHOD	STATISTICAL SOCIETY	SAMPLING GROUP	SAMPLING METHOD	UNIT OF ANALYSIS
Interview	Middle income population	Middle income population of Rwezamenyo	Systematic random sampling	Housing cost, size

Observation	Middle income population	Middle income population of Rwezamenyo Houses Neighbourhood	Systematic random sampling	Materials, Form, size
Document Analysis	Middle income population	Houses Design	Purposive sampling	Houses Materials, Form, size

Table 4. Specification of data

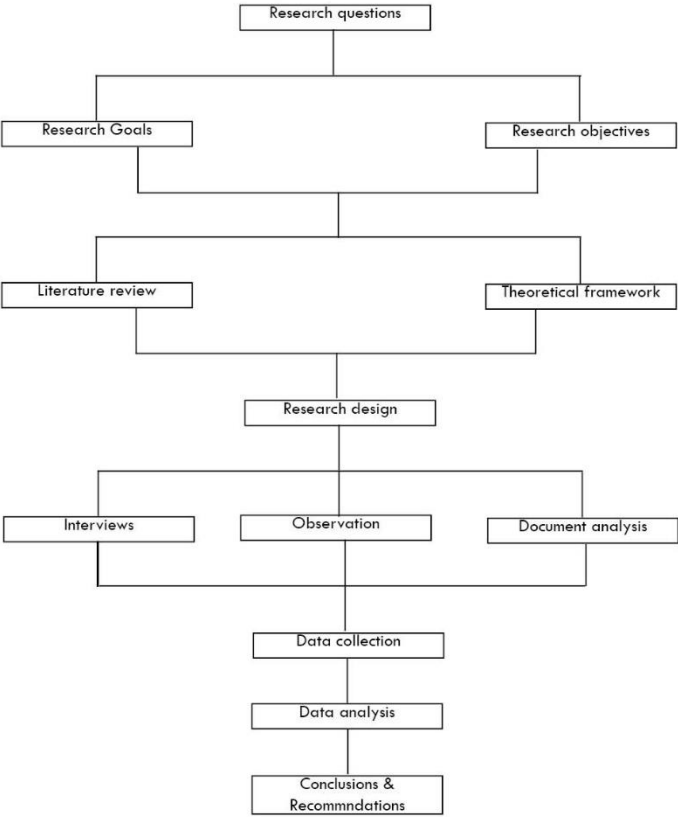


Table 5. Research design

3.4. Validity and reliability

Validity helps to remove mistake by referring to the trusted method used by other for the same method (Potter, 2002). This method ensures that the output once using the same procedures, in this research, research rely on the method used as it was cited in each section of methodology. This time validity was elaborate on the procedures during data collection on the site of research. All activities were done by following the same method sited in research design. Research also was done focusing on problem statement and objective to achieve as the framework of the research. In order to make sure that the method is neat, there was the draft information; this draft information was corrected during pilot survey and was checked second time during the in-depth study.

The way of increasing construct reliability when doing case studies research are: The use of multiple sources of evidence, establish a chain of evidence, have the draft case study report reviewed by key informants (Yin 1994). The sources as mentioned in the methodology section include observation, interview, mapping and photographs. As reliability is more concerned with the data, the pilot data has proven that the number covered are the base to prove that the data will covered at maximum in all method that will be used.

The methods and findings used from this research are very useful because they deal with a problem that can be found in many other areas of the city or even the whole country. It will not only be important to the people of Nyarugenge, but it might create even a guidelines that all housing blocks should follow in different part of the world.

The sample size was almost 100 people, with the demographics systematically taken care of. The people interviewed were both male and female to get the perspective from both men and women. The age of the interviewees also varied a lot, from 16 years old to 60 years old to have a research that will be used by people of all ages.

The thesis also will be presented to an expert from Kigali City who will review it to give it proper validity.

CHAPTER FOUR

4.1. Data collection

The data was collected in this research by first observation. The researcher used the method of observation before interviewing the residents of the areas from Nyarugenge District focusing the Mumena Sector. These people are the ones that are more likely to look for new typologies of housing because their houses are very old because they were built a long time ago just, they need renovation and even a total removal.

The object of the observation was first the typologies of the houses that people live in at the moment. This is to see the different kind of houses that are in the area so that can even help in designing the new housing blocks. The different types of housing shows the temporal dimensions of the space. The typology of buildings can tell the time at which the building was built.

Another object of the observation was the neighborhood characteristics or the neighborhood behavior on the base of how the people interact in the area which is a very important aspect in the design of housing blocks. This observation also would look at the social dimension of the place. The public facilities that are in the area and how it links the people around it.

The other data collection method used in this research is the interview method. In getting information from the people, as stated in the previous chapter, interview is the most efficient way of getting the most precise information. In the research, interview was the method used because that is where you get to see what people really think and feel about the questions and answers they are giving from that, then conclusions would be taken about the correctness of the answers gathered after analyzing even the body language of the interviewees.

In sampling the people that would be interviewed the random method was used. The people were just asked without judging neither by age or gender. The researcher visited the site for two hours in three days which equals in total of six hours. Eighty people were interviewed in total and gave different answers to the question designed in the previous chapter. The interviewees were of all ages and gender because it was important to get views from different kind of people. Among the people interviewed were the owners of the homes, those who are renting, the youth that live with their parents and others that live by themselves, men and women that are working in different areas and even women that are housewives. This enables the research to be very rich because it got the view or the perspective from very different kind of persons.

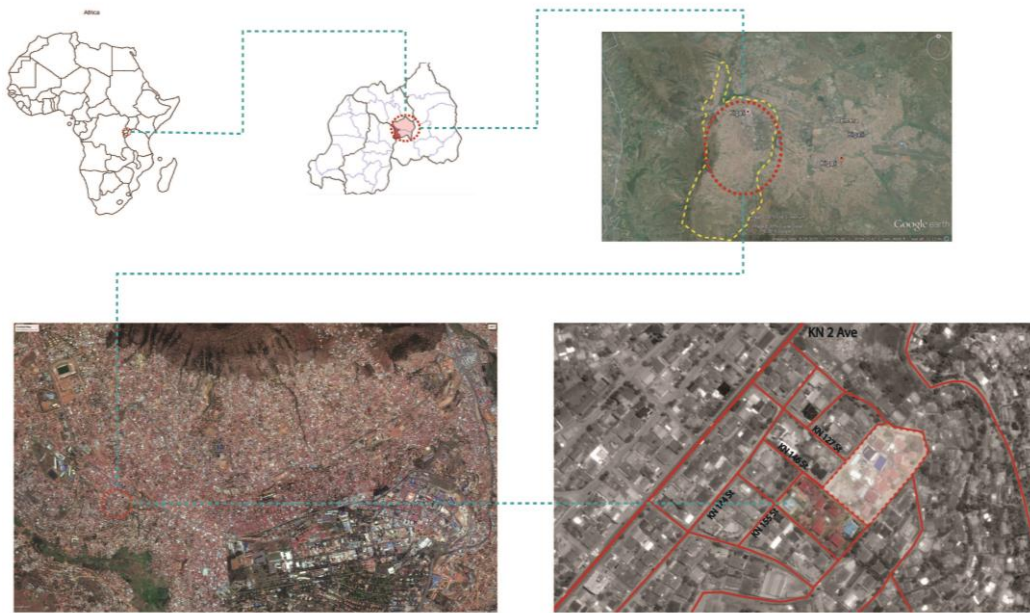
The other method used in this research is the document analysis. Documents were read and analyzed in order to find more information on first the issue and more importantly in the ways and methods used to solve this issue.

The data collection was a success in a way although it was an intensive and it had different challenges that were tough but the researcher found a way to deal with those challenges. First, there was an issue with time management because of the intensive schedule of the researcher that made it difficult. The other issue was that some of the people were not comfortable in giving interview because they were not just comfortable information to someone they didn't know. Also, as Rwandan people are discreet, they were jumping some question and in some occasion they refused to give interview completely. Next are the results of the data.

4.2. Results of data

4.2.1. Site analysis

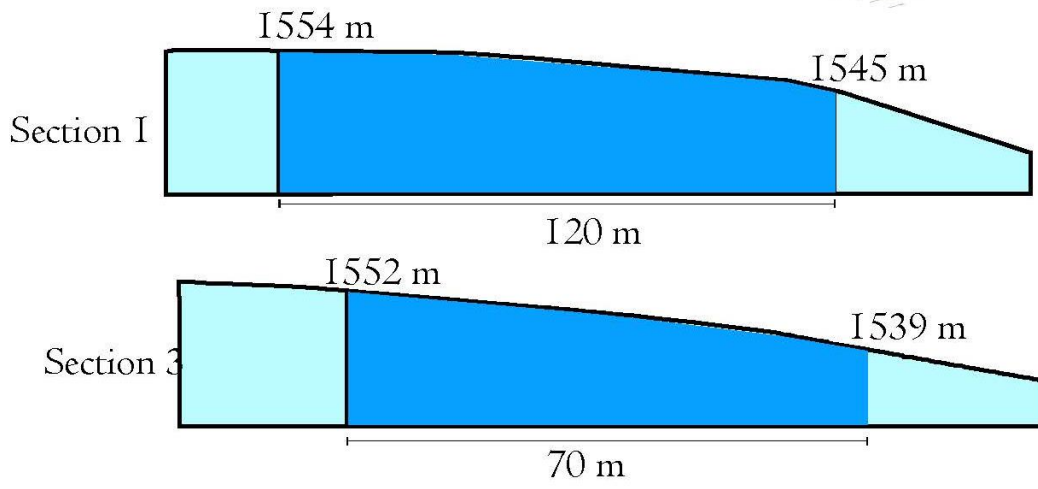
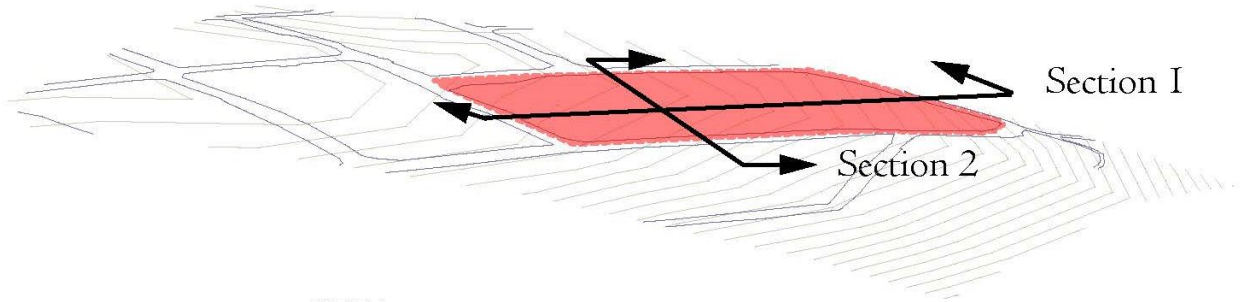
The site chosen is located in Nyarugenge District, Nyamirambo sector, Mumena cell. It was chosen because it is an area that needs an overhaul in housing because the housing in the area is very old and needs some new blood. The location of the site is also very connected to its surroundings and has around it almost all the facilities needed to support housing.



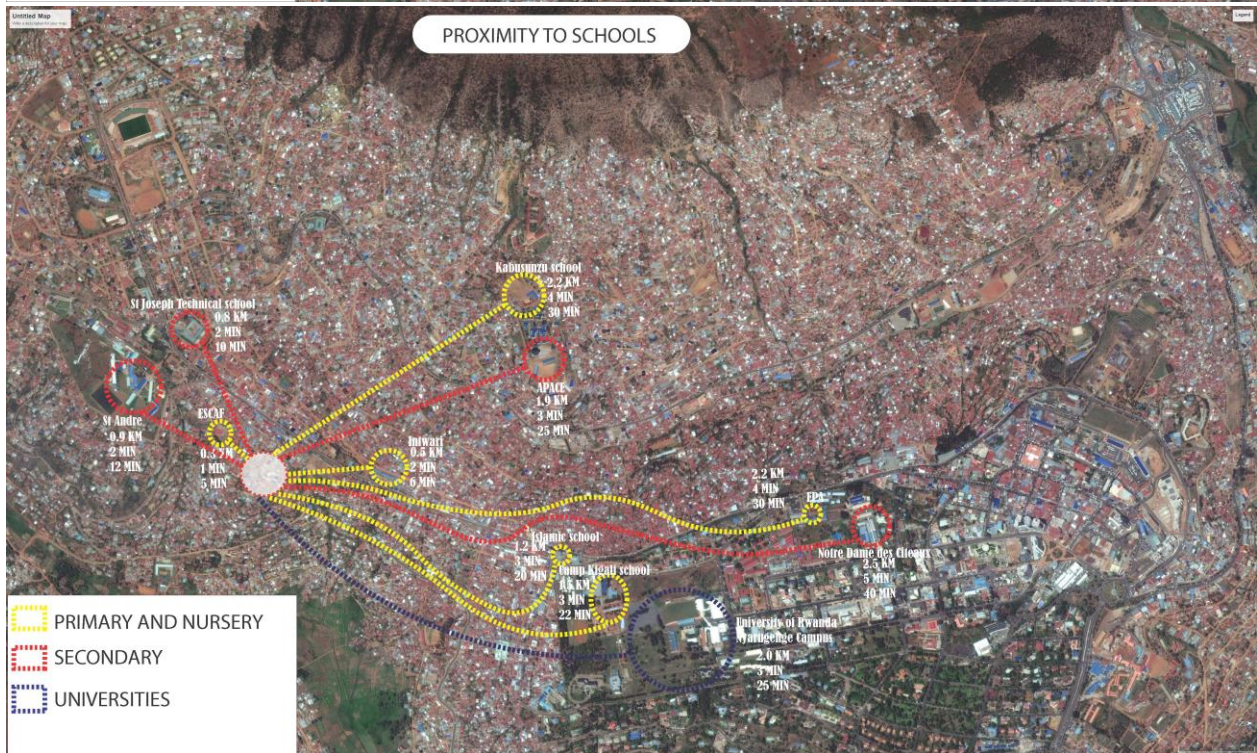
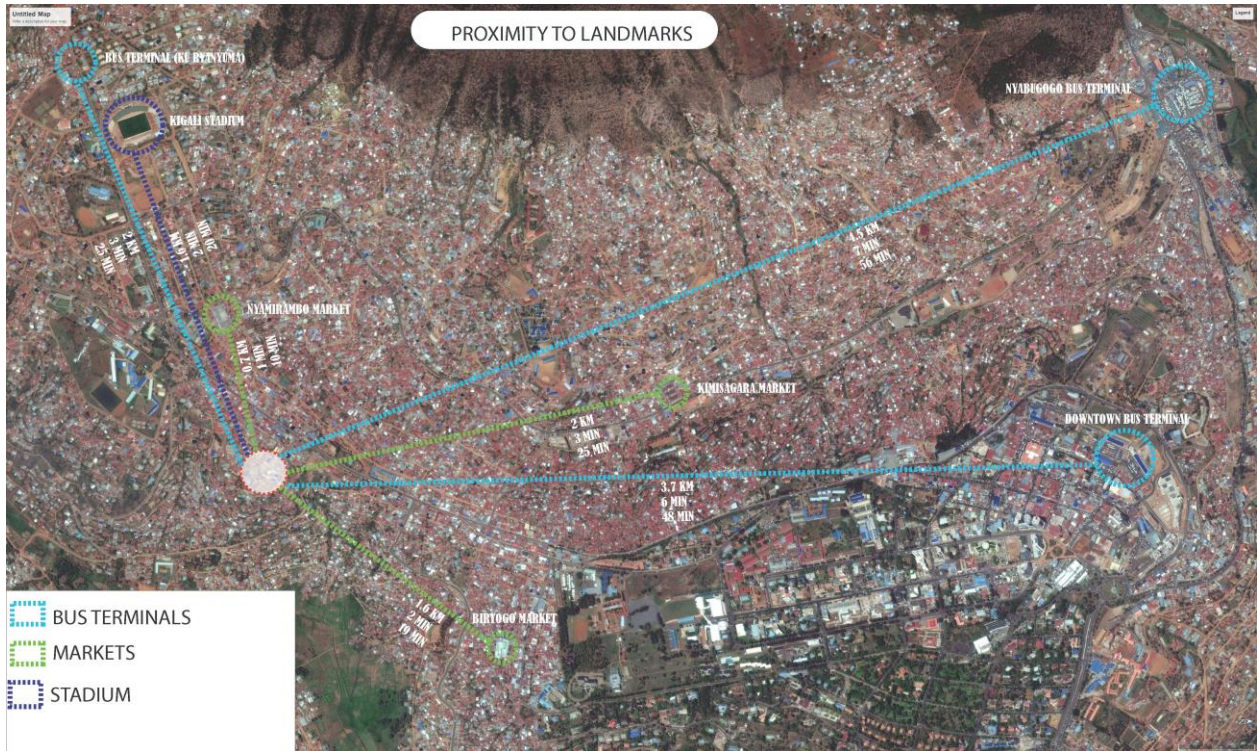
Map 8. Site location

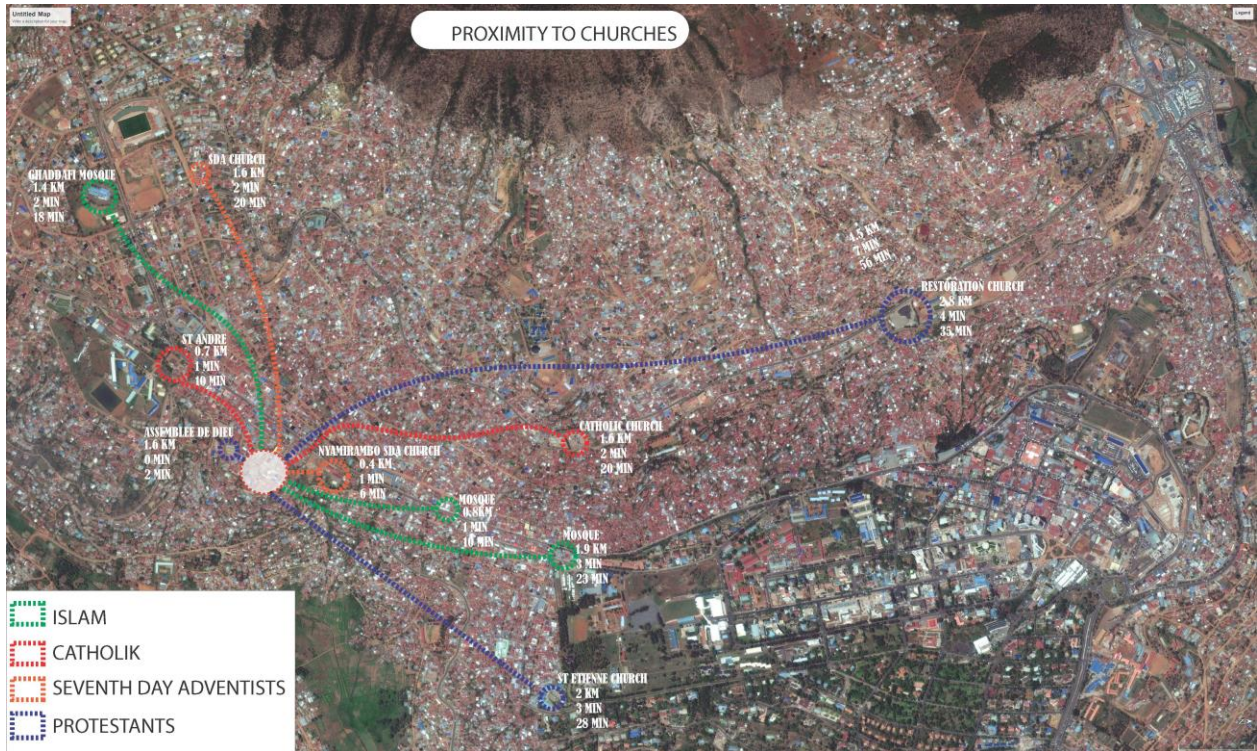


Map 9. Site Size



Map 10. Site Topography





Map 11. Proximity to surrounding facilities

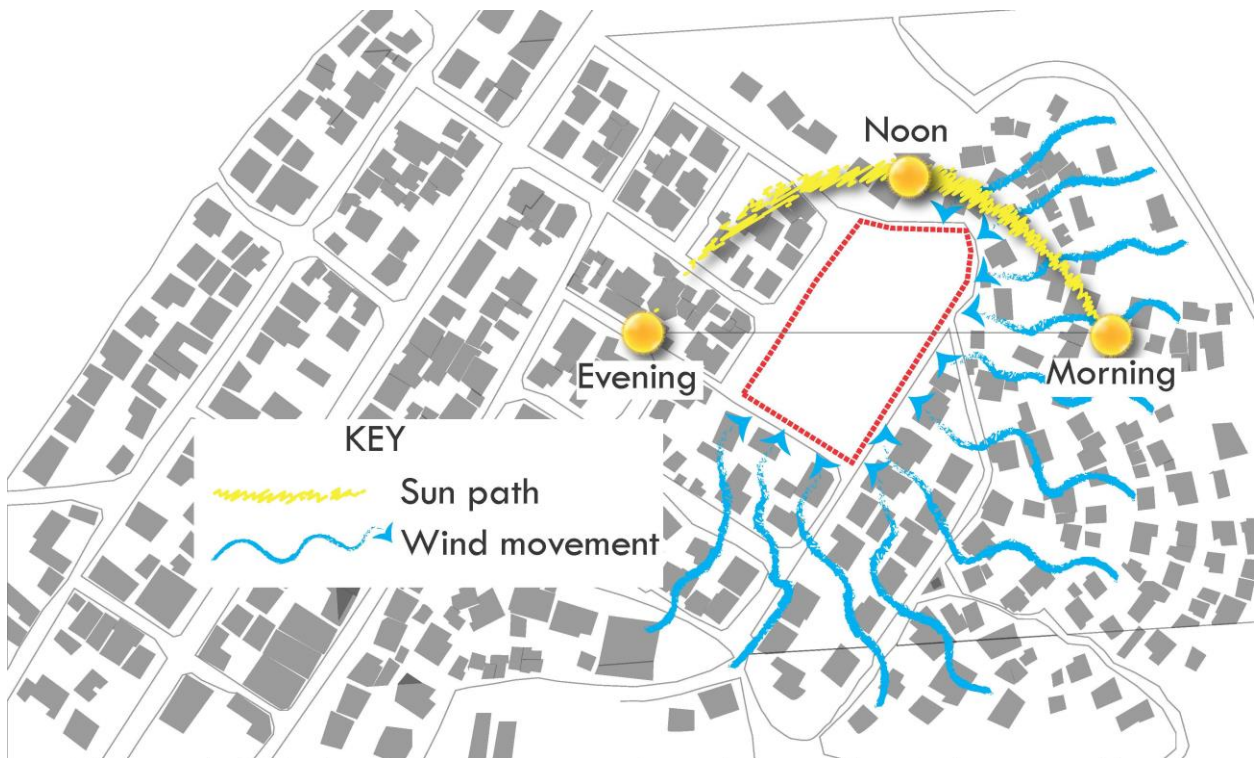


Map 12. Circulation and accessibility

LAND USE MAP

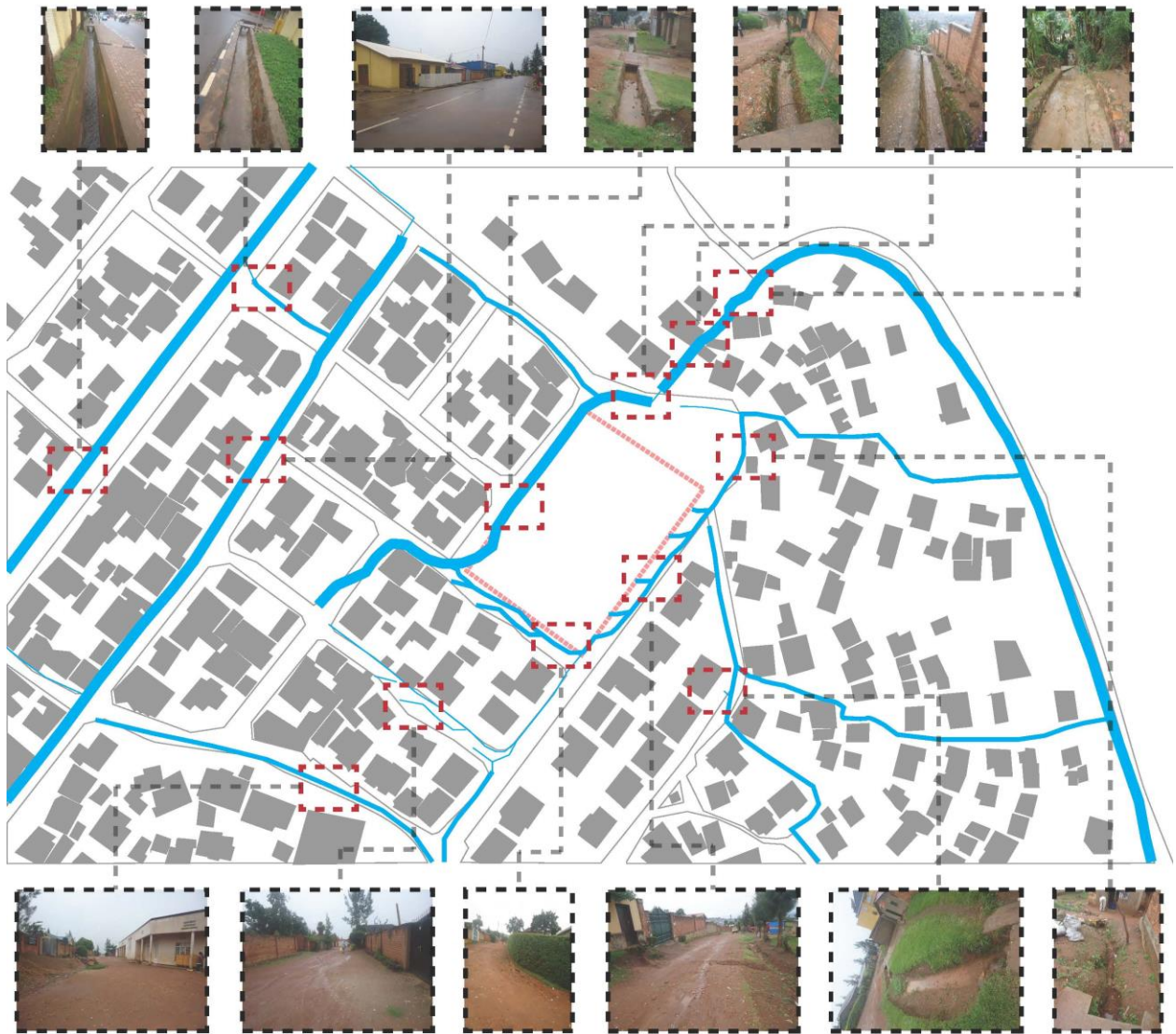


Map 13. Land use



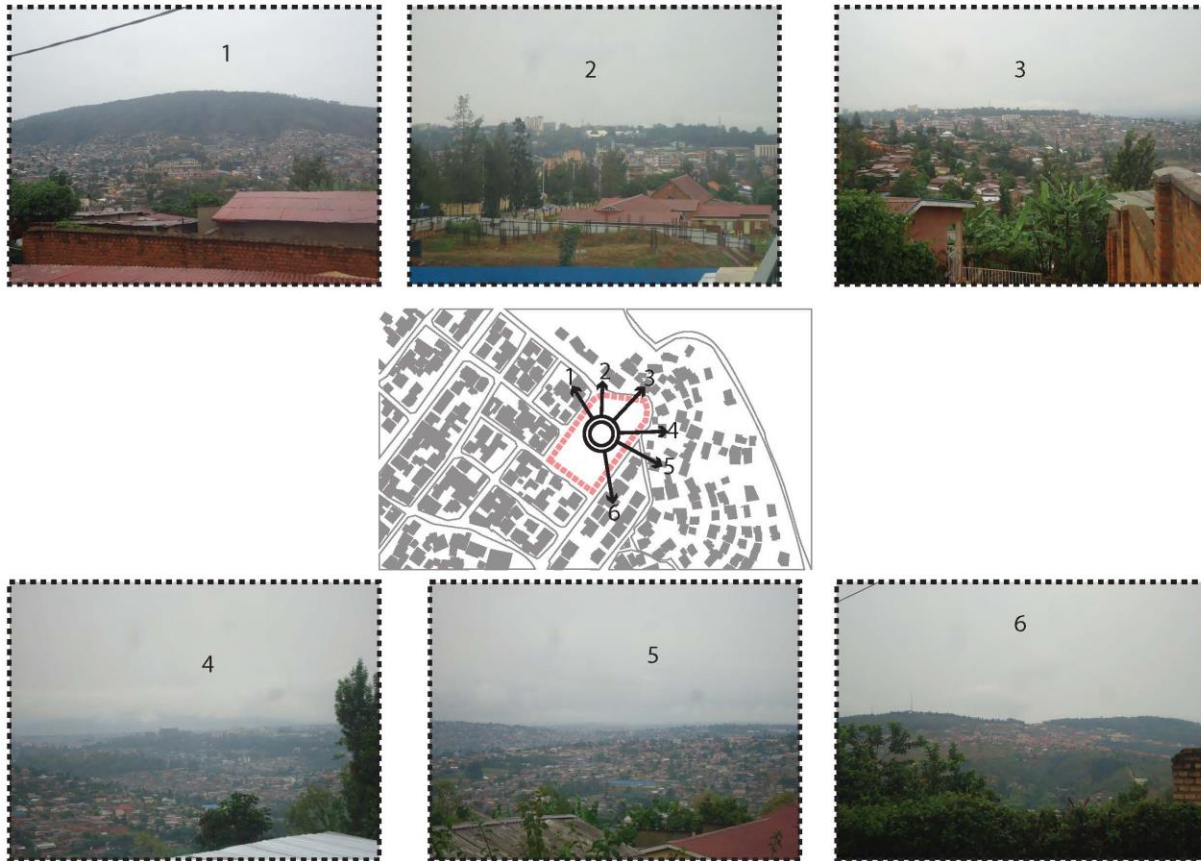
Map 14. Sun Path and Wind Movement

DRAINAGE



Map 15. Drainage

VIEWS AND VISTA



Map 16. Views and Vista

4.2.2. Observation results

In observing the housing of the area, they were categorized in different categories. There were houses that are very old, they are more than 30 years old. These houses were built in the period when the Belgians were still living in Rwanda, just a few years after the independence. The area that was focused on in this observation was formerly called “zone belge”, this translates to Belgian zone. From this first point, it is evident that these houses are very old and many of them are in a very poor state at the moment. Some of the houses still even have the marks of the bullets that were shot in 1994 as can be seen on Figure 24.



Figure 16. Site photo 1&2 showing the state the houses are in at the moment

The materials that were used in the construction of the housing in Mumena were predominantly bricks. They are the materials that were premium at the time the houses were built, because as said above, the houses were built a long time ago where bricks were the materials that were used a lot. The bricks that are used in some cases exposed or are plastered over. However For people with less income, the material used were adobe because it is easier to use and cheaper than the bricks. The adobe bricks also are covered by roughcast or plaster.



Figure 17. Site photo 2&4 showing materials used for buildings

Many of the houses are just responding to the needs of the people, and it is just that. They build the houses that just answer to their primary needs and it just stops by that. The house act as shelter to the people. Some of other needs like comfort are not that taken care of. They have few to no windows which means that the lighting in the houses are not sufficient which makes it difficult to live in there. But the people could not care less because that is what they can afford, so they are just happy even to have these existing houses.

However, as the people who live in the area through the years kept developing, some renovated their houses, in the area many compounds are a construction. On some of the sites, the construction process was undergoing at the time of the visit while others looked like abandoned sites. This shows the upward trajectory that the people from the area are on in developing themselves. When they get means, they upgrade their homes and most of the times they do it on the site of their own houses, this means that it is simultaneous with their everyday life. This is very different from the other parts of the city where when someone is building their new home, the site is exclusively for construction, the other people live in another place.

This due to the simple fact that it is cheaper to live in the plot you own than to move at a new place. It is expensive to move because one doesn't pay rent to live in his compound. This is made possible by the fact that people have a very big land in their plots that they can afford to build a house and have space to reside in.



Figure 18. Site photo 5&6 showing renovations

However there are some finished buildings that are in a very good state at the moment. Those houses are a few years old and some are not residential building, they are for other services like banks and bars. Most of the residential buildings that are in the area that are in a good condition are the ones that are for rent, like apartments.



Figure 19. Site photo 3&8 showing the tallest buildings Mumena

Another typology of buildings that are found in the area are the houses that have a compound and a fence. Due to the high density of the area these type of compounds usually have more than one house, in most of the cases all the houses belong to one person and are renting them to others. It is rare to see a big building in its own fence because the landlords are aware of the opportunities that are there of having people who rent the houses. So, the majority of buildings that are in a compound are a group of buildings instead of individual buildings.

In the majority of those compounds, the owners live in the same compounds as the one they are renting to. They want to be closer to their properties. There is a very strong sense of place that the people who live in the area even when their income increases instead of moving to better places they prefer to remain at this area because many of these persons lived in this area for a very long time.



Figure 20. Site photo 4 showing the density of houses in one plot

The architecture of the residential houses of the area is pretty simple, the floor plans are rectangular, and the roofs are gable roofs, not very pitched. In many areas of the city, the new houses are having a complex design, but in this area almost all the houses have almost the same shape, they are just different by their size and the interior arrangement of the rooms.

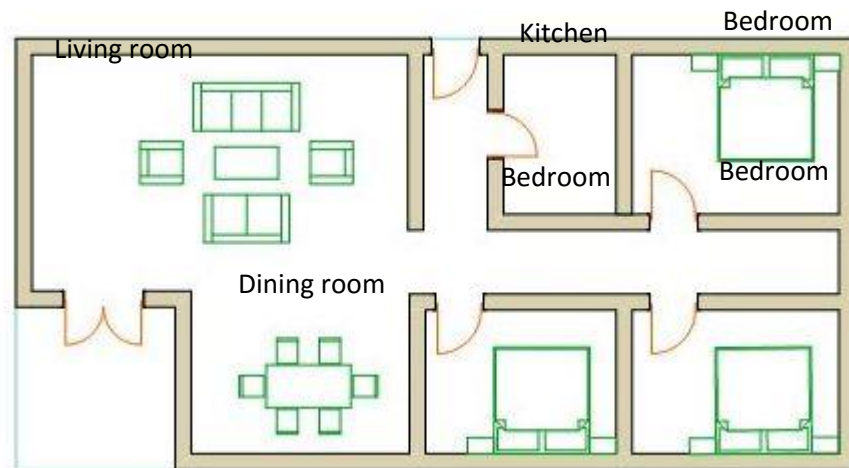


Figure 21. Typical floor plan

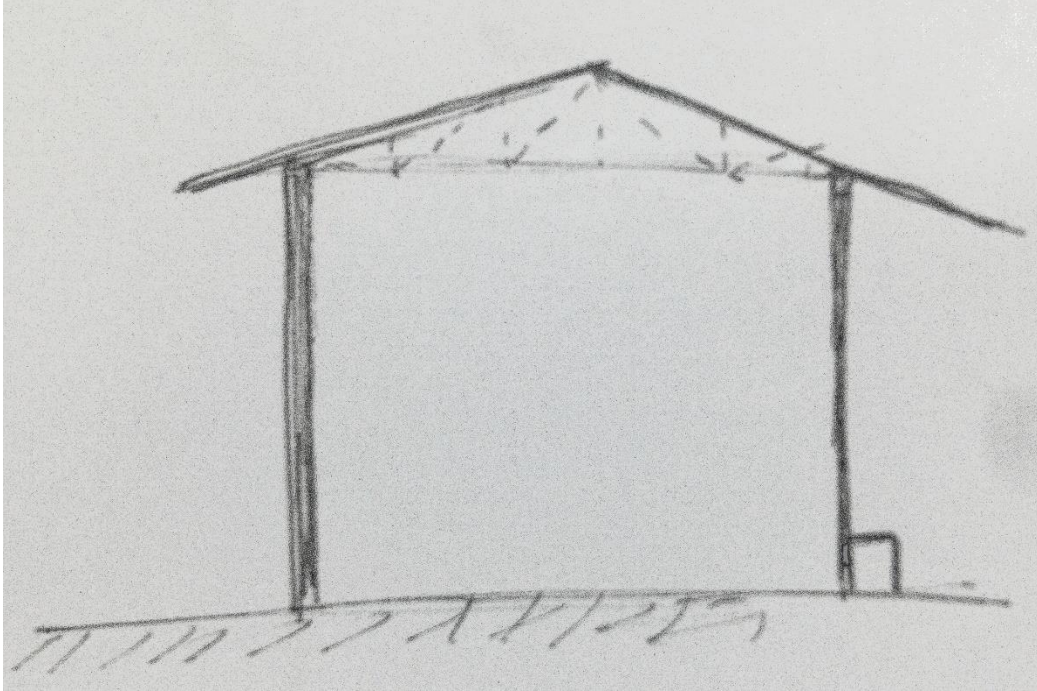


Figure 22. Site sketch 1 showing the type of roofs found in the area

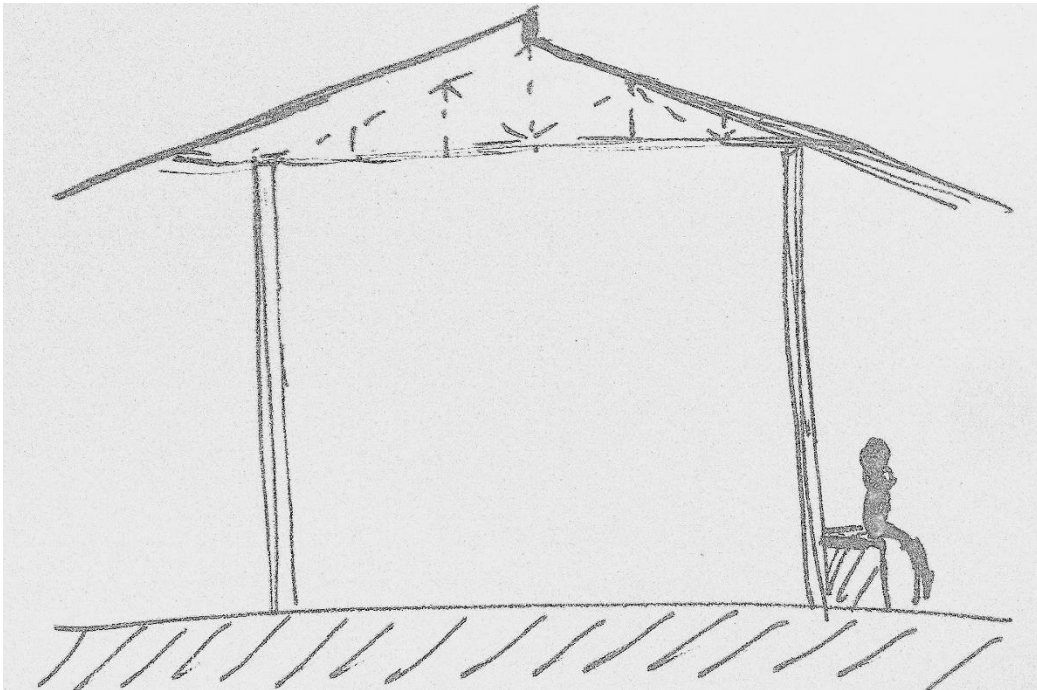


Figure 23. Site sketch 1 showing the outdoor raised platform where people sit and talk

As can be seen on the site sketch 2 there is a small raised platform that is in the backyard of many of the houses, this is used as a space where people sit to talk and relax with each other. Outdoor activities in these houses are very important because that is where the socialization happens. As mentioned above, because there are many households in the same compound, it is on this platform where people from different households sit and talk.



Figure 24. Site photo 5 showing the outdoor area

The materials used in building for the buildings in the area are mainly bricks that are in some cases exposed or are plastered over. However older buildings are made of adobe bricks but also are covered by roughcast or plaster.

Another architecture element that is very common in the area is the front facades of the buildings. The majority of the buildings have a kind of break in the facades where below the windows level and from the windows level up different materials are used. This is made because of the rain and humidity where on the lower part materials that can resist to erosion or to the water like stones, the upper part is usually made of plaster or roughcast. In other instances this is done for purely aesthetic reasons.



Figure 25. Site photo 6 showing different materials for the facades

In the area almost all the buildings are of a single story, the tallest buildings in the area have 3 stories (Photo 7&8). The residential units with 2 stories are very new and many of them still under construction.

4.2.3. Interview results

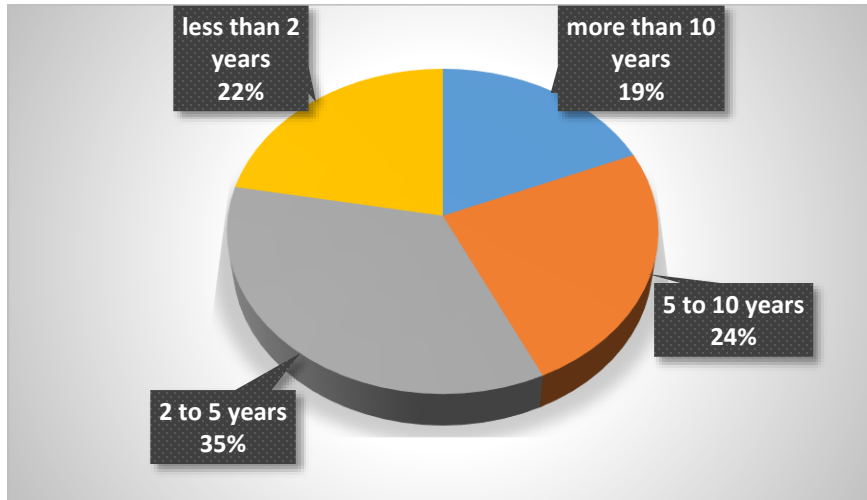
In the previous chapter, the researcher designed a set of questions that were going to be asked to different people chosen randomly. The interviewees did not have to answer to all the questions, thus having different sample size depending on what question was asked. The average sample size was taken to be 80 people asked in different times and circumstances.

Following are the answers got from the questions posed and the answers gathered from different interviewees.

1. How many years have you lived in this house?

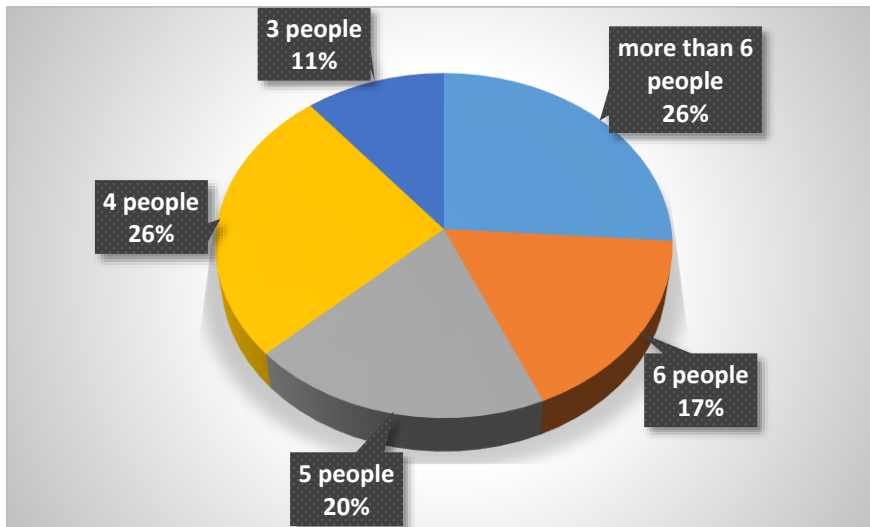
Among 86 people that were able to respond to this question, 16 of them responded that it has been more than 10 years that they live in the area. 21 of them responded that it has been 5 to 10 years that they live in Biryogo area. 30 of the interviewees answered that it

has been between 2 and 5 years that they are in the area. 19 of the people interviewed said it has been less than 2 years since they live in the area.



2. How many people live with you in this house?

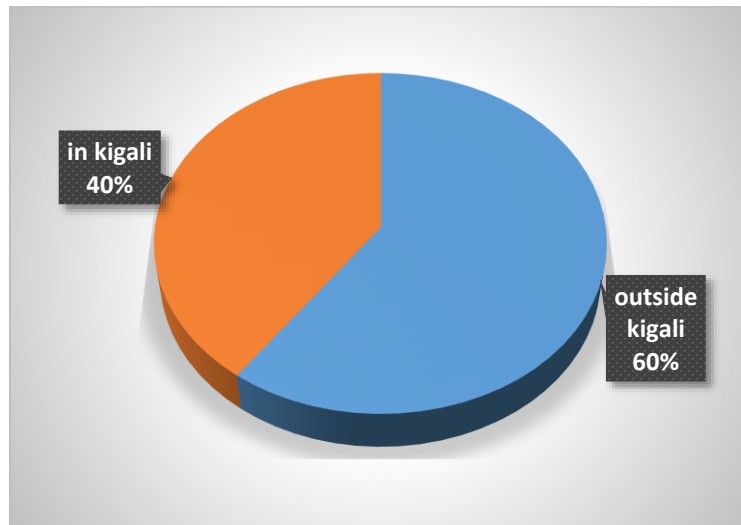
This questions was answered by 93 people, but they were from 46 households. 12 of those households are inhabited by more than 6 people, 8 of the households are inhabited by 6 people, 9 of these households by 5 people, 12 of households by 4 people and 5 households are inhabited by 3 people.



3. Where did you previously live?

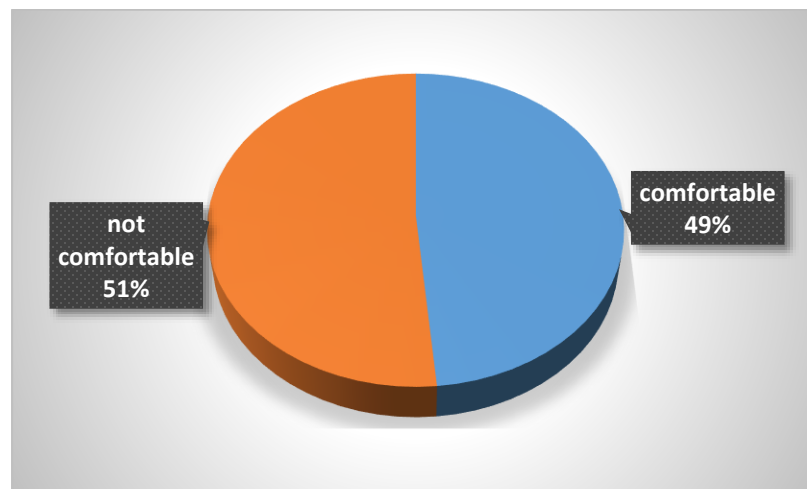
This question was answered by 76 people. 36 of the interviewees answered that they used to live in the country side or other parts of the country that are not Kigali. 24 of the interviewees responded that they used to live in the neighboring areas that are still in

Nyarugenge district. 16 people responded that they came from a different district but still in Kigali city.



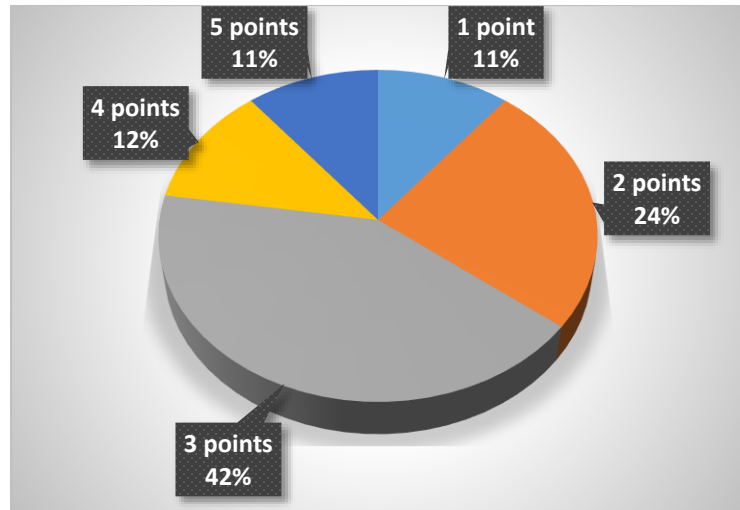
4. How do you feel in this neighborhood?

This question was answered by 68 people and got very diverse answers depending on how the interviewee interpreted it. However, the researcher in synthesizing the answers came up with the data classed in terms of the comfort. 33 of the persons felt they were comfortable in the area while the remaining 35 people felt not comfortable and believe that the situation can be improved.



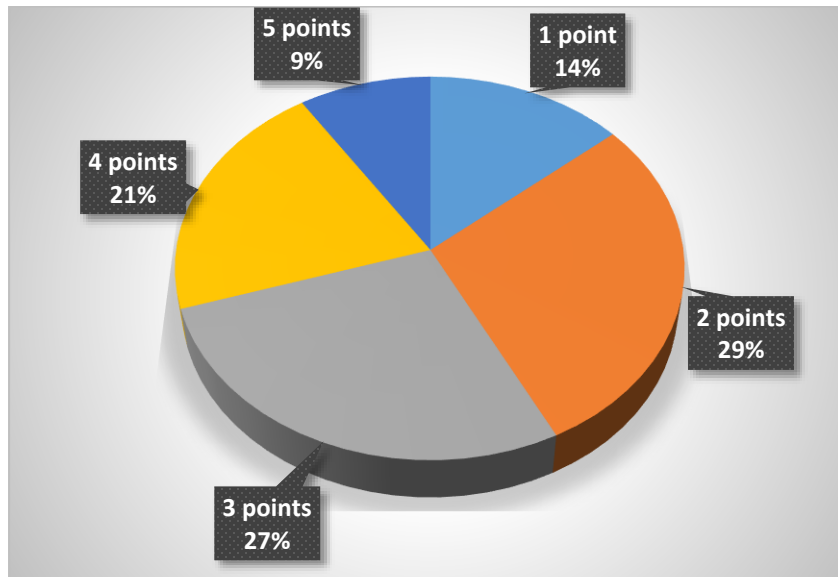
5. How would you rate your satisfaction with affordability of rent?

This question was answered by 93 people. They were to rate from 1 to 5 where 1 mean dissatisfied to 5 that means very satisfied. 10 rated the satisfaction with a score of 1, 23 of the interviewed rated it 2, 39 rated it 3, 11 rated it 4 while 10 others rated it 5.



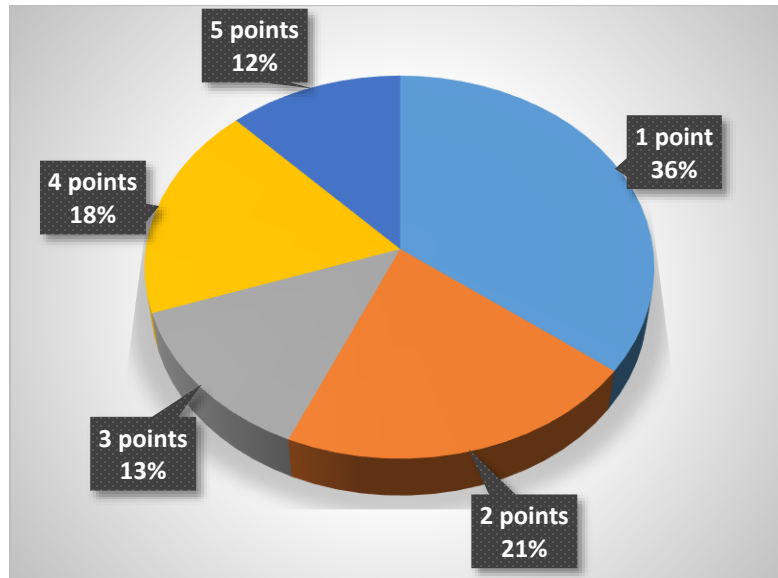
6. How would you rate your satisfaction with neighborhood safety?

This question was answered by 87 people. They were to rate from 1 to 5 where 1 mean dissatisfied to 5 that means very satisfied. 12 rated the satisfaction with a score of 1, 25 of the interviewed rated it 2, 24 rated it 3, 18 rated it 4 while 8 others rated it 5.



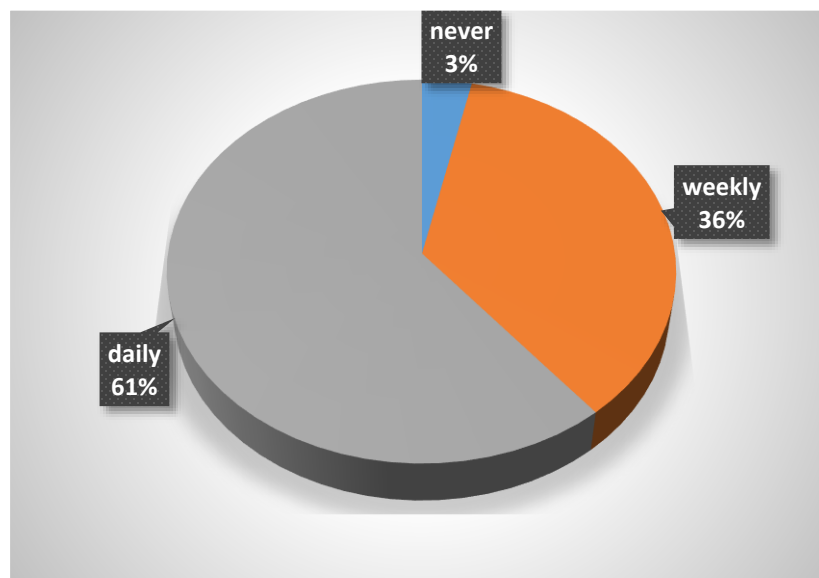
7. How would you rate your satisfaction with physical condition of the home?

This question was answered by 98 people. They were to rate from 1 to 5 where 1 mean dissatisfied to 5 that means very satisfied. 35 rated the satisfaction with a score of 1, 21 of the interviewed rated it 2, 13 rated it 3, 18 rated it 4 while 12 others rated it 5.



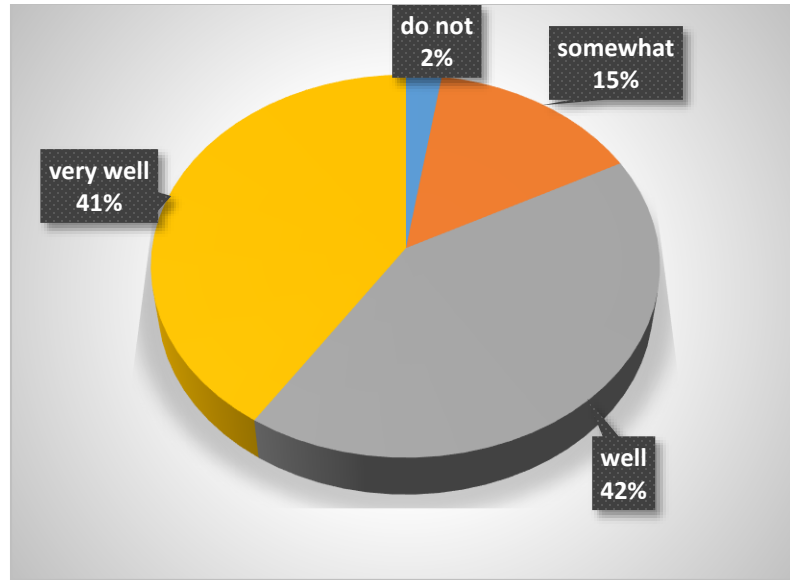
8. How often do you speak with your neighbors?

This question was answered by 87 people and the results were that only 3 people answered that they don't talk at all to their neighbors. 31 people answered that they talk to their neighbors at least on a weekly basis, while the remaining 53 people answered that they talk to their neighbors on a daily basis.



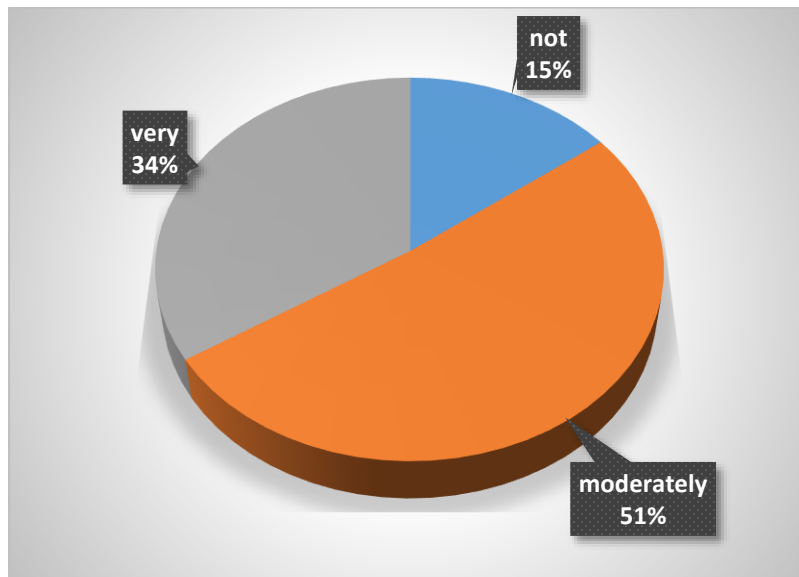
9. How well do you know these neighbors?

This question was answered by 81 people. 2 of those that answered the question said that they do not know at all their neighbors. 12 of the interviewees answered that they somewhat know their neighbors. 34 of the interviewees answered that they know well their neighbors while 33 responded that they know very well their neighbors.



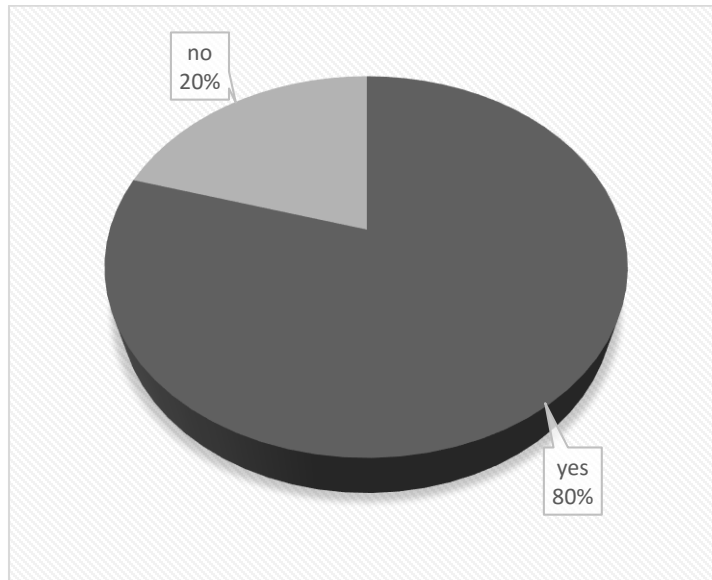
10. How comfortable are you living with your neighbors?

This question was asked to 85 people. 12 people responded that they are not comfortable with their neighbors. 42 people responded that they are moderately comfortable and 28 responded that they are very comfortable with their neighbors.



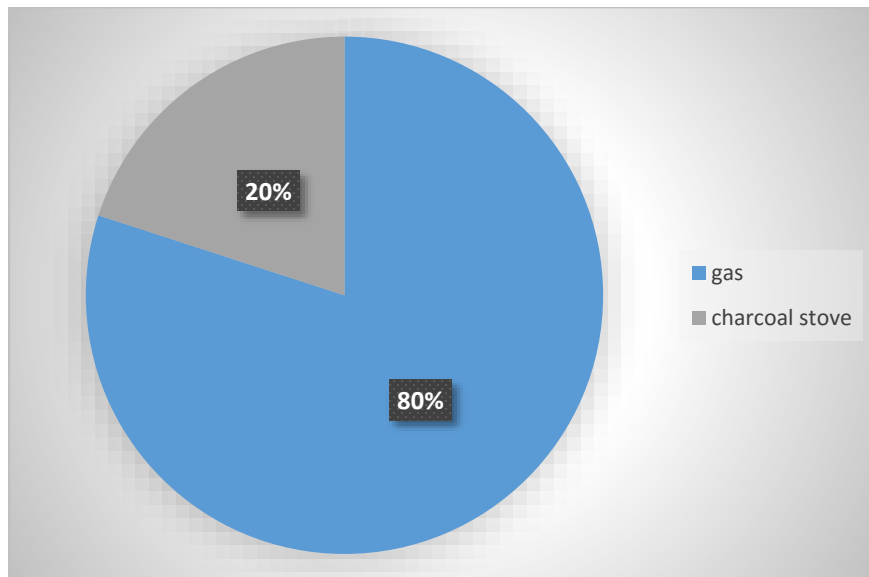
11. Would you like to keep living there?

This question was answered by 98 people. 78 people answered that they would like to keep living there while 20 wished to move to a new place.



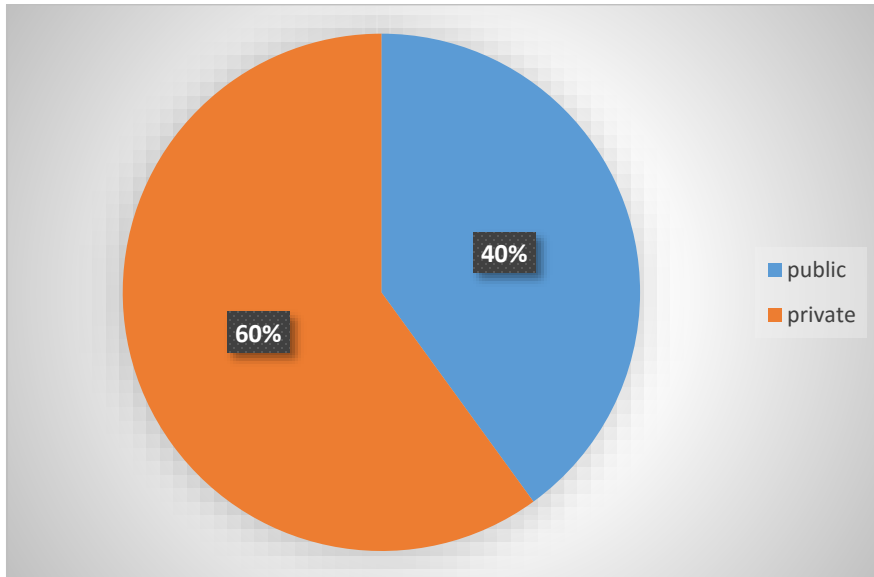
12. Do you prefer to prepare food on gas or charcoal stove?

This question was answered by 96 people. 77 people answered that they prefer to prepare on gas while 19 preferred to use charcoal.



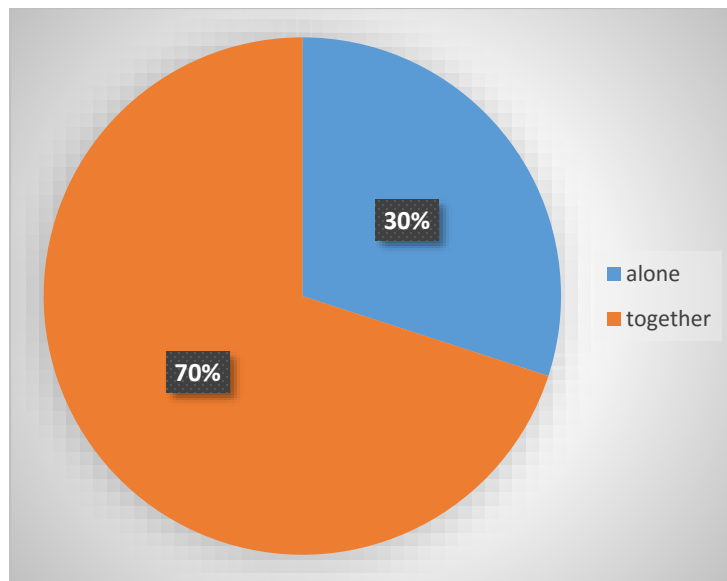
13. Do you prefer the kitchen private or public?

This question was answered by 96 people. 51 people answered that they prefer the kitchen to be private while 45 answered that they have no problem with it being public.



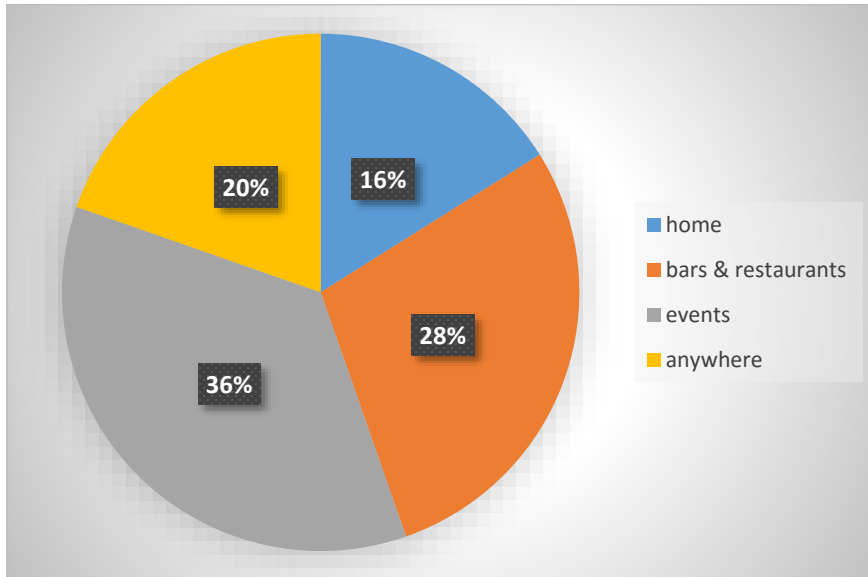
14. Do your kids sleep alone in a room or together?

This question was answered by 95 people. 64 people responded that many kids sleep in one room while only 31 responded that the children have individual rooms.



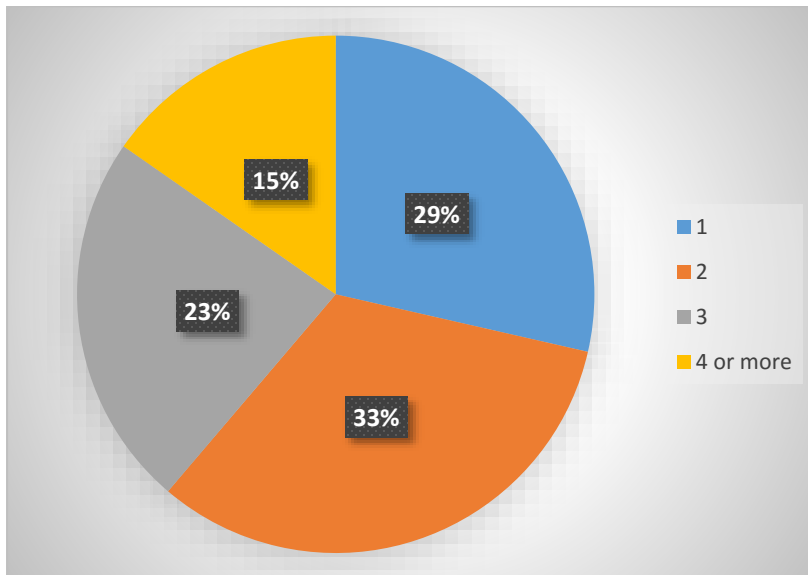
15. Where and when do you like to meet people at?

This question was responded by 96 people. 34 people responded that they visit their neighbors at their homes, 27 responded that they meet with their people at bars and restaurants, 20 people responds that they meet neighbors at specific events or meetings, 15 people responds that they meet their neighbors at all the above mentioned places.



16. How many children would you like to have?

This question was answered by 54 people who don't have kids yet, 15 answered that they would prefer having only one kid, 18 answered they would like to have 2 kids, 12 people answered they would like to have 3 kids, while 9 answered they would have 4 kids or more.



CHAPTER FIVE

5.1. Introduction

In this chapter, the researcher compass all the findings from the data collection and data analysis. Different data analyzed provide meaningful relation between data and results and the statistics which in turn give another image to the data. Hence, this provide a new perspective or view that did not exist before the research.

These findings will lead to the research framework and the design concept that will lead the researcher to the solution of housing typologies of middle income population of Kigali, and more especially of Nyarugenge.

One reason why researches are conducted is to get new information about some topic or some subject. The other reason would be to verify any given theory or knowledge. In some other cases it is to find out information in some new uncharted area of knowledge. This research was to find new information about existing knowledge but that wasn't really dug into deep. The existing knowledge is just very general and is not specific to this specific topic.

These findings are in some stages complimenting or adding some information on the existing knowledge. Which means that it gives some new information on a specific existing knowledge or clarify some points that were previously left blurred or not very explained. These findings provide a different perspective but that goes along with the existing knowledge hence making the field of research or the problem solution much more clear.

In other circumstances, the findings might be of a totally different point of view in any given subject. The findings might contradict the existing knowledge in its entirety hence providing a very contrasting view of the so-called existing knowledge. Hence proving that the popular knowledge are not necessarily the correct ones.

5.2. Findings

5.2.1. Form

From the different methods used in the research and the results found, and analysis of the criteria of form, following are the findings about this criteria.

On the shape of the houses, it was found that the majority of the houses are of a simple rectangular shape. This is because of when the houses were built and the type of construction techniques that were in place at the time. As can be seen in the theoretical framework, the shape of the house plays a big role in the cost of the housing, so in order to minimize cost, they used simple shapes in the floor plans. It was also found that rectangular shaped houses are cheaper to build than oval or complicated shaped houses.

On the organization of houses in the area of Mumena, it was found that the houses are arranged linearly according to the streets that are in the neighbourhood. This is due to the fact that as stated above, the place was occupied by colonials. This means that the area was planned before, which in turn gives an orderly organization of houses. However, this is found on the more or less flat-surfaced part of the cell. On the hilly side, the houses are not as organized, they are stacked on top of each other. This shows that this area was inhabited informally after colonization.

The height of the buildings in the area is very low where almost all the buildings are one storey high. The few buildings that were found that are not one-storey high are new buildings that are being renovated. These results tell that the financial means that the people had didn't allow them to build bigger houses which are multiple storeys high. This is shown by the fact that when the financial means of the people increase, they tend to build houses with at least two storeys. The tallest buildings in the area are 3 storey high. Only one of them is a residential building which houses apartments. This shows the direction that the people of the area are going to with the apartment's kind of residence.

The density of the area varies, where in some area there is a house in one plot, the density is very low. But in some other areas the owners of the plot took advantage of the big plots that they have and built multiple houses in one plot. This shows that people who are not conservatives, find that higher density residential model is land efficient and economically beneficial because every part of the land is used.

5.2.2. Materials

The materials used to build the houses as mentioned in the previous chapter are mainly bricks and adobe bricks for the older buildings. This shows that brick making techniques are old because it was used from a long time ago. They are not manufactured on site but the adobe bricks are made on site.

In the market perception, the people think that some materials make a house better or not. . An example is tiles, a house with tile finishes has a very high value and actually even rents or sells higher than a similar house with no tiles. People for the middle class perceives that their housing would at least have tiles. Even the landlords, when trying to raise the value of their houses, the first thing they do is to put tiles in it even if the roof might not be in a worse condition. But the perception that a house is better if it has tiles.

This perception is not necessarily real because tiles don't make a house better. The way the house is designed and how it responds to the needs of the user is what make a house good. Tiles are not the best materials in certain cases because on how they react to heat, and are sometimes uncomfortable.

5.2.3. Size

The size of the buildings and the number of rooms and amenities vary. The majority of the houses in Mumena are composed of 3 or 4 rooms. This mainly depends on the number of people that live in the particular dwelling. Apart from the main room, the other rooms are shared by many people where the kids share the same room. The majority of the houses have a room for boys and another for girls. This is due to the fact that Rwandan families are known to have many children that cannot have a room for every kid.

About amenities, the majority of the houses have two parts, the main house which is the one that has the principal programs like the living room, dining room (for those who have a dining room), and bedrooms. The other part, which one might call the secondary part is made of the kitchens and toilet. This is seen at the older houses, the new houses have the toilet and kitchen indoor.

This was due in part to the fact that the techniques that were in place at the moment didn't allow for those programs to be indoors. Be it because of the piping systems that were not developed yet, or the toilets and sinks that were not available at that time.

The market perception also touches this criteria of amenities. A house is perceived to be of a high quality house is when it has the bathroom inside the house. Actually for the houses of the low income, it is usual that their bathroom and toilets are outside the houses, and sometimes they are shared with other households in the case where it is in a compound that has many households. So, in having a toilet and a bathroom inside is considered by many as a superior house. When someone is considering renting or buying a house one of the first concern is whether the toilet is inside or outside. This perception is justified because those amenities are one of the elements that make a house better and more livable, for instance it is not convenient to have a toilet outside the house, and bathrooms should be at a reasonable distance from different parts of the house.

5.2.4. Other findings

5.2.4.1. Findings from Observation

From the observation method used in data collection, the researcher got some different findings. The first finding is that the area is a very old and important area in Kigali city as a whole. The area was one of the inhabited area of the just after the independence of Rwanda. There were still some Belgians living in the area. This was found due to its name and the nature of the houses available.

Analysing the buildings, they look like some of them are very old. They are made of local vernacular materials. As time evolved though, the buildings changed very much too. But the core structure still remains. The people from the area did not destroy the buildings but just renovated them by putting some new paint and adding some new rooms. But it is clear that some of the buildings are not of this era.

The other finding is that the area is very precious for the people that lived here since the colonization times. The people from the area are very fond of the place because they feel like that is their place. It means that there is a very strong sense of belonging to the area. These people were born in this area and grew up and their children and grandchildren were born in the area. So there is a very strong attachment to the place. This will make it very difficult for the new developments to convince them to relocate in another area if they have been in the area since a very long time ago.

The other finding is that the housing techniques of the area is a very old one where simplicity was used at that moment in time. This is because they didn't have the technology that is around today,

in order of get houses to live in from the materials and the techniques they had back in the day the design of the buildings were very simple because that what they could possibly do.

The simplicity also can be seen in the roofs, they are almost simple gable roofs. This is very different from the new houses that have very complex roofs that are much pitched. This shows the typologies that are in the area of study are very simple.

Another finding was that the people from the area are developing, and by that they started to renovate their houses. This means that a new housing project would go along with the trend of renovating and building new houses, it would be like giving them a push.

For families though, the situation is much more complex where a house of just 30 square meters can be inhabited by a family of 8 people. The people have little to no space in these houses which makes the quality of life very bad. The sanitation is also a very big issue in this area. One toilet might be shared by more than 20 people which is a very high rate and not at all good for the life of people and more specifically kids.

5.2.4.2. Findings from Interviews

In the method of interviews some more findings were found that were somehow confirming and supporting the results found through observation. These findings were drew from the answers and the statistics of those who answered the question and the responses they provided.

Firstly, it was found that the majority of people who live in the area are in the area for the last 10 years, this explains that once you get in that land it is not easy to move from there because first of the rent which is lower and the fact that the area is very close to many services and job opportunities. This was found when they answered to the first question. A portion of the people in the area also are the ones that were born in the area hence this shows that they are originated from the people that first resided in the area.

These last mentioned people are the so called landlords which means they are the one that are renting the houses, many of those have a big compound because they had the opportunity of getting the space before it was this overcrowded. Actually they live in the same compound as their clients thus making it easy for them to control their assets.

However another finding is that this place is not the safest of places in Kigali City. Because of the rate of unemployment, there are lot of wanderers who commit crimes because they do not have anything to do. But this issue is getting resolved with time.

Additionally, this area is very social, you find people talking around in the streets. One of the main causes of this is first that many people are not as busy as in other parts of the city, so this makes the people of Mumena very united. It is why we find in this area that the neighbors know each other and talk to each other frequently as can be found in their answers to the questions 10, 11, and 12. This factor is influential when you want to relocate people because they want to live near a mosque which is in the neighborhood, another point is that in order to convince one individual you have to convince the whole society.


Even if the quality of the houses itself is very low, the neighborhood quality is very high. This is also one of the main reason why the people don't even want to move to better houses. This is seen with the way 80 percent people voted in favour of not moving opposite to only 20 percent. This will be important in the design of housing blocks. The neighborhood quality should be taken care of in the design, and make these modern blocks or housing projects have the same neighboring quality as existing in the informal settlements right now.

In the way the spaces are arranged in the houses, it was found the people of Mumena slightly prefer to have the kitchen private because they don't want to be seen when preparing, however, the younger generation have no problem with having the kitchen in a space where people can see. This goes in line with the Rwandan culture where the people are very private and operate privately.

It was also found the kids usually share rooms in any of the households. However this is correlated with the age of the children, the smaller the children the more they share rooms, as they grow older they start looking for privacy, in many families where they have many kids, the older ones are the ones living in individual rooms while the younger ones share. However, in many of the cases, this is a consequence of having small houses with many kids that doesn't allow every child to have his or her own room.

It was also found that many young people of the area wish to have fewer than 3 kids, this mans in providing for housing in the area, the typologies that can hold a family of 3 kids or less would be many than bigger apartments or households. But also many of the families live with their other extend relatives which means that they need bigger households.

5.3. Design Framework

Objectives	Strategies	Tactics	Design codes	Benchmarks
<p>1. Provide affordable housing for the middle income</p>	<p>1.1. Government intervention in the form of financial assistance</p>	<p>1.1.1. Housing developers and the government officials put together housing projects by combining funding from several sources.</p>	<p>1.1.1.1. The government provides schemes that facilitate the partnership</p>	
		<p>1.1.2. Provide land for housing developers to build houses on.</p>	<p>1.1.2.1. The government provides land and developers provide houses.</p>	
	<p>1.2. Reducing house construction cost</p>	<p>1.2.1. Use local materials to build the houses</p>	<p>1.2.1.2. Priorities to locally produced materials unless not available</p>	
			<p>2.1.1.1. No use of artificial</p>	

2. Provide sustainable housing for the middle income	2.1. Reduce energy consumption of the buildings	2.1.1. Natural lighting (sunlight) and natural ventilation access to all the housing	cooling inside low rise residential 2.1.1.1. No deep corridors that require artificial lighting at all times
		2.1.2. Use materials efficiently	2.1.2.1 Use appliances efficiently which means only when in use
	2.2. Design of environmental friendly buildings	2.2.1. Incorporate greeneries in the buildings when possible	2.2.1.1. At least 20 percent of the plot is covered in greenery
3. Provide accessible housing	3.1. Design buildings that are accessible by the disabled	3.1.1. Incorporate ramps in the building and stairs that can be used by everyone	3.1.1.1. All buildings should be universally accessible



	<p>3.2.</p> <p>Design building that are accessible by the elderly</p>			
<p>4. Provide functional housing</p>	<p>4.1.</p> <p>Design buildings that respond to the functions of the space</p>	<p>4.1.1. Design of a the housing should satisfies the emotional, cognitive, and cultural needs of the people</p>	<p>4.1.1.1.</p> <p>Maintain the existing standard codes</p>	
		<p>4.1.2. Design of the housing should satisfies the technical requisites of the programs it houses.</p>	<p>4.1.2.1.</p> <p>Maintain the existing standard codes</p>	
<p>5. Provide aesthetically pleasing/beautiful housing</p>	<p>5.1.</p> <p>Design buildings that are beautiful to the eye physically</p>	<p>5.1.1. Blend the materials and the colors to have a mixture that is aesthetically pleasing</p>		

		5.1.2. Design buildings that have an impressive and beautiful (though it is subjective) shape	
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5.4. Design concept

The design concept that the project of housing will be having is **Flexibility and Variability**. Housing flexibility and housing variability can be defined as the design of dwelling structures with an understanding of the prospective development of the site as well as life and social scenarios, and with the possibility of making appropriate changes in the living environment.

The needs of the middle income people is very different depending on their incomes or family situations. This means that the design of the housing should be adaptable to these needs. This means that we need housing that is flexible and variable in order to be useful for all kind of people and that will last through time.

And as it was mentioned that the people that these housings are designed for are the middle income, which was in the range of 300001 Rwf to 600000 Rwf, it is clear that different types housing or apartment units are needed. Also these houses or apartment units may be used by individual people or families. Which means that variable apartments will be needed after some time.

Flexibility and variability enable one to change the living environment according to the new requirements in the course of their existence. It can be applied to urban and architectural design related to the actual and future needs of the people living there. In the urban context it applies mainly to the structure of amenities of a city and community in order to design specific areas for shops, services, offices, leisure and culture.

At the moment when a family expands, it needs to move from one house to another in order to live in the house comfortably, which means, the residential type of living in Mumena at the moment is rigid. Moving from one place to another is not easy and many people would prefer to stay in the

area the usually live in. The design would provide for a residential type where the apartment would be responding to the changing need of a family.

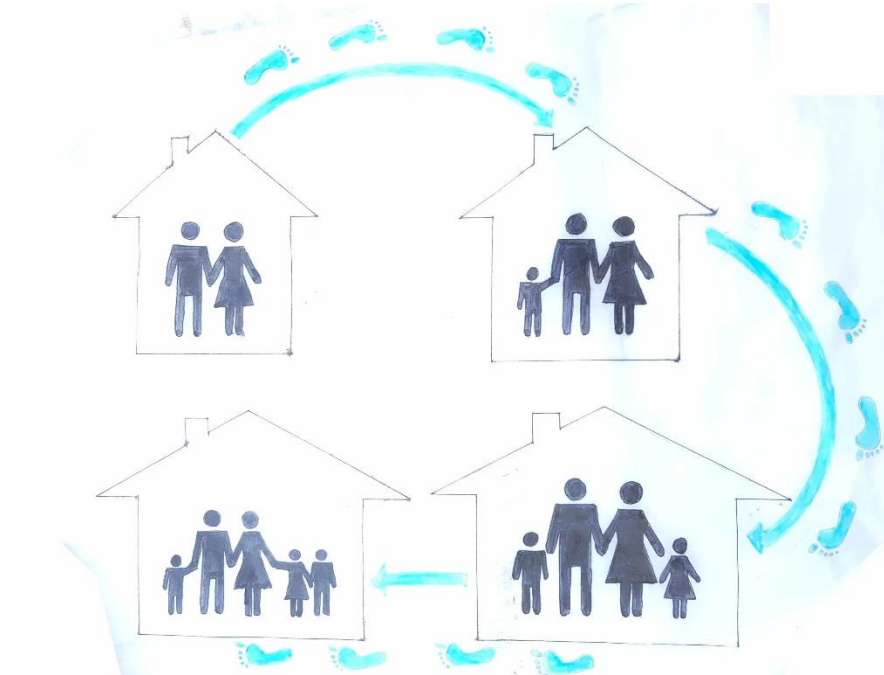


Figure 26. Current situation: Moving families

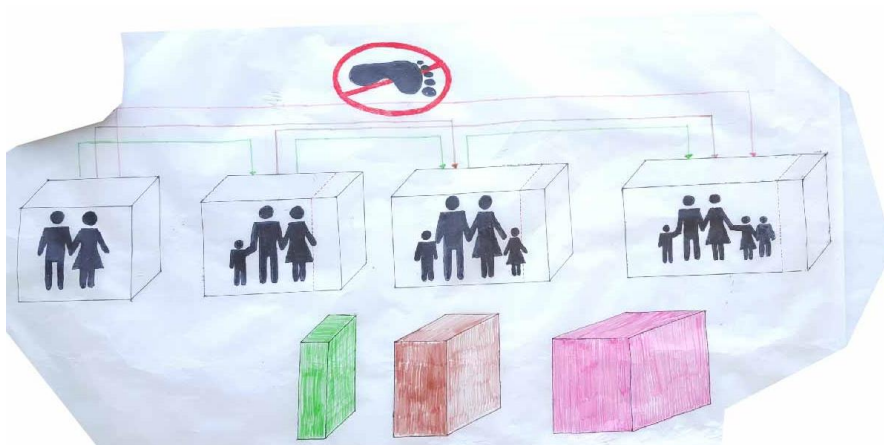


Figure 27. Adaptive apartments

As said above in the findings, the neighborhood quality of the space is very high and it is very important to keep it that way, this means that some common and public spaces will be needed in order to have a space where people from different apartments can meet and socialize.

Public spaces play significant role and create a connecting framework for the combination of individual amenities. Public spaces may offer a number of variable, flexible elements that increase their attractiveness of use and may also change their functions.

The final outcome in the context of a variable, flexible urban structure improves the quality of housing through its relationship to such structures.

In the architectural context, the flexibility and variability provide specific conditions to create spaces that are designed to change their functional use. They are the spatial expression of the activities created by a rapidly changing way of life.

Flexible housing allows homeowners to reconfigure their home as their lifestyle and economic situation changes. Rooms can change in size and/or a complete floor may change in function. The home is equipped for such changes, with pre-wiring and plumbing ready for adaptation. Flexible housing is also built to be accessible with features to accommodate young children, persons with disabilities and elderly people. Flexible housing is usually designed with multiple entrances to permit surplus space to be rented out, to either a non-related tenant or a family member, and thereby reduce the costs of ownership. The dwelling can be reconfigured as the size of the family increases or its needs change.

As the housing will likely end up being a complex with different apartments we can look at variable and flexible apartments.

A variable apartment is a dwelling with a layout that allows for certain simple, inexpensive modifications without changing the total area of the apartment. A variable apartment allows the change of layout through inexpensive modifications to the overall building.

A flexible apartment is a type of flat that allows the adaptation of its layout to current needs in a highly flexible but uncomplicated and effortless manner, without a change to the building itself, such as in the use of sliding walls and a variety of mobile furniture elements. The total area of the apartment remains unchanged. Such an apartment can be compared to a theater scene that can change very quickly. Mobile furniture elements are generally used for furnishing the day zone, which can eventually adapt to different situations

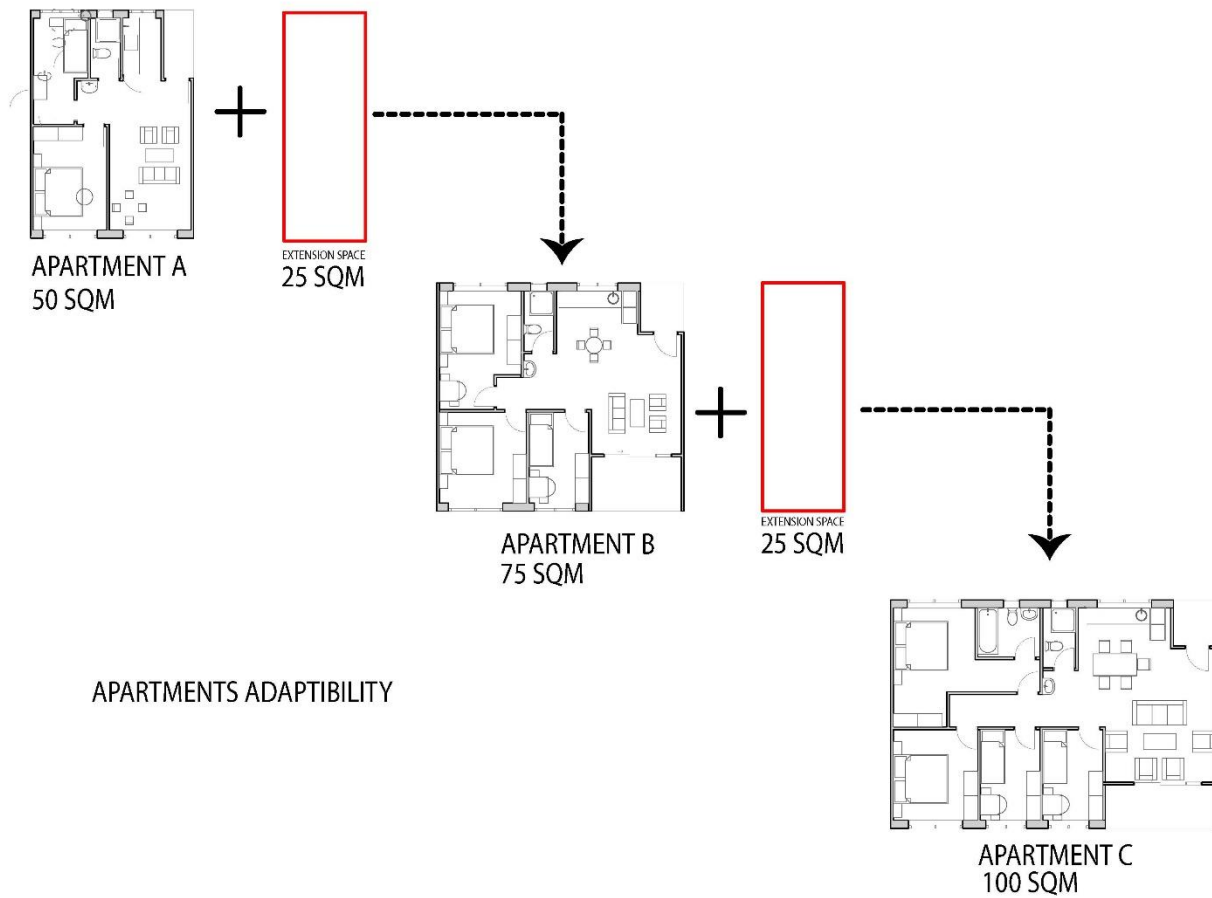


Figure 28. Apartment's adaptability

CHAPTER SIX

6.1. Summary of research

6.1.1. Chapter One

Rwanda as a country in the developing world has a target of becoming a middle class country in 2020. This means the majority of the middle income population is increasing on a very quick rate. Housing of this class of people has been problematic because of the number of houses needed and the quality of the existing houses. The architecture of the houses were not responding to the situation of the middle income in Kigali. The sustainability, endurance, functionality, and all the elements of good architecture were not found in the housing for the middle income of Kigali. Apart from the design of the housing that is not up to scratch, the pricing of the houses is very high mainly because of the price of the land, the materials and the techniques used in construction.

6.1.2. Chapter Two

The literature review of this thesis was based on different sub-topics that were steamed from the main topic. The theory was to draw from other scholars' interpretation of similar topics. The thesis drew information first of the middle income in general and the looked at different aspects of housing. The theoretical framework focused on different criteria that were researched on about housing which are form, size, and materials. These are the elements that are important in the design of housing. These criteria are broken down in indicators, measurable and references.

6.1.3. Chapter Three

The methodology used in the research was qualitative methods with emphasis on the quality of housing people of Nyarugenge need in this time and the future too. The research was done by asking several questions to ask to randomly chosen people found on site. It emphasized on the area of Mumena because that is where there is a high potential of new housing for the middle income population of Kigali because of the renovations that are taking place and the need to build new houses. The research was conveyed by doing first observation. This was done by visiting Mumena area and analyzing the existing situation and the types and quality of housing around. The next method was to interview the people found on site about how they feel about their housing and their future projection and how they would like their houses to be.

6.1.4. Chapter Four

The data was collected through the above mentioned methods of observation and interviews. It yielded different results. From observation the results were that the houses are of very simple design. There are some that stand alone but very near others. They have no fence or compound. Others are in a compound but in the majority of cases they are in one compound at four or five. They are owned by one person. And from interviews, it was found the exact numbers and the opinions of the people about their housing and their neighborhoods.

6.1.5. Chapter Five

From data analysis and results it was found that first the housing in Mumena are not of a good quality. They are just building reacting to the situation they are in. So the process of building is much more of a reaction of the existing needs, there is not much care of the next phase, it means after surviving when they start to live. While, looking at the bigger scale, the area is a chaos. The arrangement of the buildings is very random and has no order, or rhythm. It is in another word, informal. There is no respect to the paths and streets. The density inside a house is very big too. Small houses are inhabited by so many people that it is not healthy anymore. Despite all those limitations though, the neighborhood quality is very good and people get along and interact very well. More importantly it was found that people from Mumena do not want to move from there.

6.2. Answering and obtaining to the research questions

6.2.1. Answering and obtaining to the research question 1

The research question that stated “How can the design of middle income housing improve?” was researched through during the process of this whole paper. As seen in the previous chapters where the design of housing for the middle income was very simple and basic, the emergence of architects in Rwanda should help improve first-hand the design of the housing of people in Kigali because of the knowledge of space, form, function that was not available when the building found on the site were built, when they were designed by the people themselves.

However, the design of the existing houses should not be ignored because it holds and reflects the identity of the place and the needs of the people. Regardless of how much knowledge and information you have about architecture, the users of the space you have to create are the one that understand the needs and the use of the space. So, the existing housing should provide the starting point of the new designs because the local culture and uses of spaces are just as important as the new techniques and architecture of any buildings. As stated above, the new designs of the buildings

have to be culturally resonant so they need to have some elements of the local housing so that the people the housing is designed for can identify the buildings as one of theirs.

But the problem is that they are not well designed, well, this design is impeded by the budget constraint because they don't have enough funds and should build at a very low cost. This means they just design for the primary needs. But, after all, it is better than the shacks that they are living in right now and that are about to get destroyed.

The other building typologies that is used mainly in European and American countries is the subsidized housing. Subsidized housing is government assisted housing to help provide housing for its population. This model would be very useful in Rwanda. Nowadays, in our country, the government provide the housing for the people. But, this approach is not advisable in the future because the people need to have a certain kind of responsibilities on the housing. So the adequate typologies in the Rwanda of tomorrow would be subsidized housing where the government and the population both participate in the housing projects.

From the analysis and the finding though, we can see that Rwandan people need to have some public housing because as said before, the social life is very important to their everyday life. So to provide for some housing that makes them interact is very commendable.

6.2.2. Answering and obtaining to the research question 2

The research question "How can through architecture can the size and land be used efficiently for middle income housing?" was also researched through. This issue of land scarcity in our country is a well-documented issue. It is an evitable issue that would always pop up in discussions due to the area of this country. Rwanda is one of the smallest countries in the world. Its mere area of almost 26 thousand square kilometers is very small to the population of almost 12 million.

More alarming is in the urban area where the density is very high. Kigali is the densest city in Africa. This means that they are more people on one square meter of land in Kigali more than any other city in Africa. All these people need shelter, so to have houses for all this population is very critical. This means that we should find an alternative to this problem of fitting houses of all this people on the small area we have.

Rwandans historically built houses that had a very huge compound, however, the house they live in itself was a very small portion of the whole compound, and the bigger part of the compound of a typical traditional residence was comprised by the courtyard where almost all the activities were taking place.

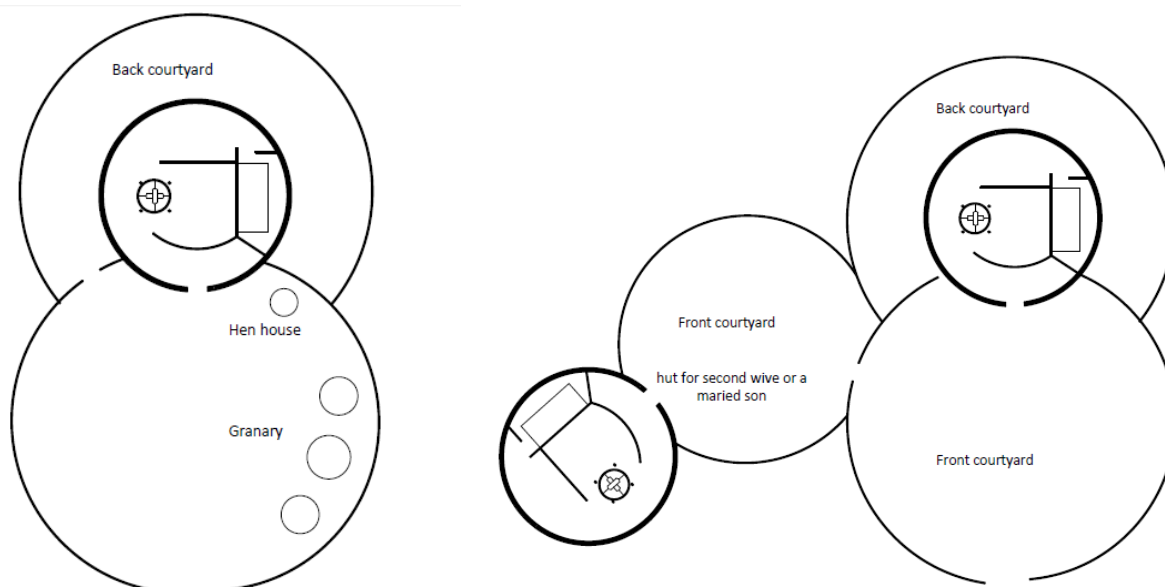


Figure 29. Typical layout of a Traditional Rwandan residence

Even in the modern times, the people who inhabited Kigali for a long time, like many of the people that reside in Mumena, they usually have a big plot, but when one looks at how it is used, it is safe to say it wasn't efficiently used.

However, this amount of land for just one family is not feasible in the situation we are in at the moment particularly in the urban fabric. This means new ways of developing residential houses is needed.

When land is scarce, it means land is expensive too. As our president famously said, "land is expensive, the sky is free". This was to say that expanding on the land has its limitation while building going up has no limits. You can build up as long as you want or as long as you can. Which brought to this constatation that instead of building these large villages that eat up a lot of space, it would be better to build vertically. By building high rise buildings we are just using a small portion of land which is very critical in a small country such as Rwanda. Also the floor area of a family

would be optimized in order to have a house that does not suffocate people with spaces that are not comfortable to use, but also that does not use the space in a wasteful way.

6.2.3. Answering and obtaining to the research question 3

The question that stated “How can materials be architecturally used in order to have good house that are affordable to the middle income?” was also searched through. The issue of affordability is the main reason there is a shortage of housing and inadequate housing in a certain way because the people cannot afford to build their own houses, and when they do, they cannot afford to build the houses of good quality.

The way materials are used in the construction industry in Rwanda is one of the reason why buildings are expensive. An example can be given on how all the rooms are enclosed thus using too many materials. There is not much use of an open plan, there are way too many walls in a typical residential house that are not that necessary and not sustainable. In some houses it goes as far as having walls separating the living and dining rooms. So in having open plans, materials are reduced in the way they are used.

The materials also used in walling in Rwandan houses also not used in an efficient way, where it can be found that for instance the partition walls in the houses are 30 cm thick walls made with bricks while they are not used to support any loads, this ends up being just wasting materials that would save money. Instead, small partition walls can be used of less than 10 cm thickness and still be practicable. In this case we can give an example of walls that are used in partitions made of rice and wheat straws that give flexible and easy to build walls that are affordable and sustainable.

The use of local materials is also commendable in order to reduce cost because, when materials are imported they are almost as twice as expensive in some instances than those that are locally made when you take into account the taxes and the transportation costs.

6.2.4. Answering and obtaining to the main question and objective

Answering to the main question which was “What is the architectural typology appropriate for the housing of the middle income?” it is through the above mentioned answers to the various questions. The above answers can be combined to give out the typology of buildings that should be used in order to tackle the issue of middle income population of Kigali and Mumena in particular.

From the answer to use the land efficient, the typology that may be appropriate to use in the case of the middle income population in Mumena would be a housing complex that is mid to high rise level in order to use the land in a way that is efficient by increasing the density of the area, which means making many people reside in a small area. This type of development would allow for the affordability of the housing units because the price of the land would in fact be shared among many people hence being affordable. The area that would traditionally be a residence for 10 families would be used by as many as maybe 100 families because the new technologies allow us to build vertically.

However, this housing complex should have a space for the community because people need to have a common space that they can all use, meet, and socialize. This is a crucial element in the design of housing complex, especially in this area of the city. From the interview and the observations, it was found that the people of this area are very social, this should not be lost. This means that the buildings should be smartly designed in order to incorporate the social element of the existing population.

This housing complex also should be accessible to all people of all age and gender. The population of Rwanda is diverse, and this should be reflected in the housing. The people have different needs and some need special elements, like ramps for the disabled and the elderly. This means that the housing complex should fulfil the needs of every person that might use it, hence it should be universally accessible.

The housing also as mentioned above should be flexible and variable in its design. Which means that the units can be changed in order to satisfy the ever changing needs of the occupants. And this would be facilitated if some materials which are flexible and can be easily removed, or reused in another way instead of the 30 cm thick walls that are rigid and cannot change very easily, which means they are almost permanent.

6.3. Conclusion

This research was intensive and challenging but gave the researcher an insight in how the housing problem in Rwanda can be resolved. There were many limitations to the process but the objectives were met which was the goal of this research.

The people of Rwanda need good, sufficient, and proper housing. To provide the solution of this issue of housing, specifically for the middle income population. The typologies that were found that can be used are mid to high rise housing complex.

As has been analysed, it has been found that the price per area for residential houses is at its lowest as the building on its eighth storey. This means that the way to optimize costs and the land efficiency is by building residential complexes that are about that height.

The people of Mumena have been living in the area for a very long time, but their houses need to be renovated or demolished and build new ones. This research provided of the alternative to the houses they are living in in providing new typologies that would upgrade their homes and their way of living. This new typology of building will also provide numerous housing units for many other people not necessarily from the area, but from all around the city because of the housing shortage in the city.

The housing typologies should also range from small families or single persons to households for a very large extend family in order to have all people covered because the nowadays models seem to provide the same typologies of houses which does not reflect the reality because not all the people need the same housing.

This research goes along with the country vision of being a middle income country in the near future by providing a modern way of housing that project to the future model of how residential places are designed but preserving some traditional elements of housing in Rwanda.

6.4. Recommendations

- Rwandan government and policy makers should up the threshold for affordable housing because the price range that make a house affordable or not is too low (15 million Rwf) to have an adequate house.
- Diversity in the typologies of housing in an estate should increase to allow for the population to have alternatives depending on their needs and their financial capabilities.
- The collaboration between the public sector and private sector in providing housing should be encouraged in order to have housing that is affordable for the middle income population of Kigali

- The policy makers also should encourage high density residential area because it helps use resources efficiently, for instance infrastructures.
- The architects should understand the relationship between the space size and the function in order to have comfortable houses but that use space in an efficient way.
- The design of housing should take into context the way of living of Rwandan in order to solve their specific issues.
- The houses design should be flexible in bid to facilitate people to modify the arrangement of space in an easy and inexpensive way.
- The financial institutions that offer mortgages to the population should reduce the interest fees because they are one of the reasons why it is very difficult for the population to afford their houses because they are not able to pay the interest fees on the mortgage

APPENDIX 1.

Interview questions

1) How many years have you lived in this house?

- a) Less than 2 years b) 2-5 years c) 5-10 years d) more than 10 years

2) How many people live with you in this house?

- a) 3 people b) 4 people c) 5 people d) 6 people e) more than 6 people

3) Where did you previously live?

- a) In Kigali b) Outside Kigali

4) How do you feel in this neighborhood?

- a) Comfortable b) Not comfortable

5) How would you rate your satisfaction with affordability of rent? Respond from 1 to 5 where 1 mean dissatisfied to 5 that means very satisfied.

- a) 1 b) 2 c) 3 d) 4 e) 5

6) How would you rate your satisfaction with neighborhood safety? Respond from 1 to 5 where 1 mean dissatisfied to 5 that means very satisfied.

- a) 1 b) 2 c) 3 d) 4 e) 5

7) How would you rate your satisfaction with physical condition of the home? Respond from 1 to 5 where 1 mean dissatisfied to 5 that means very satisfied.

- a) 1 b) 2 c) 3 d) 4 e) 5

8) How would you rate your satisfaction with convenience of location? Respond from 1 to 5 where 1 mean dissatisfied to 5 that means very satisfied.

- a) 1 b) 2 c) 3 d) 4 e) 5

9) How would you rate your overall satisfaction of your home? Respond from 1 to 5 where 1 mean dissatisfied to 5 that means very satisfied.

a) 1 b) 2 c) 3 d) 4 e) 5

10) How often did you speak with your neighbors?

a) Daily b) Weekly c) never

11) How often do you exchange information with these neighbors?

a) Frequently b) weekly c) Monthly d) Never

12) How well do you know these neighbors?

a) Do not b) Somewhat c) Well d) Very well

13) How comfortable are you living with your neighbors?

a) Not comfortable b) Moderately comfortable c) Very comfortable

14) Would you like to keep living there?

a) Yes b) No

15) Do you prefer to prepare food on gas or charcoal stove?

16) Do you prefer the kitchen private or public?

a) Private b) Public

17) Do your kids sleep alone in a room or together?

a) Alone b) Together

18) Where and when do you like to meet people at?

a) At home b) 2 c) 3 d) 4 or more

19) How many children would you like to have?

a) 1 b) 2 c) 3 d) 4 or more

APPENDIX 2. FINAL DESIGN BOARDS

MUMENA HOUSING PROJECT

BY: MBONABIHAMA CHRISTOPHE
SUPERVISOR: KEFA ANGWENI

Housing needs

Existing (20%) | New Dwellings (80%)

From the previous assessment, we identified a need for 10,000 new dwellings to meet the housing needs of the population. This need is broken down into 10,000 new dwellings, which is further divided into 2,000 new dwellings and 8,000 new dwellings.

New Dwellings

From the previous assessment, we identified a need for 10,000 new dwellings to meet the housing needs of the population. This need is broken down into 10,000 new dwellings, which is further divided into 2,000 new dwellings and 8,000 new dwellings.

Housing needs per income

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Architecture of the middle income is not adequate

Not responding for the needs and situation of the middle income of Kigali

Elements of good design missing in the existing housing

MBONABIHAMA CHRISTOPHE

Cost of housing is higher than the amount the middle income can afford

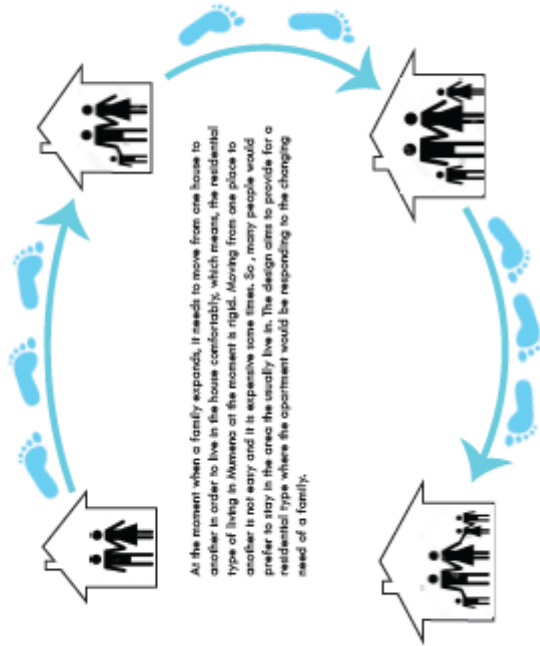
Shorpage of housing

Cost of construction

Land

Techniques

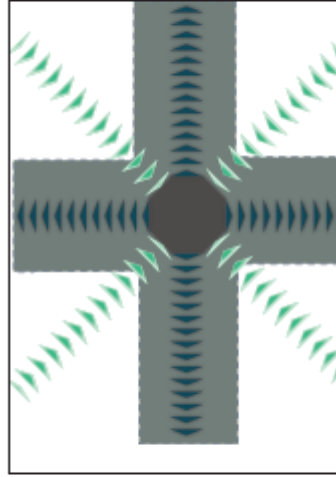
Materials



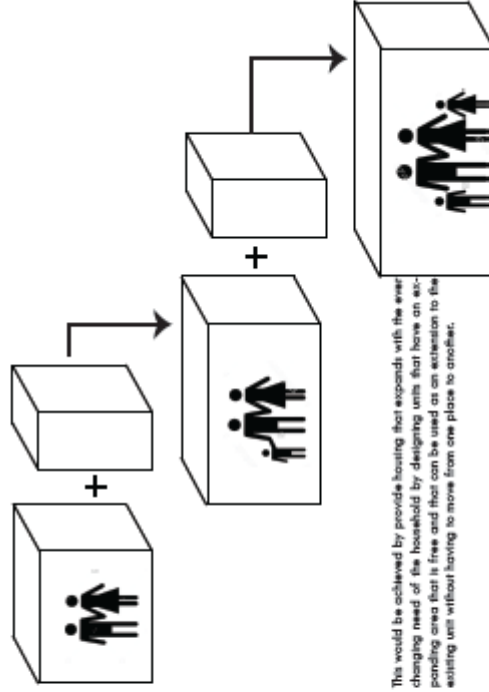
As the moment when a family expands, it needs to move from one house to another in order to live in the house comfortably, which means, the residential type of living in Mumena at the moment is rigid. Moving from one place to another is not easy and it is expensive some times. So, many people would prefer to stay in the area they usually live in. The design aims to provide for a residential type where the apartment would be responding to the changing need of a family.



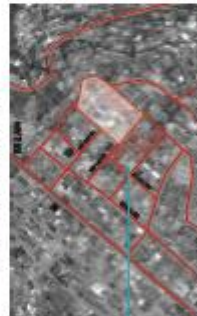
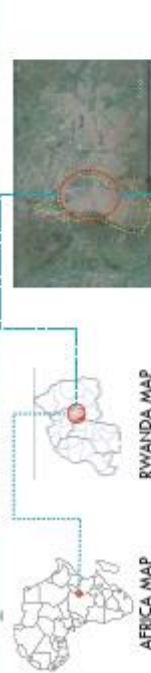
As found through the research, socialization is important so having a public space is essential to this kind of project. Public spaces play significant role and create a connecting framework for the combination of individual activities. Public spaces offer a number of variable, flexible elements that increase their attractiveness of use and may also change their functions. The public spaces of this particular project would be divided by two parts where one part is the calm part where people go to think, read and talk calmly. The other part is where there are more activities and people interact in a more vibrant way.



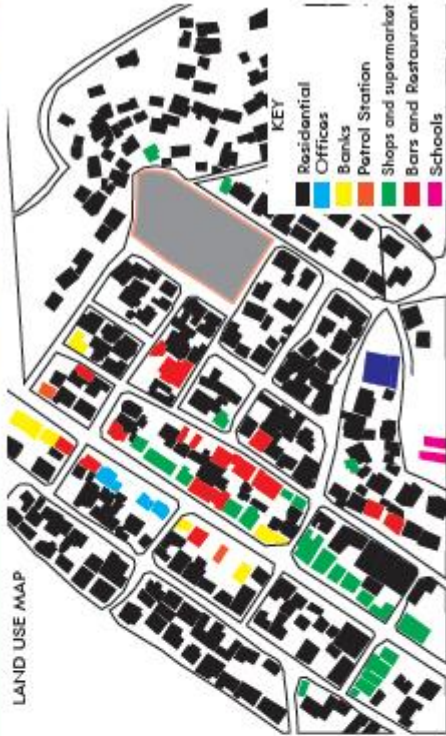
The circulation through the project would be designed in a way that there is a central space that acts like a receiver and a transmitter, by this means that it collects the people from outside the project and then transmits it to the inside of the project. This means that the main circulation from outside the project passes through the central space and then the circulation through the project is all derived from this central space.



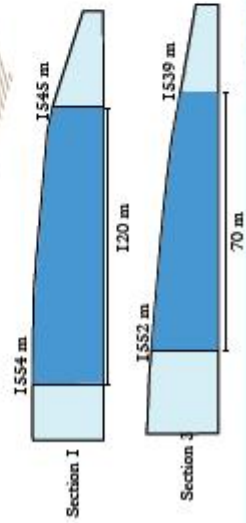
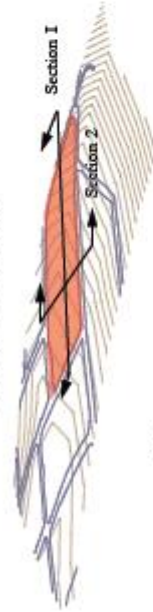
This would be achieved by provide housing that expands with the ever-changing need of the household by designing units that have an expanding area that is free and that can be used as an extension to the existing unit without having to move from one place to another.



The site chosen is located in Nyarugenge District, Nyamirambo sector, Munera cell. It was chosen because it is an area that needs an overhaul in housing because the housing in the area is very old and needs some new blood. The location of the site is also very connected to its surroundings and has around it almost all the facilities needed to support housing.



SITE TOPOGRAPHY



MUMENA HOUSING COMPLEX



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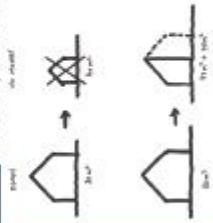


3. QUINTA MONROY / ELEMENTAL



Quinta Monroy is a residential project done by ELEMENTAL in Mexico that consists of a three-story continuous building that in section superimposes a house (first floor) with a two-story apartment above (2nd and 3rd story). Both units are designed to house the first middle class standard of which will be handed over the first half (40 sqm).

When there is not enough money to build a comfortable sized house for a family, the natural response is to simply make them smaller. ELEMENTAL rephrased the answer and thought, instead of building smaller homes, why don't we build half of a good, comfortably sized one!



In this sense, the difficult parts of the house (bathrooms, kitchen, stairs, and dividing walls) are designed for the expanded scenario. These parts are on the stationary because they are the ones that are hard to build and the community can not do it on their own.



This 'half-a-house' designed by ELEMENTAL was essentially the core of a house, the half that the residents couldn't build on their own. The initial dwellings were double height, robust concrete block structures fitted out with the very basics - a kitchen, bathroom, some partition walls and an internal timber stair.

Each of these box-like structures alternated with an empty space, of exactly the same size. In this vacancy the family could expand their own home, configuring the space however they desired.



This is done by designing the building in a way that there is an open space that the house can be incremented in. It is like designing half of the building and letting the people decide what they going to do with the other parts.

1. MONTERREY HOUSING / ELEMENTAL



This is a housing project done by ELEMENTAL in Mexico that consists of a three-story continuous building that in section superimposes a house (first floor) with a two-story apartment above (2nd and 3rd story). Both units are designed to house the first middle class standard of which will be handed over the first half (40 sqm).



As with Elemental's other housing projects, the concept of unrolled expansion is at the heart of the scheme's design. A base build is provided that allows the residents to purchase a simple house within a relatively constrained budget.



The early part that can be built by the people themselves can be added to the existing partition after some time when the population feel like they need to use that part of the house and that they have the means to add on that extension.



The plan configuration allows expansion of the accommodation into these spaces to provide a separate ground floor dining and living room and at first floor two additional bedrooms. At the circulation and the more complex building services are housed within the core structure, the residents are able to complete the expansion works themselves.

2. VILLA VERDE HOUSING / ELEMENTAL

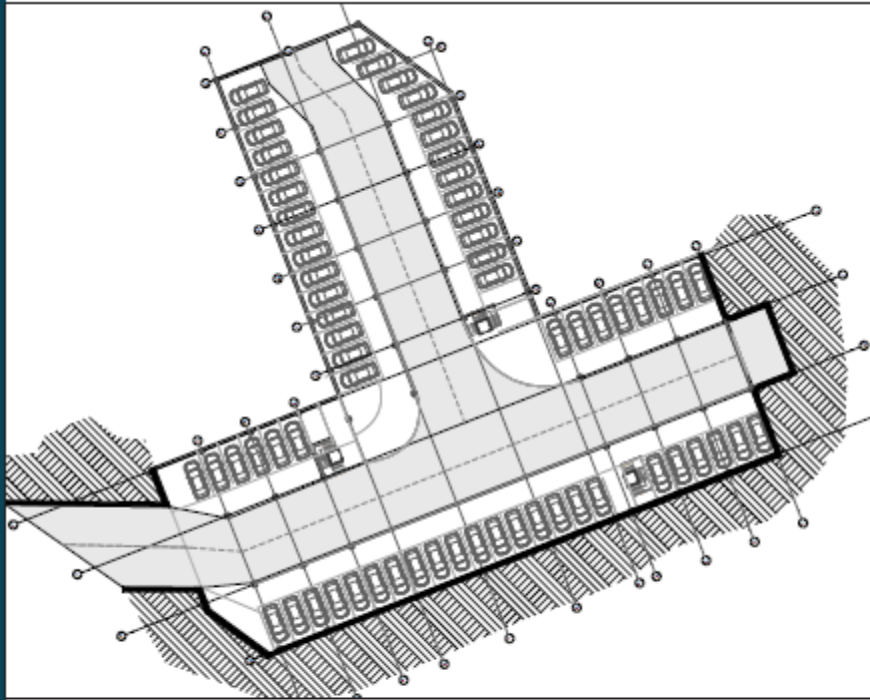


This is also a housing project done by ELEMENTAL studios in Mexico but in a forestry area for a company that wanted to give housing to their employees, this means that they operated on a higher budget than they usually encounter in its social housing projects. They decided to apply the same strategy of incremental construction with higher construction and finish standards.



On the ground floor this base build comprises a small, shared space combining kitchen, dining and living room, plus a bathroom and outside laundry space. On the first floor there are two bedrooms and an additional bathroom. However, the 57 sqm houses are structured so that they can be readily expanded to a final area of 85 sqm.





APARTMENT A
 TOTAL AREA: 50.4 SQM
 2 BEDROOMS
 LIVING ROOM
 DINING ROOM
 BATHROOM
 KITCHEN
 BALCONY

ESTIMATED PRICE: 14.000.000 Rwf



APARTMENT B
 TOTAL AREA: 75.6 SQM
 3 BEDROOMS
 LIVING ROOM
 DINING ROOM
 BATHROOM
 KITCHEN
 BALCONY

ESTIMATED PRICE: 21.000.000 Rwf



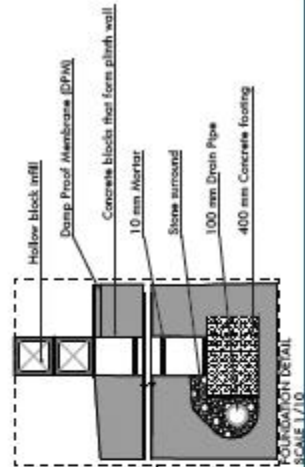
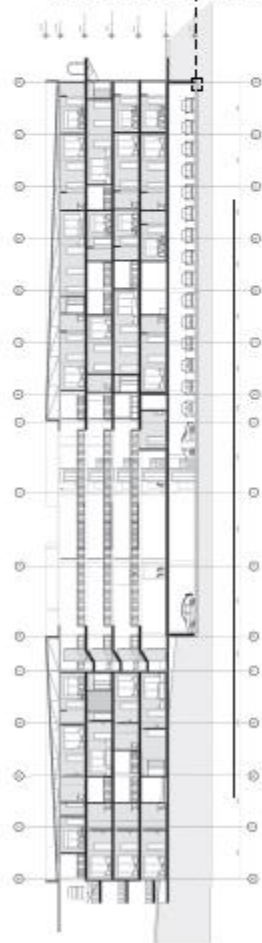
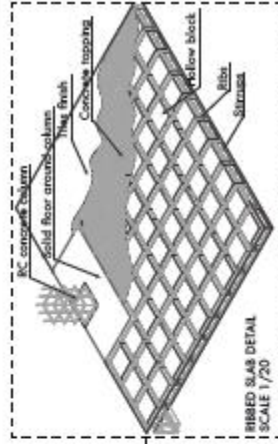
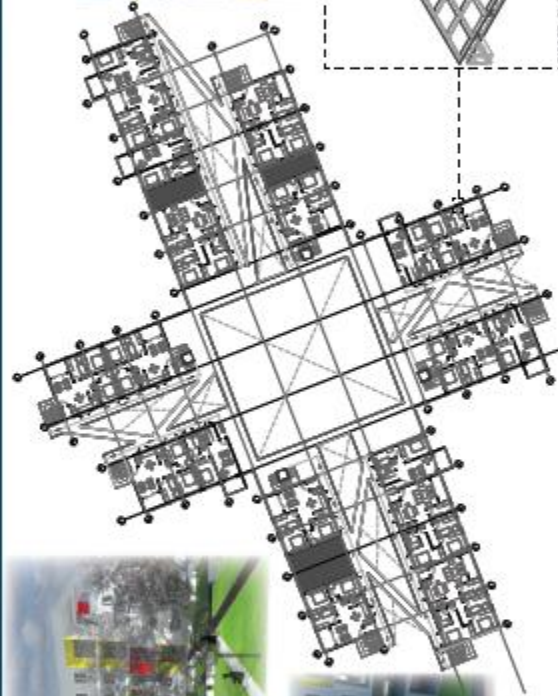
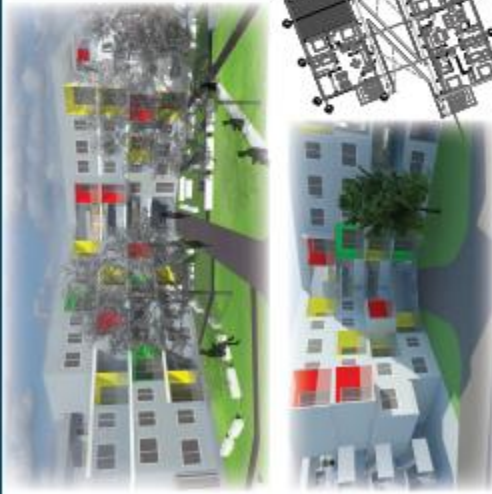
APARTMENT C
 TOTAL AREA: 100.8 SQM
 4 BEDROOMS
 LIVING ROOM
 DINING ROOM
 2 BATHROOMS
 KITCHEN
 BALCONY

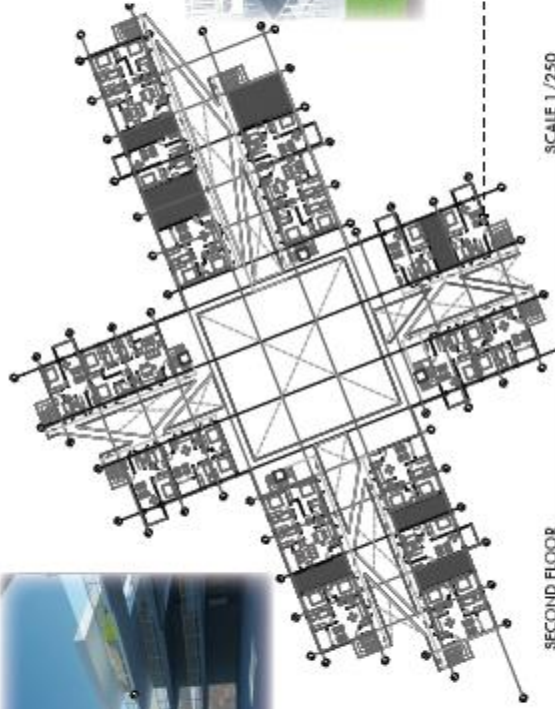
ESTIMATED PRICE: 28.000.000 Rwf

MUMENA HOUSING COMPLEX



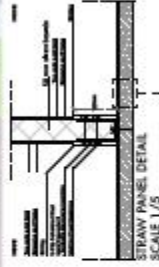
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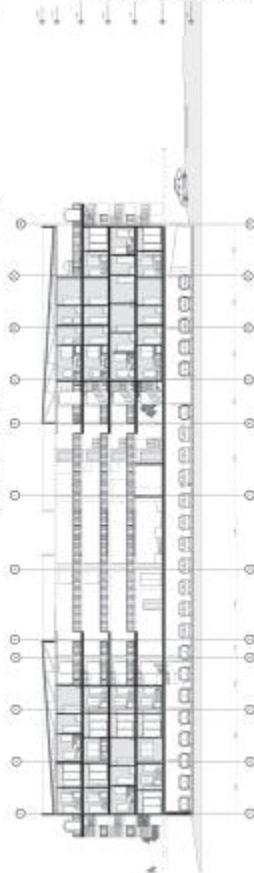


SECOND FLOOR

SCALE 1/250

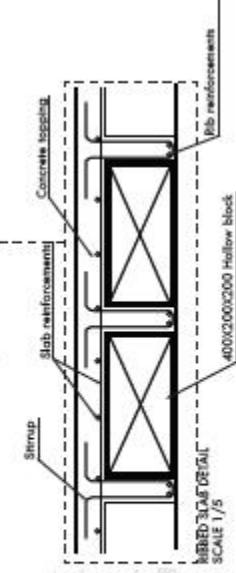


STRAW PANEL DETAIL
SCALE 1/5



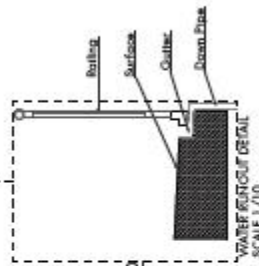
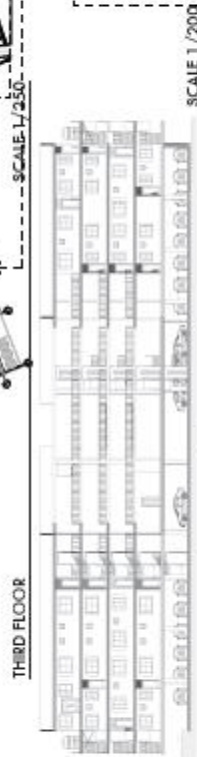
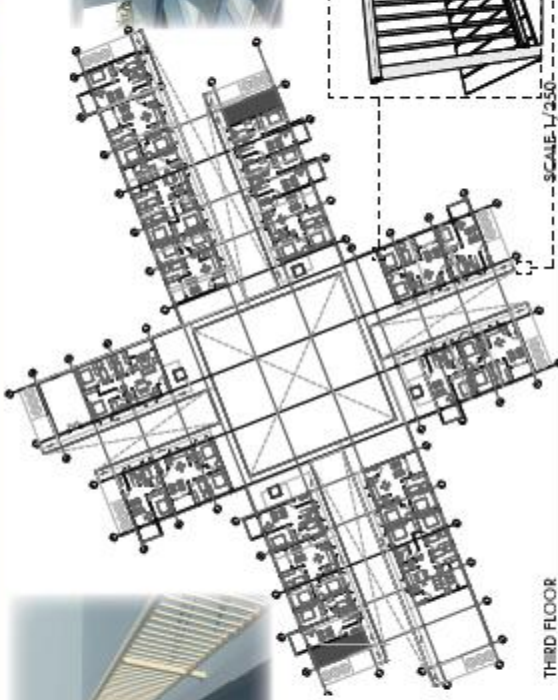
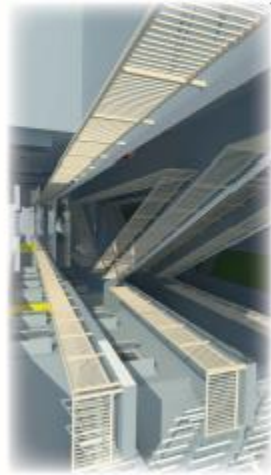
TRANSVERSAL SECTION

SCALE 1/200



REINFORCED CONCRETE SLAB DETAIL
SCALE 1/5

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ELEVATION E-01

SCALE 1/200

SCALE 1/20

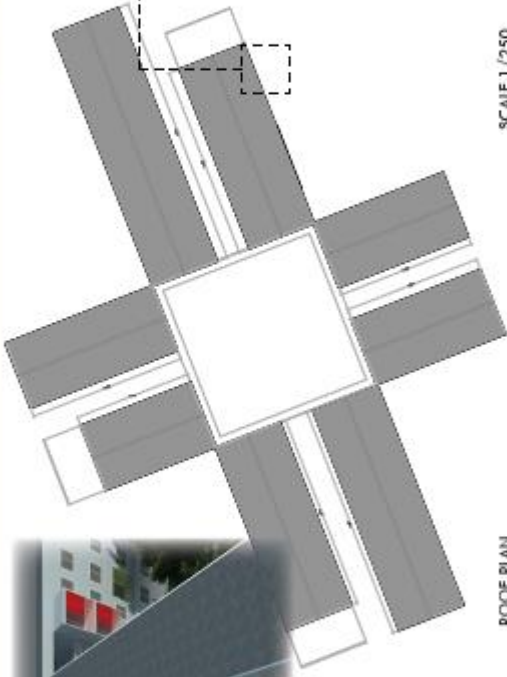
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ELEVATION E-02

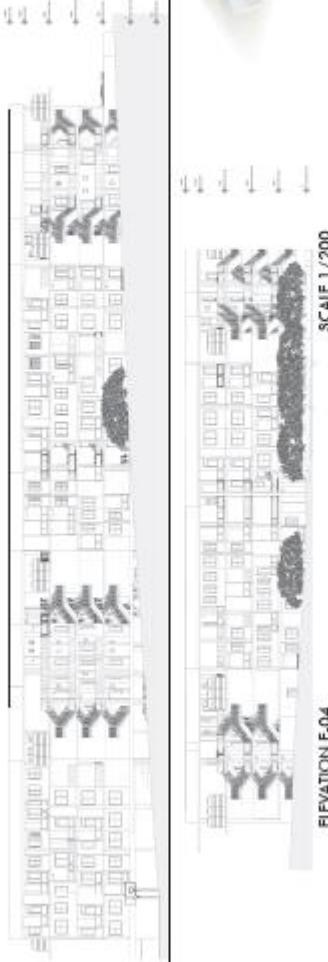
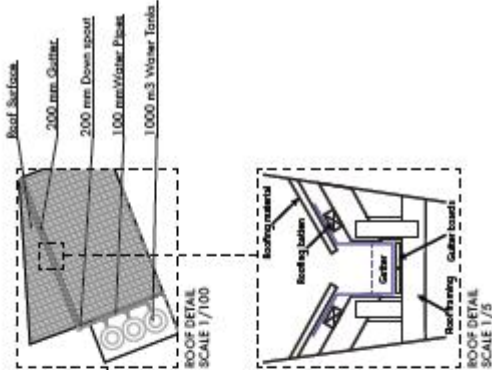
SCALE 1/200

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SCALE 1/250



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REFERENCES

- Alex Schwartz (2011) Comment on Emily Talen and Julia Koschinsky's "Is subsidized housing in sustainable neighborhoods? Evidence from Chicago", *Housing Policy Debate*, 21:1, 29-32, DOI: 10.1080/10511482.2011.534387
- Allen, Isabel. "Exciting innovation in housing design" (book review). *Architect's Journal*. v208, n19. p 68. Nov 1996.
- "Archdaily," last modified January 23, 2013, <http://www.archdaily.com/105261/28-social-housing-in-paris-koz-architectes>
- "Archdaily," last modified March 09, 2010, <http://www.archdaily.com/52202/monterrey-housing-elemental>
- "Archdaily," last modified October 20, 2010, <http://www.archdaily.com/83307/8-house-big/>
- "Architravel," last modified January 1, 2013, <http://www.architravel.com/architravel/building/les-nids/>
- Bjarke Ingels,"Infinity loop: 8-house and Little Tower," in *Yes Is More: An Archicomic on Architectural*
- Bjarke Ingels, "Yes is more: A theory of evolution," in *Yes Is More: An Archicomic on Architectural Evolution*, 14-15
- Brueckner, K. (ed.) (2012),"*Measuring Welfare Gains from Relaxation of Land-Use Restrictions: The Case of India's Building-Height Limits*"
- Brueckner, J., Fansler, D., (ed.) (1983). "The economics of urban sprawl: Theory and evidence on the spatial size of cities."
- "Buildipedia," last modified November 23, 2010, <http://buildipedia.com/aec-pros/featured-architecture/bjarke-ingels-groups-big-8tallet>
- "Dezeen," last modified October 22, 2010, <http://www.dezeen.com/2010/10/22/8-house-bybig-2/>
- Detailed Masterplan of Nyarugenge District, Feb 2010
- DISTRICT PROFILE Kigali – Nyarugenge, by Rwanda National Institute of Statistics

Edward G. Goetz (2012) The Transformation of Public Housing Policy, 1985–2011, *Journal of the American Planning Association*, 78:4, 452-463, DOI: 10.1080/01944363.2012.737983

Emily Talen & Julia Koschinsky (2014) The Neighborhood Quality of Subsidized Housing, *Journal of the American Planning Association*, 80:1, 67-82, DOI: 10.1080/01944363.2014.935232

Emily Talen & Julia Koschinsky (2011) Is subsidized housing in sustainable neighborhoods? Evidence from Chicago, *Housing Policy Debate*, 21:1, 1-28, DOI: 10.1080/10511482.2010.533618

Fourth Population and Housing Census, Rwanda, 2012 District Profile Nyarugenge Housing Survey Summary, May 15, 2012 Addendum.

Huth Mary J. "Urban Housing in the Peoples' Republic of China", Leslie K. Martin, Harjinder Singh, eds., *Housing in the Third World*, Concept Publishing Company, New Delhi, 1992, pp. 79 - 112.

Jie Chen, Zan Yang & Ya Ping Wang (2014) The New Chinese Model of Public Housing: A Step Forward or Backward?, *Housing Studies*, 29:4, 534-550, DOI: 10.1080/02673037.2013.873392

Kigali City Website, 2015

Lawrence J. Vale & Yonah Freemark (2012) From Public Housing to Public-Private Housing, *Journal of the American Planning Association*, 78:4, 379-402, DOI: 10.1080/01944363.2012.737985

Lawson, J, Haffner, M and M. Oxley (ed.) (2009), *Comparative housing research in the new millennium: methodological and theoretical contributions from the first decade*, Melbourne.

Mahood, S. (ed.) (1992) "*Shelter Within My Reach*": Medium Rise Apartment Housing for the Middle Income Group in Karachi, Pakistan.

Pandya, Yatin. "Playing 'Housie' ", Santosh Gosh ed., *Housing Development and Management*, Center for Built Environment, Calcutta, 1996, pp. 156 - 158.

Ploeger, R Lawson,J and M Bontje (2001) *The methodological challenge to comparative research Journal of Housing and the Built Environment* 16 (1): 1–5

Smelser, N J (2002) On comparative Analysis, Interdisciplinary and Internationalization in Sociology *International Sociology* 18 (4) 643-657

Rouda, Mitchell. "Houses as Products", *Architectural Record*, Jan. 1999, pp. 115 - 117.

National Housing Policy, Rwanda Housing Authority (RHA)

Survey Background Information: February 2012 Survey Questions, Berkeley

Mercer, C. (ed.) (2014) *Middle class construction: domestic architecture, aesthetics and anxieties in Tanzania*. *The Journal of Modern African Studies*, 52 (02). pp. 227-250.

Susan J. Popkin , Mary K. Cunningham & Martha Burt (2005) Public housing transformation and the hard-to-house, *Housing Policy Debate*, 16:1, 1-24, DOI: 10.1080/10511482.2005.9521531