

**PERCIEVED FACTORS INFLUENCING SUSTAINABILITY OF
COMMUNITY DISASTER RISK REDUCTION PROJECTS IN KENYA: A
CASE OF ORDER OF SAINT AUGUSTINE IN EVURORE WARD, EMBU
COUNTY**

OKOTH GLANNAH ACHIENG

**A Research Project Report Submitted in Partial Fulfilment of the Requirements for the
Award of the Degree of Master of Arts in Project Planning and Management of
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DECLARATION

This research project is my original work prepared with no other than the indicated sources and support and has not been presented elsewhere for a degree or any other award.

Signature.....

Date.....

Okoth Glannah Achieng

Registration No: L50/6010/2017

This research project has been submitted for examination with my approval as the university Supervisor

Sign.....

Date.....

Dr John Mbugua,

**Lecturer University of Nairobi,
Department of Open Learning,
School of Open and Distance Learning.**

DEDICATION

This project is dedicated to my beloved husband Emmanuel Owino, my mother Rose Okoth and my sister Janet Okoth for the support they accorded me during this study and especially in writing of this research project.

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TABLE OF CONTENTS

	Page
DECLARATION.....	ii
DEDICATION.....	iii
ACKNOWLEDGMENT	iv
TABLE OF CONTENTS	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF ABBREVIATIONS AND ACRONYMS	x
ABSTRACT.....	xi
CHAPTER ONE: INTRODUCTION	1
1.1 Background of the Study	1
1.2 Statement of the Problem.....	5
1.3 Purpose of the Study	5
1.4 Objectives of the Study.....	6
1.5 Research Questions.....	6
1.6 Significance of the Study	6
1.7 Delimitations of the Study	7
1.8 Limitations of the Study.....	7
1.9 Basic Assumptions of the Study	8
1.10 Definition of Significant Terms as used in the Study	8
1.11 Organization of the Study	9
CHAPTER TWO: LITERATURE REVIEW	10
2.1 Introduction.....	10
2.2 Sustainability of Community Disaster Risk Reduction Projects	10
2.3 Community Participation and Sustainability of Community Disaster Risk Reduction Projects	11
2.4 Community Disaster Risk Awareness and Sustainability of Community Disaster Risk Reduction Projects	14
2.5 Community Environmental Conservation Practices and Sustainability of Community Disaster Risk Reduction Projects.....	16

2.6 Agricultural Extension Services and Sustainability of Community Disaster Risk Reduction Projects	18
2.7 Theoretical Framework.....	19
2.8 Conceptual Framework.....	20
2.9 Knowledge Gap	23
2.10 Summary of Literature Review.....	26
CHAPTER THREE: RESEARCH METHODOLOGY	28
3.1 Introduction.....	28
3.2 Research Design.....	28
3.3 Target Population.....	28
3.4 Sample Size and Sampling Procedure	29
3.5 Research Instruments	30
3.5.1 Pilot Testing of Instruments.....	30
3.5.2 Validity of Research Instruments.....	31
3.5.3 Reliability of Research Instruments.....	31
3.6 Data Collection Procedures.....	32
3.7 Data Analysis Techniques.....	33
3.8 Ethical Considerations	33
3.9 Operationalization of Variables	34
CHAPTER FOUR: DATA ANALYSIS, PRESENTATION AND INTERPRETATION	36
4.1 Introduction.....	36
4.2 Respondents Rate.....	36
4.4 Demographic characteristics of respondents.	37
4.5 Respondents opinion on sustainability of disaster risk reduction projects	38
4.6 Community participation and sustainability of community disaster risk reduction projects.....	39
4.6.1 Correlation analysis between Community Participation and Sustainability of Community Disaster Risk Reduction Projects	40
4.7 Community disaster risk awareness and sustainability of community disaster risk reduction projects	42
4.7.1 Correlation analysis between Community Disaster Risk Awareness and Sustainability of Community Disaster Risk Reduction Projects.....	43
4.8 Environmental Conservation Practices and Sustainability of Community Disaster Risk Reduction Projects.....	44

4.8.1 Correlation analysis between Environmental Conservation Practices and Sustainability of Community Disaster Risk Reduction Projects.....	45
4.9.1 Correlation analysis between Utilization of Agricultural Extension Services and Sustainability of Community Disaster Risk Reduction Projects.....	49
CHAPTER FIVE: SUMMARY OF FINDINGS, DISCUSSION, CONCLUSION AND RECOMMENDATIONS.....	51
5.1 Introduction.....	51
5.2 Summary of Findings.....	51
5.2.1 Community Participation and Sustainability of Community Disaster Risk Reduction Projects.....	51
5.2.2 Community Disaster Risk Awareness and Sustainability of Community Disaster Risk Reduction Projects.....	51
5.2.3 Community Environmental Conservation Practices and Sustainability of Community Disaster Risk Reduction Projects.	52
5.2.4 Agricultural Extension Services and Sustainability of Community Disaster Risk Reduction Projects .	52
5.3 Discussion of Findings.....	52
5.3.1 Community Participation and Sustainability of Community Disaster Risk Reduction Projects.....	52
5.3.2 Community Disaster Risk Awareness and Sustainability of Community Disaster Risk Reduction Projects.....	54
5.3.3 Community Environmental Conservation Practices and Sustainability of Community Disaster Risk Reduction Projects.	55
5.3.4 Agricultural Extension Services and Sustainability of Community Disaster Risk Reduction Projects.	56
5.4 Conclusion	58
5.5 Recommendations.....	59
5.6 Suggestions for further studies.....	60
REFERENCES.....	61
APPENDICES.....	65
Appendix I Letter of Transmittal	65
Appendix II Household Respondent Questionnaire	66
Appendix III Authorization Letter	72
Appendix IV UON Letter for Data Collection	73
Appendix V NACOSTI Research Permit	74

LIST OF TABLES

Table 2.1 Knowledge Gap Matrix	23
Table 3.1 Target Population.....	28
Table 3.2 Stratified Proportionate Sampling Of Respondents.....	30
Table 3.3 Reliability Analysis.....	31
Table 3.4 Operationalization Of Variables	34
Table 4.1 Questionnaire Return Rate.....	36
Table 4.2 Respondents Characteristics	37
Table 4.3 Sustainability of CDRR Project.....	38
Table 4.4 Levels of Community Participation.....	39
Table 4.5 Correlation Matrix Between Community Participation and Sustainability of Community Disaster Risk Reduction Projects.....	40
Table 4.6 Disaster Risk Awareness	42
Table 4.7 Correlation Matrix Between Community Disaster Risk Awareness and Sustainability of Community Disaster Risk Reduction Projects	43
Table 4.8 Proportion of Farmers Practicing Environmental Conservation.....	44
Table 4.9 Correlation Matrix Between Environmental Conservation Practices and Sustainability of Community Disaster Risk Reduction Projects	47
Table 4.10 Access and Utilization of Extension Services	48
Table 4.11 Correlation Matrix Between Utilization of Agricultural Extension Services and Sustainability Of Community Disaster Risk Reduction Projects	49

LIST OF FIGURES

Figure 1 Conceptual Framework	22
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LIST OF ABBREVIATIONS AND ACRONYMS

AES:	Agricultural Extension Services
CDRR:	Community Disaster Risk Reduction
DRR:	Disaster Risk Reduction
FAO:	Food and Agricultural Organization
MID-P:	Merti Intergrated Development Program
NDMA:	National Drought and Management Authority
NDOC:	National Disaster Operation Centre
RACIDA:	Rural Agency for Community Development Assistance
SPSS:	Statistical Package for Social Sciences
UNISDR:	United Nations International Strategy on Disaster Reduction

ABSTRACT

Community Disaster Risk Reduction (CDRR) enable communities to build resilience in coping with disasters. However, sustainability issues continue to impact Community Disaster Risk Reduction projects. Therefore, there is need for assessing factors that influence sustainability of disaster risk reduction projects. The purpose of this study was to identify factors influencing sustainability of community disaster risk reduction projects implemented by Order of St Augustine in Evurore ward, Embu County. This study sought to establish the extent at which community participation, community disaster risk awareness, community environment conservation practices and agricultural extension services influence sustainability of community disaster risk reduction projects. This was a cross-sectional survey in which 393 participants were sampled and 374 accepted to participate representing a 95% response rate. Stratified proportionate sampling was used in sampling participants from Kamarandi, Ndurumori and Iria Itune wards. Data was collected by use of structured questionnaire. Descriptive statistics (mean, standard deviation) were used in analyzing characteristics and study variables. Correlation analysis test was used to assess the association between variables and sustainability of CDRR projects. Statistical Package Social Sciences (SPSS) software version 23 was used in analysis. The results indicated a significant and strong positive correlation between community participation and sustainability of community disaster risk reduction projects as correlation factor $r=0.789$, $p=0.002<0.05$. There was a significant and strong positive correlation between community disaster risk awareness and sustainability of community disaster risk Reduction projects ($r=0.773$, $p=0.000<0.05$). Equally there was a significant and strong positive correlation between environmental conservation practices and sustainability of community disaster risk reduction projects as correlation factor $r=0.725$, $p=0.001<0.05$. A significant and strong positive exists between utilization of extension services and sustainability of community disaster risk reduction projects ($r=0.769$, $p=0.011<0.05$). Drought is the most common type of disaster risk, however not all respondents had made adequate preparation towards disasters. There is high uptake of conservation practices that promote long-term sustainability of CDRR project. Most farmers had received extension services, however there is need to scale up access to services such as linking farmers to markets for them to sell their produce. On overall knowledge gained from extension services can be considered as a critical factor in sustainability of CDRR projects.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The impact of disasters on community livelihood is dependent on level of vulnerability existing in the community when natural hazards occur (Hallegatte, Vogt-Schilb, Bangalore, Rozenberg, 2017; Twigg, 2015). Accordingly, the vulnerability of a community is shaped by human practices economic, social, cultural, and institutional which define the environment within which members of a community live in (United Nations International Strategy on Disaster Reduction, 2015). Vulnerability can be assessed in terms of level of poverty and in terms of environmental degradation (UNISDR, 2015). Risk reduction is an important approach used in identifying, assessing and reducing vulnerability of communities when it comes to occurrence of natural hazards with community disaster risk reduction being one of the recommended approaches (UNISDR, 2015).

Community disaster risk reduction (CDRR) approach intends to reduce vulnerability and risks by empowering individuals and communities living in disaster prone areas (Binas, 2010). CDRR works on the basis that natural hazards are caused by human activities. The aim of CDRR is to prevent hazards, mitigate against risk and reduce vulnerability through building both individual and community support systems (Binas, 2010). The process of CDRR involves bringing individuals together to address a risk and collectively pursue disaster risk reduction measures. The target is to create communities that cohesively deals with conflicts, address risks and implement tasks that help them bounce back when natural hazards occur (Binas, 2010). CDRR considers that disasters are localized within a community, the first responders are normally people within the community and that communities are the foundation of any society, nation and the world (Binas, 2010). CDRR consist of seven steps which are the: Selection of communities based on disaster history; understanding the community at risk; risk and vulnerability assessment; risk reduction planning; grass root implementation; formal endorsements by local and national government and participatory monitoring and evaluation(Lassa, Boli, Nakmofa, Fanggidae, Ofong & Leonis, 2018).

CDRR approach has been implemented worldwide with considerable success and failures in equal measure. For example, in Indonesia, CDRR approach was launched in late 1990's in

Toineke a village in Eastern Indonesia which had experienced humanitarian crisis arising from El-Nino, droughts and floods (Lassa *et al.*, 2018). The implementation of CDRR in the area realised that disaster specialist and community had different perception on risks and hazards. While specialist considered droughts and floods as the only hazards, the community considered lack of skills, human resources, lack of market access and lack of farming technology as risks that affected their ability to cope with effects of natural hazards (Lassa *et al.*, 2018). One of the important lessons learnt through participatory processes was that community elders identified the source of risks and vulnerabilities facing the community for a long time. This enabled implementation of projects that reduced floods and droughts in the area. Considerably Lassa *et al* (2018) concluded that CDRR planning should capture all aspects of people's lives such as shelter, education, nutrition and social dimensions. In China, CDRR approach has been used to build capacities of communities, improve policy and laws on disaster management (Yi & Zhao, 2013). However, the success of CDRR remains affected by lack of community participation, inefficient community organizations and failure of local communities to adopt a culture of safety first.

In sub-Saharan Africa, CDRR has been implemented in several countries, most significantly is the use of CDRR approach in managing veld fires in Zimbabwe (Dube, 2015). The CDRR measures involve; early warning systems, access to emergency response, evacuation plans, education and training of communities. In evaluating the effectiveness of CDRR activities, Dube (2015) observed that local communities were not well prepared to manage veld fires despite existence of CDRR activities in the area. He observed that local district civil protection unit lacked experience in disaster risk reduction which then meant that fire disasters would continue to occur. The three case studies discussed above suggest there are issues with sustainability of CDRR activities in different communities. Therefore, it is necessary to identify factors that affect sustainability of CDRR projects in communities.

Sustainability of CDRR is important if such projects are to achieve their aims of improving living conditions and quality of life of local communities (Ceptureanu, Gabriel, Luchian, & Iuliana, 2018). The need for sustainable CDRR projects arises from the fact that initiating the projects is costly and early termination often leads to negative effects such as lose of trust from local communities where such projects are implemented (Ceptureanu, Gabriel, Luchian, & Iuliana, 2018). Ceptureanu *et al* (2018) propose that sustainability of community projects be

evaluated using indicators occurring at three levels. These are: Individual level which comprise of indicators that assess benefits of CDRR projects to individuals or households, organization level which focuses on continuation of program activities within the host-organization and community level which consists of indicators that measure capacity of the community to continue with the project (Ceptureanu *et al.*, 2018).

Developing an understanding on factors that influence sustainability of CDRR projects is important since just like other community-based projects its success depends to certain features in the community. These features include the fact that CDRR relies on community-based approach to identify community resources that will help in risk reduction and developing solutions that support the community needs. Hence CDRR projects that correctly identifies community resources are likely to remain sustainable over a long time (UNISDR, 2015; Ceptureanu *et al.*, 2018). Another feature in the success of CDRR projects is community acceptance and involvement. To ensure sustainable projects it is important to realise that community members have better understanding and are suited in using their skills and resources in solving their problems (Ceptureanu *et al.*, 2018). Failure to consider community acceptance and involvement often leads to collapse of community projects (Mulwa, 2010). The success of CDRR projects also requires implementation of projects that do not undermine the socio-cultural practices of the community. CDRR projects that undermine cultural practices would be rejected by communities thus affecting its sustainability (Oino, Towett, Kirui & Luvega, 2015).

Disaster risk reduction (DRR) activities in Kenya is under the management of national DRR. Disaster Risk Management is coordinated by the Directorate of Special Programmes under the Ministry of Devolution and Planning and Ministry of Interior and Coordination of National government (United Nations Development Program, 2018). Some of the projects implemented at national levels includes: Post-Election Violence Livelihoods Recovery Project whose aim was to restore and expand livelihoods opportunities for communities affected by the post-election violence in 2007/2008. Drought recovery program set up to improve the resilience of communities in Turkana and Garissa counties which were worst hit by recent droughts. Most recently closed project is the refugee host project which sought to reduce conflicts, improving

living conditions and mitigate effects of drought on communities hosting refugees (UNDP, 2018).

Apart from the National level projects, several CDRR projects have been implemented across the country. Most notable ones include: Rehabilitation of rangelands in Walda location, Moyale County with aim of increasing pasture to mitigate against shortage of livestock feed during drought period. Another CDRR is the Merti Integrated Development Programme (MID-P) whose focus was to increase advocacy of community which has resulted in community led efforts to counter creation of wildlife conservancy in the Chari rangeland. The restocking of load camels in Marsabit North contributed in reduction of women load and costs of water especially during famine (Gordon, 2012).

In Evurore Ward, one significant CDRR project has been implemented by St Order of Augustine at Ishiara Parish. This is a community resilience and climate change adaptation project in an area prone to drought. The aim of the project is to build cooperative community approach to climate change adaptation, natural resource management and disaster risk preparedness. This project aims to increase food security, diversify household income and thus enhance the resilience of residents when faced with droughts. The CDRR project is being implemented using two approach; Water for Food Security and Climate Change Adaptation and Community Resilience. Projects under water for food security involves provision of irrigation water, farming inputs and capacity building on sustainable natural resource management. While climate change adaptation and community resilience focuses on providing education on agriculture, farming practices, training on natural resource management and building nutritional capacity at household level (<http://augustinians-un.org/projects-in-kenya/>). The implementation of these projects has brought about significant benefits at household levels and within communities involved. However, extensive assessment on factors that would affect the sustainability of such projects has not been conducted despite the success of the projects. Therefore, this study sought to assess how perceived factors related to community governance structure such as community participation, community disaster risk awareness, community environmental conservation practices and agricultural extension services would influence sustainability of CDRR projects in Evurore Ward. This is important since even well-purposed

projects can increase vulnerability of communities if sustainable practices are not incorporated early in the project.

1.2 Statement of the Problem

Project sustainability is considered one of the greatest challenges affecting communities after its termination. While project implementers' temporarily look into the success of projects, training of community members in managing projects should be one of the primary need for the cycle of sustainability of these projects (Nyaga and Muturi, 2015). Community Disaster Risk Reduction (CDRR) approach has enabled communities to acquire knowledge through training and participation in putting up disaster risk reduction measures to help mitigate any risk occurrence in their areas. However, the issue of sustainability continues to affect implementation of Community Disaster Risk Reduction projects. Due to lack of sustainability, it is estimated that 40% of community projects never achieve the intended objective of improving community livelihoods (Hallegatte, Vogt, Bangalore & Rozenburg, 2017). Failure to consider and plan for sustainability measures makes project operates for a short period of time never to impact meaningful change in the communities. In Evurore, Order of St Augustine by Trocaire International is implementing two CDRR projects after previous attempts to initiate similar projects in the area achieved little success in a drought prone area. The current projects water for food security and climate change adaption and community resilience intends to make community less vulnerable from effects of drought. These projects, however, have not achieved significant success at household level within the community. Despite the effort to realise the success, certain human activities such as charcoal production and encroachment of the water catchment areas for agricultural purposes continue to occur. These activities continue to persist and increases the vulnerability of the community to natural hazards such as drought. Therefore, there is need for assessing perceived factors that influence sustainability of community disaster risk reduction projects in Kenya, Evurore ward Embu County

1.3 Purpose of the Study

The purpose of the study was to investigate perceived factors that influence sustainability of community disaster risk reduction projects implemented by St Augustine projects in Evurore ward, Embu County.

1.4 Objectives of the Study

This study was guided by the following objectives:

- i. To determine the influence of community participation on sustainability of community disaster risk reduction projects in Evurore ward, Embu County.
- ii. To examine the influence of community disaster risk awareness on sustainability of community disaster risk reduction projects in Evurore ward, Embu County.
- iii. To establish the influence of community environmental conservation practices on sustainability of community disaster risk reduction projects in Evurore ward, Embu County.
- iv. To examine the extent at which agricultural extension services influence sustainability of community disaster risk reduction projects in Evurore ward, Embu County.

1.5 Research Questions

The study sought to address the following research questions:

- i. How does community participation influence sustainability of community disaster risk reduction projects in Evurore ward, Embu County?
- ii. How does community disaster risk awareness influence sustainability of community disaster risk reduction projects in Evurore ward, Embu County?
- iii. How does community environmental conservation practices influence sustainability of community disaster risk reduction projects in Evurore ward, Embu County?
- iv. To what extent does agricultural extension services influence sustainability of community disaster risk reduction projects in Evurore ward, Embu County?

1.6 Significance of the Study

Project sustainability is one of the primary goals for attaining sustainable development across the globe and especially within Africa. To achieve sustainable development at grass root level, local communities need to mitigate related natural and man-made hazards that hinder development of their livelihood project through disaster risk reduction. Uncontrolled and unchecked hazards may create an impact to the communities, the nation and its borders in terms of great economic loss, and high mortality rate. The relevance of the study was to identify effort put in place by the communities in adopting disaster risk reduction projects. The study identified ways of achieving and maintaining sustainable development to mitigate poverty at the grass root level of communities and to reduce over-dependency on aid funds. Therefore,

the findings of the study would be useful to the local communities in highlighting the success of CDRR projects which can be replicated in different communities' country wide. The findings of the study would help communities identify the threats to sustainability of CDRR projects. The results of the study provide information to the national government to guide in developing policy frameworks to be used in guiding implementation of CDRR projects. The study findings help in providing information that will enable county government develop work-plan and county strategic plan on disaster management. Results from the study would also be useful to stakeholders on identifying potential strategies of managing both short- and long-term disaster risks.

1.7 Delimitations of the Study

The study focused on four independent variables that were considered as being essential towards achieving sustainability of CDRR projects. These were; community participation, disaster risk awareness, environmental conservation practices and agricultural extension services. The dependent variable of interest was sustainability of CDRR projects. The study was conducted within an on-going CDRR project located in Evurore Ward-Embu County. The key respondents were the local community member engaged in CDRR projects sponsored by Trocaire International.

1.8 Limitations of the Study

Some of the respondents due to their state of illiteracy required a translator fluent in local language to help in interpretation of the questions so as to enable them provide the needed information that would draw meaningful conclusion for the study, hence the process of data collection took more time than the projected timeline.

The study was based on only one area, therefore a smaller sample size, which significantly limits the ability to generalize the findings realized. This may happen since the conclusions on the findings may not be true about other areas within Embu County where drought has since been reported for over decade. To mitigate this challenge, the researcher ensured that respondents provided responses to all items in the questionnaire. This helped in avoiding missing information which would affect the ability of the sample to provide adequate data and results.

1.9 Basic Assumptions of the Study

It is assumed that the respondents would cooperate and give true information during the period of data collection, that the weather would be good, and that the respondents would be easily reached. It is also assumed that there is a good working relationship between the local community members and the project coordinators in facilitating and ensuring that the projects run smoothly and are in operational.

1.10 Definition of Significant Terms as used in the Study

Agricultural Extension Services: These are advisory agricultural services rendered to community farmers at the local government to help in improving their agricultural productivity. Agricultural extension services provide farmers with duly and precise knowledge including range of crop prices, knowledge on soil type for plantation of various crops, newly introduced seed varieties, crop management, and produce markets thus enabling sustainable management and development of agricultural resources.

Community Disaster Risk Awareness: This refers to community perception and understanding on disaster; risk of disaster occurrence and level of preparedness towards disaster occurrence.

Community Disaster Risk Reduction (CDRR): Refers to building communities' capacity by strengthening their foundation of safety through prevention and mitigation of potential hazards that may render them more vulnerable to economic loss and mortality. CDRR reduces the degree of vulnerability of risk within communities and in turn increases their survivability and sustainability.

Community Environmental Conservation Practices: This will be assessed both as knowledge on practices that promote environmental well-being and measures used by community households in conserving the environment

Community Participation: This refers to level of involvement and engagement in planning, implementation and evaluation of community –based risk reduction projects in Evurore ward.

Sustainability of Community Disaster Risk Reduction Projects: Sustainability refers to maintaining at equilibrium the three pillars of sustainable development that is social, economic and environmental factors in harmony without possible mismanagement of either. On the other hand, sustainable development is meeting the needs of the present without compromising and depleting the needs of the future generation. By doing so, communities can manage and reduce disaster risks hazards that may affect their projects.

1.11 Organization of the Study

The study is organized into five chapters. Chapter one covers introduction of the study. This constituted background of the study, statement of problem, purpose of the study, objective of the study, research questions, significance of the study, scope of the study, limitation of the study, assumption, operation definition of terms and finally the structure of the study. Chapter two covers literature review based on the research objectives that addressed community participation, community disaster risk awareness, community environmental conservation practices and agricultural extension services influencing sustainability of community disaster risk reduction project. Chapter two also includes the theoretical framework, conceptual, knowledge gap and summary of the literature review. Chapter three contains research design, target population, sample size to be used, sampling procedures, research instruments and their validity, data collection procedures, techniques for data analysis, ethical considerations and operational definition for variables. Chapter four covers data analysis presentation, interpretation and discussion while chapter five discussed the summary of the findings, discussion, conclusion, recommendations and suggestions for further research.

CHAPTER TWO LITERATURE REVIEW

2.1 Introduction

This chapter covered, a critical review of published literatures which are organized according to the study objectives. It presented the concepts of sustainability of community disaster risk reduction projects, described literature related to influence of community participation, community disaster risk awareness, community environmental conservation practices and agricultural extension services to the sustainability of community disaster risk reduction projects. It also presented the theoretical framework and conceptual framework. The chapter concluded by providing knowledge gaps and a summary of the literature review.

2.2 Sustainability of Community Disaster Risk Reduction Projects

The United Nations in 1987 through the Brundtund Commission released a report whose key theme was achieving sustainable development. In long-term stability the focus is on ensuring that both social, natural and man-made resources/capital last long enough to sustain needs of those in need of those resources. While inter-generational equity addresses the fact that use of resources by current generation should not deprive future generation the opportunity to use similar resources. As argued by Emas (2015) future generations should not bear the burden of inappropriate pollution or depletion of natural resources by current generations.

Sustainability is a synonym of sustainable development; from the definition of sustainable development it is evident that key theme is ensuring that resources sustain the needs of both current and future generations. In this paper, the definition of sustainability as provided by Salas-Zapata & Ortiz-Munoz (2019) will be used. They indicated that sustainability can be defined using four constructs/concepts namely: A set of social and ecological criteria that guides human action; an object characterised by behaviour of systems in terms of resilience, balance and adaptive capacity; a goal of humankind to achieve best social, economic and environmental consequences and as an approach of study (Salas-Zapata & Ortiz-Munoz, 2019). This paper applied the definition of sustainability as an object characterised by behaviour of systems in terms of resilience, balance and adaptive capacity (Salas-Zapata & Ortiz-Munoz, 2019). It evaluated the capacity of community based-risk reduction projects to promote sustainable use of resources in promoting resilience of a community living in an area exposed to multiple occurrences of natural disasters.

Several studies have explored on concept of sustainability as an object. For example, Arias & Halliday (2013) assessed on sustainability of Peruvian Anchovy fisheries and observed that clearly defined resource boundaries, rule enforcement and appropriate conflict resolution mechanisms were vital in promoting the sustainability of the fisheries. Similarly, Montazar (2013) indicated that decision-making model is key in ensuring sustainable use of water resources in irrigation. He indicated that decision making that utilises planning tools is important in sustainable implementation of irrigation projects. Other studies have explored on sustainability as an object and it includes Enqvist, Green, Masterson *et al* (2018) who indicated that close collaboration and dialogue among actors in a project is essential in achieving sustainability of projects. In understanding the sustainability of community-based risk reduction project, Lassa, Boli, Nakmofa *et al* (2018), indicated that community participation in risk identification, risk ranking and prioritizing of projects are critical in ensuring sustainability of community-based projects. In application of sustainability as an object the study sought to evaluate the influence of community participation, community disaster risk awareness, environmental conservation practices and agricultural extension services as important elements that influence sustainability of disaster-risk reduction projects in Evurore ward. Through this approach the sustainable performance of community disaster risk reduction projects in promoting community resilience, environmental conservation, and ecological impact amidst the occurrence of disasters were assessed.

2.3 Community Participation and Sustainability of Community Disaster Risk Reduction Projects

Community participation is an integral component in sustainable development goals as it allows community to become custodians of their own development agenda. Community participation has been defined as a social process through which a community takes an active role in needs assessment/identification, decision making and identifying means of attaining their needs (Ofuoku, 2011).

As a process, community participation occurs along a continuum, from passive (low) to active (high) participation. Within this continuum there are 4 levels namely, passive, interactive, functional and optimal (Ochunga & Awiti, 2017). In passive participation the community has no role in resource allocation and decision making since funders have assumed the primary role of prescribing solutions to community problems. The role of community is just like a pupil in a classroom to listen attentively to the prescribed solutions. In interactive level community

participation is achieved through involvement of community in planning, decision making and control as well as involvement in learning best practices (Ochunga & Awiti, 2017). In functional participation, there is involvement of the community in formation of the group project, formation of supervisory committee for the project and in establishing goals of the project. Functional participation tends to achieve greater participation from the community compared to passive and interactive levels. The last level is optimal participation which is characterised by community taking an active role in evaluating reason for participation, analysing the effectiveness and benefits of their participation and having control over operations of the project (Ochunga & Awiti, 2017).

Similarly, Noor (2017) indicated that community participation can be achieved through four techniques which are; participatory need assessment, participatory planning and design, participatory implementation and participatory monitoring and evaluation. He indicated that using these techniques improves the participation of community in all stages of a project thus increasing long-term sustainability of the project.

Studies have explored on importance of community participation in promoting sustainability of projects with mixed results being reported. Ceptureanu, *et al* (2018), identified and ranked sustainability factors based on their impact on project continuity. In their study, community participation was ranked second overall as an important measure of sustainability. They observed that adequate community involvement determines how fast and successful a project will be implemented and lack of community participation leads to slow and less adaptation of the project. Although their study ranked community participation as the second most important element in project sustainability, they did not describe how levels of community participation would impact on sustainability of projects. As such it would be necessary to explore in this paper what level of participation is sustainability achieved.

On the other hand, Hes (2017), explored on impact of community engagement on sustainability outcomes and provided four mechanisms through which participation can be achieved. She indicated that first mechanism comprises of establishing objective of participation, creating inclusiveness, provision of information through capacity building, setting up spaces for dialogue and having transparency during engagement (Hes, 2017). The second mechanism is that meaningful participation should start early with community narrative being explored throughout. The third mechanism deals with providing feedback as a way of promoting

meaningful participation. The fourth mechanism is to establish measures or indicators that can help monitor the extent of community participation. Information from the fourth mechanism would then be used to improve future efforts in community participation (Hes, 2017).

Project performance is linked to adequate community participation and lack of adequate participation makes a project less successful. For example, Mbui and Wanjohi (2018) sought to establish what influence community participation has on financial management, governance, operations as well as maintenance and monitoring of water projects in Ruiru, Meru County. They observed that passive community participation as characterised by apathy and stakeholder marginalization. They noted that community role was only to elect project leaders and members rarely attended project meetings and did not participate in decision making. However, they observed that community members took an active role in providing resources (labour, funds and materials) needed for the project but donor took a more active role in project oversight. Their findings point that community participation was not well undertaken and the project leaders failed to incorporate ideas from community. However, despite these important findings, their study only established that financial management, project governance, operations and management as well as monitoring and evaluation only had moderate influence on project performance. Their findings suggest that there are more factors within community participation that would enhance the sustainability of a project. As such this study seeks to identify which elements of community participation that would impact on sustainability of a rural based community disaster risk reduction projects.

Community participation in disaster risk reduction projects has been evaluated and it has been realised that it is an essential element in sustainability of these projects. Macherera & Chimbari (2015) assessed community participation in development of early warning systems as part of disaster prevention. They observed that early warning systems are concentrated at national and regional level with little or no input from the community. For example, they established that results from a pastoral early warning system did not stimulate response or action since the community were not aware of such systems and were equally not involved in developing response plan. Their findings suggest that lack of community participation can lead to no action thus reducing the viability of well-intended community projects. Similar findings were observed by Dube (2015) in exploring the use of new strategy and model for improving disaster risk reduction. He observed that incorporating community members as part of the district civil

protection unit is key in improving the capacity of local community in dealing with fires. He emphasised that community participation should be the first step in a new model for disaster-risk reduction strategies.

In documenting the experience of community-based disaster risk reduction in Indonesia, Lass *et al* (2015) observed that in one of the project villages newly constructed roads were destroyed by floods. However, the new planning documents to rehabilitate the roads did not mention floods as the cause of destruction. They observed that planners did not involve community members in risk assessment but rather outsources a project template for a big road project from the national level. Their findings highlight that ignoring community participation at early stages of planning is setting up a project for failure. They concluded from their findings that failing to involve community reduces the chances of intended social change and further limits the possibility of future cooperation when new projects are to be rolled out. Adesida & Okunkola (2016) assessed on effects of community participation in maintenance of rural infrastructure in Ondo state, Nigeria. They observed that community participation creates ownership and increases level of commitment in project implementation. They observed that improved education levels of community members were associated with increased level of participation in community projects. Based on the findings from literature review above it is necessary to evaluate how community participation influences the sustainability of community-based disaster-risk reduction projects in the local set-up.

2.4 Community Disaster Risk Awareness and Sustainability of Community Disaster Risk Reduction Projects

Awareness on nature and risks of disaster is an important element in implementation of community disaster risk reduction projects. As indicated by Macherera & Chimbari (2015) lack of awareness by a community on an early warning system yielded no action when disasters occurred. They indicated that creating awareness improves community's capacity to deal with disasters and participate in decision making while failure to create awareness leads to lack of participation. Community awareness can be evaluated in terms of what a community perceives to be a risk or considers to be a disaster. Lassa *et al* (2015) indicated that in many instances disaster risk reduction projects have failed to achieve their intended purposes because of failure to incorporate community definitions or ranking of what they considered to be disaster risks. They indicated that project planners should consider community perception and awareness of risk and disasters. In their study they observed that project implementers only considered

flooding and drought as disasters while the community ranked pests and diseases as a major risk to community resilience.

Community awareness is part of the strategies proposed towards promoting sustainability of disaster risk reduction projects. Hes (2017) explained that utilizing local or traditional knowledge in the community in early warning systems promotes understanding on local causes of disasters. She argued that awareness informs the community on the level of their vulnerability and helps them adopt measures to reduce their vulnerability. She further explained that community risk awareness and assessment is the first step in disaster reduction framework as such local understanding of what is considered a disaster risk should be explored at all levels (Hes, 2017). In understanding the importance of awareness, Ceptureanu *et al* (2018) ranked community awareness at the same level with community participation. They indicated that building community awareness of risk is part of creating opportunity for community participation in projects. In concurrence, Cubelos *et al.* (2019) argued that due to unpredictable nature of disasters, improving community awareness and risk perception then becomes important step in disaster management.

Role of community awareness of risk in disaster management has been assessed through different studies. In a study conducted in Chileto establish level of community awareness towards disasters established the local community had higher level of awareness of risks and threats of tsunami (Cubelos *et al.*, 2019). They observed community awareness was more than awareness level of the local authorities responsible for managing disasters in local areas. They attributed high awareness levels to transmission of knowledge from one generation to another. In demonstrating awareness, the local community was able to identify; tsunami risk areas, flood prone areas, critical infrastructures that can help in recovery following tsunami, safe zones for evacuations and areas of possible contamination following flooding (Cubelos *et al*, 2019). Their findings demonstrated that community knowledge and awareness of disaster risks cannot be ignored. They argued that with such high level of awareness the community views should be sought and incorporated in disaster risk reduction projects, without which the project is less likely to be sustainable.

In contrasts, in a study conducted in Nepal observed low levels of community awareness on risk and occurrence of disasters (Tuladhar, Yatabe, Dahal & Bhandary, 2015). They observed that more than three quarters of their respondents had no awareness of what are considered

major disasters in Nepal despite the country being a prone to natural disasters. They further observed that respondents did not consider themselves at risk of being affected by disasters (Tuladhar *et al.*, 2015). Their study demonstrated low levels of risk perception and awareness towards disasters and it was therefore necessary to assess if similar occurrence is replicated in Evurore area which is also prone to natural disasters.

Khan (2017) assessed the influence of risk awareness in disaster preparedness in Pakistan and observed a positive correlation between awareness and preparedness. He observed that community members were able to identify destruction of forests, climate change and burden of monsoon rain as leading causes of flooding. In the same study Khan (2017) observed existence of myths in which community members attributed flood disasters to be punishment from God. In terms of demographic factors that influence risk awareness and perceptions, Khan observed that households with improved level of education had higher understanding on risk of disasters compared to households with low level of education. The findings highlighted need to assess contribution of demographic factors such as education, gender and family size on disaster risk awareness.

2.5 Community Environmental Conservation Practices and Sustainability of Community Disaster Risk Reduction Projects

Community environmental conservation practices and response towards disasters affects the sustainability of disaster risk reduction projects in many areas (Lassa *et al.*, 2015). Uptake of conservation practices is influenced by several factors such as land ownership and risk awareness. In a study conducted in a flood prone area of East Timor, Lassa *et al* (2015) observed that some community members declined to have flood dykes pass through their land. They observed that occurrence of flood was high in areas where farmers declined the dykes to pass through their farms. Their findings suggested that failure of local communities to undertake construction of dykes as a measure of protection against floods increased their vulnerability and equally affected long term control of floods. On the other hand, they observed that certain practices as implemented by local farmers helped prevent occurrence of health hazards following occurrence of floods. Such practices included, construction of artificial riverbanks; raising the floors of houses as well as crop diversification (Lassa *et al.*, 2015).

Enhancing environmental conservation practices such as land use, combating desertification and promoting sustainable agricultural practices are critical in prevention of disasters (Has,

2017). Iloka (2016) in his assessment of indigenous knowledge for disaster reduction in Africa, argued that use of plant derivatives such as oil and ash from trees such as eucalyptus and neem were effective in pest control without causing harm to the environment. He observed that use of plant derivatives promoted growing of beneficial trees for medicinal value which in-turn conserves the environment. Furthermore, Iloka (2016) indicated that practicing mixed cropping and minimum tillage as practiced by local farmers helped in soil conservation and preservation of soil nutrients. Through these practices that promoted soil conservation farmers achieved adequate harvest and food security. In addition, he highlighted that conservation practices such as planting of indigenous trees such as bamboo and raffia by local farmers in Nigeria helped strengthen riverbanks thus preventing soil erosion and landslides. His findings highlighted important indigenous practices that help in prevention of disasters hence it was important to assess in the study those indigenous practices used by local farmers.

In understanding the role of indigenous knowledge in drought risk reduction Muyambo, Bahta, and Jordaan, (2017) observed that two-thirds of farmers used indigenous knowledge in farming and drought reduction. They observed that indigenous knowledge used by farmers included, observing behaviour of animals and birds to predict drought. They also practiced identification and sprinkling ash on good maize cobs for use as seeds during planting season. Other beneficial practices included rituals towards drought preparedness in sacred forests (Muyambo *et al.*, 2017). By conducting these rituals in sacred forests, communities practice conservation of forests since it is considered a taboo to cut trees from such forests. Dube & Munsaka (2018) explained the vital contribution of indigenous knowledge in disaster prevention. They indicated that despite being undocumented indigenous knowledge is an important part of disaster risk reduction measures. Therefore, it is necessary to assess indigenous knowledge that exists in the study area and what impact it has on disaster risk reduction.

Onset of climate change required local communities to develop adaptive strategies. In a study conducted in rural Zimbabwe to examine use of indigenous knowledge towards adapting to climate change observed that local farmers were highly adaptive to climate change (Mugambiwa; 2018). For example, local farmers switched from growing maize to millet and Sorghum which were drought resistant. He observed that farmers practiced mulching in their farms and constructing temporary dams in rivers to store water for use in dry season. These practices indicated that local communities are conversant with helpful practices that can help address harmful effects of disasters arising from drought.

2.6 Agricultural Extension Services and Sustainability of Community Disaster Risk Reduction Projects

The United Nations, Food and Agriculture Organization indicated that aim of extension services is to develop technical skills of farmers through equipping them with knowledge, information, technology and business skills that improve agriculture productivity (Food and Agriculture Organization, 2010). Extension services is achieved through technology transfer, rural learning sessions, practical demonstrations and direct involvement of farmers in solving agricultural problems. Other extension services include; promoting capacity for good agricultural practices, linking farmers with input dealers and market as well as education farmers on value addition techniques (Danso-Abbeam, Ehiakpor, Aidoo, 2018). In their study to assess the role of extension services in promoting farm productivity, Danso-Abbeam *et al* (2018) indicated that extension services had positive impact in improving farm productivity at household level. They observed that farmers with long farming experiences were more adaptive to extension services. However, their study despite its findings did not assess the impact of extension services on sustainable farming practices.

Berhane, Ragasa, Abate and Assefa (2018) assessed on the impact of agricultural extension services (AES) on farm productivity. They described agricultural extension services as comprising; crop production services, crop protection; livestock production techniques, and natural resources management such as agroforestry, soil conservation, and water harvesting (Berhane et al., 2018). They observed that access to extension services had more than doubled across Ethiopia. They observed that crop production services and natural resources management were adopted by most farmers. These included practices such as proper seed selection and use of irrigation in crop production.

The role of extension services in promoting sustainability of disaster related projects has been addressed in several studies. Ogemah (2017) in examining ways of modernizing farming in Africa, highlighted that poor farming practices such as mono-cropping, excessive use of pesticides, poor tilling practices that depletes soil nutrients are common among many farmers. He suggests that use of sustainable agriculture extension services in promoting farming practices that are protect and conserve the environment. In a study conducted in Indonesia, Mariyono (2019) indicates that through extension services, farmers have been educated on mixed farming practices that has resulted in improved crop production and concurrent

reduction in famine. Both studies have demonstrated the beneficial aspects of AES and it will be necessary to determine, availability, access and impact of AES as part of disaster risk reduction strategy in Evurore ward, the proposed study area.

2.7 Theoretical Framework

This study was guided by the Social change theory

2.7.1 Theory of Social Change as Proposed by Doug Reeler (2007)

Key assumptions in this theory includes: project interventions stimulate change and are means of delivering development; problems exist and can be discerned by cause and effect analysis through application of a logical problem tree; participatory process at planning stages that gets everybody involved creates ownership and sustainability; external and internal disruptions and inconveniences that arise from project implementation should be addressed as the project moves along. Lastly, proper planning is key to project success. In planning outcomes, and expected impacts are described in action plans in a logical way (Reeler, 2007; Serrat, 2013).

The theory observed three major changes namely emergent, transformative and projectable change. Emergent change deals with day to day activities of communities in adjusting to improve or enhance their practices and knowledge when faced with shifting realities such as disasters. Emergent change is largely influenced by emotions, perceptions and intentions of the community. Transformative change occurs through crisis and unlearning of formed habits that hinder development. For example, faced with effects of climate change, farmers can choose to adopt planting drought resistant crops or using irrigation as opposed to primarily depending on rain fed agriculture. Projectable change occurs when communities or individuals identify visions or outcomes to be achieved and then develop action plans to achieve the change they desire. Projectable change is achieved through problem fixing and creative change (Reeler, 2007; Serrat, 2013). In problem fixing for example lack of water in community is addressed by drilling boreholes to provide water. While in creative change focus is not on problem fixing but developing long-term solutions that address lack of water such as reforestation of water catchment area.

The theory highlights three considerations in promoting sustainability of projects. First in dealing with communities that are less conscious of their problem it is necessary to introduce

change slowly without rush. The aim is to help people understand their own risks and identify resources that can help build their resilience. Secondly transformative change can only occur when impact of crisis has been understood. This theory asserts that conventional approach to development that ignores local crisis more often creates resistance and unsustainable projects. Third to achieve community participation implementation of projects should not alienate local culture and practices (Reeler, 2007; Serrat, 2013).

Twigg (2015) explored the application of theory of change in disaster risk reduction project. He explained that theory of change should be applied during project planning and in monitoring and evaluation of a project. Key strengths of this theory of change is that it highlights the importance of preparation in project planning as key in attaining sustainability of a project. It also clarifies that adequate stakeholder participation and contribution creates project ownership hence sustainability (Twigg, 2015).

Key weakness of this theory is that its approaches might not be applicable in emergency responses when disasters strike. Understanding community perception of risks takes time and application of emergent change approach in emergency is therefore limited. However, this theory adequately captures three approaches that can promote development of sustainable projects in response to disaster in communities.

2.8 Conceptual Framework

The conceptual framework described the relationship between different variables within the study as illustrated in figure 1. This structural description illustrated the possible underlying factors influencing sustainability of community disaster risk reduction projects. Independent variables are community participation, community disaster risk awareness, access to agricultural extension services and existing environmental conservation practices. Community participation covers level of involvement and decision making by the community members, which are key in ensuring sustainability of their projects.

Community disaster risk awareness as the second independent variable explains that awareness on risks associated with different types of disasters may improve the capacity of the community members to identify, mitigate and be prepared to act when natural hazards occur.

The third component of independent variable is the community environmental conservation practices identifies farming practices. Good farming practices helps in soil conservation and

preservation of soil nutrients. Implementing environmental conservation practices are critical in long term control of natural disasters. Use of indigenous knowledge by communities to enhance farming productivity and drought reduction are effective in promoting sustainability of disaster risk reduction projects.

Lastly use of agricultural extension services through technology transfer to equip farmers with knowledge on good farming practices helps in solving agricultural related problems. Extension services equips farmers knowledge needed in as far as improving sustainability of community disaster risk reduction projects is concerned.

The dependent variable for this study is sustainability of community disaster risk reduction projects. Key elements of sustainability include reduction of harmful farming practices, utilization of new information and adoption of new farming practices by households.

Independent Variables

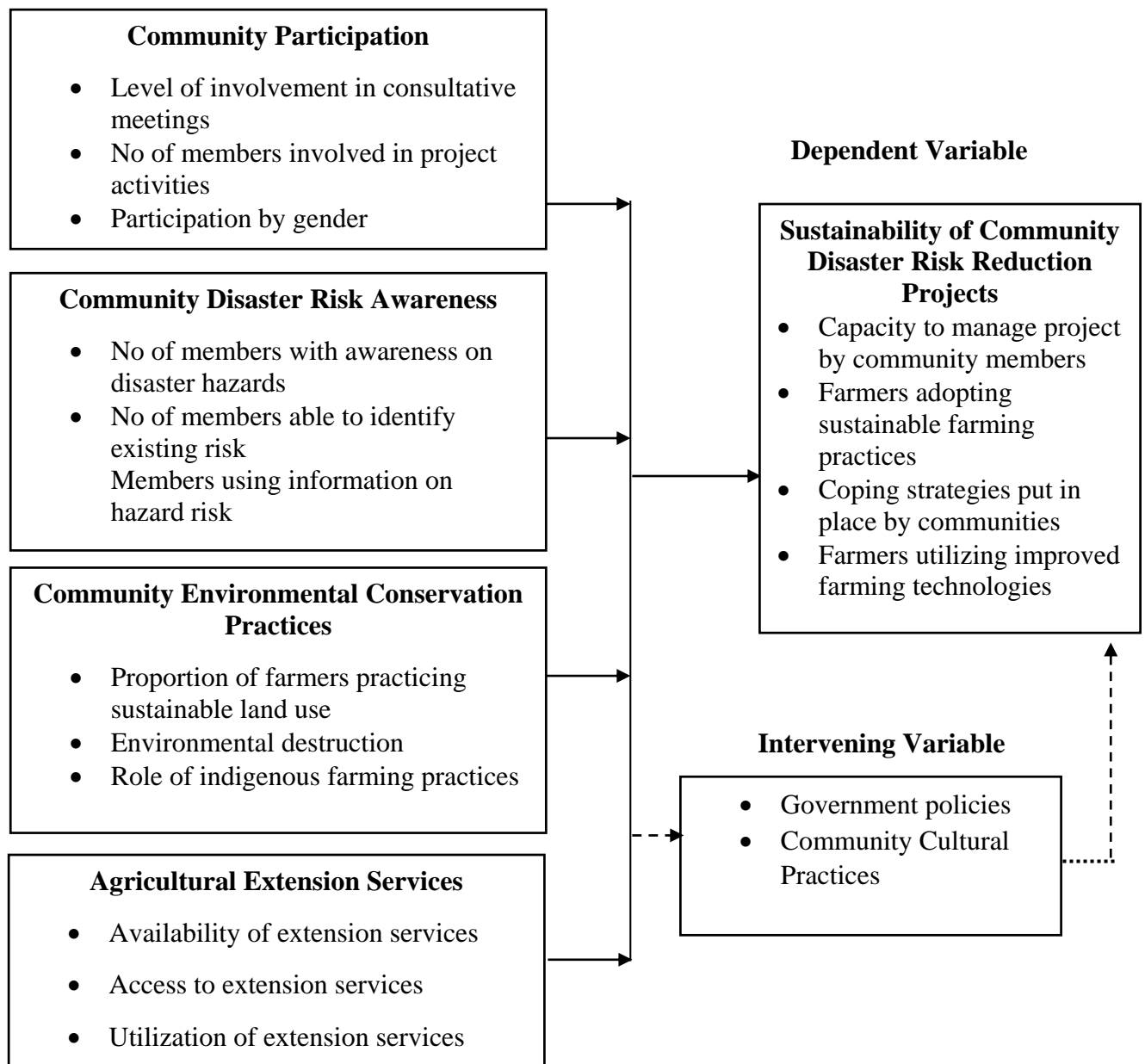


Figure 1 : Conceptual framework

2.9 Knowledge Gap

The literature review identified several knowledge gaps that are of importance for this study. The gaps are presented in table below.

Table 2.1 Knowledge Gap Matrix

Variables	Author(s) & Year	Title of the Study	Findings	Knowledge Gaps
Community participation	Ochunga, & Awiti, (2017).	Influence of Stakeholder Participation on Sustainability of Community Development Projects Implemented by Plan International in Homa-Bay Town Sub-County, Kenya	There is negative association between passive participation and sustainability of community development projects	The study did not explore on influence of information and community awareness in promoting community participation, The study interviewed project team members from community-based organisations rather than direct beneficiary of the projects.
	Mbui. & Wanjohi, (2018).	Influence of community participation on project performance of Ruiru water projects, Meru County, Kenya	Community participation in financial planning had a moderate positive influence on project performance	This study only focused on finance and governance aspects of community participation and did not consider determinants such as access to information and gender contribution to community participation
	Dube (2015)	Improving disaster risk reduction capacity of District Civil Protection Units in managing veld fires: A case of Mangwe District in Matabeleland South Province, Zimbabwe	Involving community members as part of civil protection unit was key in improving capacity of local community in dealing with fires.	Mainly focussed on small sample size and did not explore association between gender and participation

Community awareness	Khan (2017).	Disaster Management Risk Perception of Local Communities.	There is positive correlation between risk perception and experience in disaster management. Level of education had significant influence on risk perception.	The study did not explore on the association between gender and risk awareness. The study used convenience sampling method rather than probability sampling approach
	Cubelos <i>et al</i> (2019)	Understanding Community-Level Flooding Awareness in Remote Coastal Towns in Northern Chile through Community Mapping	Community had more awareness on disasters and risk than authorities Involving community is therefore important	The study used a limited sample of 10 participants of which 9 were females and only one male. Study did not include views of younger generation since most participant were above 55 years.
	Tuladhar <i>et al.</i> , (2015)	Disaster risk reduction knowledge of local people in Nepal	Community had low levels of risk perception and awareness towards disasters	This study assessed awareness on all forms of disaster. Did not focus on specific type of disasters that are unique to the local area.
Extension services	Danso-Abbeam & Aidoo (2018).	Agricultural extension and its effects on farm productivity and income: insight from Northern Ghana.	Extension services improves farm productivity	The study did not assess on proportion of farmers with access to extension services. The study did not describe impact of extension services in adoption of sustainable farming practices.
	Berhane, (2018).	The state of agricultural extension services in Ethiopia and their contribution to agricultural productivity.	Access to extension services increases farm productivity through adoption of modern farming practices.	The study assessed the impact of extension services on improving farm productivity but not on disaster risk reduction in drought prone areas of Ethiopia.
	Ogemah (2017)	Sustainable Agriculture Developing a Common Understanding for Modernization of Agriculture in Africa	Poor farming practices are common due to inadequate use of agriculture extension services	This was review paper and did not assess farmers' role in access and utilization of agriculture extension services.

Environmental Conservation Practices	Iloka N. G. (2016).	Indigenous knowledge for disaster risk reduction: An African perspective.	Mitigation strategies used by government and disaster management experts does not recognise how local communities work.	This was a systematic review. The researcher did not collect the actual data but rather did a systematic review of other related literature.
	Mugambiwa(2018)	Adaptation measures to sustain indigenous practices and the use of indigenous knowledge systems to adapt to climate change in Mutoko rural district of Zimbabwe.	Local farmers were highly adaptive to climate change effects	Study was mainly qualitative and did not assess for association between use of indigenous knowledge and sustainability of farming practices.
	Muyambo, F., Bahta, Y. T., & Jordaan, A. J. (2017).	The role of indigenous knowledge in drought risk reduction: A case of communal farmers in South Africa.	More than two thirds of farmers relied on indigenous knowledge in their farming practices and in drought risk reduction.	This study used purposive sampling of few farmers. Did not test for association between use of indigenous knowledge and improvement in farming practices.

2.10 Summary of Literature Review

This chapter established the relationship between sustainability and different variables as described by evidence from studies related to sustainability of community disaster risk reduction projects. From literature of review, it is evident that sustainability can be measured. Promoting sustainable approaches in execution of community projects is vital in achieving sustainable development.

From the literature review several factors influence sustainability of projects. These are: Political, social, economic, technical and environmental factors. Political factors comprise government commitment in creating environment that sustains implementation of community projects. Social factors comprise community acceptance and support systems that allow early adoption of projects. Economic factors include both availability of resources and adequate utilisation of those resources. Technical factors deal with access and utilisation of new knowledge while environmental factors are concerned with ability of the project to generate enough response against environmental hazards (Twigg, 2015; Emas, 2015; Cubelos *et al*; 2019).

Literature review above has demonstrated community participation is central to sustainability of community projects. Participation should be achieved through adequate and early involvement of community members in decision making, planning and in implementation of the community projects. Participation is enhanced through mutual involvement of community members to identify goals and engage in actualization of the project goals.

From the literature awareness relates to ability of community to gauge its understanding of types of disaster common in their areas as well as risks associated with occurrence of certain disasters. The aim of disaster risk awareness is to empower community with useful information needed in decision making before disasters occur and after occurrence of disasters.

The literature view has demonstrated the intricate relationship between environmental conservation practices and occurrence of disasters. From the literature review it is possible to deduce that disasters occur when there is an imbalance in natural environment, most of which is caused by harmful farming practices. The literature has also highlighted the significance of indigenous knowledge and farming practices in promoting conservation of environment.

In exploring the role of extension services, literature reviewed has described the value of extension services in disaster risk reduction. Most significantly is the ability of extension

services in increasing the adaptive capacity of rural farmers when faced with disasters. Therefore, this study seeks to establish how the highlighted factors influence sustainability of community disaster risk reduction projects implemented by St Augustine projects in Evurore ward, Embu County.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter present research methodology. The chapter outline the research design, describes the study area, the target population, sampling procedures, data collection instruments and procedures, data analysis and ethical issues.

3.2 Research Design

The study adopted descriptive cross-sectional survey design. Descriptive study design is used to describe existing events and allows for in-depth collection of data. The cross-sectional survey allows for collection of data at one point in time (Kothari, 2010). In using descriptive cross-sectional survey, the research intended to collect information on conditions that exist, practices that prevail, beliefs and attitudes that are held, processes that are ongoing and trends that are developing. The research also used this design since it allows for quick collection of large amounts of data but at a minimal cost.

3.3 Target Population

The study was conducted in Evurore ward among households engaged in community disaster risk reduction projects. The target population was 22,272 community members engaging in climate change adaptation project as at June 2019 (Order of Saint Augustine Climate Change Project data, 2019). Community members taking part in climate change adaptation project for at least six months formed the accessible population from which the sample was obtained.

Table 3.1 Target Population

Clusters/Location	Number of Persons Taking Part in Project
Kamarandi	5,841
Ndurumori	10,705
Iria Itune	5,726
Total	22,272

3.4 Sample Size and Sampling Procedure

This section presents how the sample size was derived from the targeted population and sampling procedures used.

3.4.1 Sample Size

A sample of 393 members drawn from households taking part in climate change adaptation group was selected to take part in this study. The sample size was determined by use of Yamane's method for sample size calculation for descriptive studies (Yamane, 1967). This method is suitable when the proportion of the population with characteristic of interest is not known. The formula is also suitable when random sampling is to be used in selecting the final respondents.

$$n = \frac{N}{1 + N(e)^2}$$

Where

n = the desired sample size

N = the population under study which in this case is 22,272 community members engaged disaster risk reduction project

e = the desired margin of error is set at 95% (0.05)

Thus, desired sample size

$$\frac{N}{1 + N(e^2)}$$
$$\frac{22,272}{1 + 22,272(0.05^2)}$$

n= 393

3.4.2 Sampling Procedure

Stratified proportionate sampling method was applied to determine the number of respondents from each location. Stratified proportionate sampling is a probability sampling method in which respondents are drawn from units (strata) of the population (Kothari, 2010). The units (strata) were the location/wards where CDRR projects are being implemented. A random sample that is proportional to number of persons engaged in CDRR projects per location was selected for participation in this study. The sampling procedure described in the table below.

Table 3.2 Stratified Proportionate Sampling of Respondents

Clusters/Location	Number of Persons Taking Part in Project	Proportion in Population	Sample from Each Location
Kamarandi	5,841	0.26	$0.26 \times 393 = 102$
Ndurumori	10,705	0.48	$0.48 \times 393 = 189$
Iria Itune	5,726	0.26	$0.26 \times 393 = 102$
Total	22,272	1	393

3.5 Research Instruments

Primary data on perceived factors that influence sustainability of community disaster risk reduction projects implemented by St Augustine projects in Evurore ward was collected by use of structured and pretested questionnaires. Questionnaire allowed for a fast collection of data and can equally be used to survey a big population within a shortest time. The questionnaire used is divided into six parts. The first part covered demographic information/household characteristics of respondents. The second part contained aspects community participation; the third part section contain community risk awareness factors. The fourth part covered environmental conservation practices. The fifth part contained aspects related to extension services and use of technology. The last part covered aspects on uptake and sustainability of disaster risk reduction activities.

3.5.1 Pilot Testing of Instruments

The pilot test was done using 10% of the study sample size. The aim of pilot study is to pre-test the questionnaire to identify areas that need to be addressed prior to actual data collection (Bolarinwa, 2015). Through pilot study the researcher was able to establish relevance and appropriateness of items in the questionnaires. Pilot study was conducted in Ishiara Location among 39 community representatives 1 week prior to actual data collection. After completion of the questionnaires, the researcher conducted individual debriefing with selected respondents to obtain their feedback on the questionnaire. Through debriefing a researcher's aim was to gauge respondent's ability to respond to items in questionnaires and provide response/data

required for the study. The researcher will made use of observations from pilot study to refine items and remove any ambiguities in the questionnaire.

3.5.2 Validity of Research Instruments

Validity is the ability of a test or tools to measure what is expected to measure (Bolarinwa, 2015). Content and face validity of the questionnaire was established by subjecting the questionnaire to an expert review. In establishing face validity, the questionnaire was reviewed by the research supervisor to evaluate if all variables as described in the conceptual framework had been captured in the questionnaire. In establishing content validity, an expert on disaster response reviewed the questionnaire for clarity and accuracy to determine if the questionnaire covered concepts on sustainability of community lead disaster risk reduction strategies.

3.5.3 Reliability of Research Instruments

Reliability is the ability of an instrument to provide consistent results (Bolarinwa, 2015). To ensure that reliability is achieved, a pilot study was conducted among 39 respondents from the study area. Split-half reliability test was used to determine the internal consistency of items hence reliability of the questionnaire. In split-half technique, the researcher divided the items in the questionnaire into two halves using odd and even items and administer the two separate forms to respondents in a pilot study. Data obtained was coded and analyzed using Statistical Package for Social Sciences Version 23 to determine the correlation coefficient of the items. The aim of this test is to achieve a Cronbach alpha coefficient of at least 0.70 which indicates that the questionnaire is reliable. The total Cronbach Alpha coefficient for the five variables was 3.882 presenting an average coefficient of 0.7764 (78%) indicating an acceptable level. The results obtained are presented in table 3.3

Table 3.3 Reliability Analysis

Variables	Cronbach's Alpha	No. of Items
Community Participation	0.781	7
Community Disaster Risk Awareness	0.764	12
Community Environmental Conservation Practices	0.778	11
Agricultural Extension Services	0.753	12
Sustainability of Community Disaster Risk Reduction Projects	0.806	11

Average Cronbach Alpha coefficient

0.7764

3.6 Data Collection Procedures

During data collection, the researcher met with key stakeholders in CDRR project in Evurore ward. Through this meeting, the researcher introduced the aims of study and seeks support of the stakeholders. During the meeting stakeholders 'concerns was addressed and questions about the study were addressed. The researcher used this meeting to obtain permission from management of Trocaire International and community representatives to proceed with data collection. Thereafter the researcher and trained assistants administered questionnaire to the respondents during scheduled community meetings. Collecting data during community meetings helped reduce inconvenience to community members and expedited data collection. Procedures for data collection involved the researcher and assistants explaining the purpose of the study to potential participants and seeking their consent to collect data from them. Thereafter, the researcher and assistant administered the questionnaire to the participants. For participants who are illiterate the researcher used local research assistants who spoke local language to read and translate for respondents the contents for questionnaire as they complete the questionnaire.

3.7 Data Analysis Techniques

Data collected was coded and keyed into a computer then checked for accuracy and completeness using a Microsoft Excel program. Final data was then exported for analysis using Statistical Package for Social Sciences, SPSS-software Version 23 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics (frequencies, mean, and percentages) were used to describe the characteristics of the respondents and responses to each survey item. Inferential statistic technique, correlation analysis was done to test the strength and direction of relationship between variables and sustainability of community disaster risk reduction projects. A *p* value of less than 0.05 is considered statistically significant. Data analysed is presented by use of tables, and discussion of findings.

3.8 Ethical Considerations

Approval to conduct the study was obtained from the National Commission for Science, Technology and Innovation (NACOSTI). Permission was also sought from St Augustine at Ishiara Parish before undertaking the study. Approval to collect data was obtained from the School of Open and Distance Learning of the University of Nairobi. The researcher briefed participants using a study information sheet which explained to them purpose of the study as well as sought for their informed consent. The researcher-maintained confidentiality such that no respondent knew the identity of other respondents and ensured they participated voluntarily. Respondents were assured of their right to withdraw from the study at any stage. Researcher will also ensure that collected data is kept confidential and findings be used for research purposes only.

3.9 Operationalization of Variables

Table 3.4 Operationalization of Variables

Objective of the Study	Variable	Indicators	Measurement	Measurement scale	Data Analysis Techniques	Tools of Data Analysis
To determine the influence of community participation on sustainability of community disaster risk reduction projects in Evurore ward, Embu County.	Community participation (Independent)	Level of involvement in consultative meetings No of members involved in project activities Participation by gender	Participation by gender Participation by level of education Participation by location	Ordinal	Frequencies, Proportion Mean, Standard Deviation Pearson Correlation analysis	Descriptive statistics Inferential statistics
To examine the influence of community disaster risk awareness on sustainability of community disaster risk reduction projects in Evurore ward, Embu County.	Community Awareness (Independent Variable)	Level of awareness on community disaster risk reduction strategies	No of community members able to identify hazards No of community members able to indicate level of risk	Ordinal	Frequencies, Proportion, Mean, Standard Deviation Pearson Correlation analysis	Descriptive statistics Inferential statistics
To establish the influence of environmental conservation practices on sustainability of community disaster risk reduction	Environmental Conservation practices (Independent Variable)	Uptake of conservation practices	Proportion of farmers utilizing indigenous knowledge in farming practices	Ordinal	Frequencies, Proportion, Mean, Standard Deviation	Descriptive statistics

projects in Evurore ward, Embu County.					Pearson Correlation analysis	Inferential statistics
To establish the influence of environmental conservation practices on sustainability of community disaster risk reduction projects in Evurore ward, Embu County	Environmental Conservation practices (Independent Variable)	Uptake of conservation practices	Proportion of farmers accessing extension services Proportion of farmers using extension services	Ordinal	Frequencies, Proportion, Mean, Standard Deviation Pearson Correlation analysis	Descriptive statistics Inferential statistics
	Sustainability of community disaster risk reduction projects (Dependent Variable)	Number of farmers impacted by project Number of respondents adopting sustainable farming practices Number of respondents using early warning systems Number of respondents willing to transfer knowledge to new farmers	Proportion of farmers adapting sustainable farming practices.	Ratio	Mean, Standard Deviation	Descriptive statistics

CHAPTER FOUR DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents results of the study and discussion of research findings based on research objectives. The chapter also presents the response rate, results from reliability analysis and descriptive characteristic of respondents. Furthermore this chapter also includes respondents assessment of sustainability of CDRR project Study results are presented based on specific objectives which includes; influence of community participation on sustainability of CDRR projects, influence of disaster risk awareness on sustainability of CDRR projects, influence of environmental conservation practices on sustainability of CDRR projects and influence of agricultural extension services on sustainability of CDRR projects. Data collected was analyzed and presented using frequency distribution tables for descriptive analysis and Correlation analysis test of association for inferential analysis.

4.2 Respondents Rate

A sample of 393 participants were approached for interview out of which 374 accepted to provide responses thus achieving a 95% response rate as shown in Table 4.1. This response rate was appropriate and adequate for data analysis according to Kothari (2010).

Table 4.1 Questionnaire Return Rate

Respondents Category	n	%
Questionnaire filled and returned	374	95
Questionnaires not returned	19	5
Total Questionnaire administered	393	100

4.4 Demographic characteristics of respondents.

The collected information on gender, age, level of education, duration of project involvement, number of families and household characteristics of respondents in the study.

The characteristics are summarized in the table below.

Table 4.2 Respondents Characteristics

Characteristics	Category	n	%
Gender	Male	97	25.9
	Female	277	74.1
Age in years	<20	2	0.5
	20-29	29	7.8
	30-39	100	26.7
	40-49	88	23.5
	50-59	85	22.7
	≥ 60	70	18.7
Duration of involvement in CDRR	0-1	8	2.1
	2-3	321	85.8
	4-5	39	10.4
	>6	6	1.3
Education Level	College/University	21	5.6
	Secondary	50	13.4
	Primary	145	38.8
	None	158	42.2
Family per compound	1	194	51.9
	2	68	18.2
	3	49	13.1
	≥4	63	15.8
Number of persons per household	3	33	9.0
	4	50	13.0
	5	64	17.0
	>5	229	61.0
Number of adults per household	1	7	2.0
	2	150	40.0
	3	94	25.0
	≥4	124	33.0
Number of children per household	≤1	61	16.0
	2	90	24.0
	3	84	22.0
	4	139	37.0

Table 4.2 shows the distribution of respondents and their household characteristics. Three quarter of respondents were female (n=277) as compared to males (n=97). Most of the

participants were aged above 40 years. Majority of participants (n=321) had spent 2 to 3 years in the CDRR project. In terms of education majority of respondents had no formal education while only 5.6 % (n=21) had attained tertiary level of education. More than half of respondents were staying 1 family per compound. More than two-thirds of families had up to 5 or more persons per households with 98% of the households having 2 or more adults. In terms of children only 16 % (n=61) of households had at-least 1 child as compared to 46 % (n=174) which had 2 or 3 children with 37 % (n=139) households had 4 or more children.

4.5 Respondents opinion on sustainability of disaster risk reduction projects

Table 4.3 Sustainability of CDRR Project

Sustainability Factors	Mean	Std. Deviation
The projects have impacted farmers as planned	4.47	0.749
You now use farming practices that conserve the environment and prevent natural disasters	4.58	0.565
You are now more equipped to use early warning systems in prevention of disasters	4.50	3.034
The disaster risk reduction project has met your needs as a farmer/community member	3.70	1.231
More farmers and community members are now willing to join and participate in disaster risk reduction projects	4.57	0.724
The project has built your capacity in management and prevention of disasters	4.73	3.742
Method of delivering project have been effective and clear to members	4.59	0.549
Current farmers taking part in project can transfer knowledge to new farmers interested in implementing similar project	4.52	0.580
The project will continue if Order of St Augustine pulls out or relocates from the area	4.49	0.662
The project being implemented by Order of St Augustine will bring about long-term change in the area	4.53	0.770
Community members can maintain project on their own in the future	4.21	0.846

Table 4.3 shows opinion of respondents on sustainability of the disaster risk reduction projects. Majority of respondents on a scale of 1 (strongly disagreed) to 5 (strongly agreed) agreed that the project is sustainable. Most farmers agreed (mean=4.73, SD=3.7) that the project has built their capacity in management and prevention of disasters. Most farmers agreed (mean= 4.58, SD=0.56) they can use farming practices that conserve environment and prevent natural disasters. There is concurrence among respondents that methods of project delivery have been effective (mean=4.59, SD=0.549). Respondents also agreed they can transfer knowledge to new farmers who are interested in implementing similar projects (mean= 4.52, SD=0.662). On overall respondents both agreed that the project will continue once the funder pulls out and that the project will bring about long-term change in the area (mean= 4.53, SD=0.770)

4.6 Community participation and sustainability of community disaster risk reduction projects

Table 4.4 Levels of Community Participation

Participation factors	Strongly Disagree 1		Disagree 2		Neutral 3		Agree 4		Strongly Agree 5	
	f	%	f	%	f	%	f	%	f	%
I was involved in planning	94	25	92	25	8	2	92	25	88	24
Both Community and Order of St Augustine contributed funds	123	33	18	5	8	2	83	22	142	38
Only men were involved in project planning	245	66	84	22	33	9	8	2	4	1
Only women were involved in project planning	232	62	107	29	30	8	5	1	0	0
Both men and women could lead projects	19	5	15	4	3	1	87	23	250	67
Community participated in project selection, planning and design	67	18	102	27	11	3	86	23	108	29
Community members decided on geographical area project should cover	93	25	88	24	21	6	103	28	69	18

Table 4.4 shows level of community participation in planning and implementation of the community disaster risk project. Half of respondents indicated they were not involved in

project planning as compared to 49% (n=190) who indicated they were involved in project planning. 60% (n=225) of respondents indicated they contributed funds for the community projects while 38% (n=141) indicated they did not contribute any funds. In terms of gender involvement, more than 88% (n=329) disagreed that only men were involved in project planning. A similar proportion of 89% (n=339) disagreed that only women were involved in project planning. In terms of leading project 90% (n=337) of respondents agreed that both men and women were involved in leading projects. In terms of community involvement 55% (n=194) of respondents agreed they were fully involved in selection of projects as compared to 45% (=169) who indicated they were not involved. In terms of selecting areas to be covered by the project, only 46% (n=172) of respondents agreed they were involved in selecting project coverage area as compared to 49% (=181) who indicated they were not involved.

4.6.1 Correlation analysis between Community Participation and Sustainability of Community Disaster Risk Reduction Projects

The study sought whether there existed a strong association between community participation and sustainability of community disaster risk reduction Projects. The correlation matrix analysis between the variables was determined using Pearson Product Moment correlation coefficient. This was to evaluate the strength of association between community participation and sustainability of community disaster risk reduction Projects that exist. The criterion employed was that Correlation Coefficient of 0.7 and above was strong, 0.4-and less than 0.7 was assigned moderate between 0 and less than 0.4 weak (Mirie, 2014). Table 4.5 shows the results.

Table 4.5 Correlation Matrix between Community Participation and Sustainability of Community Disaster Risk Reduction Projects

		Sustainability of Community Disaster Risk Reduction Projects
Community Participation	r	.789*
	Sig (2-tailed)	.002
	n	374

*- Correlation is significant at the 0.05 (2 tailed)

The correlation results in Table 4.5 indicated that there is a strong, significant and positive correlation between community participation and sustainability of community disaster risk

Reduction projects as correlation factor $r=0.789$, $p=0.002<0.05$. This implied that community participation predicts a positive and significant influence on sustainability of community disaster risk reduction projects by a correlation factor of 78.9% at a 95% confidence level. The finding was supported by Hes (2017) that community engagement contributed to sustainability outcomes influenced creation of inclusiveness, provision of information through capacity building, setting up spaces for dialogue and having transparency during engagement resulting into reduction in risk and success in project performance. The findings further concurred with Macherera and Chimbari (2015) that community participation in development of early warning systems correlate positively with disaster prevention.

4.7 Community disaster risk awareness and sustainability of community disaster risk reduction projects

Table 4.6 Disaster Risk Awareness

Aspects on Disaster Risk Awareness	Strongly Disagree 1		Disagree 2		Neutral 3		Agree 4		Strongly Agree 5		Mean	Std. D
	f	%	f	%	f	%	f	%	f	%		
Disasters are of no concern to you	227	61	101	27	2	1	27	7	17	5	1.68	1.100
Flooding are the common disasters	231	62	114	30	1	0	11	3	17	5	1.58	.987
Wildfires are the common disaster	193	52	141	38	6	2	20	5	0	0	1.72	1.003
Drought is the common disaster	16	4	11	3	2	1	48	13	297	79	4.60	.971
Landslide is a common disaster	219	59	117	31	0	0	20	5	18	5	1.67	1.060
Disasters are increasingly common	12	3	55	15	12	3	145	39	150	40	3.98	1.146
My family has been affected by a disaster	13	3	19	5	9	2	181	48	152	41	4.18	.958
Not done anything to prepare for a disaster	34	9	89	24	4	1	168	45	79	21	3.45	1.302
Your community has early warning system?	31	8	28	7	2	1	180	48	133	36	3.95	1.187
Your community have a disaster response plan	128	34	112	30	10	3	79	21	45	12	2.47	1.443
Community members have been trained on disasters	47	13	33	9	1	0	175	47	118	32	3.76	1.322

Table 4.6 shows opinions of respondents towards disaster risk awareness. More than three-quarters of respondents at 88% (n=337) indicated that occurrence of disasters is a concern to them as compared to 12 % n=44) who stated they were not concerned about disasters.

Drought is the commonest type of disaster as indicated by 91 % (n=345) of respondents. 79% of respondents (n=295) agreed that disasters are increasingly common in the area as compared to 18 % (n=67) who indicated otherwise. In terms of being affected by disasters, 89 % (n=333) agreed to have been affected by disasters in the last 5 years while 8 % (n=22) indicated they have not been affected by disasters. In terms of preparation, 66 % (n=247) indicated they have not made any preparation against disasters while 33 % (n=123). On early warning, 84 % (n=313) agreed their community has early warning system while in terms of disaster response plan, 64 % (n=240) indicated their community has no disaster response plan. More than three quarter of respondents at 79 % (n=293) agreed they have received training on disasters as compared to 22 % (n=80) who indicated they have not received any training on disasters. On overall, most respondents indicated that drought is the most common form of disaster (mean=4.60, SD=0.971). Equally most respondents indicated they have been affected by natural disasters in the past 5 years (mean=4.18, SD=0.958).

4.7.1 Correlation analysis between Community Disaster Risk Awareness and Sustainability of Community Disaster Risk Reduction Projects

The study sought whether there existed a strong association between community disaster risk awareness and sustainability of community disaster risk reduction Projects. The correlation matrix analysis between community disaster risk awareness and sustainability of community disaster risk reduction was determined using Pearson Product Moment correlation coefficient. This was to assess the strength of correlation between Community disaster risk awareness and sustainability of community disaster risk reduction Projects that exist. Table 4.7 shows the results.

Table 4.7 Correlation Matrix between Community Disaster Risk Awareness and Sustainability of Community Disaster Risk Reduction Projects

		Sustainability of Community Disaster Risk Reduction Projects
Community disaster risk awareness	r	.773*
	Sig (2-tailed)	.000
	n	374

*- Correlation is significant at the 0.05 (2 tailed)

The correlation results in Table 4.7 indicated that there is a strong, significant and positive correlation between Community disaster risk awareness and sustainability of community disaster risk Reduction projects as correlation factor $r=0.773$, $p=0.000<0.05$. This demonstrated that community disaster risk awareness predicts a positive and significant relationship with sustainability of community disaster risk reduction projects by a correlation factor of 77.3 as 95% confidence level. The results concurred with Khan (2017) that community risk awareness in risks had a significant and positive correlation with preparedness of identified destruction of forests, climate change and burden of monsoon rain as leading causes of flooding.

4.8 Environmental Conservation Practices and Sustainability of Community Disaster Risk Reduction Projects.

Table 4.8 Proportion of Farmers Practicing Environmental Conservation

Conservation practices	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	SD
	1		2		3		4		5			
	f	%	f	%	f	%	f	%	f	%		
Practiced mixed cropping	40	11	28	7	2	1	138	37	166	44	3.97	1.309
Used plant derivatives such as oil and ash in pest control	39	10	72	19	5	1	131	35	127	34	3.63	1.389
Planted indigenous trees in my farms	15	4	19	5	10	3	160	43	168	45	4.41	3.074
My community has sacred forests	108	29	129	34	18	5	43	11	76	20	2.60	1.508
Switched from growing maize to millet & Sorghum	28	7	82	22	12	3	118	32	134	36	3.66	1.354
Practiced mulching in my farm	28	7	36	10	7	2	168	45	135	36	3.93	1.199
We have temporary dams store water for dry season	79	21	77	21	5	1	107	29	106	28	3.22	1.558
I harvest rainwater from my roof	17	5	20	5	3	1	161	44	169	46	4.75	5.331
I grow fodder crops in my farm	57	15	80	21	11	3	118	32	108	29	3.37	1.470

I practice crop rotation & growing of native crops	18	5	22	6	7	2	146	39	181	48	4.20	1.064
I burn my farm before tilling/digging	151	40	103	28	10	3	63	17	47	13	2.34	1.459
I now use less pesticide in my farm	61	16	76	20	8	2	135	36	94	25	3.33	1.455

Table 4.8 shows environmental conservation practices as adopted by respondents. Over 80 % (n=304) of respondents were practicing mixed cropping compared to 18 % (n=68). More than two-thirds of respondents (68%, n=258) used plant derivatives such as ash in pest control compared to 29 % (n=101) who indicated they were not using such. 88 % (n=328) of respondents indicated they planted indigenous trees in their farms as compared to 9 % (n=34) who indicated otherwise. More than half of respondents indicated their community has no sacred forests (64%, n=237). 68 % (n=252) indicated they have switched to growing millet and sorghum while 29 % (n=100) indicated they have not switched from growing maize. In terms of mulching, 81 % (n=303) of respondents indicated they practiced mulching as compared to 17 % (n=64).

In terms of water storage, 58 % (n=213) of respondents indicated they have temporary dams for storing water to be used in dry season. On the other hand, 42 % (n=156) indicated they had no temporary dams. 90% (n=330) of respondents indicated they practiced rain harvesting as compared to 10 % (n=37) who were not harvesting rainwater. More than 60 % (n=226) of respondents indicated they grew fodder crops. More than three quarter of respondents (87%, n=327) indicated they practiced crop rotation and growing of native crops. On farm preparation, 68 % (n=254) indicated they were not burning their farms prior to tilling. On use of pesticides, 61 % (n=229) indicated they are using less pesticides while 36 % (n=137) indicated they are not using less pesticides in their farms. On overall, planting of indigenous trees (mean 4.41, SD=3.074), harvesting of rainwater (mean=4.75, SD=5.331) and practicing crop rotation (mean=4.20, SD=1.06) are conservation practices that are commonly being practiced by respondents.

4.8.1 Correlation analysis between Environmental Conservation Practices and Sustainability of Community Disaster Risk Reduction Projects

The study sought whether there existed a strong association between environmental conservation practices and sustainability of community disaster risk reduction Projects. The

correlation matrix analysis between environmental conservation practices and sustainability of community disaster risk reduction was determined using Pearson Product Moment correlation coefficient. This was to assess the strength of correlation between environmental conservation practices and sustainability of community disaster risk reduction Projects that exist. Table 4.9 shows the results.

Table 4.9 Correlation Matrix between Environmental Conservation Practices and Sustainability of Community Disaster Risk Reduction Projects

		Sustainability of Community Disaster Risk Reduction Projects
Environmental Conservation Practices	r	.725*
	Sig (2-tailed)	.001
	n	374

*- Correlation is significant at the 0.05 (2 tailed)

The correlation results in Table 4.9 indicated that there is a strong, significant and positive correlation between environmental conservation practices and sustainability of community disaster risk Reduction projects as correlation factor $r=0.725$, $p=0.001 < 0.05$. This clearly indicated that environmental conservation practices predict a positive and significant influence on sustainability of community disaster risk reduction projects by a correlation factor of 72.5% as 95% confidence level. The results concurred with Iloka (2016) that indigenous knowledge for disaster reduction in Africa, argued that use of plant derivatives such as oil and ash from trees such as eucalyptus and need were effective in pest control without causing harm to the environment. Further Has (2017) that enhancing environmental conversation practices such as land use, combating desertification and promoting sustainable agricultural practices are critical in prevention of disasters.

4.9 Agricultural Extension Services and Sustainability of Community Disaster Risk Reduction Projects

Table 4.10 Access and Utilization of Extension Services

Access and utilization of extension services	Strongly Disagree 1		Disagree 2		Neutral 3		Agree 4		Strongly Agree 5		Mean	SD
	f	%	f	%	f	%	F	%	f	%		
	Visited by extension service officer	19	5	32	9	10	3	155	41	158		
Extension services are not useful	163	44	134	36	2	1	20	5	55	15	2.12	1.404
Paid to access extension services	201	54	138	37	2	1	13	3	20	5	1.70	1.037
Extension services are affordable	45	12	38	10	7	2	145	39	139	37	3.79	1.356
Received Crop Production Services	6	2	21	6	3	1	181	49	161	43	4.53	3.804
Received Crop Protection	1	0	21	6	3	1	176	47	173	46	4.33	.780
Received services on Livestock Production	12	3	29	8	3	1	166	44	164	44	4.18	1.008
Received Training on Agroforestry	5	1	20	5	0	0	173	47	173	47	4.32	.839
Received training on Soil Conservation	8	2	18	5	0	0	176	47	172	46	4.30	.870
Received water Harvesting Training	6	2	15	4	0	0	188	51	162	44	4.41	2.210
Linked to markets	34	9	72	19	3	1	145	39	120	32	3.66	1.343
Accessed dealers on farm inputs	37	10	58	16	9	2	150	40	120	32	3.69	1.328
Received Dairy farming training	53	14	103	28	4	1	129	34	85	23	3.24	1.430
Received Poultry training	41	11	71	19	10	3	144	39	108	29	3.55	1.366
Received Beekeeping Training	48	13	75	20	9	2	129	34	113	30	3.49	1.425
Received Fish farming training	67	18	104	28	8	2	108	29	87	23	3.12	1.485

Table 4.10 shows proportion of respondents with access to agricultural extension services in which 83 %(n=313) of respondents indicated they have been visited by an agriculture

extension officer, while 14 %(n=51) indicated having not been visited. On usefulness of extension services, 80 %(n=297) of respondents indicated that services are useful as compared to 20 %(n=77) who indicated that services are not useful. 91%(n=339) of respondents indicated they did not have to pay to access extension services while 76 %(n=284) indicated the services are affordable. On receiving extension services more than 90% of respondents indicated they have received most extension services on crop production, crop protection and livestock production techniques. A similar proportion (>90%) indicated they have received services on agroforestry training, soil conservation and water harvesting.

On linkages to markets, 61 %(n=265) indicated they have been linked to markets to sell their produce compared to 28 %(n=106). 72 %(n=270) indicated they have been linked to dealers of farm inputs as compared to 26 %(n=95). More than half of respondents indicated they received training on dairy farming (57%, n=214), poultry farming (68%, n=252), bee keeping (64%, n=242) and fish farming (=61%, n=195). On overall, most respondents have been visited by an agriculture extension officers (mean= 4.07, SD=1.117). Equally most respondents had received a variety of extension services on crop production (mean=4.53, SD 3.8); crop protection (mean 4.33, SD=0.78); livestock production techniques (mean=4.18, SD 1.008); training on agroforestry (mean=4.32, SD 0.839); training on soil conservation (mean = 4.30, SD 0.870) and training on water harvesting (mean=4.41; SD 2.210). On the other hand, services less received include; training on dairy farming, poultry farming, beekeeping and fish farming.

4.9.1 Correlation analysis between Utilization of Agricultural Extension Services and Sustainability of Community Disaster Risk Reduction Projects

The study sought whether there existed a strong association between utilization of agricultural extension Services and sustainability of community disaster risk reduction Projects. The correlation matrix analysis between utilization of agricultural extension services and sustainability of community disaster risk reduction was determined using Pearson Product Moment correlation coefficient. This was to assess the strength of correlation between utilization of agricultural extension services and sustainability of community disaster risk reduction Projects that exist. Table 4.11 shows the results.

Table 4.11 Correlation Matrix between Utilization of Agricultural Extension Services and Sustainability of Community Disaster Risk Reduction Projects

		Sustainability of Community Disaster Risk Reduction Projects
Utilization of Agricultural Extension Services	r	.769*
	Sig (2-tailed)	.011
	n	374

*- Correlation is significant at the 0.05 (2 tailed)

The correlation results in Table 4.11 indicate there is a strong, significant and positive correlation between utilization of agricultural extension services and sustainability of community disaster risk reduction projects as correlation factor $r=0.769$, $p=0.011 < 0.05$. This clearly indicated that accessibility and utilization of agricultural extension services predict a positive and significant relationship on sustainability of community disaster risk reduction projects by a correlation factor of 76.9% as 95% confidence level. The findings were consistent with Mariyono (2019) results that revealed through extension services farmers gained skills and knowledge mixed farming practices that enhanced crop production and concurrent reduction in famine. Further the findings concurred with Berhane *et al* (2018) that utilization of agricultural extension services (AES) which includes crop production services, crop protection; livestock production techniques, and natural resources management such as agroforestry, soil conservation, and water harvesting contributed to increase in farm productivity.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This section covers discussion of findings based on objectives. The discussion is focused on application of study findings in relation to findings of other studies and conceptual framework. Finally, conclusion and recommendations emanating from this study are presented.

5.2 Summary of Findings

Key findings related to sustainability indicates that CDRR project has built respondents capacity in management and prevention of disasters. Most farmers indicated they can use farming practices that conserve environment and prevent natural disasters. There is concurrence among respondents that methods of project delivery have been effective. While a significant proportion of respondents confirmed they can now transfer knowledge to new farmers who are interested in implementing similar projects.

5.2.1 Community Participation and Sustainability of Community Disaster Risk Reduction Projects

In terms of participation it was realized that nearly half of the respondents were involved in project planning. A significant proportion confirmed they contributed funds towards initiation of the community projects. On gender involvement there was concurrence among respondents that both men and women were involved in leading projects. In project selection more than half of respondents confirmed they were involved in selecting project activities and areas to be covered by the project activities.

5.2.2 Community Disaster Risk Awareness and Sustainability of Community Disaster Risk Reduction Projects

On disaster risk awareness, respondents identified drought as the most common type of disaster which is consistent with natural occurrence in the area. More than three quarter of respondents confirmed they received training on disaster. Equally most respondents indicated they have been affected by natural disasters in the past 5 years. Factors related to disaster risk awareness with significant influence on sustainability of CDRR projects

includes making no preparation against disasters, having a community early warning system and community members receiving training on disaster.

5.2.3 Community Environmental Conservation Practices and Sustainability of Community Disaster Risk Reduction Projects.

Uptake of environmental conservation practices is high among respondents who took part in this study. Planting of indigenous trees, harvesting of rainwater and practicing crop rotation are conservation measures commonly being practiced by respondents. Equally above practices were significantly associated with sustainability of CDRR projects in the study area. Use of plant derivatives for pest control, having temporary dams, harvesting rainwater and burning of farms before tilling all had no significant association with sustainability of CDRR projects.

5.2.4 Agricultural Extension Services and Sustainability of Community Disaster Risk Reduction Projects.

On Agricultural extension services, most respondents confirmed they have received a variety of extension services. These services were deemed to be affordable and include services on crop production, crop protection and livestock production techniques. On overall, most respondents have been visited by an agriculture extension officers. Equally most respondents had received a variety of extension services such as crop production; crop protection, livestock production techniques, training on agroforestry, training on soil conservation and training on water harvesting. On the other hand, services less received include; training on dairy farming, poultry farming, beekeeping and fish farming.

5.3 Discussion of Findings

5.3.1 Community Participation and Sustainability of Community Disaster Risk Reduction Projects

This study observed high level of community involvement in planning, selection and implementation of community disaster risk reduction projects. Evidence from this study suggests that community were adequately involved in selecting and implementation of project activities. This confirms the community took an active role in identifying their needs as well as participating in addressing their needs through the CDRR projects. Evidence from this study concurs with Ofuoku (2011) who indicated that community participation provides

a means through which local communities actively gets involved in solving their local needs. Consistent with findings from this study, Noor (2017) argued local community gets to be involved through participatory needs assessment, participatory planning and participatory implementation. Through such levels of participation local communities develop an understanding of project dynamics through which they also learn how to sustain the project on their own. Consistent with findings of this study, Adesida & Okunkola (2016) concurs that active community participation creates ownership and increases level of commitment in project implementation.

While community involvement in project planning was associated with sustainability of the CDRR projects, it is important to highlight that nearly half of respondents indicated they were not involved in project planning. This finding suggests need for involving community in project planning since lack of involvement is likely to lead to apathy and lack of action on part of the community. As indicated by Macherara & Chimbari (2015) failure to involve local communities in project planning impacts on viability of a project hence its sustainability.

Equal participation among men and women was observed as one of the factors that influence sustainability of CDRR projects in as far as this study is concerned. Equal contribution by men and women creates a sense of shared ownership and joint participation in implementation of the projects. Furthermore, this study observed that women also had an opportunity to lead in the projects and this indicates that women were involved in providing leadership and making project related decision. Lack of women involvement in local projects has been identified in several literature as a limiting factor in attaining meaningful community development. Consistent with findings of Serrat (2013) this study demonstrates that local community has adopted transformative change by involving more women in local projects.

Making joint contribution of resources and funds was one of the factors that had significant association with sustainability of CDRR projects. Community contribution of funds demonstrates community acknowledgement of their need and desire to resolve their local problems. Community contribution of funds also allows the community to develop a sense of ownership of the project and therefore take active role in implementation. It is evident that by making contribution of funds, local community fully participated in planning and implementation of the projects. It is through such level of participation that made local

community believe that CDRR projects would continue once the funder exit. Contrasting findings were observed by Mbui and Wanjohi (2018) who observed from their study a passive kind of community participation. They noted that despite community providing resources needed for the project, but donor took a more active role in project oversight. Findings from this study demonstrates that apart from contributing resources, local community should be empowered to take an active role in implementation and oversight of a local projects. By doing so, local communities gain experience and build their capacities which then ensures sustainability of local projects.

5.3.2 Community Disaster Risk Awareness and Sustainability of Community Disaster Risk Reduction Projects

This study observed that drought was identified as the common form of disaster that impacts local livelihood. The devastating effects of droughts was confirmed to have impacted most families in the past few years. By correctly identifying common form of disaster local communities can adopt appropriate measures towards the common type of disasters. As observed from other studies, local projects should build on such knowledge when making decision on type of activities that need to be implemented towards addressing the disasters. It is appropriate to mention that local CDRR project seeks to build resilience of local community towards drought. This confirms that CDRR project aligns with local community perception of risk. Lassa *et al* (2015) argues that many disaster risk reduction projects have failed to achieve their intended purposes because of failure to incorporate community definitions or ranking of what they considered to be disaster risks. Consistent with findings of this study, Hess (2017) argued that by identifying common type of disasters, local community can demonstrate their level of vulnerability. Furthermore, by identifying drought as common type of disaster risk, local community was able to provide framework for developing risk reduction measures.

Despite high level of awareness on drought as common type of disaster, it was observed that several respondents had not made adequate preparation towards disasters. This finding suggest that local communities are prone to adopt a wait and see approach towards disasters. As observed by Khan (2017) awareness should match with level of preparedness. In this regard there is need to educate local communities on measures they need to adopt towards preparing for drought as a common type of disasters. These measures include, preservation

of food crops, growing drought resistant food crops and water harvesting amongst other measures.

This study observed that most respondents had received training on action they need to take when disasters occurs. The training improves awareness of local communities and enhances their understanding of the risks facing them. Through such awareness, local communities are more likely to adopt project activities that build their adaptive capacities against drought as a disaster. This explains why receiving training on disasters was significantly associated with sustainability of CDRR projects. Consistent with findings from this study, Cubelos *et al* (2019) concluded that training builds community understanding on impact of disasters and improves not only their ability to cope but also their willingness to adopt disaster risk reduction projects which then guarantees sustainability of local projects. As explained by Ceptureanu *et al* (2018) findings from this study demonstrates that training on disasters enabled local community to appreciate the risks facing them and hence led to improved participation in project implementation as observed in this study.

5.3.3 Community Environmental Conservation Practices and Sustainability of Community Disaster Risk Reduction Projects.

This study observed high uptake of practices that enhance conservation of environment and thus promote long-term sustainability of the CDRR project in the study area. It is noted that majority of respondents practiced crop rotation, planting of indigenous trees and water harvesting. These practices require little capital at outset as such many farmers would sustain these practices beyond the life of the project. It is important to highlight that most the measures adopted are targeted towards mitigating the effects of drought which is the common form of disaster in the area. The proportion of farmers practicing. In concurring with findings from this study, Mugambiwa (2018) indicated that local conservation practices adopted by farmers such as water harvesting and mulching of farms demonstrates the ability of local farmers in mitigating and addressing effects of disasters such as drought. Consistent with other studies, it was observed that most farmers had switched from growing maize to drought resistant crops such as millet and Sorghum. The switch to drought resistant crops indicates that farmers can adopt practices that cushion them against effects of drought.

Use of indigenous knowledge on pest management was also reported among respondents. Of importance is that most respondents indicated low use of commercial pesticides. By using

less pesticides and adopting use of plant derivatives for pest control indicates farmers ability to conserve environment. As they increase crop production but equally use less pesticides farmers are not creating harm to the environment. Consistent with findings from this study, Iloka (2016) attests that use of plant derivatives such as oil and ash from trees were effective in pest control without causing harm to the environment. While use of such practices was not significantly associated with sustainability of CDRR projects it is worth highlighting that many farmers confirmed they use plant derivatives in pest control. This suggest the need to harness use of plant derivatives in pest control in the project area as way of reducing over-reliance on commercial produced pesticides with harmful effects to the environment.

This study further observed high uptake of water conservation practices such as water harvesting and use of temporary dams among respondents, although only water harvesting practices was significantly associated with sustainability of CDRR projects. Water harvesting practices as adopted by indicates that project has improved understanding of communities on measures that would mitigate against effects of droughts. Compared to construction of temporary dams, water harvesting at household level is more likely to be adopted since construction of dams is labour and capital intensive. Hence this explains the significant influence of water harvesting at household level on sustainability of CDRR projects. Lassa *et al* (2015) concurs that practices such water harvesting helps farmers cope well with effects of disasters. Despite high uptake of water harvesting at household level, it is important to consider construction of dams to serve as reservoirs of water that would serve the larger community when households deplete their stock of water.

5.3.4 Agricultural Extension Services and Sustainability of Community Disaster Risk Reduction Projects.

Access to extension services as observed from this study had significant influence on sustainability of CDRR projects. Through extension services farmers acquire knowledge and skillset that is critical in adopting sustainable farming practices. A significant proportion of respondents confirmed they have been visited by an agricultural extension officer. Through such visit's farmers received training that improves their adaptive capacities in coping with effects of droughts. As explained by FAO (2010) extension services builds the capacities of farmers which enables them to adopt practices that solves local problems effectively. In concurring with findings of this study, Danso-Abbeam *et al* (2018) explains that extension services improve not only farm productivity but also adoption of sustainable

farming practices. Therefore, through extension services farmers acquire knowledge which then they can transfer to new farmers interested in implementing similar project, which then ensures sustainability of the CDRR project activities.

It was observed that most respondents had received services on crop/livestock production, crop protection, agroforestry, soil conservation and training on water harvesting. These services are aligned to the needs of local communities in addressing the effects of drought. Knowledge on crop production, agroforestry and soil conservation as well as water harvesting are essential in drought management. Through such knowledge farmers can adopt sustainable farming practices that not only conserves the environment but mitigates against effects of drought. Consistent with findings from this study, Berhane *et al* (2018) observed from their study that most farmers had received services on crop production and natural resources management. These included practices such as proper seed selection and use of irrigation in crop production. Adoption of such services at household level sufficiently explains why most respondents indicated that they can adopt farming practices that conserve the environment and prevent natural disasters.

Evidence from this study suggests that most farmers have received extension services, however there is need to scale up access to certain services. These includes services such as linking farmers to markets for them to sell their produce. By having access to markets farmers can sell their produce at fair prices and earn enough income. Such income can then be ploughed back in sustaining farmers during periods of extended drought. Through extension services Serrat (2013) concurs is a means for equipping communities develop long term solutions in fixing problems arising from effects of disasters such as droughts. The importance of extension services is well explained by the fact that most respondents indicated their capacity in management and prevention of disasters has been improved through participating in the CDRR projects. Such improvement can be attributed to the role played by extension services in improving the adaptive capacities of local communities in coping with effects of disasters.

5.4 Conclusion

This study has demonstrated that community participation has an influence on sustainability of CDRR projects. Involving community members in planning, selection of project activities and inviting them to contribute resources creates a sense of ownership and which in long-term contributes to sustainability of community projects. This study has equally demonstrated that engaging both men and women in community projects increases level of participation. Increased level of participation by both genders is a catalyst in promoting sustainability of community projects. On the other hand, this study has demonstrated that not all members of a community get involved in project planning. Lack of involvement by community members is a risk to sustainability of community projects. There is need for project implementers to consider input of most of the community members at the planning phase.

This study has established that risks awareness has an influence on sustainability of CDRR projects. Training of community members on disaster management increases the awareness and the ability to cope with emerging disasters. Drought is the common type of disaster as identified by community members which demonstrate that they understand the risks they face. Therefore, projects that target addressing effects of drought is more likely to succeed as compared to projects addressing certain disasters like flood. The study has highlighted early warning system as an important factor in maintaining sustainability since community members are able to identify disasters early enough hence develop mitigating measures to curb the risks.

This study demonstrated high uptake of practices that are sustainable farming practices. These includes practices such as planting of indigenous trees, crop rotation and rainwater harvesting. Uptake of such practices is high since the community has identified drought as common disaster risk and hence, they can adopt sustainable farming practices. Considerably this study highlighted role played by indigenous knowledge and practices in safeguarding the environment. The study findings further demonstrate the need for large scale water project such as a multipurpose dam since most community members relied on water harvested at household level.

Extension services plays an important role in building capacity of local community members. Through extension services, members can access training on sustainable farming

practices related to crop and livestock production. Evidence obtained from this study suggest that most farmers have acquired extension services and are implementing knowledge gained. This is evidenced by high number of respondents trained on agroforestry and corresponding proportion growing indigenous type of trees. On the other hand, there is low access to services such as linkages to markets and access to farm inputs. Hence, there is need to scale up extension services on linking farmers to markets for them to earn decent income from sale of their products. On overall knowledge gained from extension services is one of the factors that significantly influences sustainability of CDRR projects.

5.5 Recommendations

Based on the findings, the study recommends the following:

1. The study demonstrated that community participation influenced sustainability of CDRR project in Embu County extensively. Therefore, policy formulation by project implementers on project planning, selection and implementation should include stakeholders' participation to promote sense of ownership and project acceptability at the community level. These policies should recommend active involvement of community members in every project phase.
2. The study found out that disaster risk awareness had significant influence on sustainability of CDRR projects. It is therefore recommended that project implementers should offer training of members of the community on ways of identifying common risks targeted by CDRR projects. Training should focus on use of early warning system to enable local communities identify disaster risk and corresponding mitigating measures.
3. This study realized the influence of environmental conservation practices such as planting of indigenous trees, rainwater harvesting and crop rotation sustainability of CDRR projects. There is need to promote adoption of conservation practices that can easily be implemented at a household level. Cultural practices that promote environmental conservation practices such preservation of sacred forests should be promoted.

4. The study also established that access to agricultural extension services had a significant influence on sustainability of CDRR project. There is need to expand access to other components of extension services such as linkages to markets. The study has demonstrated the importance of extension services as such implementers of community development projects should consider including extension services as one of the components of community projects. Policy makers need to develop guidelines that would guide integration of extension services in implementation of community disaster risk reduction projects.

5.6 Suggestions for further studies

Knowledge obtained from this study suggests there is need for further research on sustainability with emphasis on the following:

- A qualitative study to assess community perceptions on barriers to sustainability of CDRR projects.
- A study to assess the impact of socio-cultural practices that promote uptake of disaster risk reduction activities in rural communities.
- A study to assess factors that hinder community participation in project needs assessment in areas where CDRR projects are being implemented.

REFERENCES

- Adesida, I & Okunlola, J. (2015). Effects of Community Participation on the Sustainability of Rural Infrastructure in Ondo State, Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology*, 7. 1-9.
- Arias, M., & Halliday, A. (2013). Uncommon among the Commons? Disentangling the Sustainability of the Peruvian Anchovy Fishery. *Ecology and Society*, 18(2), 53– 67.
- Berhane, G., Ragasa, C., Abate,C.T., & Assefa, T.W. (2018). The state of agricultural extension services in Ethiopia and their contribution to agricultural productivity. Available online at: <https://www.cgiar.org>. Accessed on 21st September 2020
- Binas, R.R. (2010). *Understanding Community Managed Disaster Risk Reduction*. Available Online: <https://www.cordaid.org/media/medialibrary>. Accessed on 15th July, 2020
- Bolarinwa, O.A. (2015). Principles and methods of validity and reliability testing of questionnaires used in social and health science researches. *Nigeria Postgraduate Medical Journal*; 22: 195-201.
- Ceptureanu, S.I., Ceptureanu, E.G., Luchian, C.E. & Luchian, I. (2018). Community Based Programs Sustainability. A Multidimensional Analysis of Sustainability Factors. *Sustainability* 10, 870.
- Cubelos, C.; Kularathna, A.H.T.S.; Bruno Valenzuela, V.P.; Iliopoulos, N.; Quiroz, M.; Yavar, R.; Henriquez, P.; Bacigalupe, G.; Onuki, M.; Mikami, T.; Cienfuegos, R.; Aranguiz, R. & Esteban, M. (2019). Understanding Community-Level Flooding Awareness in Remote Coastal Towns in Northern Chile through Community Mapping. *Geosciences*, 9, 279.
- Danso-Abbeam, G., Ehiakpor, D.S. & Aidoo R. (2018). Agricultural extension and its effects on farm productivity and income: insight from Northern Ghana. *Agriculture & Food Security*. 7:74
- Dube, E., & Munsaka, E. (2018). The contribution of indigenous knowledge to disaster risk reduction activities in Zimbabwe: A big call to practitioners. *Jamba (Potchefstroom, South Africa)*, 10(1), 493
- Dube, E., (2015) 'Improving disaster risk reduction capacity of District Civil Protection Units in managing veld fires: A case of Mangwe District in Matabeleland South Province, Zimbabwe', *Jàmbá: Journal of Disaster Risk Studies*, 7(1).
- Emas, R. (2015). The Concept of Sustainable Development: Definition and Defining Principles. Brief for GSDR. Available online at: <https://sustainabledevelopment.un.org>. Accessed on 2nd July, 2020
- Enqvist ,J.P., West, S., Masterson, V.A., Haider, J., Svedin, U., & Tengö, M. (2018). Stewardship as a boundary object for sustainability research: Linking care, knowledge and agency, *Landscape and Urban Planning*, 179, 17-37

- Food and Agriculture Organization (FAO) of the United Nations. Ethiopia Country Brief; 2010. Retrieved from www.fao.org/countries/55528/en/eth/. Accessed 21st April 2020
- Gordon, A. (2012). Community-Managed Disaster Risk Reduction: Investing in Resilience Community-Managed Disaster Risk Reduction/Drought Cycle Management: Its Added Value in the Recent (2011) Drought Situation in the Horn of Africa. Centre for Development Innovation, Wageningen University & Research Centre.
- Hes, D. (2017). Impact of community engagement on sustainability outcomes. Available online on; <https://cpb-ap-se2.wpmucdn.com/blogs.unimelb.edu.au>. Accessed 23rd June 2020
- Hallegatte, S., Vogt-Schilb, A., Bangalore, M., & Rozenberg, J. (2017). Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters. Climate Change and Development; Washington, DC: World Bank. © World Bank.
- Iloka N. G. (2016). Indigenous knowledge for disaster risk reduction: An African perspective. *Jamba (Potchefstroom, South Africa)*, 8(1), 272.
- Khan, M.G. (2017). Disaster Management Risk Perception of Local Communities. *Journal of Kemanusiaan*. 26. 1.
- Kothari, C. (2010). *Research Methodology: Methods and Techniques*, Mumbai: New Age International Publishers
- Lassa, J.A., Boli, Y., Nakmofa, Y., Fanggidae, S., Ofong, A. & Leonis, H., (2018). ‘Twenty years of community-based disaster risk reduction experience from a dryland village in Indonesia’, *Jàmbá: Journal of Disaster Risk Studies* 10(1), 502.
- Macherera, M. & Chimbari, M.J. (2016). ‘A review of studies on community based early warning systems’, *Jàmbá: Journal of Disaster Risk Studies* 8(1), 206.
- Mariyono, J. (2019), “Farmer training to simultaneously increase productivity of soybean and rice in Indonesia”, *International Journal of Productivity and Performance Management*, 68 (6), 1120-1140.
- Mbui, J. N. & Wanjohi, J. M. (2018). Influence of community participation on project performance of Ruiru water projects, Meru County, Kenya. *International Academic Journal of Information Sciences and Project Management*, 3(2), 331-344.
- Montazar, A. (2013). A decision tool for optimal irrigated crop planning and water resources sustainability. *Journal of Global Optimization*, 55(3).
- Mugambiwa S. S. (2018). Adaptation measures to sustain indigenous practices and the use of indigenous knowledge systems to adapt to climate change in Mutoko rural district of Zimbabwe. *Jamba (Potchefstroom, South Africa)*, 10(1), 388.
- Muyambo, F., Bahta, Y. T., & Jordaan, A. J. (2017). The role of indigenous knowledge in drought risk reduction: A case of communal farmers in South Africa. *Jamba (Potchefstroom, South Africa)*, 9(1), 420. Doi:10.4102/jamba. v9.420

- Mulwa, F. (2010). *Demystifying Participatory Community Development Community Development*. (2nd Edition). Nairobi. Paulines Publication.
- Nyaga, C.M & Muturi, W. (2015). Factors affecting the sustainability of community food security projects in arid and semiarid lands, Kenya.the case of food security projects in Turkana County. *The Strategic Journal of Business Change and Management*. Vol. 2, Iss. 2 (123), pp 2009 – 2024.
- Noor, H., (2017). Community Participation in Sustainability of Development Projects: A Case Study of National Solidarity Program Afghanistan. *Journal of Culture, Society and Development*, 30. 2. 132-167
- Ochunga, F.O & Awiti, L.H. (2017). Influence of Stakeholder Participation on Sustainability of Community Development Projects Implemented by Plan International in Homa Bay Town Sub-County. *International Journal of Academic Research in Business and Social Sciences*. 7, (4)
- Ofuoku, A.U. (2011). Effect of community participation on sustainability of rural water Projects in Delta Central agricultural zone of Delta State, Nigeria. *Journal of Agricultural Extension and Rural Development*. <http://academicjournals.org/JAERD>. 3 (7), 130-136
- Ogemah, V.K. (2017). Sustainable Agriculture: Developing a Common Understanding for Modernization of Agriculture in Africa. *Africa Journal of Food Agriculture Nutrition and Development*. (1): 11673-11690
- Oino, P.G., Towett, G. Kirui, K.K., & Luvega, C. (2015). “The Dilemma in Sustainability of Community-Based Projects in Kenya,” *Global Journal of Advance Research*. 2.(1)
- Order of St Augutinians International, (2019). OSA-Ishiara Kenya. Available at <https://osakenyaproject.github.io>. Accessed 19th April 2020
- Reeler, D (2007). A Three-fold Theory of Social Change and Implications for Practice, Planning, Monitoring and Evaluation: Available online: <https://www.cdra.org.za>. Accessed 14th Match 2020.
- Salas, Z.,W.A., & Ortiz, M.,S.M. (2019). Analysis of meanings of the concept of sustainability. *Sustainable Development*. 27:153–161.
- Serrat, O. (2013). *Theories of change*. Manila: Asian Development Bank.
- Tuladhar, G., Yatabe, R., Dahal, R.K. Bhandary, N.P., (2015). Disaster risk reduction knowledge of local people in Nepal *Geoenviron Disasters*. 2: 5.
- Twigg, J. (2015). Disaster Risk Reduction: Good Practice Review no.9. London: Overseas Development Institute, Humanitarian Practice Network. Available Online. Available Online: <https://goodpracticereview.org>. Accessing 12th January 2020

United Nation International Strategy on Disaster Reduction (2015): Strategic Framework. Available Online: https://www.unisdr.org/files/51557_strategicframework.pdf. Accessed 17th June 2020.

United Nations International Strategy for Disaster Reduction (UNISDR), (2015). Global assessment report (2015) Making development sustainable: The future of disaster risk management', The Pocket GAR 2015, United Nations, Geneva

Yamane, T. (1967). *Statistics: An Introductory Analysis*, 2nd Edition, New York. Harper and Row.

APPENDICES

Appendix I Letter of Transmittal

Glannah Okoth

P.O Box 23747-00100

Nairobi.

Dear Respondent,

RE: REQUEST TO RESPOND TO RESEARCH STUDY QUESTIONS

I am a Masters student at the University of Nairobi pursuing a degree of Masters of Arts in Project Planning and Management. I am expected to conduct a research as partial requirement for the award of the above mentioned degree. My choice of research topic is “Perceived factors influencing sustainability of community disaster risk reduction projects in Kenya: A case of Order of St Augustine projects in Evurore ward, Embu County”.

The purpose of this short letter is to kindly request you to participate as a respondent in this study by completing the attached questionnaire as accurately as possible, your time and the effort made to answer each and every questions in the questionnaire will be highly appreciated. Any information given by the participant will be treated with confidentiality and will only be used for the purpose of this particular study as requested.

Thank you very much for your cooperation.

Yours Sincerely,

Glannah Okoth

Appendix II Household Respondent Questionnaire

A Research Questionnaire for a study on Perceived Factors Influencing Sustainability of Community disaster risk reduction projects in Evurore Ward, Embu County. Kenya

Introduction and consent statement

Interviewer	
Community Name	
Household Number	

Hello, my name is Glannah Achieng Okoth a student from University of Nairobi. I am here to learn more about disasters reduction projects in your community. The survey will take about 15 to 20 minutes to complete and it is anonymous which means your name and address will not be recorded. Do not include your name on the questionnaire. The information generated from this study will be used for academic purposes only, participation is voluntary.

PART A: HOUSE-HOLD AND RESPONDENT CHARACTERISTICS

1. Respondent Gender: Male Female
2. Age in Years of Respondents_____
3. Duration of taking part in CDRR project:_____
4. How many families live in your compound? :_____
5. Number of people in household:_____
 - i. Of these how many are Adults_____
 - ii. How many are children_____
6. What is the highest level of education that head of household/respondent has completed?
 - College/university
 - Secondary level
 - Primary level
 - None

PART B: COMMUNITY PARTICIPATION

Please indicate your opinion with regards to participation in disaster risk reduction projects: *(Kindly tick the appropriate box for the following statements)*

Community Participation	1= Strongly Disagree	2= Disagree	3= Neutral	4= Agree	5= Strongly Agree
I was involved in planning for the project					
Both the Community and Order Of St Augustine contributed funds for the community projects					
Only men were involved in project planning, design and implementation					
Only women were involved in project planning, design and implementation					
Both men and women could lead projects					
Community participated in project selection, planning and design					
Community members decided on what geographical area the project should cover					

PART C: COMMUNITY DISASTER RISK AWARENESS

Please indicate your opinion with regards to community awareness on risk of disasters: (Kindly tick the appropriate box for the following statements)

Aspects on Disaster Risk Awareness	1= Strongly Disagree	2= Disagree	3= Neutral	4= Agree	5= Strongly Agree
Disasters are of no concern to you					
Rains and flooding are the common disasters that threaten my community					
Wildfires are the common disasters that threaten my community					
Drought is the common disaster that threatens my community					
Landslides is a common disasters that threaten my community					
My community can experience a natural disaster in the next 5 years					
Disasters are becoming increasingly common in this area					
In the past 5 years my family has been affected by a disaster or emergency					
We have not done anything to prepare for a disaster or emergency but we plan to in the coming months					
Your community has an early warning system?					
Your community have a disaster response or emergency plan?					
Community members have been trained to assist others in the event of a disaster?					

PART D: COMMUNITY ENVIRONMENTAL CONSERVATION PRACTICES

Please indicate your opinion with regards to conservation measures that your practice (*Kindly tick the appropriate box for the following statements*)

PRACTICES	1= Strongly Disagree	2= Disagree	3= Neutral	4= Agree	5= Strongly Agree
You practice mixed cropping in the farm					
You normally use of plant derivatives such as oil and ash in pest control					
I have planted indigenous trees in my farms					
My community has sacred forests					
I have switched from growing maize to millet and Sorghum					
I practiced mulching in my farm					
We have temporary dams store water for dry season					
I harvest rain water from my roof					
I grow fodder crops in my farm					
I practice crop rotation in my farm and especially growing of native crops					
I burn my farm before tilling/digging					
I now use less pesticide in my farm					

PART E: ACCESS AND UTILISATION OF AGRICULTURAL EXTENSION SERVICES

Please indicate your opinion with regards to access and utilization of agricultural extension services: (Kindly tick the appropriate box for the following statements)

Community Participation	1= Strongly Disagree	2= Disagree	3= Neutral	4= Agree	5= Strongly Agree
I have been visited by local agriculture extension service officer					
Agriculture extension services are not useful to me					
I have to pay to access agriculture extension services					
The cost of extension services are affordable					
I have received the following services:					
• Crop Production Services,					
• Crop Protection;					
• Livestock Production Techniques					
• Training on Agroforestry,					
• Soil Conservation					
• Water Harvesting Training					
• Linkages to markets for harvest					
• Access to dealers on farm inputs					
• Dairy farming training					
• Poultry training					
• Beekeeping					
• Fish farming training					

PART F: QUESTIONS ON SUSTAINABILITY

Please indicate your opinion with regards to success of the disaster reduction projects

Aspects on sustainability	1= Strongly Disagree	2= Disagree	3= Neutral	4= Agree	5= Strongly Agree
The community members can maintain the project on their own in the future					
The project (s) being implemented by Order of St Augustine will bring about long term change in the area.					
The project will continue if Order of St Augustine pulls out or relocates from the area.					

Current farmers taking part in the project can transfer knowledge to new farmers interested in implementing similar projects in the future					
The methods of delivering project have been effective and clear to the members					
The project has built your capacity in management and prevention of disasters					
More farmers and community members are now willing to join and participate in disaster risk reduction projects					
The disaster risk reduction projects has met your needs as a farmer/community members					
You are now more equipped to use early warning systems in prevention of disasters					
You now use farming practices that conserve the environment and prevent natural disasters					
The project has impacted farmers as planned					

Thank you for taking time to talk with me and for answering the questions. Before I complete the interview, do you have any questions about the survey or is there anything else that you think I should know?

Appendix III Authorization Letter



ORDER OF ST. AUGUSTINE - KENYA PROJECT
PROJECT OFFICE
P. O. Box 18088 - 00500 , Enterprise Road, Nairobi

DATE: 16th February, 2020

Glannah Achieng Okoth
P.O Box 23747-00100
NAIROBI

Dear Ms. Okoth

REF: AUTHORIZATION TO CONDUCT RESEARCH

Your letter dated 10th February 2020 refers, I wish to authorize you to carry out research on Factors influencing Sustainability of Community Disaster Risk Reduction projects implemented by Order of Saint Augustine in Evurore ward, Mbeere North Sub County, Embu County as per your request and proposal for the fulfillment of the requirements for Master of Arts in project planning and Management at University of Nairobi.

Sustainability of Community Disaster Risk Reduction Projects is an area of importance not only to our organization but also to our stakeholders. This research will inform the organization on key issues to consider in projects design, planning, financing, implementation and management for sustainability.

I therefore find this research timely and worth for the benefit of the community. Go ahead with data collection for your research and feel free to share with us your findings.

Signature
Fr. Patrick O. Barasa
PROGRAMMES MANAGER

ORDER OF ST. AUGUSTINE
ISHIARA PROJECT OFFICE
16 FEB 2020
P. O. Box 2-60102, ISHIARA

Appendix IV: UON Letter for Data Collection



UNIVERSITY OF NAIROBI
OPEN, DISTANCE AND e-LEARNING CAMPUS
SCHOOL OF OPEN AND DISTANCE LEARNING
DEPARTMENT OF OPEN LEARNING
NAIROBI LEARNING CENTRE

Your Ref:

Main Campus
Gandhi Wing, Ground Floor
P.O. Box 30197
NAIROBI

Our Ref:

Telephone: 318262 Ext. 120

REF: UON/ODeL/NLC/31/337

22nd November, 2019

TO WHOM IT MAY CONCERN

RE: OKOTH GLANNAH ACHIENG - REG.NO. L 50/6010/2017

The above named is a student at the University of Nairobi, Open Distance and e-Learning Campus, School of Open and Distance Learning, Department of Open Learning pursuing a Masters course in Project Planning and Management.


She is proceeding for research entitled "*Factors Influencing Sustainability of Community Disaster Risk Reduction Projects: A Case of Order of Saint Augustine in Evurore Ward, Embu County, Kenya.*"


Any assistance accorded to her will be appreciated.


CAREN AWILLY
CENTRE ORGANIZER
NAIROBI LEARNING CENTRE




Appendix V: NACOSTI Research Permit


 REPUBLIC OF KENYA


**NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY & INNOVATION**

Ref No: **761468** Date of Issue: **24/January/2020**


RESEARCH LICENSE




**This is to Certify that Ms.. Glannah Okoth of University of Nairobi, has been licensed to conduct research in Embu on the topic:
FACTORS INFLUENCING SUSTAINABILITY OF COMMUNITY DISASTER RISK REDUCTION PROJECTS: A CASE OF
ORDER OF SAINT AUGUSTINE IN EVURORE WARD, EMBU COUNTY, KENYA for the period ending : 24/January/2021.**

License No: **NACOSTI/P/20/3570**

761468
 Applicant Identification Number


 Director General
**NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY &
INNOVATION**

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The Grant of Research Licenses is Guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014

CONDITIONS

1. The License is valid for the proposed research, location and specified period
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4. Excavation, filming and collection of specimens are subject to further necessary clearance from relevant Government Agencies
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National Commission for Science, Technology and Innovation
off Waiyaki Way, Upper Kabete,
P. O. Box 30623, 00100 Nairobi, KENYA
Land line: 020 4007000, 020 2241349, 020 3310571, 020 8001077
Mobile: 0713 788 787 / 0735 404 245
E-mail: dg@nacosti.go.ke / registry@nacosti.go.ke
Website: www.nacosti.go.ke