CONCEPT AND TECHNIQUES: SUSTAINABLE DESIGN TECHNIQUES IN THE 
LANGI TRADITIONAL ARCHITECTURE. A CASE STUDY OF THE LANGI 
TRADITIONAL HOUSING.

BY
OKELLO DANIEL
12/U/13279/PSA

SUPERVISOR:
ARCH.DOREEN KYOSIMIRE

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DECLARATION

I Okello Daniel, hereby declare that this research is a result of my own work and has not been presented anywhere else.

NAME: OKELLO DANIEL
STUDENT REGISTRATION NUMBER.............................. 12/4/13279/PSA
SIGNATURE................................................................
DATE...........................................................................

SUPERVISOR
1. ARCH.DOREEN KYOSIMIRE
SIGNATURE................................................................
DATE...........................................................................
DEDICATION

I dedicate this piece of dissertation with gratitude to my family, Madhivan foundation, my university supervisor Arch.Doreen Kyosimire, for your support rendered to me throughout my time of study at the university.
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First and foremost, I bow before Almighty God in deep gratefulness that His limitless wisdom and mercy granted me enough strength to complete my research and I express thanks from the core of my heart to Holy Jesus (peace be upon him).

I would like to express thanks to my supervisor, Arch.Doreen Kyosimire for her advices, constant encouragement and crucial contributions to my research.

I would also like to thank a faculty members, staff and friends at Makerere University, department of architecture and physical planning.

Thank you for your hospitality, kindness, and generosity. Most importantly, this research would have been impossible without the love, encouragement and support of my family.

Last, but not least, i would like to thanks my parents for their constant prayers, unconditional love and sacrifices. This dissertation is dedicated to you with all of my heart and soul. I thank you.

Of vital importance is the gratitude I owe to the local communities of Alokiri, Akaidebe and Abenyo,and their respective Local Council One for gladly opening their homes and environs for interviews, conversations, photographs, sketches and audio recording. I pray that this research will lead to the upliftment of your community.
# TABLE OF CONTENTS

DEDICATION ......................................................................................................................... ii

ACKNOWLEDGEMENTS .......................................................................................................... iii

ACRONYMS AND ABBREVIATIONS ....................................................................................... vii

LIST OF FIGURES ................................................................................................................... viii

LIST OF TABLES ..................................................................................................................... ix

ABSTRACT ............................................................................................................................... x

CHAPTER ONE ........................................................................................................................ 1

INTRODUCTION ..................................................................................................................... 1

1.1. Background ..................................................................................................................... 1

1.2. Problem statement ......................................................................................................... 3

1.3. Research Objective ....................................................................................................... 4

1.4. Specific Objectives of the study .................................................................................... 4

1.5. Research questions ........................................................................................................ 4

1.6. Significance of the study ............................................................................................... 4

1.7. Justification of the study ............................................................................................... 5

1.8. Scope and limitations of the Study ............................................................................... 6

1.10. Key approaches and concepts guiding the research ................................................... 7

1.11. Research Methodology ............................................................................................... 7

1.10. Definition of terms ...................................................................................................... 7


CHAPTER TWO ....................................................................................................................... 9

LITERATURE REVIEW .......................................................................................................... 9

2.0. Introduction ..................................................................................................................... 9

2.1. The concept of sustainability ....................................................................................... 9

2.2. Traditional architecture and sustainability concept .................................................... 12

2.3. Cultural aspect and traditions in traditional architecture .......................................... 14

2.3.1 Housing as a strategy for sustainability .................................................................... 15

2.3.2 Affordable sustainable housing ................................................................................ 16

2.3.3 Influence of culture on space organizations .............................................................. 17

2.4. Features of traditional Architecture ............................................................................. 18
2.5 Construction form, Technology and material selections in Traditional Architecture

2.5.1 Traditional materials used in Traditional Architecture

2.6 Climatic aspect in Traditional architecture

2.7 Sustainability features of Traditional Architecture

2.7.1 Site issues

2.7.2 Material selections and construction methods

2.7.3 Natural lighting

2.7.4 Nature and courtyards

2.7.5 Natural Ventilation

RESEARCH METHODOLOGY

3.0 Introduction

3.1 Research Design

3.2 Population and Sampling technique

3.2.1 Target/Accessible Population

3.2.2 Sampling

3.2.3 Sampling Techniques

3.3 Data collection Instruments

3.3.1 Research Instruments

3.3.1.1 In-depth interviews

3.3.1.2 Observation

3.3.1.3 Focus Group Discussion

3.3.1.4 Photographic analysis

3.3.1.5 Audio Recordings

3.3.1.6 Sketching

3.3.2 Research procedure

3.4 Validity of research instrument

3.4.1 Reliability of research instrument

3.5 Ethical Consideration

CHAPTER FOUR

REVIEW ON HISTORY OF THE LANGI TRADITIONAL ARCHITECTURE AND FINDINGS ON THE STUDY AREA
ACRONYMS AND ABBREVIATIONS

FGDs: Focused Group Discussions
LRA: Lords Resistance Army
NUSAF: Northern Uganda Social Action Fund
WCED: World Commission on Environment and Development.
UNCP: Uganda National Cultural Policy
UBOS: Uganda Bureau of Statistics
UNHP: Uganda National Housing Policy
LIST OF FIGURES

Figure 1: Levels of interface between the building and the environment................................. 11
Figure 2: Relationship between sustainable factors...................................................................... 12
Figure 3: Main types of construction materials in 2009/2010 (%). (UBOS, 2010)...................... 20
Figure 4: Typical African Straw hut .......................................................................................... 22
Figure 5: Typical Langi housing typology. Source: Author .......................................................... 22
Figure 6: A diagram showing research framework. (Author: 2017)........................................... 30
Figure 7: Showing researcher interviewing during the field survey.......................................... 33
Figure 8: Contextual map of Uganda showing Lango sub-region.............................................. 38
Figure 9: sketch of Langi typical homestead lay-out................................................................. 39
Figure 10: sketch of granary lay-out .......................................................................................... 40
Figure 11: sketch of granary section ........................................................................................... 40
Figure 12: Sketch of Langi woman’s traditional ........................................................................... 42
Figure 13: sketch of Langi man’s traditional ............................................................................. 42
Figure 14: Bachelor langi house (otogo). (Driberg, 1923:86).................................................... 43
Figure 15: Showing first traditional Langi houses. (Driberg, 1923:87)........................................ 43
Figure 16: sketch of atypical section through the Langi traditional house................................ 44
Figure 17: View of hutments in Akaidebe village...................................................................... 47
Figure 18: View of hutments in Abenyo village........................................................................ 47
Figure 19: Map showing Dokolo District. (Okello Okellos, 2009)............................................. 48
Figure 20: showing construction method and housing typology (Author, 2017).................. 52
Figure 21: Architectural details of the selected houses A, B, C, D, E, and F............................. 55
LIST OF TABLES

Table 1: Showing the distribution of household sizes studied at selected five villages.......................... 49
Table 2: showing the determining factors of sustainable traditional design techniques in selected villages
in the study area ........................................................................................................................................ 50
Table 3: Showing mostly used traditional materials for wall construction in the study area.................. 51
Table 4: Area Specific Profiles – showing building materials usage in the study area.......................... 53
Table 5: General information about the houses in question ................................................................................................................ 55
Table 6: Types of materials used in the houses investigated .................................................................................. 56
Table 7: Most used materials and their properties ................................................................................................. 57
Table 8: Qualitative investigation of bioclimatic design strategies used in Langi traditional................... 58
ABSTRACT
The characteristic of traditional architecture generates a congenial place through a sympathetic design of its cultural environment and local people. The study demonstrates how the characteristic of traditional architecture accumulates and embodied its significant of traditional values in the traditional architecture. Studies have indicated on a common thought of supporting the concept of tradition, and its related features.

This dissertation examines the sustainable design techniques through a study addressing issues such as social, cultural identity, tradition and sustainability. Traditional case studies within Lango sub-region community built by the local people clarify the reintroduction of the local traditional techniques to strengthen the sustainability of the built environment moreover improving the cultural identity of the people.

The research promotes the implementation of traditional building techniques and indigenous knowledge into contemporary or modern architecture through a participatory approach to community development. Following the findings, the knowledge concerning a local tradition cannot be irrelevant to contemporary or modern architecture which may play an essential role in guiding architects through the past in order to navigate to the present and sustainable future.
CHAPTER ONE

INTRODUCTION

1.1. Background
Throughout history, mankind has tended to strengthen its ties with the world in order to preserve the continuity of their existence. This could be understood instinctively in an effort to directly meet its basic needs from natural sources. The basic tangible requirements (eating, drinking, covering, sleeping, breathing, security), which is ranked first in the Maslow’s hierarchy of requirements, are considered as preconditions for social and moral requirements that separate human beings from other living things (McLeod, 2017)

The human race has changed and shaped the environment in which they live with intuition and conscious/unconscious environmental sensitivity, through trial-and-error learning processes to meet the need for accommodation.

Therefore, traditional architecture in Lango region like most of the other similar examples in the world is developed based on the needs of users and living conditions in the region. There are several factors which affect the architecture in a region such as climatic conditions, topography, available material and culture (Rapoport A., 1980)

Architecture of house can be considered as one of the most important achievements in the traditional Langi architecture which needs to be discussed and analyzed in different aspects. For starting the discussion about the architecture of Langi traditional house, there is a need to define the meaning of the house. On the other hand, the importance of the spaces and the relationship between the spaces in the house and also the relationship of exterior/interior spaces can be discussed in more detail.

The house and dwelling can be defined in several ways and it has roots in the history. House as a shelter, from the early days of humankind, has been a worthy place, each culture and race has grown up under this shelter. Dwelling has always been such a fusion of living habits, environmental condition and cultural boundaries. Home is never created until there is a combination of comfort, fulfillment and a sense of belonging to a dwelling space. The word home comes after house. The house with the sense of belonging and comfort and the place of memories can be called home (Shabani, 2011).
However, in recent years “sustainability” has become a more widely discussed topic among societies seeking to lessen the detrimental effects that wasteful consumption has had on the environment. This increased acknowledgement may have resulted from the “new technology understanding of the importance ecosystems hold in the balance of the environment; yet it may also simply be out of fear of what the future may bring in terms of global climate change.

**Sustainability** can be defined as the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland.H., 1987). Sustainability is not a new fashion in the Uganda’s construction industry.

Contemporary societies in Uganda have inherently become increasingly detached from nature in a way that is harmful to both the environment and people. In general, this disconnect has mostly developed from our own desire to advance our ways of life. We design and adapt structures and technologies to cope with natural forces beyond our control as a means of gaining some power over them. This power, in turn, allows for a creation of a sense of both physical and emotional comfort, from which people feel protected and happy.

However, this disconnect can be addressed architecturally by visiting into the past how our ancestors lived in their built environment through their sustainable ways of constructing their dwellings. Therefore, sustainable architectural design, is the kind of design which respects natural resources, and embraces, human, cultural, and historical distinctions (Crowder.D.w., 2013).

It inspires people to see this connection to nature more clearly and to create greater understanding, interaction and enjoyment with their surroundings. This atmosphere is created by careful holistic planning, green design and construction processes, with an emphasis on aesthetic and experiential considerations.(Rapoport.A., 2005).

The past is significant of what has made the present what it is and subsequently what will become of the future. Therefore, by examining how traditional architecture interacted with their respective environment in the past can be the most beneficial stage of creating new, sustainable
architecture, accepting that this technology can be inspired by the past. This is why traditional architecture is very relevant when it comes to redesigning our methods of sustainability. With tremendous increase in Uganda’s population, Lango sub-region which constitutes of the Langi people have experienced a greater deal of urbanization by creation of daughter districts. Therefore some traditional communities have become urbanized ‘without notice’. As the urban area ‘colonizes’ rural space, rural people also migrate to urban areas for various reasons. There is a need to study on the traditional Langi houses, in order to find spatial qualities, design techniques for which can be applied on modern architecture.

Banham argues that the modern homes are a set of modern appliance and services, not bound to any location and therefore essentially rootless (Banham.R., 1975) cited in (Shabani, 2011).

1.2. Problem statement.
Traditional architecture of Langi has suffered a great deal, be it from human negligence, socio-economic conditions, weather, ravages of war by the LRA (Lord’s Resistance Army) and modernization in most parts of Lango sub-region.

Among the Langi, the relics of mud and wattle, adobe and stone buildings are seen in their traditional urban centers as reminiscences of history, the old traditional buildings are being replaced by modern structures. The combination of these challenges further compound the sustainable techniques within the Traditional architecture especially that of Langi people which have gradually eroded and diminished conservational practices of the historical or ancient buildings. Attempts have been made to introduce foreign interventions by use of ‘new technology’ to people who have adequately housed themselves in the past. Unfortunately, these attempts have usually been in the form of apartments or low-cost housing schemes to attain the booming sustainability issues in the built environment. Such ‘housing provision’ rarely takes into account the culture or traditions of specific communities, and the mass produced dwelling hardly reflects the values of the families which are seen traditional architecture of specific communities. As a result, many modern building are being built which tends to ignore traditional design techniques which may create some kind of architectural harmony. Hence, the need to investigate sustainable
design techniques in Langi traditional architecture by taking a case study of the Langi traditional housing.

1.3. Research Objective
The main research objective of this research is to examine and discuss Sustainable traditional design techniques in Langi traditional architecture.

In this research, the architecture of the traditional houses in Lango region in Uganda will be analyzed by considering the issues which are related to influence of culture in architecture, space organization, spatial relationship and traditional design techniques used in construction. Analyzing the traditional Langi houses may lead architects to discover some principles which might help them to design new buildings more consciously within Lango region and Uganda at large.

1.4. Specific Objectives of the study
1. To analyze Langi traditional architecture in terms of form, space organization, building materials and technology.
2. To analyze culture and its influence on the Langi traditional architecture.
3. To analyze traditional architectural techniques traditionally practiced among the Langi.
4. To identify lessons that can be drawn from traditional architecture of the Langi.

1.5. Research questions
The study will intend to subjectively solve or satisfy the following research questions.

1. Can we take traditional architecture as an example of attaining sustainable design by incorporating its principals in the modern societal setting?
2. What are the basic principles used in Langi traditional architecture?
3. Are the techniques in traditional housing sustainable and adaptable for modern sustainable design?
4. What are the cultural influences on traditional Langi architecture?

1.6. Significance of the study
As the world tends to a more sustainable approach towards the design of the buildings. There are still quite a number of gaps that are yet to be filled when it comes to the design for modern society especially when it comes to cultural, climatic and energy aspects of sustainability.
The study is significant in a way that it will provide information from the findings for future researchers to build on as there is no enough information that has been provided on sustainable designs within Lango region.

The study will also be significant because it is an academic requirement for the researcher for the partial fulfillment of award of the degree in architecture.

The study will also be significant because its recommendations are to be adopted elsewhere in the region and Uganda at large for purposes of comparing sustainable design approaches in terms of architectural design challenges.

1.7. Justification of the study
Sustainability is abroad topic, but within the realm of architecture provides its own particular variety of hurdles, as the process of constructing buildings is both a necessity as well as a large source of wastes.

This does not mean architectural sustainability through incorporation of traditional design techniques is unachievable. Architecture and construction in Uganda will always require materials; however, we can choose them more carefully and use them more intelligently in order to reduce the negative impacts on environment.

According to (McDonough.W., Braungart.M, 2002), “Just about every process has a side effect, we can be humbled by the complexity and intelligence of nature’s activity, and we can also be inspired by it to design some positive side effects to our own enterprise instead of focusing exclusively on a single end

The same can be said about traditional architecture, we can ignore it or be inspired by it; traditional people learned how to live with natural environment because they lacked the technology to control it.

In exploring various design techniques with in the traditional Langi architectural styles, it can be discovered that these techniques can be incorporated into the modern designs which are beneficial characteristics concerning sustainability of the built environment.
The study findings on this research are to act as learning lessons for making necessary improvements on existing design measures which guide sustainable architectural development for Lango region and Uganda at large.

1.8. **Scope and limitations of the Study**

The study will be conducted within three villages (Abenyo, Alokiri and Akaidebe) in Angwecibange parish, with Dokolo district.

The study will also be conducted on the existing traditional architecture of the Langi on the selected villages. The research intended to identify the gaps within the traditional architecture and modern architectural designs in terms of sustainable design techniques.

The research will cover the entire three villages because architecture is most influential with land use development comprising different functional elements according to class such as residential, commercial, institutional, infrastructure, environmental, industrial and recreational land uses.

1.9. **Clarifying the reason for this study**

The stimulus for the research grew as a result of the authors’ upbringing in Lango sub-region in Northern Uganda

The demolition of existing traditional dwellings in the Angwecibange Community of Alokiri, Abenyo and Akaidebe in favour of the low-cost housing provided by the Northern Uganda Social Action Fund (NUSAF) caused an urgency in the research of Langi traditional architecture after decades of struggle for space in Internally Displaced People’s camps. The NUSAF started as a program to rebuild on the lost hopes after the war insurgency in Northern Uganda.

This study is inspired by the belief that one way of achieving a pride-filled architectural identity among the Langi would be through the implementation of that which is from the specific culture and environment.

Therefore, the reasons for the study are to be aimed at the revalidation of traditional design techniques for a sustainable built environment thereby increasing professional awareness, community pride, cultural identity and essentially global sustainability.
1.10. Key approaches and concepts guiding the research

This dissertation is structured for research purposes - indicating certain fundamental principles in rural architecture and building as well as the exploration of specific characteristics such as environmental conditions, material resources, structural systems and technologies which have a bearing on architectural form. With the view of relating contemporary Uganda design to a regional tradition, the potential of the study is to solve problems not only with regard to low-cost housing but also that of our architectural.

Primarily, two approaches will be utilized to arrive at supporting evidence. The developmental approach proposed by (Brundtland.H., 1987), which focuses on improved human and ecological well-being expressed in such terms as economic growth, improved housing, health and ecological sustainability. (Brundtland.H., 1987).

Secondly an ecological approach which focuses on habitat as part of the overall environmental system, both natural and nurtured thereby ensuring that humanity meets the needs of the present, without compromising the ability of future generations to meet their own needs (Brundtland.H., 1987).

1.11. Research Methodology

The researcher will select specific rural community and those of the municipality areas that will be analyzed as cases representing the general Langi vernacular architecture. This analysis will be carried out in two stages; one is the theoretical study of the area. This will involve getting information through interviews from the locals and any relevant authorities on the architectural history of the Langi traditional architecture in particular. Two, is the observation of the current architecture in the urban centre and those in the selected rural communities. The analysis will include photographic analysis, sketches and drawings of the current situation.

1.10. Definition of terms

Traditional Architecture-refers to those buildings made by common builders in an informal way, rather than by architects using design methodologies.

According to (Rudofsky.B, 1965)-a building designed by an amateur, without any training in design; the individual will have been guided by a series of conventions built up in their locality, paying little attention to what may be fashionable.
Sustainability- can be defined as the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland.H., 1987)

Traditional housing-refers to structures built using locally available materials and techniques. Environment- As defined in the Environmental Management -Act “land, water and air; all organic and inorganic matter and living organisms as well as biological diversity; the interacting natural systems that include components referred to in sub-paragraphs, the human environment insofar as it represents archaeological, aesthetic, cultural, historic, economic, paleontological or social values”.


To echo the research question, a literature review in Chapter Two follows this introductory chapter and outlines the literature sources consulted. It starts with the understanding the concept of sustainability within the realm of architecture as it is vital the study of this research. Next, the sustainability of traditional architecture is addressed followed by the cultural aspect and traditions in traditional architecture. This chapter further explores futures of traditional architecture in terms of climatic, material and technological aspects used in traditional architecture. Much debate follows in Chapter Two examining traditional terms, definitions, varying views in the given context. Ultimately, the chapter draws to a close with the introduction of the primary research methods namely the developmental and ecological approaches which, together with the research methodology and design are discussed in broader terms in Chapter Three.

Chapter Four introduces the review on Langi traditional architecture and research study area, starting with the historical and political contexts within Uganda, followed by the Angwecibange parish and concluding with a detailed analysis of the selected three communities. Climatological, environmental factors are addressed, focusing on the specific geographical location. The research problem and research methods follow within Chapter Three. Findings which resulted from the research in Chapter Four are discussed in detail in the trailing chapter. Chapter Five is the final chapter whereby conclusions are drawn and recommendations are made with regard to the relevance of the research conducted.
CHAPTER TWO
LITERATURE REVIEW

2.0. Introduction
Traditional architecture is an important subject of our day today lives as it provides valuable insight into what works and what may not in terms of sustainability of the built environment. This chapter talks about how culture, traditional building techniques and climate play a major role in the design of a home. The problem being researched is the gap between cultural aspect and traditional ways of building constructions that has seemingly been ignored in the recent modern architecture. This has resulted into architectural conflicts where the building spaces do not conform to the user needs.

This chapter therefore explores and defines the variables of this research, which include concept of sustainability in the realm of architecture, culture, traditional architecture, and housing and how each influences the others, in the view of works of other researchers on this topic. Attached to every built form, culture is the major subject which affects the built environment varying from micro to macro picture of our society.

However, this further compound into another variable of urban setting (urbanism), as the study lies in the assumption that much of the produced houses in the urban center signors people’s cultural values. Old traditional buildings are being brought down for new modern architecture which to some extent does not reflect on the values of specific communities. The fast growing urban centers have led to detrimental change in people’s cultural considerations in their urban housing.

Literature is supplemented by works of other researchers on the issues of sustainable design which requires all the variables mentioned.

2.1. The concept of sustainability
Prior to explaining the principles of sustainable design in architecture, it is proper to explain what sustainability means. An overview of the concepts of sustainability was provided by Andrew Dobson, based on four questions, 1. What to sustain, 2. Why, 3. For Whom, and 4. Substitutability (Dobson A., 1996)
The word ‘Sustainable’ “is often used to characterize a technology with a lower environmental impact on a single environmental problem such as (climate change, water resource use, etc.), often quantified in terms of reduced resource use or pollution emissions as a fraction or percentage” (Levin.H., 2015)

Anyone involved in building design, in recent years will have been confronted in one way or another by the term sustainability. The term remains elusive to many, and while a number of definitions exist, they give little indication of how to apply principles of sustainability in modern architecture where traditional architectural techniques have been ignored. The concept of achieving sustainability in architecture came from the sustainable development strategy.

**Sustainable development** is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland.H., 1987). Sustainable development is about ensuring a better quality of life for everyone, now and for generations to come.

“Sustainability,” in terms of architectural design, is a word that has received an increasing amount of attention in recent years, yet a clear definition for it is difficult to determine.

It is on this premise that sustainable architectural design/green building/sustainable construction/green construction all referring to the same thing is based. Some definition of the term includes:

According to (Plessis.C., 2007), he defines sustainable design as a holistic process aiming to restore and maintain harmony between the natural and the built environments, and create settlements that affirm human dignity and encourage economic equity.

According to (Paola.S., 2006) in his book ‘Strategies for Sustainable Architecture’ talks about sustainability approach in architecture. Sustainable buildings must be resilient to climate change and be adaptable, flexible and durable in order to increase a building’s life-span. He further argues that buildings have potential lives spanning hundreds of years. What is being built now could affect the next ten generations. Not to build for maximum energy, water, materials and waste efficiency is to place an unacceptable burden on future generations.

However, Sustainable design can help put into practice and even encourage a sustainable way of life. But how can buildings be designed and built to contribute positively to the sustainability
agenda, to achieve economically strong, socially inclusive, stable communities while minimizing the impact on the environment?

There are perhaps two main aims for sustainable architectural design which Paola talks about which are relevant to my study, these include:

First, sustainable buildings should minimize the environmental impacts associated with their construction, their life in use and at the end of their life. Sustainable buildings should have small ecological footprints.

Second, buildings should make a positive and appropriate contribution to the social environment they inhabit, by addressing people’s practical needs while enhancing their surrounding environment and their psychological and physical well-being.

Sustainable design in a broad perspective consists of buildings designed, built, renovated, operated, or reused in an energy efficient and economic manner. Sustainable building can also be viewed as “the combination of building design and construction that examines all aspects of the building process that will effect and be affected by the environment”. (Poveda, 2011)

From the above definitions it is obvious to see that the aim and purpose of sustainable design in architecture is to construct adaptive and better functioning buildings that acts in response to the resources consumed and emission/pollution produced, during a building’s lifecycle with a view to reducing its impact on the natural environment.
According to the International Environmental Commission Statement, major goals of sustainable development may be summarized as follows:

**Principles of Sustainable Designing:** The principles include:
- Harmony with the climate.
- Sustainable materials.
- The proper position of building for taking maximum advantage of recyclable energies. Sustainable capacity and shape of the building.
- Local construction techniques.
- Economizing the use of resources.
- Noticeable presence of the nature.

This framework highlights three features environment, economy and society which are central to understanding the nature of sustainability and having hazard-resilient communities.

### 2.2. Traditional architecture and sustainability concept

Oliver defines traditional architecture in his authoritative edited Encyclopedia of Vernacular Architecture of the World (Oliver.P., 1997) as comprising of “... dwellings and other buildings of
the people. Related to their environmental contexts and available resources, they are customarily
owner- or community-built, utilizing traditional technologies. All forms of traditional
architecture are built to meet specific needs, accommodating the values, economies and ways of
living of the cultures that produce them”. Traditional architecture is the “architecture of the
people, and by the people, but not for the people” (Oliver.P., 1997)
Similarly, Bernard Rudofsky, throughout his exhibition of “Architecture without Architects," shown at the Museum of Modern Art in 1964, broke down the narrow concepts of the art of
building and introduced the unusual word of "non-pedigreed architecture." In regard to
"vernacular /traditional, anonymous, spontaneous, indigenous, or rural architecture," he stated:
traditional architecture does not go through fashion cycles. It is nearly immutable, indeed un
improvable, since it serves its purpose to perfection. As a rule, the origin of indigenous building
forms and construction methods is lost in the distant past.
According to (Rudofsky.B, 1965), a building was designed by an amateur, without any training in
design; the individuals were guided by a series of conventions build up their built environment in
their locality.
However, the objective of traditional architecture is based on local needs, local building
materials, and reflecting the local traditions. This type of architecture is normally not built by
formally trained architect but more rely on design skills and tradition of local builders. Most of
the elements used in traditional are outcome of function needs. On the other hand traditional
architecture involves special type of building typologies such as temples, palaces or house for
rich people. The elements used in traditional architecture are most of times functional but few
elements also to be added for the sake of aesthetic reason, continuing the some tradition without
knowing its functionality (Rudofsky.B, 1965).
Traditional architecture evolved throughout centuries for different countries in the world. This is
the reason that element used in these type of architecture are based on functional need most of
times, taking care of climate, building material, social and cultural need of people as well
economics. The technology involved in this type of architecture is very appropriate to the local
needs which must not be ignored in order to produce a sustainable architecture

From the modern context perspective, the objectives of sustainable design in modern context are
similar to traditional architecture except the sustainable design in modern context are more
sophisticate and more measurable. But due to similarity in its objective the study of traditional architecture might help achieving the sustainability.

2.3. Cultural aspect and traditions in traditional architecture
Culture can be defined in a number of ways, some of which include:
According to (Merrill, 1965), the patterned behavior resulting from social interaction. Uganda has 65 indigenous communities (UNCP, 2006) representing Uganda’s diverse cultural heritage. The diversity contributes to a wealth of indigenous knowledge, languages, customs and traditions and products that can be harnessed for development.
According to (UNCP, 2006) culture concerns itself with socially transmitted behavior patterns, arts, beliefs, institutions and all other products of human work and thought. Culture includes intangible and tangible heritage, which is varied, complex, and in constant evolution. The tangible heritage includes architecture, art and crafts, sites, manuscripts, books and other objects of artistic and historical interest. The intangible heritage includes language, oral traditions, performing arts, music, festive events, rituals, social practices, traditional craftsmanship, knowledge and practices concerning nature.
Ugandans have different beliefs and traditions that are deeply rooted in their cultural and religious values which are reflected in their traditional architecture. The beliefs, traditions and values have contributed to the propagation of social harmony and development in the built environment.
Tradition is fundamentally the retention of the developed culture over time. Tradition further conserves the traits for generations. Culture involves evolving ideas and exhibiting them while as traditions is about retaining and transforming those ideas to the new generations. This puts forth the difference and relationships between culture and tradition. (Aliyu, 2015)
Focusing on culture as one of the factors which determines each individual community, (Rapoport.A., 1969) discusses the relationship between culture, the built environment, and design by showing that the purpose of design is to create environments that suit users and is thus user-oriented. He argues that design must also be based on knowledge of how people and environments interact. Therefore, design needs to respond to culture. Amos Rapoport comes to the conclusion that there needs to be a “change from designing for one’s own culture to designing for users’ cultures” (Rapoport.A., 2005).

14
From (Rapoport A., 1969) and (Rapoport.A., 2005), we see Culture plays a very vital role in the housing in our built environment.

2.3.1 Housing as a strategy for sustainability
The Webster dictionary defines housing as dwellings provided for people, something that covers or protects, the space taken out of a structural member to admit the insertion of part of another. The house is an institution not just a structure, created for a complex set of purposes. Building a house requires understanding the cultural values, customs and beliefs. It is from this that we see culture guiding house forms and organization of spaces and spatial layout of spaces (Rapoport A., 1969).

Amos further discuses that in housing, culture forms an essential part of most traditional or primitive society. This leads to symbolic nature of buildings. The symbolic nature in buildings can be seen in Uganda for different indigenous communities in paintings, techniques of constructions from micro to macro level of settlement pattern of different communities. That is to say from village spatial layouts to urban centers.

At the scale of homestead, village, district and cities, the layout is based on cultural setting. It’s from this ideology that we see symbolic views affecting not only the form of cities but their founding (Rapoport.A., 1969).

Just like in houses, space organization for different communities is designed basing on hierarchy and functions.

Because man always lives in houses, attached to them are cultural meanings of spaces and Underlying the basic spatial layouts are signs and symbols with associated meanings for different communities (Abonyo.D.A, 2005)

Around the world today, every country is striving hard to have healthy and satisfactory housing through different approaches to meet the growing need for sustainable housing, which are appropriate for the inhabitants. Housing strategies have been developed through different governing bodies to improve the living conditions of the building occupants in the built environment.

In Uganda attempts have been made “to provide a framework that provides adequate housing for all” (UNHP, 2016). The attempt looks at providing the following:

- To increase the production of adequate housing for all income groups, from the current 60,000 to 200,000 housing units per annum to meet the housing need by 2022
To improve the quality of the existing housing stock
- To promote efficient utilization of energy and other resources in housing
- To increase access to affordable housing

With architectural design assuming the main purpose of creating a sustainable living environment, the concept of affordable housing can be the solution if the lifestyles, culture, and user experiences are addressed well architecturally by not denying our old traditional ways of construction.

2.3.2 Affordable sustainable housing

The affordable housing concept is a Western concept which has been adopted by most countries which defines who is eligible to get for such type of housing. The main aim is to provide low cost houses for low income people. The affordable housing concept has been adopted in Uganda region but twisted to suite the local building laws. It does not seem to reflect the real needs of users of such type of housing. A number of theories emerged of how to build a knowledge that is used in housing design to provide tailored design solution to people needs. Within this frame of having affordable sustainable housing, researchers such as (Pierre.B., 1984) stated the importance of getting information about the social status, cultural aspects of a certain area and lifestyles.

Bourdieu points out that lifestyle and cultural aspects have not been considered in the present housing design-that are adhered with the life in the present setting of our houses such as: the visual and sound privacy, the need for outdoor space for children activities or entertainment and the need for flexibility in design. The absence of these aspects has enforced the owners to carry out a number of changes on their properties and adapt it to suite their local lifestyle.

This can be seen in Ugandan context where houses have greatly suffered great modification especially in the private housing sector.

From my point of view affordable sustainable housing as the housing policies and guidelines for housing types do not consider people lifestyle. Unnecessary alterations could be avoided in the affordable housing if well-defined guidelines on housing design were set and applied in the early stages of design by taking into considerations of traditions, culture, climate and other aspects that may affect the user.

On the other hand, the application of local traditions and culture in housing define the user’s rights in terms of how to build, alter or extend his or her property. These local norms and
traditions provide a flexible framework to the user of how to change his or her property without harming neighbors and violating their rights (Akbar.J., 1988).

Similarly, (Hillier.B., Hanson.J., 1984) pointed out that spaces have qualities and characteristics that would affect people interaction and use of these spaces. He suggested two social dimensions of buildings and “buildings operate socially in two ways: they constitute the social organization of everyday life as the spatial configurations of space in which we live and move, and represent social organization as physical configurations of forms and elements that we see. Space creates and controls the interfaces between different categories of people and their interaction with objects” (Hillier.B., Hanson.J., 1984).

Therefore, if spaces are designed wrongly, then natural patterns of social and cultural meanings of space are not achieved. The above studies suggest that lifestyle which is seen in today’s modern architecture inspired by local traditions. Therefore designers such as architects should take into considerations the user needs in order to produce architecture that fits within the locality. The abandonment of the culture, traditions and lifestyle aspects by the architect/designer would produce poor, unpleasant, inflexible and uncomfortable architectural product. Such disregard would have a number of harmful consequences on building owner and users as explained above.

2.3.3 Influence of culture on space organizations

Space organization is an important subject in the theory of architecture, which can explain a way of living or living habits and culture of a given society. Dating back in the old traditional societies, people organized their spaces according to what they believed in their customs and believes. Each space had meanings and therefore they placed items, elements of traditions, sizing and placements. This study is relatively important in the modern society as people are tending to much more sophisticated built environment. There is need to visit our past societal setting of spaces and incorporate such ideologies in order to achieve better spaces which does not conflict with the user experiences.

Different organization of spaces in a building can be classified according to the space organizations which are related to several issues like function, accessibility, dimension, hierarchy, and view or natural light source. According to (Ching, 1979) space organization can be classified as: linear, centralized, radial, grid and clustered organizations.
However, we can see the aspect of culture creating an impact on determining which kind of organization each society addressed in the old traditional society. The houses were laid out according to religious sanction rules for specific communities (Rapoport.A., 1969).

Abonyo (2005) carried out a study on the Luo of Kisumu, Kenya to determine the cultural aspect in traditional Luo houses. She describes how the home was spatially laid out in a specific way to serve both functional and cultural requirements. The homestead accommodated huts belonging to the larger family which consists of the man who is the head of the home, his wife (wives), and sons (unmarried and married). The homestead accommodates huts for two generations and thus grandsons do not build their huts in this compound. When they grow up, it signifies time for their fathers to establish new homes and thus the process continues. Other important elements within the homestead include the cattle kraal, granaries and the courtyard (Abonyo.D.A, 2005)

Abonyo’s study on the traditional Luo housing, gives a satisfying results where she concludes by saying that traditional buildings have greater quality in terms of form, spaces and esthetics in their relationships.

From Abonyo’s study, we see how different societies respected social status, hierarchy of spaces, meaning of spaces and spatial organization of the entire home.

Similarly (Rapoport.A., 1969)in his book (*House, Form and Culture*) describes hierarchy in building form with aspects of taboo, religion and political organization of a given society or community. This study is important in my case study as it shows a similar approaches which are used in different communities in Uganda.

He further argues that inside the houses attached are symbolic attitude which accounts for prevalence of symbolic space distributions in the house.

Reflecting to our present day “MORDERN” the houses rarely depict the cultural setting and minimal spaces are symbolic where most homes have been gated in urban centers. The decision as to whom, what use, where to build, what to build with, are questions that must be addressed well when designing houses for different cultural settings. This however takes the researcher to another variable of technology, construction, and material selections which may affect the way we build to achieve sustainability.

2.4. Features of traditional Architecture

As discussed earlier in section 2.3.1, housing could be considered as a physical space that reinforces the consciousness of being human or the user. Housing does not only apply to spatial
items that meet the physical needs of individuals, but also responds to their social, cultural and emotional needs in creation of the idea environment which is expressed through specific organization of spaces. (Rapoport A., 1969)

From Amos Rapaport’s ideology of creation of a resilient and an idea environment, it can be argued that people may have to undertake all the processes of design, construction, use and demolition of the structures they need for sheltering due to the conditions of the natural environment in which they live.

However, in Langi traditional architecture, users design and build at the same time. Moreover, they adapt improvable and continuous design processes to their lives in their own built environments that they develop according to their needs. Needs that arise or disappear are reflected directly and quickly by the users in the design of the buildings. Needs in the perspective of traditional architecture do not precede aesthetic concerns. The Langi have environmental concerns that would allow them to continue their lives before aesthetic sensitivities when constructing their buildings. Traditional constructions of their houses are simple, easy to understand and can easily integrate with nature. Building forms could be shaped by different parameters such as local materials, social and economic facts of the community, natural environment, or the reflection of events in social memory.

According to Rudofsky (1965), some concepts that gain popularity in architectural perspectives such as sustainability, prefabrication, standardization of building components, flexible and moving building parts, floor heating, ventilation and control of daylight seem to have taken place in past examples of traditional architecture. For instance, while natural daylight controlling has been an ordinary parameter for years for the users of vernacular architecture, it takes place as design criteria in sustainable architecture today.

2.5. Construction form, Technology and material selections in Traditional Architecture

To create any type of house or space must be enclosed. The availability and choice of materials and construction techniques in architectural situation will greatly influence the form of the building (Rapoport A., 1969).

Amos further argues that the house should respond to the physical stresses of climate-heat, cold, humidity, radiation and light. He also stresses that the house must be structurally.
In the primitive or traditional society builders used materials which were most conveniently available and these materials determined the form of the building. From this juncture, we see choice of materials determining how the form of the building would be.

However cultural values were attached to selection of materials for construction. According to (Rapoport A., 1969) material selection was by religious proscriptions. He also argues that certain materials were prohibited for constructions certain housing typologies because of believes attached to them.

Amos further also discusses in his book (house, form and culture) that housing typologies constituted of structural systems which depended on traditions the materials chosen.

In the Ugandan context, construction methods and materials are costly and limited access to good quality materials whether imported or produced locally. Moreover, due to the weak transportation infrastructure and limited access to urban factories, particularly in rural areas, material supply cannot cope with the high housing demand. Using locally available materials seems to be an appropriate solution which has already been considered in many parts of Uganda. Bricks, mud and poles are the most common walling materials/methods in Uganda. Brick walling is the most common system in both urban and rural areas; however, mud and poles walls are much more common in rural than in urban areas.

![Construction Materials (2009/10)](image)

**Figure 3**: Main types of construction materials in 2009/2010 (%). *(UBOS, 2010)*

Achieving sustainability of building design and construction in developing countries such as Uganda requires confronting the conventional conception of progress and modernity.
(Rudofsky.B, 1965) Book “Architecture without Architects” challenged the prevailing views of the day and remains highly relevant today. Rudofsky opposed the ideas of Le Corbusier and other architects that Western technology was the solution to problems around the world. He believed that developing countries are not backward – they have their own technologies and know-how. Together with a host of emerging architects around the world, traditional building methods and materials can be combined with modern innovations to produce sustainable designs.

2.5.1. Traditional materials used in Traditional Architecture
The materials used in construction of the houses in the traditional African communities were environmentally sound. Based on their thermal properties, they kept the houses’ interior cool during the hot seasons and warm during the nights and cold seasons.

According to (Rapoport.A., 1969), he discusses how the house form is affected by climate of a given community. He argues that the house is a container, whose main purpose is to shelter and protect its occupants and contents from animals, human enemies and those of natural forces known as weather.

From this juncture, we see how man built wisely than we do today in our modern style. Therefore principals of design were very environmentally friendly which we must not ignore at great cost.

Availability of these materials were not an issues, materials were readily available within the local setting. However some communities who did not have such material would actually grow materials to suit their needs especially for building.

From his arguments, proper designs need proper materials which should not cause effects on the users. In Uganda’s case materials of constructions have been deeply depleted and alternatives have been seen in importation of the western materials which sometimes does not suit the user needs and experiences.

To be specific to the research study, selective materials will be discussed which is related to study area. These materials include; stone, thatch/straw, timber and adobe/mud.

Stone Architecture
The basic form of the use of stones/rocks for dwellings begun with the habitation of the naturally occurring caves about which walls and roofs in mud or thatch, brick and straw were erected converting them to livable places. As an ethical standard, when natural rock caves, rocks or
boulders were converted to dwellings, little modifications were made to the rock itself but other constructions finished up the enclosure that existed. Besides, the surrounding environment were developed using similar thoughts to stone which were methodically placed and arranged to fashion out the finery of the natural landscape. The existence to of such favorable conditions within the physical environment obviously, enhanced its exploitation. As a result of its natural endowment, stones/rocks were exploited in its natural and man- made formation to define spirituality, reverence and seclusion. The stone were ferried by communal community participations.

The crafts men of Rock buildings in most tradition societies were highly skilled in the art of stone construction with distinctive understanding on the types of rocks, their material constituent, refining; involving extraction from earth, cutting and reshaping them to fit together into architecturally stable forms.

**Straw/Thatch Architecture**

Various natives of traditional communities took to straw/thatch as a construction material in a comparable way choosing to great extent the appropriate materials for the most suitable use. In contrast to stone which is not easily renewed, straw/thatch is a byproduct of grown plants hence, a cultivated material. Even though, large quantities of this material could be sourced from the immediate surrounding and the wild, the villagers cultivated much of the straw as cereals in their farms which in turn provided them a building material. Style was another issue which was used to define certain communities, clans, tribes and so on.

**Adobe/Mud Architecture**

Although stone architecture of historic periods have left remains for display, very little of adobe/mud brick architecture have lasted especially in traditional districts in Uganda.
Nevertheless, the enduring cultural practice of the rural people indicates that adobe surely has been one of the most common and abundantly obtainable materials that influenced and sustained the rural villages as a part of the environment which connected it to the cyclic and delicate eco-system.

Mud and wattle are the most commonly used to create such a kind of architecture in the most rural setting in Uganda as seen from Figure 3 in Uganda’s context. The typical traditional houses in the study area of this research are mud and wattle technology.

A similar study can be seen from (Osasona, 2012) and (Dmochowski, 1988) works, how they describe the traditional Nigerian mud and wattle construction which is similar to the researcher’s study case.

According to (Osasona, 2012) and (Dmochowski, 1988), mud and wattle technology is a method in which use of solid wooden post frame is first made then filled with adobe balls to create a wall. Most often, the African builders construct the walls of their building layer by layer using the mud bricks and a slurry mixture of earth as the mortar. Once the wall dries up and binds into a monolithic structure, a dense mud plastic plaster strengthen with various additives depending on the people’s culture (cow dung, goat dung, beaten straw, animal hair, animal skin fat) was spread on by hands to smoothen the facade. This method had been used in building even the granary storage houses (Dmochowski, 1988). The materials were gotten from the environment, and the work force having been made available by the community, certainly made it a highly sustainable practice, that utilized small amount of energy and did not generate any greenhouse gas or harmful waste (Dmochowski, 1988).

**Timber as building materials.**

Timber as a building material has a wider usage also in traditional architecture. The best timber used in traditional buildings are obtained from the trunks palm trees before introduction of machines for splitting timber from trees such as ‘muvule’. Traditional people usually harvested their timber from the locally available tree trunks mostly male palm trees (tugu) and use them in construction as beams and columns. Methods of curing timber were adequate whereby they were left so that it cans breath and various preservatives such as soot from cooking spaces. Due to the availability of modern construction materials such as steel rods and other steel sections with
concrete, the use of ‘tugu’ as building material has vanished completely; invariably affecting the traditional sustainable practices.

Most importantly, materials need to treat with great thoughts in this era of modern society where technology is advancing every day. Amos Rapoport stresses that new materials are being used thoughtlessly, without due attentions. He further argues that traditional builders respected qualities and characteristics of materials which are worthy study in order to create a sustainable building.(Rapoport A. , 1969)

Therefore material selections in the traditional architectural housing were not only in terms of adequacy for structure but also to respect the climatic conditions of the area. From this we see another variable of climate affecting how materials for constructions were selected basing on the climatic conditions.

2.6. Climatic aspect in Traditional architecture

The issue of thermal comfort issues in the traditional architecture seems to be out dated but worth of study for this research. Traditional houses were thoughtfully placed on site to respect the sun movement. Organization of the house forms also played a big role in solving the climatic conditions of the areas (Rapoport A. , 1969).

Similar study can be seen from Tuan Anh Tuan Nguyen’s analysis of sustainable housing in Vietnam. He emphasizes that thermal standards applied to the built environment are very important for architects ensure comfort, health and work productivity of occupants in a building. A good estimation of the environment not only offers comfortable thermal sensation to occupants, but it also determines the amount of energy that will be consumed by cooling and heating systems of the building (Tuan, 2013)

Different Langi traditional societies applied techniques to curb the climatic effects. As discussed earlier; material selections played a big deal in the thermal control of the interior spaces of houses. The techniques that ensured thermal comfort in the traditional houses included;

- Site issues
- Material selections and construction methods.
- Natural lighting
- Nature and courtyards
- Natural ventilation
2.7. Sustainability features of Traditional Architecture

Traditional architectural forms and designs are representative of both cultural preferences and their distinctive relationship with the natural environment. This unique relationship is illustrated through various aspects of traditional design, such as the use of natural light, their representation of nature around the homesteads, natural ventilation, flexibility of space, and material selection as discussed earlier.

2.7.1 Site issues

Sustainable architectural design implies more than merely a tool of the built environment; it is about creating a connection to nature that brings about a proactive, integrated, and mutually beneficial relationship to the environment. Sustainable architectural design seeks to exist within a natural environment, and not as a separate entity.

Buildings are not merely placed on a site with no conscious regard to the specifics of the area; the architecture must connect to the nature and atmosphere of its home (Vallero.D.A., Brasier.C., 2008).

This implies that a building does not reject naturally occurring features of the site that may affect it; instead these structures must connect to nature and exist with the environment.

Similarly it was wrong to minimize the importance of the site for traditional builders. (Rapoport A., 1969) States in his book (house, form and culture) that the site had mystical attachment and the site was treated as the houses were place on site (Rapoport A., 1969)

From Rapoport’s study, we see how traditional natives attached meanings to site basing on their believes and house forms were determined by the nature of the site. The way we chose our site matters a lot in terms of sustainability of the house. Site selections may be due to supernatural aspects which are attached to land on which the site sits (Rapoport A., 1969)

For this reason, the characteristics of a site are essential to analyzing the sustainability of a building. People have always recognized the importance of location, but only recently has this essential trait been acknowledged as a vital component to sustainability of the buildings.

The importance of siting houses to take advantage of the sun, prevailing breezes and natural drainage was obvious to experienced buildings all over the world until mechanized heating, cooling, and infrastructure systems began to offer what seemed to be a free ride (Brown.A., 2009).
People in the past, in lacking the technology in mind, were forced to learn how to take advantage of their environments in a way that we are attempting to remember now. Although we are defining “sustainability” in a modern sense, it is important to note that present techniques are not necessarily new as much as rediscovered.

2.7.2 Material selections and construction methods
The site is not the only important feature that requires careful selection; a building will not achieve sustainability if the proper materials are not chosen and the purpose of renewability is not applied to the design. For instance, a building designed such that it serves multiple uses will have far greater value to a community than one that simply houses offices. This concept of allowing a site to support multiple uses is key to sustainability. A multi-use complex (such as a building with housing and retail) allows for more community interaction and benefit, but also has a tendency to allow for future adaptability.

Traditionally, flexibility in design was vital especially in space utilization and in construction materials. Spaces would be used for various activities at different times of the day. Building materials would also be reused for generations after a demolition that is, building materials were shifted from one site to another without alterations.

As societies stand today, building construction and deconstruction is a major source of waste, as well as environmental destruction.

Brown observes:
“Building construction consumes approximately 40 percent of all the raw materials produced globally. Not only does the production and transportation of these materials consume vast quantities of water and energy, but we have given little thought to what happens to the materials after buildings are demolished.”

Construction and deconstruction of a building both have harmful, destructive, and waste producing traits that are increased when toxic and unsustainable materials are used. In addition, they can lead to environmental degradation and destruction both by the waste they produce and the site on which they are built if thought is not given to how the building can work with the environment.(Brown.A., 2009).

Many contemporary societies such as in Uganda are struggling to accept the concept of reuse and recycling in terms of basic goods, making it difficult to apply the strategy of reuse when it comes
to something as large as a building. People are not always reliable when it comes to sustainable practices following the creation of a building or material.

2.7. 3. Natural lighting
Natural light is essential to the mental health of people as it often creates a feeling of peace within an architectural space, if presented correctly.

According to the architect Louis Kahn: “The lighting of the room must stem from its very structure”, which essentially implies that in the design process itself, an architect must understand how light will play inside a space. How light is presented in a room, or the availability of light, is essential to the comfort a space allows its users.

In terms of sustainable design, sunlight plays an important role in not only in the disposition of those utilizing the building, but also in energy efficiency and the structure’s internal climate control system. Amos Rapoport, (1969) presents in his book (house, form and culture) those traditional houses were oriented such that spaces would receive maximum lighting especially in sacred spaces within the rooms (Rapoport.A., 1969).

Natural light positively changes the behavior of a room and its users, and its availability within a space often causes people to be drawn there. The sun is thus an essential feature to the feeling created by a room, and the subsequent comfort it provides.

However, providing the appropriate amount of light in the changing seasons as well as differing times of the day is something that requires specific design techniques, especially in traditional design where technological climate control systems were not available. In traditional architecture different societies derived means to overcome the problems in various ways by providing the ability to filter out the sun when necessary, and allowing people within a room to sit anywhere depending on the amount of light.

Uganda’s architects utilized numerous passive methods of modulating the amount of sun and heat that could enter a room and, subsequently, controlled the comfort of a space.

The flexibility of the space in traditional designs allowed the users to choose; a room that could be lit from two sides, one, or not at all. This preference for the amount of light entering a room was most often a result of the current season, as in the absence of technologically controlled climate systems the availability of solar radiation was the main method of climate control and interior light.
2.7.4 Nature and courtyards
In traditional Langi architecture, builders often found ways to connect a building to nature either in a keen way, such as with natural ventilation and material selection, or more visually with certain architectural features such as courtyard designs.

The concept of nature and courtyards are also relevant in spatial layout of a homestead (Anyamba T.J.C, Adebayo A.A, 1993). The authors describes that hedges were used to connect the homestead to the outer environment as well as providing defense.

From their study, houses were built in such a manner that courtyards were created for activities such as communal gatherings, dryings of food crops, storytelling and so on. It can be seen that in the traditional setting of homesteads courtyards defined the built form of each individual form of housing.

2.7.5 Natural Ventilation
Traditional builders in the Langi traditional society design their buildings such as to take advantage of the natural flow of energy. In other words, buildings were designed such that air was allowed to flow through them naturally to help control the climate within.

Techniques such as raising the house above the ground and putting opening allowed easy flow of wind through the building. The styles, shapes and sizes of these openings varied from traditions of people (Rapoport.A., 1969).
CHAPTER THREE

RESEARCH METHODOLOGY

3.0. Introduction
This chapter presents the research design, research instruments, study population, research procedure and methods of data analysis that will be used in this study to acquire knowledge about the research problem.

3.1. Research methodology
Research methodology refers to an unchangeable system of clear rules and actions upon which research is based and against which claims for knowledge are assessed. These rules are procedures are continuously improved by scientist, as they search for new ways of data collection, observation, analysis, logical inference and generalization. When these new processes are developed and found to be compatible with the core assumptions of the scientific approach they are integrated into the system of rules that govern scientific methodology (Nachmias.D & Nachmias.F, 1996:13).

Research methodology helps researchers to see or it facilitates communications between the researchers who either have shared or want to share a familiar experience. Scientific methodology necessities proficiency in rational ways of thinking and analysis. Rational reasoning by itself does not ensure empirical objectivity therefore intersubjectivity, which means sharing observations and factual information among scientists is indispensable. The importance of intersubjectivity is dependent on the capability of the scientist to comprehend and weigh up the methods of the others and to carry out alike observations so as to corroborate empirical facts and conclusions (Nachmias.D & Nachmias.F, 1996:13, pp. 14-16)

3.1. Research Design
The researcher intends to use phenomenological design to explore whether Sustainable traditional design techniques in Langi traditional architecture could be incorporated into the modern style of architecture. Phenomenological design enables the researcher to give in-depth description of the phenomenon as experienced by the subjects (Fade, 2004)

According to (Amin, 2005), the phenomenological researcher seeks to derive and describe findings that give insights and understandings of the phenomenon through intensive collection of
narrative data. This research design framework has been chosen because researcher intends to cultivate in-depth understanding of the phenomenon.

**Figure 6:** A diagram showing research framework. (Author: 2017)
3.2. Population and Sampling technique
The parent population for the study will be homestead heads, native elderly people (50-90 years) in three villages (Akaidebe, Alokiri and Abenyo) within Angwecibange parish and their respective Local Council ones in Southern ward of Dokolo District.

3.2.1 Target/Accessible Population.
Traditional houses will be representative of the following: traditional houses and improved traditional houses. The houses will be selected within the geographical areas where the study will be conducted. Selection will ensure that traditional houses of different forms are studied.

3.2.2 Sampling
Amin (2005) states that, “Sampling is a process of selecting elements from a population in such a way that the sample elements selected represent the population”. The study will therefore employ purposive sampling, snowball sampling and stratified random sampling techniques. 20 subjects including: six villages, six housing typology and six elderly persons (50-90 years) will be selected for the study. Selection will also cater for ability to generate the necessary information and willingness to participate.

3.2.3 Sampling Techniques
Purposive sampling techniques will be employed to identify homesteads with traditional housing so that their head of homesteads will help identify others. Purposive sampling has primary consideration of the researcher’s judgment regarding who can provide the best information to achieve the objectives of the study. This is supported by (Kumar, 2011:207), when he states that, “You as a researcher only go to those people who in your opinion are likely to have the required information and be willing to share it with you, this sampling is more common in qualitative research.”

After identifying homesteads with traditional housing, snowball sampling will be employed to identify more homesteads that are known to the head of homesteads of those purposively selected homes.

3.3. Data collection Instruments
Data collection instruments can be applied to mean the methods that will be used to gather necessary information for the study, from the subjects. These methods are also referred to as research instruments.
3.3.1 Research Instruments
The researcher will triangulate the research instruments (use of primary and secondary data collection instruments to realize necessary emic and etic data up to saturation. The primary data collection instruments will include; in-depth interviews, observation, group discussion, photographic analysis, sketching, video and audio recording plus documentary review.

3.3.1.1 In-depth interviews
Kumar (2011) argues that, *An interview is a verbal interchange, often face to face, though telephone may be used, in which an interviewer tries to elicit information, beliefs or opinion from another person. Any person to person interaction either face to face or otherwise, between two or more individuals with a specific purpose in mind is called an interview.*

The researcher will use interviews by asking the subjects questions which the latter will answer. Interview guides for the different subjects will be prepared to aid the interviews. “An interview guide is written list of questions open or closed ended prepared for use by an interviewer in a person to person interaction.” (Kumar, 2011).

These interviews will address the issues of undocumented information that has been passed on orally from generation to generations. The information will be architectural based in relation to the cultural norms. These will also make it possible to obtain the different participants’ experiences in the actual transition from traditional housing to improved traditional housings.

With this techniques, more cultural norms were identified as much of these are not documented. One hardly finds a book written on just a particular tribe, proving to be more convenient a method. The interviews also gave a picture of how people see cultural influence on architecture.
The researcher will also employ unguided interview method to obtain insights into hidden motivations, personal hopes, fear and conflicts. Unguided interviews permit the subjects to talk freely while the researcher acts as a good listener waiting to approve and ask probing questions (Amin, 2005).

3.3.1.2 Observation
According to (Amin, 2005), this method employs vision as the method of data collection in which the researcher examines what is happening in the environment, classifies and records pertinent issues according to a predesigned scheme. The researcher obtained first-hand information in the research environment like photographs and other sources of useful information.

3.3.1.3 Focus Group Discussion
Focus Group Discussions (FDGs) refers to a number of people chosen basing on their interest, expertise or position to participate in a brainstorming session where the researcher gets the different perspectives of the subjects. FDGs involved; local council ones and elderly homestead heads (50-90 years of age) from three selected different villages (Alokiri, Abenyo and Akaidebe) to brainstorm on the researcher’s questions from their experiences.

3.3.1.4 Photographic analysis
Schulze (2007) argues that,

When the participants comment on the photographs taken by the researcher, the identification and reading of photographs are used as the ‘can-opener’ or ‘golden key’ to human settings while the participants are put in the role of experts who teach the researchers.

Figure 7: Showing researcher interviewing during the field survey
Therefore the researcher selected some photographs of traditional houses, construction techniques and informants in well selected and related activities to the study. Photographs provided visual evidence to the research, especially for qualitative research, for both the informants and the researcher. Some information which may not easily be explained in words can easily be explained by pictures.

In the field, the presence or knowledge of a photographer’s presence may bias the responses given by the informants, therefore resulting into inaccurate data. This is because the participants may become self-conscious or intimidated by the action.

3.3.1.5 Audio Recordings
The researcher made audio recordings of some interviews and transcribed them later. Smith and Osborn (2007) argue that audio recording for purposes of data collection is significant because it enables the researcher to capture all expressive details of the subjects, help the interview smoothly and establishment of report. This saved interviewing time and made the flow of the subjects’ thoughts more natural as there were pauses like the case would be when the researcher only takes field notes. The resulting recorded materials were transcribed later to become research data.

3.3.1.6 Sketching
Sketching was used where a camera could not work, for example, if a participant offered an explanation which would best be described or put forward by a drawing, a sketch was utilized. Other sketches were also used as a supplement to observation, where an illustration is needed.

Sketching can be a means of quick illustration of an observation and it can also be used to describe what is not necessarily tangible in reality.

3.3.2 Research procedure
The researcher obtained a letter of introduction from the head of department seeking permission to visit the area of research study. The researcher presented the letter of introduction to the relevant authorities to make appointments for interviews. The researcher also obtained a letter of introduction from the Local Council one seeking permission to visit the area of research study. Video and audio recording equipment was used with permission of the subjects to record the proceedings of the interviews for transcription and analysis later. Each subject was
interviewed until the researcher’s saturation point. The process of data gathering and analysis was iterative as is often the case with phenomenological research.

3.4.0 Validity of research instrument.
According to (Amin, 2005),
Validity is the ability to produce findings that are in agreement with theoretical or conceptual values…to produce accurate results or measure what is supposed to be measured…a research instrument is valid when it measures what it is supposed to measure.

To ensure validity of the instruments, the researcher discussed with the clan heads, local council ones and interview guide with the supervisor.

3.4.1 Reliability of research instrument.
Reliability refers to the extent to which an instrument is capable of yielding the same results each time it is administered to the same subject. The researcher had prolonged engagements with the subjects in order to gain adequate understanding of the environment in which they operate and to establish relationships of trust as proposed by (Shenton, 2007)

3.5 Ethical Consideration
A research design that involves an interview inquiry is a moral enterprise. The interaction to take place between the researcher and the informants and knowledge gained affect the informants in different ways. It also affects our understandings as humans (Kvale, 1996:109)

The ethical guidelines to be considered in this research are informed consent, confidentiality and consequences. These came at different times throughout the research process.

Informed Consent:
There was need to obtain the consent of the participants in the study. The need to be aware of investigation, the main features included, as well as the risks and benefits from the participation (Kvale, 1996:111-113)

Confidentiality:
Confidentiality in research implies that private data identifying the subjects will not be reported (Kvale, 1996:114). The subjects had to agree to the release of particular information they provide, especially if the works are to be published. This was exercised in designing interviews and reporting.
**Consequences:**

The ethical principal of beneficence means that the risks of harm to a subject should be the lease possible. The sum of potential benefits to a subject and the importance of knowledge gained should outweigh the risks of harm to the subject (Kvale, 1996:15). The researcher examined the possible consequences of the research, both harmful and beneficial to the informants and the larger group they represent. This was addressed by careful regard to the questions asked, and how far the interviewer went with the questioning in case of interviews and photography.
CHAPTER FOUR

REVIEW ON HISTORY OF THE LANGI TRADITIONAL ARCHITECTURE
AND FINDINGS ON THE STUDY AREA

4.0 Introduction
This chapter presents the review of Langi traditional architecture and findings on the study area. These findings were used to obtain answers to the research questions for the fulfillment of the study objectives. Theories obtained from literature review on this topic as well as data earlier retrieved on the subject of study were put to test and qualified.

4.1 Historical and geographical background
The Langi (Langi is the plural of Lango. Lango refers to an individual Langi. The term Lango also refers to the country of the Langi) are one of the ethnic groups in the present-day northern Uganda. They occupy the districts of Amolatar, Apac, Alebtong, Kole, Dokolo, Lira, and Oyam. It is believed that they belong to the ateker (ateker are a paranilotic people e.g. here are karamajong, toposa, iteso, turkana and Jie) group yet they speak Luo language. They share a lot of material cultures with the luo stalk in east Africa. The two districts are bounded by Lake Kyoga and river Nile to the south. The two water bodies constitute a natural frontier between the Langi and the neighbors, the Bantu speaking peoples of Busoga, Buganda and Bunyoro. (Okello, 2015)

The Langi originated from Abyssinia in Ethiopia. They are considered to be part of the Nilo-Hamites (also known as semi-Hamitic) group which includes the Teso, Kumam, Jie and Karamojong tribes. The Lango, in contrast of their fellows, adopted the simpler Nilotic tongue. It is believed that their move from further North into the present habitat took place between the years 1800-1890 approximately. Apart from times of wars, when some sort of cohesion was achieved under one or two war leaders, the Langi before the advent of British Administration in 1889, were divided into many small groups or clans each with its own leader, i.e. chieftainship. Dokolo sub-county, the study area is located within Dokolo district.
4.2 Settlement pattern and homestead

The settlement pattern of the Langi is nucleated and conglomerate type with the various compounds dotting the ridges. Each ridge is settled by one or several clans. Site leveling was in most cases necessary before construction of the houses and hilly sites were avoided because gods (*Joki*) are believed to reside there. The choice of the site of a homestead was done by the head of the homestead after consulting a fortune teller. The site was cleansed after which it was cleared and leveled. The bush maintained around the homestead screened it from the whole village and strangers giving the homestead a defensive character. Figure depict a typical Langi homestead lay-out which shows the centralized kind of organization.

The smallest homestead was composed of at least two houses, the man’s house and wife’s house. The social organization of the Langi is reflected in the physical lay-out of the homestead. The edge of the homestead extended outwards in due course as the number of sons and grandsons increased.
In central organization usually there is a center point or dominant part which is surrounded by a group of minor spaces. Indeed, there is no directional form in this type of organization. The entrance can be identified by making differences in one of the minor spaces as an entrance part. In this organization the circulation patterns can be circle, spiral or radial. The secondary spaces can get organized in two ways, symmetrically or asymmetrically around the central point. (Ching, 1979)

The courtyard in traditional Langi building can be defined as a central point and the other parts of the building which are grouped around it can be defined as secondary components.

Central organization according to (Meiss, 1990) is related to hierarchy of spaces and the most valuable space is dominated in the center and it is surrounded with the secondary spaces. In the same respect (Chen, 2011) mentions that a large space is dominated with smaller secondary spaces which are surrounding the central space which can be in regular form. The secondary spaces are in the same form and size to each other or in different forms to serve the functional needs. (Chen, 2011)
Likewise in a typical Langi homestead, it shows how space organization is expressed in the built form. The sons eventually established semi-autonomous (secondary) courtyards off the father’s main courtyards, and likewise, the grandsons established their courtyards off their father’s courtyards.

4.3 Langi Housing typology
As discussed earlier in section 4.2, there were basically two types of dwelling units, the man’s house (Ot ekyo) and the woman’s house (Ot adako). In addition to these two, there was granary (dero) for the storage of grain.

The distinctive character and location of the man’s house and those of his wives as well as the granaries were an integral part of the Langi traditional architectural concept. The interior displacement of functions is the architectural response to the social and cultural needs of the family. It is important to note that the gender of the family members played a major role in moulding the architecture of the Langi traditional homestead.

The third type of building in any Langi homestead was the granary as shown in figure 8 below. The significance of the granary (ies) was that it indicated the economic independence of each wife. This is because each wife was responsible for feeding her own children.

![Figure 10: sketch of granary lay-out](image)

![Figure 11: sketch of granary section](image)
4.3.1 Effect of Culture on formation of traditional Langi Houses
This influence of the culture can also be seen in people’s lifestyles and behaviors in Uganda. Religion forms the main part of people’s culture in this country. According to Rapoport (1995) “first, culture maintains the identity of groups within the single biological species that humans belong to. Second, culture acts as a control mechanism, carrying information that direct how behavior and artifact are to be created. Third, a major role of culture is to act as structure or framework that gives meaning to particular”. (Rapoport A., 1969). The dwelling unit of the family is the reflection of Langi cultural values in architectural design and includes the requirements of privacy, dignity, health and security, within the family means”.

4.3.2 Privacy in traditional Langi houses
The concept of privacy which is highly related to the culture can be explained as a control of connection of inhabitants of the house with outside and also the connection of the outside world with the people who are living in a house. (Rapoport A., 2005) Privacy is one of the main factors that affect housing architecture. Culture and religious issues in Langi architecture have concerned the user. Effect of culture on architecture made division in the house to create privacy. Traditional Langi houses are including two different types of privacy: privacy from outside the house and also in next level, privacy from common spaces in the house. The architectural typology of the Langi woman’s house (ot adako), depicts a clear definition of the master and servant spaces: the porch, ash heap corner, lobby and circulation spaces. The entrance porch to the house is the transition space between inside and outside; it also defines the beginning of the house. The privacy from semi-public entrance porch to very private bed space is strictly maintained. However, in the man’s house, the privacy is not as strict, since the linkage from the outside to the inside, because this is the domain of basically one person. The man’s and woman’s house is shown in figure 10 and 11. It is clear that the transition between outside and inside is less defined in man’s house than in woman’s house.
The bachelors (aged boys) resided in a house called *otogo* which is quite different from the father and mother’s housing forms.

According to Driberg (1923), *otogo* was occupied by a man after attaining the age of puberty till his wife bears him a child; but though he then builds his wife an *ot* (house), he often retains his *otogo* at any rate till it falls out of repair as his own private quarters where he sleeps alone. Men who were too old to beget any more children and whose wives are dead not frequently build themselves an *otogo*, but in their case not elevated more than afoot off the ground, as their age makes the climbing of steep staircase a matter of difficulty. (Driberg, 1923:87)

This shows how privacy was maintained among the different age groups using different housing forms. The method of construction remains the same.
4.4. Construction, technology and materials

Three types of houses evolved among the Langi due to the increasing population and the scarcity of certain building materials. The three types were exactly the same in lay-out, only the materials used for the walls differed.

**Brushwood house (Ot lango):** This was the earliest type and was built when brushwood was abundant.

*Figure 14: Bachelor langi house (otogo). (Driberg, 1923:86)*

*Figure 15: Showing first traditional Langi houses. (Driberg, 1923:87)*
**Plank-wall house.** With the increasing cultivation, the brushwood gave way to the plank-wall house.

**Mud-walled house:** This was the last type of house in the evolution and was built when there was scarcity of timber. The house forms took two types; first the circular form and later square form. Figure 15 shows atypical section through the Langi traditional house, while figure 10 shows the granary support systems as discussed in section 4.3.

*Figure 15: sketch of atypical section through the Langi traditional house*

The materials used in the construction of the house were environmentally sound. Based on their thermal properties, they kept the houses’ interiors cool during the hot seasons and warm during the nights and cold seasons. Because of the nature of the grass thatch, air and the smoke from the central fire place easily seep through. The smoke and air also found its way out through the gap between the wall and the roof (eaves).

To cope with these environmental conditions not only the buildings but also the overall layout of the homestead in the region is developed with special characteristics. The characteristics include:

- Buildings have individual courtyards
- There are circular roofs
- Ground floor is lower than natural ground level
- Buildings are oriented towards a central courtyard
- There are main central courtyards
- Construction materials are stone, adobe, Grass thatch and mud
All these characteristics together with other means of using passive energy to acclimating the buildings makes the traditional Langi architecture a sustainable one.

On this subject Rapoport (1969) states that: Traditional architecture can be considered as a sustainable way of architecture. It is easy for dealing with the environmental problems in long period of time. Climatic factors as well as local construction materials of hot-arid regions and natural cooling systems are the area which the sustainability is obvious. (Rapoport A., 1969)

The elements which deal with hot and dry climatic conditions in traditional architecture of Langi can be categorized:

- Walls
- Windows (Vents)
- Material
- Courtyard
- Roof
- Planting

These elements and the way they are developed to reduce the effects of the harsh environmental conditions in the residential spaces are explained below.

**Windows:**

External walls do not have many windows and there is enough open vents which run all over the upper building wall. Ventilation Passing is done by these windows (vents) as same as wind catcher which also helps to the internal ventilation.

**Material:**

The common used material for constructing wall in Lango region in Uganda are mud, mud brick, stone, brick, mortar, and wood.

However, the thermo-physical specifications of these materials are the important issues in hot and dry regions. ‘These materials have thermal resistance; high heat capacity and they absorb the sun radiation by their external surfaces.'
Courtyard:
The courtyard in Langi homestead is the heart of the house in two aspects of social issues and also environmental issues. The size of the court yard is in relation with the total size of the land which house is built in it. They are large enough to create a shaded space during the day in dry season, at the same time wide enough to get solar rays. A courtyard can be a secure, private, and a comfortable place in the house. Courtyards among the Langi traditional homes form a focal space of which all sets of day activities are staged. Within the courtyard specific trees are planted like the mango trees to provide fruits and some trees are prohibited because beliefs are attached to them.

The temperature variation in Langi land throughout the year is marginal. This makes a courtyard layout an ideal solution as it provides outdoor spaces for outdoor living.

4.5. Climatic aspect in Langi Traditional Architecture.
Before the advent of the industrial age, and the invention of mechanical heating and cooling, bio climatic means were exclusively used to achieve moderately comfortable climates inside buildings. Today, active heating and cooling devices ensure interior comfort, but require major energy inputs. However, given the dual challenge of a growing fuel crisis and concerns of global warming, the amount of energy used to provide thermal comfort levels will become unsustainable. Sustainable, ecological, and climate-adaptable architecture offers possible solutions to these challenges. Many architectural publications advocate that traditional and vernacular homes form the basis of environmentally conscious design. (Meir, I. A., Roaf, S. C, 2006).

The parish Angwecibange; three selected villages are classic example of traditional settlement which has sustained through the ages. The form and structure of settlement of Angwecibange are a result of centuries of evolutionary process and knowledge transfer, reflecting a set of varying physical and non-physical determinant forces such as climate and geology, religion, socio-cultural values, economics, technology and administrative factors. It is a closely knit fabric of small clusters of dwellings comprising of thick mud walls, thatch roofs, small openings. The house plans essentially remains same in size, shape and detailing, and their climate sensitivity.

An average hut measured approximately 5 to 6 meters long and 3 to 4 meters wide (Figure 11, 12). The huts vary in size. There are also a considerable number of the larger huts that extend up to 12 to 14 meters in length and 8 to 9 meters in width. These huts are arranged in a linear pattern.
along the cross streets which are connected to the main street of a village (Figure 4). A typical hut usually consists of a multipurpose space and a kitchen with sleeping space (Figure 6) but others cooking were done in separate houses and on verandahs. Most day to day activities occur in outdoor spaces (Figure 7). The houses are often on a raised platform made of compacted earth called as lobo (Figure 5). The high thermal mass helps to keep the house cool in the evenings in the dry season, which makes it pleasant for people to rest in the evenings. The huts in the study area had minimal openings. Often the only opening on the external walls is the main door.

![Figure 17: View of hutments in Akaidebe village](image17)

![Figure 18: View of hutments in Abenyo village](image18)

The type of mud-house construction employed in Angwecibange, three selected villages is adobe (mud blocks) in which damp earth is molded and compacted by ramming in formwork. The huts were made of local materials like timber, bamboo, clay, straw, cow dung, and a special variety of grass called obia or ochwici were used to build houses. The walls were made of mud mixed with cow dung and chopped straw to make the raw material for the walls. The walls are approximately 250 mm thick (Figure 11, 12). These houses were mostly self-built by family members, sometimes aided by neighbors.

The roof rested on wooden posts erected rows, purlins supported the roof structure. The huts usually had a thatched roof (Figure 15). Bamboo sticks formed the mullions to support the thatch. The thick thatch used as roofing material prevented rain from entering the house and at the same time provided insulation to the building. All these materials were locally available in the agricultural fields surrounding the village. The average life time of the thatched roofs in Angwecibange parish is about 10 years.
4.5 CASE STUDY

4.5.0 Angwecibange Parish-Dokolo District.

Historical Background.
The present Dokolo District started as a settlement point for the British Colonial Administrators who camethrough Teso land and now Soroti District. The Colonists were said to have left Dokolo and relocated to Nambieso in the current district of Apac.(Okello Okellos, 2009)

Historically, the inhabitants of Dokolo are Langi by tribe believed to have originated from Abyssinia inEthiopia. They are believed to have moved in the general migration of the Nilo-Hamites (also known as semi-Hamitic) group, which includes the Teso, Kumam, Jie, and Karimojong tribes between 1800 and 1890 and settled in the present location where they took up the Agrarian life. Due to intermarriages and internal movements, the Kumam and Itesots now occupy part of the district.(Okello, 2015)

Dokolo district consist of five Sub Counties and 32 parishes with 355villages. (Okello Okellos, 2009).Angwecibange parish being the research study area has 5 villages, located in Dokolo sub-county.

![Map Showing Dokolo District](image)

*Figure 19: Map showing Dokolo District. (Okello Okellos, 2009)*

4.5.1. Research Findings, Data Collection
The target of this data collection is to come out with reasonable and reliable findings which will be of great help as regards the technological influence on Ugandan indigenous (traditional) building materials in terms of innovation, availability, cost- effective, climatic suitability, mass
production, improved products, social and legal acceptability, technical know-how, durability as well as the occupation and economic activities, craft activities, religious beliefs and practice, security, compound and housing unit. The research methodology adopted was by studying various traditional buildings built with local materials found in some selected villages in Angwecibange parish and the effect of innovative technology on these materials and houseform using questionnaire.

4.5.2 Target population studied
The researcher was able to interact and interview the local administrators of Angwecibange parish on issues concerning the sustainable traditional design techniques in the study area. And as the study is directed on application of the traditional design techniques in both the interior and exteriors of the dwellings. With limit of time only 50 households were observed and interviewed on aspects of; use of traditional building design techniques, technology, materials
The 50 households included traditional residential buildings; small, medium-sized and large-sized and they were selected at different parts of the selected villages within the parish.

4.5.3 Data Presentation, sample size and techniques
A sum of 50 questionnaires were prepared and distributed for interview guide at various locations in some selected villages. The buildings focus were traditional buildings, improved traditional buildings. Questionnaire of close ended type was used, all questionnaires were distributed and administered and 50 retrieved after proper follow-up from the respondents. Therefore, this data analysis will make use of 50 questionnaires retrieved as 100%. Random sampling technique was adopted for this research work and residents in different locations were interviewed to uncover their opinion about innovative technological influence on traditional building materials in their traditional and improved traditional housing design.
Table 3 corroborates the known fact that cost is a deciding factor in the adoption of new technology and use of innovative materials. Several of the respondents believe that innovative material should be made available at affordable price at the open market or from sellers because materials nowadays are hardly available as was the case in the past.
Table 3: Showing mostly used traditional materials for wall construction in the study area.

<table>
<thead>
<tr>
<th>Materials</th>
<th>Number of dwelling housing units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mud (Adobe)</td>
<td>180</td>
</tr>
<tr>
<td>Timber</td>
<td>177</td>
</tr>
<tr>
<td>Wattle</td>
<td>3</td>
</tr>
<tr>
<td>Stone</td>
<td>2</td>
</tr>
<tr>
<td>Bamboo</td>
<td>1</td>
</tr>
<tr>
<td>Thatch (Grass)</td>
<td>178</td>
</tr>
</tbody>
</table>

Table 3 suggested that mud (adobe) block and thatch (grass) accounted for the material used in traditional buildings. Bamboo is the least used because it is not readily available.

4.5.4. Angwecibange parish traditional architecture

Angwecibange parish traditional architecture shows how different villages utilize various materials available within their environment to build houses. In Angwecibange parish, traditional earthen round houses. Traditional architecture is more manifested in the construction of roofs. Mud construction dominated the whole of villages and part of Northern Uganda. Most of them are in fact not built of mud entirely but are reinforced with timber or bamboo. The range of roofs found in various parts of the study area falls under different categories that is; round conical roof and mixture different conical roofs. The technology of terrace roofs is very common in Lango sub-region.

These are, achieved by laying mating or short poles arranged in herringbone pattern on top of the roof beams and plastering the hut over with mud.

In case of some villages, the house had conical roof resting on square walls. The conical roof was construction round two circular platforms built on a pyramid structure which rested on top of the house walls.

In Lango sub-region, house with thatched roofs above walls has great variations in shape, materials used and construction techniques while some roofs rested on pillars are independent of the walls below them. Saddle back roof always rested on wall plates supported on forked uprights within the walls. The ridge pole were supported by upright poles but usually rested between the gable ends. The beams are occasionally used. The shape of the roof is usually
adhering in relation to the shape of the walls. Roofs above round walls would be conical, and roofs above rectangular walls could be saddle back heaped on pyramid.

![Figure 20: showing construction method and housing typology (Author, 2017)](image)

**4.5.5. Rural settlement housing typology**
Traditional rural dwellings of the study area were of different types; relatively permanent houses grouped in villages are only visible in agricultural villages. A typical farming village consists of a number of family compounds along with structures that serve the larger community. Each family setting normally had separate buildings for various purposes like cooking, eating, sleeping, storing food, and protecting animals from adverse effect and external aggression at night. Based on their creativity and indigenous technological know-how using available materials, resources and manpower within their reach, buildings may be round. Communal structures, or holding meetings and teaching children are located in a prominent in the village.

Using available technology, geographical location, materials availability, culture and economic, people of Angwecibange in southern Dokolo built their villages on the low lying lands and avoided hill tops.
Table 4: Area Specific Profiles – showing building materials usage in the study area.

<table>
<thead>
<tr>
<th>Village</th>
<th>Construction Materials For the Dwelling Units</th>
<th>Number of houses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Akaidebe</td>
<td>permanent roof materials</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Non-permanent roof materials</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>permanent floor materials</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Non-permanent floor materials</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Non-permanent wall materials</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>permanent wall materials</td>
<td>3</td>
</tr>
<tr>
<td>2. Alokiri</td>
<td>permanent roof materials</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Non-permanent roof materials</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>permanent floor materials</td>
<td>08</td>
</tr>
<tr>
<td></td>
<td>Non-permanent floor materials</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>Non-permanent wall materials</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>permanent wall materials</td>
<td>10</td>
</tr>
<tr>
<td>3. Abenyo</td>
<td>permanent roof materials</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Non-permanent roof materials</td>
<td>03</td>
</tr>
<tr>
<td></td>
<td>permanent floor materials</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>Non-permanent floor materials</td>
<td>02</td>
</tr>
<tr>
<td></td>
<td>Non-permanent wall materials</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>permanent wall materials</td>
<td>02</td>
</tr>
</tbody>
</table>

From table, it’s notable that most family housings were constructed from locally available materials. Most of the traditional building materials and techniques still dominate in the housing conditions of the study area.

4.6. Climate responsive design strategies in Langi traditional housing

Uganda is a country with diversified indigenous communities in different regions of the country. Today in many parts of Uganda, majority of the people still live in traditional houses like their ancestors did.

However, reflecting on the specific research area of the Langi traditional architecture in northern region of Uganda. Most traditional buildings in the Lango sub region have suffered a great deal or have completely disappeared in some communities due to damage by LRA civil wars and natural disasters. Those remaining, among which the most have changed in design, size and shape. This study is investigated in six housing typology which exists in Lango Sub-region in
tropical climatic region. The six housing typologies includes also the ancient housing (ot lango) which are rarely constructed in the region. The study is represented by two case-study houses; one in an urban area of Dokolo Town Council and the other in a rural area of Angwecibange Parish, since many significant differences between these two housing styles exist. Urban houses are typically large, multi-functional and influenced by foreign architectural styles while as traditional rural houses are small, purely traditional and only used for living purposes.
All Figure 21: Architectural details of the selected houses A, B, C, D, E, and F listed in Table 6. The purpose of this selection is to find the climate responsive design strategies corresponding to the local climatic types in Uganda.

**Table 5: General information about the houses in question**

<table>
<thead>
<tr>
<th>Typology</th>
<th>Location</th>
<th>Climatic region</th>
<th>Architectural style</th>
<th>Function</th>
<th>Construction method</th>
</tr>
</thead>
<tbody>
<tr>
<td>House A</td>
<td>First house in the ancient Langi homestead</td>
<td>North</td>
<td>Traditional style</td>
<td>Living space</td>
<td>By local skilled workers of traditional villages</td>
</tr>
<tr>
<td>House B</td>
<td>Abenyo village</td>
<td>North</td>
<td>Traditional style</td>
<td>Living space and storage</td>
<td>By local skilled workers of traditional carpenter bands abenyo</td>
</tr>
<tr>
<td>House C</td>
<td>Abenyo village</td>
<td>North</td>
<td>Traditional style( transitional)</td>
<td>Living space</td>
<td>By local skilled workers of traditional carpenter bands abenyo</td>
</tr>
<tr>
<td>House D</td>
<td>Akaidebe</td>
<td>North</td>
<td>Traditional</td>
<td>Living space</td>
<td>By local skilled workers of</td>
</tr>
</tbody>
</table>
It is well-known that traditional housing all over the world makes use of materials found locally which reduces energy consumption for material extraction and fabrication, reducing its environmental impact. Local materials also encourage local characteristics which is also the case of the houses studied (see Table 7).

**Table 6: Types of materials used in the houses investigated**

<table>
<thead>
<tr>
<th>Typology</th>
<th>Foundation</th>
<th>Wall</th>
<th>Structure</th>
<th>Roof</th>
<th>Floor</th>
<th>Openings</th>
</tr>
</thead>
<tbody>
<tr>
<td>House A</td>
<td>No foundation</td>
<td>Wooden panel and thatch</td>
<td>wooden frame and thatch</td>
<td>Thatch (straw, thatch, reeds, spear grass…)</td>
<td>Natural floor</td>
<td>wooden panel with thatch</td>
</tr>
<tr>
<td>House B</td>
<td>Simple foundation (Building raised above the ground)</td>
<td>Adobe/mud blocks</td>
<td>Mud blocks and thatch</td>
<td>Thatch (straw, thatch, reeds, spear grass)</td>
<td>Natural floor</td>
<td>One opening (door)</td>
</tr>
<tr>
<td>House C</td>
<td>Simple foundation</td>
<td>Bamboo/Adobe/ mud and wattle</td>
<td>Mud blocks and thatch</td>
<td>Thatch (straw, thatch, reeds, spear grass…)</td>
<td>Natural floor</td>
<td>One opening (door)</td>
</tr>
<tr>
<td>House D</td>
<td>Simple</td>
<td>Burt brick</td>
<td>Burt brick and</td>
<td>Thatch (straw, thatch, reeds,</td>
<td>Cement</td>
<td>Two</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>thatch</td>
<td>grass…)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Among the above mentioned materials, some types were used in housing construction in Lango sub-region, especially in rural areas. These materials have certain advantages and positive characteristics as described in the table below.

**Table 7: Most used materials and their properties**

<table>
<thead>
<tr>
<th>Materials’ name</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thatch</td>
<td>Extremely low thermal conductivity, local availability, light - weight material, easy fabrication</td>
</tr>
<tr>
<td>Clay-straw mixture</td>
<td>Available in the regions, easy fabrication, low thermal conductivity</td>
</tr>
<tr>
<td>Ramped earth</td>
<td>Available in the region, multi-purpose usage, easy fabrication, low compressive strength</td>
</tr>
<tr>
<td>Bamboo</td>
<td>High durability, local availability, easy fabrication, multi-purpose usage, high tensile strength, light - weight material</td>
</tr>
</tbody>
</table>

**4.7. Design strategies of housing climate in Langi traditional housing**

The popular climate strategy used in the built environment in tropical region was categorized as numbered as 10 architectural solution proposed by the author as follows;

1. Building orientation and shape
2. Solar shading
3. Natural ventilation: cross ventilation,
4. Natural lighting techniques
5. Light weight construction
6. High thermal mass
7. Passive cooling by using color
8. Thermal insulation by material
9. Thermal insulation by design (e.g. well ventilated attic, double-skin facade…)
10. Passive solar energy
11. Others

The 11 strategies applied in these selected houses were qualitatively investigated and evaluated using the description and image approach. In this approach, the criteria of assessment is that if there is at least one climate responsive solution which correspond to each of the local climatic factors, the house is considered completely adaptable to the local climate. The following were carefully examined.

Table 8: Qualitative investigation of bioclimatic design strategies used in Langi traditional

<table>
<thead>
<tr>
<th>Climatic features</th>
<th>Description of strategies used</th>
<th>Image or sketch</th>
<th>category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional house in Abenyo Village</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High solarradiation, especially on West and Eastern surfaces</td>
<td>Thick thatch roof (about 200mm) provides ideal insulation. Thatch roof absorbs moisture which reduces overheating by evaporative cooling effect</td>
<td></td>
<td>D,E,F</td>
</tr>
<tr>
<td></td>
<td>Deep eaves shade short walls, protecting all walls and openings from direct sun</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Well ventilated attic by open roof</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High average temperature</td>
<td>Traditional house easily meets airflow at higher speed.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
and humidity

The air near the ground is often stagnant

The house is raised 0.6m above ground to prevent moisture entering from the ground

Heavy rain

Steeped roof (30°) and deep eaves (0.8m from the wall) enhance rainwater discharge

<table>
<thead>
<tr>
<th>Climatic features</th>
<th>Description of strategies used</th>
<th>Image or sketch</th>
<th>category</th>
</tr>
</thead>
</table>
| Two different seasons (hot and fairly cold) | - Cooking (brazier) is done right at the middle of the house to keep warm in cold season.  
- Openings on the gables enhance stack effect and release smoke from the cooking area |                 | 11       |
| North cold wind, South-East cool wind | Windows are oriented to the South; cross ventilation through door, windows, and openings on the gables. When there is no wind, stack effect increases airflow |                 |          |
| Others                             | House adapts well and prevents wild animals (snakes, insects etc.) from entering               |                 |          |

Traditional house in Akaidebe Village
<table>
<thead>
<tr>
<th>High solarradiation, especially on West and Eastern surfaces</th>
<th>Thick porous roofing materials absorb moisture at night and release it during daytime cooling the roof.</th>
</tr>
</thead>
<tbody>
<tr>
<td>shade trees in the courtyard and backyard</td>
<td></td>
</tr>
<tr>
<td>High average temperature and humidity</td>
<td>Mainly large openings which runs all over the wall enhancing natural ventilation.</td>
</tr>
<tr>
<td>Heavy rain</td>
<td>- Pitched roof (45°) and deep eaves (0.8m from the wall) enhance rainwater discharge</td>
</tr>
<tr>
<td>Hot and cold season</td>
<td>Doors had louvers above which allowed wind to flow through the house interiors</td>
</tr>
<tr>
<td>Others</td>
<td>Except the front yard, shade trees have been planted around the house, providing shading and cooling down the air temperature</td>
</tr>
<tr>
<td>Traditional house in Alokiri Village</td>
<td></td>
</tr>
<tr>
<td>High solarradiation, especially on West and</td>
<td>Deep eaves around the house protect it from direct sunlight.</td>
</tr>
<tr>
<td>Eastern surfaces</td>
<td></td>
</tr>
<tr>
<td>Easternsurfaces</td>
<td><img src="image" alt="Image" /></td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td><strong>Main facade is oriented to the South/North</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Height of the front roof is minimized, producing an effective solar shading solution</strong></td>
<td></td>
</tr>
<tr>
<td><strong>High average, temperature and humidity</strong></td>
<td><strong>Gable openings on all the facades allow effective natural ventilation</strong></td>
</tr>
<tr>
<td><strong>Ceiling height is significant (max 0.5m)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Heavy rain</strong></td>
<td><strong>- Deep eaves around the protect it from wind driven rain.</strong>  - Pitched roof (32°)</td>
</tr>
</tbody>
</table>
Comprehensive analysis in table 9 indicated that traditional housing has adapted relatively well to the climate as well as adverse weather conditions. Though the solutions employed are considered simples, inexpensive and easy to apply, they prove to be very effective, demonstrating a deep understanding of the past about building and its surrounding environment.
CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATION

5.0 CONCLUSIONS
This research dissertation, therefore, will be beneficial to designers, architects and other allied professionals in the built environment, reinstating the essence to integrate traditional form, ideas, expressions, materials into their modern/ recent designs and techniques. Creation of a new traditional approach enhances the resultant interplay between the modern and traditional design concepts cum materials utilization.

Although today we look at traditional Langi designs as a specific style, in actuality there are numerous ones, each inspired by another, absorbing and passing down the traits deemed desirable for their context. In other words, Langi traditional architecture, in its evolution, is an excellent template for contemporary sustainable design as it demonstrates an ability to absorb beneficial methods. In creating an improved sustainable design concept that is inspired by past techniques, the ability to adopt these characteristics without losing the feeling of a specific culture’s architecture is key. This merging of styles and techniques is not only limited to traditional design; Ugandan architects have, even in this rapidly evolving modern world, succeeded in maintaining the spirit of traditions in their designs.

In designing modern or contemporary sustainable structures, it is fair to say we are, in a way, reconnecting ourselves with tradition. Therefore, acknowledging successes and failures of traditional designs, such as traditional Langi architecture, is an essential step in creating this improved sustainable architecture that we seek in our modern or contemporary, global society. People can learn from the past and base our “new” and improved ideas on hindsight rather than foresight. We can look to the past to improve our lifestyles as well as the futures of our ecosystems and natural environments.

Also, there were several existing evidences that traditional materials such as mud, bamboo, stone, grasses, leaves, reeds, cow dung among others were used for construction of various buildings in Lango sub-region. As these materials are readily available in abundance, the usage has been on decline in some time past due to flair for imported building materials which are produced with disregarded for the climatic suitability of Uganda and high cost implication. The fact that most people believe that living in brick, timber or stone houses symbolize abject poverty
which has created hatred for these materials. Also the quest for modernization without considering our background did not help us to look inward and develop our traditional building materials rather than searching for foreign materials. In view of this social impression that causes the decline in the utilization and with cognizance to these materials’ numerous advantages, cost benefits, this research work provide vivid information on available sources of building materials, their classification, properties, advantages and their uses as well as the production of some building components using identified local materials.

However, principles of Traditional Architecture can be applied to modern architecture and offer improved adaptation to a particular climate. The Mud house studied reinforced the fact that mud and thatch used in building envelope keeps the inside of the hut cooler in summer. Mud and Thatch are the locally available materials in Lango sub-region. Use of locally available building materials has certain advantages for example, since the material is from same climatic conditions, it shows more adaptability, longer lifespan and better economic. From environmental point of view this has added advantages such as:

(a) Low environmental impact in production and renewability.
(b) Significant reduction in energy involved in processing and transport.

It has also been found that some solar passive techniques are used in these houses to control the indoor environment and address the existing climatic constraints.

However the cooling effect of these traditional mud houses can be further improved and living conditions inside the huts improved by proper design considerations like proper building orientation, surface-volume ratio maximization, projecting eaves of roofs and having proper openings in roof which guard against water ingress of huts to facilitate nocturnal ventilative cooling, use of shading devices being properly used and proper building material selection which can be economically viable for rural areas as well as have proper thermal insulation properties. Modern day industrially improved thatch can be used with all the good thermal properties intact and the disadvantages of thatch gone. Presence of entire village with traditional character without any modern development is a rare phenomenon nowadays. Preserving the architectural character of the villages would add heritage value of Akaidebe, Alokiri and Abenyo villages which has other interesting tourist attraction also. Use of rationalized traditional technologies would help in
improving the sustainability of the huts, easy maintenance and help improve the indoor air quality of the huts. It would be a great boon to the vast rural populace of Angwecibange if they could see their modest mud-house being improved by the use of rationalized traditional technologies and if they could be given an easily constructible prototype mud-hut. These can be systematically being made available to the rural poor through awareness and government initiatives and loans/grants.

In conclusion, this research had critically examined the numerous factors that contributed to the sustainability of Langi traditional architecture of the Northern part of Uganda. The tremendous impact of modernization is commendable and cannot be underrated, better still; this research advocates the importance of cross-blending the modern concept and traditional concept. Thus, experts are advised not to get rid of our traditional inheritance expertise associated with design evolvement and execution. It will be a great tragedy and a colossal loss if our traditional building styles and construction process disappear from the continent. The benefits derived from our indigenous methods and materials were enormous and needed to be propagated, while any inadequacy associated with the traditional approach could be modified.

5.3 Suggested recommendations
The encouragement of the use of local building materials produced modern technology should be a collective responsibility of the government, individual and private organization, for instance, the following recommendations will be of great help:

This research recommends that Architects’ interest should focus on traditional design vis-avis modern concepts and expertise. Through this, the utilization of cheaper building materials such as earth, wood, stone and thatch and the design principles of privacy, space, comfort rooted in the Langi Traditional Architecture would be enhanced and Uganda at large.

(i) That the Government should ban or place restriction on some imported building materials. This will allow the growth of local building industries and encourage people in using locally produced building materials.

(ii) That the Government should encourage the local building materials industries by creating conducive atmosphere for operation right from the registration process to the grant as well as granting of holiday tax in some cases when it is highly needed.
(iii) That government should encourage the exportation of the locally produced building materials to find places in the world market and to generate enough capital to enhance the development of home based manufacturers.

(iv) That government and private bodies/organizations should be encouraged to establish industries that produce local building materials.

(v) Some planning authorities who hitherto restrict people from using local building materials in the cities should be made to relax their stringent condition thereby encouraging developer to commence their development with the use of local building materials.

(vi) That the Government (at all levels) should always ensure that all related research findings are implemented and not for record purposes alone. This may be achieved by establishing a well-funded, research findings’ implementation commission, which would be responsible for demonstrating such findings in the form of mass housing (construction) units. Thus, serving as an architectural/structural model that would help in no small way in encouraging and promoting; the acceptance of the use of locally sourced materials with the corresponding and appropriate indigenous technology.

(vii) That public enlightenment campaign or dissemination of information should be encouraged on the developed local building materials and their applications to the masses, as better substitutes to the expensive and relatively scarce conventional materials, possibly through the existing rural development program of the Government.

(viii) That the curriculum of technological, architecture, engineering institutions should be reviewed to reflect the study of the application of locally sourced building materials.

(ix) That the Government, Architects, Engineers and other relate professionals should lay examples by building their respective houses with these materials as a substitute to the conventional ones.
REFERENCES


Appendix 1: Research questionnaire

MAKERERE UNIVERSITY

COLLEGE OF ENGINEERING, DESIGN, ART AND TECHNOLOGY.
Department of Architecture and Physical Planning

Administered by................................. Date..........................

Declaration: The information obtained is purely used for academic purposes and will be treated with maximum confidentiality.

The purpose of this research is to examine and discuss sustainable traditional design techniques in Langi traditional architecture.

Please help by answering the following questions honestly as you can.

Personal information
1. Name of respondent.................................................................
2. Gender: Male [ ] Female [ ]
3. Village……………………………….        Parish……………………..
4. Marital status: Married [ ] Single [ ] Widow [ ] Widower [ ]

General Information.
1. When did you start living in this house?
   ………………………………………………………………………………………………………
   ………………………………………………………………………………………………………
2. Where did you live before?
   ………………………………………………………………………………………………………
   ………………………………………………………………………………………………………
3. Are you the first one to live in this place/house?
   ………………………………………………………………………………………………………
SECTION A.
Questions about homestead
1. How many people live in your homestead?
   ...........................................................................................................................................
2. Which kind of house does your family live in?
   ...........................................................................................................................................
3. How many houses do you have as stated in (2) above?
   ...........................................................................................................................................
4. Describe in few words how you organize your houses in your homestead?
   ...........................................................................................................................................
   ...........................................................................................................................................
5. Mention the housing typology in your homestead?
   ...........................................................................................................................................
   ...........................................................................................................................................
   ...........................................................................................................................................
Questions about Housing spaces in a homestead
6. Where do you usually prepare meals from? Do you have a kitchen or a separate space for cooking?
   ...........................................................................................................................................
7. Where do the different members of the family sleep (indoor or outdoor, indicate the space)?
   ...........................................................................................................................................
8. Are these sleeping spaces separated from other functions like cooking, eating, storage?
   ...........................................................................................................................................
9. Which kind of outdoor space do you have?
   ...........................................................................................................................................

SECTION B.
Questions about building construction materials
10. Which materials do you use for: roof, wall and floor construction?
    Roof.......................................................................................................................................  
    Wall.......................................................................................................................................  
    Floor.......................................................................................................................................  
11. Where do you get these materials for construction in Question (10) above from?
    ...........................................................................................................................................
12. Why do you use such specific materials in the constructions of your houses?
    ...........................................................................................................................................
13. Do you have some cultural beliefs for some construction materials?

........................................................................................................................................

14. How do you store these construction materials before or in the event of future use for construction of new houses?

........................................................................................................................................

15. How do you treat these materials before use?

........................................................................................................................................

16. Briefly describe how you construct your roof?

........................................................................................................................................

........................................................................................................................................

........................................................................................................................................

17. Briefly describe how you construct your wall?

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........................................................................................................................................

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........................................................................................................................................

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........................................................................................................................................

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Evaluative questions

18. Do you think you have any problems related use of the materials you chose for constructions?

........................................................................................................................................

........................................................................................................................................

........................................................................................................................................

19. Are you satisfied with your dwelling in terms of space organizations? Give reasons.

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........................................................................................................................................

........................................................................................................................................

20. How comfortable is your family in these types of housing? Give reasons.

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........................................................................................................................................
Appendix 2: Research Authorization letter from University

MAKERERE UNIVERSITY
P.O.Box 7062 Kampala UGANDA
E- mail: arch @ tech.mak.ac.ug
Tel: +256 - 41 - 531860
Fax: +256 - 41 - 530686

DEPARTMENT OF ARCHITECTURE AND PHYSICAL PLANNING

Your Ref: 
Our Ref: 

Date 13th October, 2017

TO WHOM IT MAY CONCERN

RE:  MR. OKELLO DANIEL REG. NO. 12/U/13279/PSA

The bearer of this letter Mr. Okello Daniel is a 5th year student of the Department of Architecture and Physical Planning at Makerere University. As part of the architecture program, the student is required to carry out a research study in the area of Lango sub-region. (Angwaibange Parish - Dokolo District)

Any assistance given to the student will be highly appreciated.

Assoc. Prof. S. Mukiibi
Head of Department
Appendix 3: Research Authorization letter from Local one Alokiri Village

ALOKIRI LOCAL COUNCIL ONE (LC1)  
ANGWECIBANGE PARISH, DOKOLO SUB-COUNTY, DOKOLO DISTRICT

Your Ref:..........................  
Date: 15TH OCTOBER, 2017

Our Ref:..........................

TO WHOM IT MAY CONCERN

RE: MR. OKELLO DANIEL
This is to introduce to you Mr. Okello Daniel, a student of Makerere University. He is going to carry his research in Alokiri cell.

We the political, cultural and traditional and the Opinion leaders of the community of Alokiri LC1 and Dokolo Sub-county at large know Mr. Okello Daniel. We therefore consider his research as a big asset as far as the development of Dokolo and Uganda at large is concerned.

Your kind consideration of this letter will be highly appreciated.

Yours in service,

LC1 CHAIRPERSON  
ALOKIRI VILLAGE