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CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT: AN INSIGHT INTO PERCEPTIONS OF THE OFFINSO SOUTH DISTRICT

BY

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A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES, KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF PHILOSOPHY DEGREE IN SUSTAINABLE AND INTEGRATED RURAL DEVELOPMENT

BY

GILBERT AWUAH-KUSI

JULY 2016

DECLARATION

I, **Awuah-Kusi Gilbert**, author of this thesis do hereby declare that except for specific references which have been duly acknowledged, this project is the result of my own research and it has not been submitted either in part or whole for any other degree elsewhere.

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ABSTRACT

This study was conducted to seek the perceptions of the residents of Offinso South district on climate change and resilience. The main aim of the study was to obtain an understanding of community's perception about climate change and resilience. A multistage sampling technique was employed in selecting the 308 respondents from five (5) communities within the Offinso South District. Data was analyzed using SPSS and results were presented using tables, graphs and charts. Results show that respondents believe climate change was mainly a change in the weather condition. They had also observed major changes in rainfall intensity and pattern, sunshine and wind intensity which contributed to the prolong dryness hence increase in food shortage and poverty. It was made clear that respondents perceived that climate change is a natural phenomenon and that its part of earth's natural cycle. Respondents further indicated that climate change had increased poverty both at the individual and community level. Respondents also perceived that education and sensitization on climate change and diversification of livelihoods would help improve their resilience against climate change.

In conclusion, results from the study shows that climate change is affecting the lives and properties of rural individuals. The sad thing is most of community members have no idea about what to do and things to avoid in this era of climate change to improve their resilience. These major impacts of climate change and naivety of individuals and community as a whole on actions to take with regards to climate change may bring development to a halt if not reversed.

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DEDICATION

This work is dedicated to God Almighty for the gift of life, for hearing my daily prayers and the many blessings given my family and myself. To my parents Rev. Samuel Kusi and Mrs. Beatrice Kusi for their unending support and prayers. Also to my brothers and sisters (Daniel Kusi, Obed Kusi, Samuel Kusi, Dorcas Kusi and Anna Kusi) for their encouragement. I say God bless you all.

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God bless you.

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LIST OF ACRONYMS

MDG's	- MILLENIUM DEVELOPMENT GOAL's
UNEP	- UNITED NATIONS ENVIRONMENT PROGRAMME
UNDP	- UNITED NATIONS DEVELOPMENT PROGRAMME
UN	-UNITED NATIONS
UNISDR	- UNTED NATIONS INTERNATIONAL STRATEGY FOR DSASTER REDUCTION
EPA	- ENVIRONMENTAL PROTECTION AGENCY
USAID	- UNTED STATES AGENCY FOR INTERNATIONAL DEVELOPMEN
IPCC	- INTERNATIONAL PANEL ON CLIMATE CHANGE
NOAA	- NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
HIV	- HUMAN MMUNE VIRUS
AIDS	- ACQUIRED IMMUNE DEFICIENCY SYNDROME
WHO	- WORLD HEALTH ORGANISATION
UNFCC	- UNITED NATIONS FRAMEWORK ON CLIMATE CHANGE
USD	- UNITED STATES DOLLARS
WCED	- WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT
SDG's	- SUSTAINABLE DEVELOPMENT GOAL's
CARRI	- COMMUNITY AND REGIONAL RESILIENCE INSTITUTE
SPSS	- STATISTICAL PACKAGE FOR SOCIAL SCIENTIST
IFAD	- INTERNATONAL FUND FOR AGRCULTURAL DEVELOPMENT

CHAPTER ONE

INTRODUCTION

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1.1 Background of the study

The study is focused on soliciting respondents' perception on building climate resilient communities as a means through which Ghana will be able to sustain and maintain its current developmental gains as well as securing it for use by its future generations. Climate change has become a torn in the flesh of many developing countries and even some developed countries and hence has become a concern of world organizations such as the United Nations and World Bank. The earth's average surface air temperature has increased by about 0.8 °C (1.4 °F) indicating a change in the atmosphere since 1900. Much of this increase has been taking place since the mid-1970s.A number of observations such as reduced arctic sea ice extent, increased ocean heat content and indications from the natural world such as pole ward shifts of temperature also indicates this change. It has increased poverty and also caused a lot of disasters around the globe reversing developmental growth through biodiversity loss, the degradation of water, dry lands and forests. In view of this as stated in Ghana Goes for Green Growth discussion paper (2010) by H.E. John Dramani Mahama the then Vice president (now President) *"We cannot allow climate change to pull us back. The only way we can go forward, developmentally, is to address its impact and to seize any opportunities it presents".* This indicating the need for building climate resilient communities in Ghana.

Resilience refers to "the ability of a system to sustain itself through adaptation and occasional transformation" (Magis, 2010). Community's ability to sustain, withstand and

recover from adversity (e.g. Climate change, economic stress, influenza pandemic, manmade or natural disasters) has become a key policy issue, especially in recent years (National Security Strategy, 2010; DHS, 2010a). Climate-resilient development is a key topic in the resilience literature suggesting that people, communities, businesses, and other organizations in the future will be able to cope with the current climate changes as well as protect developmental gains, and reduce damages (United States Agency for International Development, 2014). Climate-resilient development is about the inclusion of impacts of climate change and opportunities in the early stages of development decision-making in order to improve development outcomes, rather than implementing development activities in a completely new way. Dangers associated with climate change cannot be excluded, but negative impacts on people and economies can be reduced or managed. Therefore inclusion of climate-resilient activities in developmental projects or programs will help reduce the costs and consequences of climate impacts so they do not serve as a hindrance to progress towards achieving developmental goals (United States Agency for International Development, 2014). There were substantial progress in achieving the Millennium Development Goals (MDGs) and several successes in reaching specific targets globally and in individual countries.

However, the prospects for achieving all of the MDGs differed sharply across and within countries and regions. More than a billion people still live in extreme poverty (United Nations, 2013) and hence has led to the development of the sustainable development goals. Far too many individuals are confronted with serious deprivation in health and education with advancements being hindered by various inequalities related to age, ethnicity, income, disability, gender and location. Climate change combined with an extended global

economic decline in recent years have increased poverty, inequality and exclusion. Biodiversity loss, the degradation of water, dry lands and forests and the intensifying risks of climate change threaten to reverse development successes realized to date and undermine any future gains (United Nations, 2013). Indeed, it was observed that there was a drastic reversals in Millennium Development Goals' progress after countries experienced climate related disasters during the waning years of the last decade. Therefore, building resilience to such shocks will be a key aspect of sustaining any post- millennium development goal targets thus the new Sustainable Development Goals (United Nations Development Programme, 2011). Day in day out development faces a new series of problems, ranging from climate change to food insecurity, from energy issues to citizens' insecurity, from fiscal and monetary crises to growing global inequalities. Shocks and crises are rather becoming normal occurrence rather than an exception and hence increasing a lot of countries vulnerability more than ever (United Nations Development Programme, 2011). Clearly, most shocks or disasters have the potential to completely destroy developmental gains that have taken years for countries to achieve. This can have a domino effect on human development and can have a lasting impact on countries. For example a negative impact on health and education today can lead to higher mortality rates tomorrow. A reduction of children in school can lead to reduction completion rates in later years and the aim to help people to escape from poverty can be delayed by household incomes that fall far below the poverty line (World Bank, 2010). For example, the 200001 Pakistan drought was estimated to have increased poverty levels by more than 15 per cent in Sindh province (up to 30 per cent in rural areas). Most importantly, with women, girls and vulnerable socio-economic groups disproportionately affected, the impact of such disasters is highly unequal (Jones & Bahadur, 2013). Indeed, epidemics like malaria, dengue and

diarrhoea that spread in the wake of a disaster can, in many cases, contribute as much to the death toll as the disaster event itself (Asian Disaster Preparedness Center, 2010). Similar negative impacts of climate change were associated with each of the other MDGs– from universal primary education to gender equality and maternal health. Climate change in Ghana can be seen through rise in average temperatures, reduction in rainfall totals and changes in rainfall patterns, rise in sea levels and high occurrence of weather extremes and disasters (UNEP/UNDP, 2012). The overall assessment of Ghana's progress toward the MDGs revealed that, while progress was generally positive, performance was mixed across indicators, regions and localities and thus the overall pace of progress, based on current trends, was insufficient to achieve many of the MDGs such as under-five, infant and maternal mortalities as well as access to improved sanitation by the target date of 2015 (Osei-Assibey & Grey, 2013).

It has therefore become necessary that developing nations will need to protect and sustain development progress and, even as governments in their bid to increase their pace towards the achievement of the new sustainable development goals, they will need to protect progress already made (United Nations Development Programme, 2011) especially by improving community resilience to climate change. This shortfall in the achievement of the millennium development goals due to disasters has led to the acknowledgement that disaster risk reduction and increasing resilience to all types of dangers (climate change) in countries, as indicated in the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters is very important (Asian Disaster Preparedness Centre, 2010). Resilience in general was not sufficiently captured in the original Millennium Development Goal agenda, in spite of the relationship between disasters and development (UN System Task Team, 2012) but now there is a clearer

understanding of trends through the availability of climate and weather related evidence which shows how natural hazards (climate change) are caused by these disasters. Vulnerability to countries will continue to increase and hence resilience has become a pivotal discussion in the post-2015 development agenda if the objectives of sustainable development are to be achieved (UN System Task Team, 2012).

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1.2 Statement of the Problem

There is no doubt that developing countries around the globe are now experiencing the impacts of climate change which are beginning to manifest on the entire globe and are relatively vulnerable compared to developed nations (UNEP/UNDP, 2012). Climate change is a global challenge, but many of the effects will be felt most acutely by poorer countries and poorer people (World Bank, 2010). Since the first Rio summit in 1992, 4.4 billion of people have been affected by disasters associated with climate change and natural hazards. This has also caused $2 trillion of damage and killed 1.3 million people (UNISDR, 2012). The extent of these losses related to the impact of climate change and disasters on economic growth at times of economic decline, has pushed the issue of disaster risk management up the international political agenda. These tendencies are likely to pose a significant challenge for achieving the next generation of development goals, although evidence for this line of argument needs to be improved. Disasters hinder economic growth, particularly in developing countries, delay or reverse poverty reduction efforts and destroy properties (Mitchell, 2012).

Ghana as a developing country is also a victim of the current impacts of climate change. These changes have been mainly attributed to human activities such as deforestation, mining activities, burning of fossil fuels etc. which have led to the increase in atmospheric

carbon concentration. Ghana's economy is very susceptible to climate change because it is highly dependent on sectors which are susceptible to climate change, examples include agriculture, energy, forestry, etc. for its developmental gains. Although climate change tends to affect everybody whether rich or poor in diverse ways but in Ghana, farmers stand to suffer the most. This being so because they are heavily reliant on rainfall as source of water to "feed" their crops and that the current change in climate has made it very difficult to predict rainfall trends; thus when are the rains beginning, its duration, its intensity and when it will be ending. There has been a steady rise in temperature and decrease in mean annual rainfall in all the six agro-ecological zones from year 1961 to 2000 in the country. The annual average temperatures in all the six agro-ecological zones are estimated to be between 0.8°C and 5.4°C for the years 2020 and 2080 respectively (UNEP/UNDP, 2012). There has also been a general reduction in rainfall levels and patterns with increasing average temperature(Agyemang-Bonsu et al., 2008 as cited in UNDP/UNEP, n.d) due to global warming supposedly caused by emissions of greenhouse gases of which carbon emissions plays a major role(United States E.P.A,2010).

The only way out is for communities to develop resilience towards climate change; thus ensuring that people, communities, businesses, and other organizations are able to absorb and recover from current climate change variability as well as adapt to future climate change, to protect development gains, and reduce the impacts. Although most of the people in Ghana especially the farmers in the rural areas in their own local ways appreciate the changes that have been taking place in the rainfall and temperature patterns within the last decade. The question remains that what is the level of knowledge about climate change of these local folks? Are they aware of the causes of these changes? In what ways have they

been adapting to these changes in the climate? This research therefore seeks to address these problems by engaging both community members and resource persons in order to find out ways through which they can develop and improve on local community resilience to the fast changing climate in Ghana within the shortest possible time.

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1.3 Main objective

The main aim of this study is to obtain an understanding of the residents of the OffinsoSouth community's perception about climate change and resilience.

1.3.1 Specific Objective(s)

1. To understand communities perception of climate change.
2. To explore various ways through which the residents of Offinso-South district have been reacting to climate change.
3. To explore perceptions on how the Offinso-South district can become climate-resilient.

1.4 Rationale /Justification for the Research

There are many problems that confront developing countries in relation to development of their economies and giving their citizens a better life. The question may be asked that why do we have to pay attention to climate change in a country where children suffer from malnutrition and disease, inadequate clean drinking water and lack of sanitation facilities? The answer to this question as stated by USAID (2014) includes the dangers climate change pose to meeting many development goals (sustainable development goals), such as eradication of poverty. Secondly, consideration of climate change into projects, programs and development strategies can enhance their sustainability as well as expose alternative

development approaches and lastly climate change serves as an opportunity to address development challenges, including risks from current climate variability, with a fresh perspective.

The resurgence of building resilient communities relates to the current ongoing discussions as to what elements or targets are going to be included in the post millennium development agenda to ensure that a post-2015 development framework is better able to deal with and respond to disasters and longer-term stresses. This is where the concept of climate resilience adds value. This research therefore when completed will inform policy makers and donors on how communities can locally achieve resilience in the face of the various impending shocks and stress as a result of climate change which can lead to economic downfalls. This will then serve as a pathway for protecting already achieved developmental levels of the millennium development goals whiles creating room for safeguarding developments projects that will be undertaken in the post millennium development goals that will be drawn.

1.5 Organization of the Study

This study is structured into five chapters. Chapter one opens with background information of the study. The scope of the study can also be found here.

In chapter two, relevant literature based on critical review and evaluation of the empirical and theoretical prepositions and generalization on the subject matter are the main focus.

This is important in understanding the work of others and gaps that could be filled in already completed works in order to add more to knowledge.

The third chapter contains the methodology employed in this study. Here, the choice of the study area and sampling procedure as well as the data collection method is elicited includes

some basic concept definition as used in this work. Chapter four deal with results analysis and presentation pertaining to the data collected and discussion of the outcome also in chapter five. The study then concludes with chapter six, which summarizes the major results of the study and the main recommendations.

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CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter seeks to review relevant literature based on critical review and evaluation of the empirical and theoretical prepositions and generalization on climate change and building climate resilient communities. Lots of works and researches have been conducted by various world bodies on the subject of resilience towards climate change and hence these works will be studied and reviewed to give more understanding of the work of others and gaps that could be filled in already completed works in order to add more to knowledge.

2.1 Climate Change and Its Impact

Climate is widely thought of as the expected weather conditions at a given location over time. By using statistics such as average temperatures, number of rainy days, and the frequency of droughts, climate can be measured at regional levels or the entire globe— (National Research Council, 2012).

The United Nations in their Framework Convention on Climate Change (1992) defines climate change as "changes of the climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods". This definition is also backed by the IPCC (2014) which also defines climate change as "change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically ten years or more". These definitions indicate that in order for a change in the climate to be regarded as climate change, the change should have lasted not less than a decade(10 years) (International Panel on Climate Change, 2014).

Climate change is a normal part of the Earth's natural variability, which is related to interactions among the atmosphere, ocean, and land, as well as changes in the amount of solar radiation reaching the earth (NOAA National Weather Service, 2007). If so then why is the current climate change (warming) of concern?

The current climate change has become of great concern now because since 1900 through to the mid- 1970s, there has been an increase in the global average surface temperature of the earth by about 0.8 °C (1.4 °F) with much of this increase taking place since the mid1970s. Also there has been observations and signs from the natural environment including reduced Arctic sea ice extent, increased ocean heat content, pole ward shifts of temperature-sensitive species of fish, mammals and insects, etc. which together serves as an undisputable evidence of global-scale warming (The Royal Society, n.d). The problem is not just changing temperatures; it is a changing climate—or a change in the weather patterns that people and ecosystems have become accustomed to over time and these changes could have devastating effects on humans. (Pew Center on Global Climate Change, n.d)

This rise in average temperature as indicated in figure 2.1 has been mainly attributed to the increase in carbon emissions by human activities by about 40%, with more than half the increase occurring since 1970 at the start of the Industrial Revolution (IPCC, 2007) leading to climate change. The increase in atmospheric carbon dioxide is related to two main causes thus anthropogenic causes such as mainly digging up and burning of coal, oil, and natural gas for energy, such as cement production and cutting down and burning of forests (deforestation). Other school of thoughts also attribute these changes to natural internal forcing mechanisms including ocean variability, Plate tectonic, volcanism, solar output,

precessions of the equinoxes, obliquity, eccentricity etc. the rise in temperature (The Royal Society, n.d).

These changes in climate have dire impacts on countries such as famines, floods, biodiversity loss etc. as shown in Figure 2.1 especially Africa where estimates reported indicate that one third of African people already live in drought- prone areas and 220 million are exposed to drought each year (United Nations Framework Convention on Climate Change, 2007).

Apart from the above mentioned fact, Africa including Ghana will face increasing water shortage and stresses. This will be so because all of the 50 river basins in Africa are cross boundary and this has a possibility to cause of water conflicts (Ashton 2002, De Wit and Jacek 2006). Agricultural production will be highly compromised because it is rainfall dependent for irrigation and will be severely compromised in many African countries, particularly for subsistence farmers and in sub-Saharan Africa (United Nations Framework Convention on Climate Change, 2007). Most of the agricultural lands will be lost under climate change which will be accompanied by decreased growing seasons and reduced yields. Reports indicate that climate change will bring about a general decrease in most of the subsistence crops, e.g. maize in Ghana and groundnuts in Gambia. This will expose people to hunger due to climate change (Fischer et al. 2002).

Furthermore, Africa is susceptible to a number of climate sensitive ailments including but not limited to malaria, tuberculosis and diarrhea (Guernier et al. 2004). Rise in temperature under climate change have changed the geographical distribution of disease vectors which are migrating to new areas and higher altitudes. For example, the female anopheles mosquito has now migrated to higher altitudes which will expose a lot of people to infection in the densely populated east African highlands (Boko et al. 2007). Future climate changes

in combination with other stresses and vulnerabilities such as HIV/AIDS, conflicts and wars will reduce life expectancy in many African countries (Harrus and Baneth 2005), resulting in increased vulnerability and risk to infectious diseases such as cholera, diarrhea and malnutrition for adults and children (WHO 2004).

To add more, according to the UNFCC, (2007) the African coastlines including the already degraded coral reefs on the Eastern coast is at risk because of future sea level rise. National communications indicate that the coastal infrastructure in thirty percent of Africa's coastal countries, including the Gulf of Guinea (Ghana), Senegal, Gambia, Egypt, and along the East-Southern African coast, is at risk of partial or complete flooding due to increased sea level rise. In Tanzania, a sea level rise of 50 cm would flood over 2,000 km^2 of land, costing around USD 51 million (UNEP 2002). Lagoons and mangrove forests of both eastern and western Africa are also threatened by future rise in sea level, and is likely to impact urban centers and ports, such as Cape Town, Maputo, and Dar Es-Salaam (United Nations Framework Convention on Climate Change, 2007).

Climate Change: Processes, Characteristics and Threats

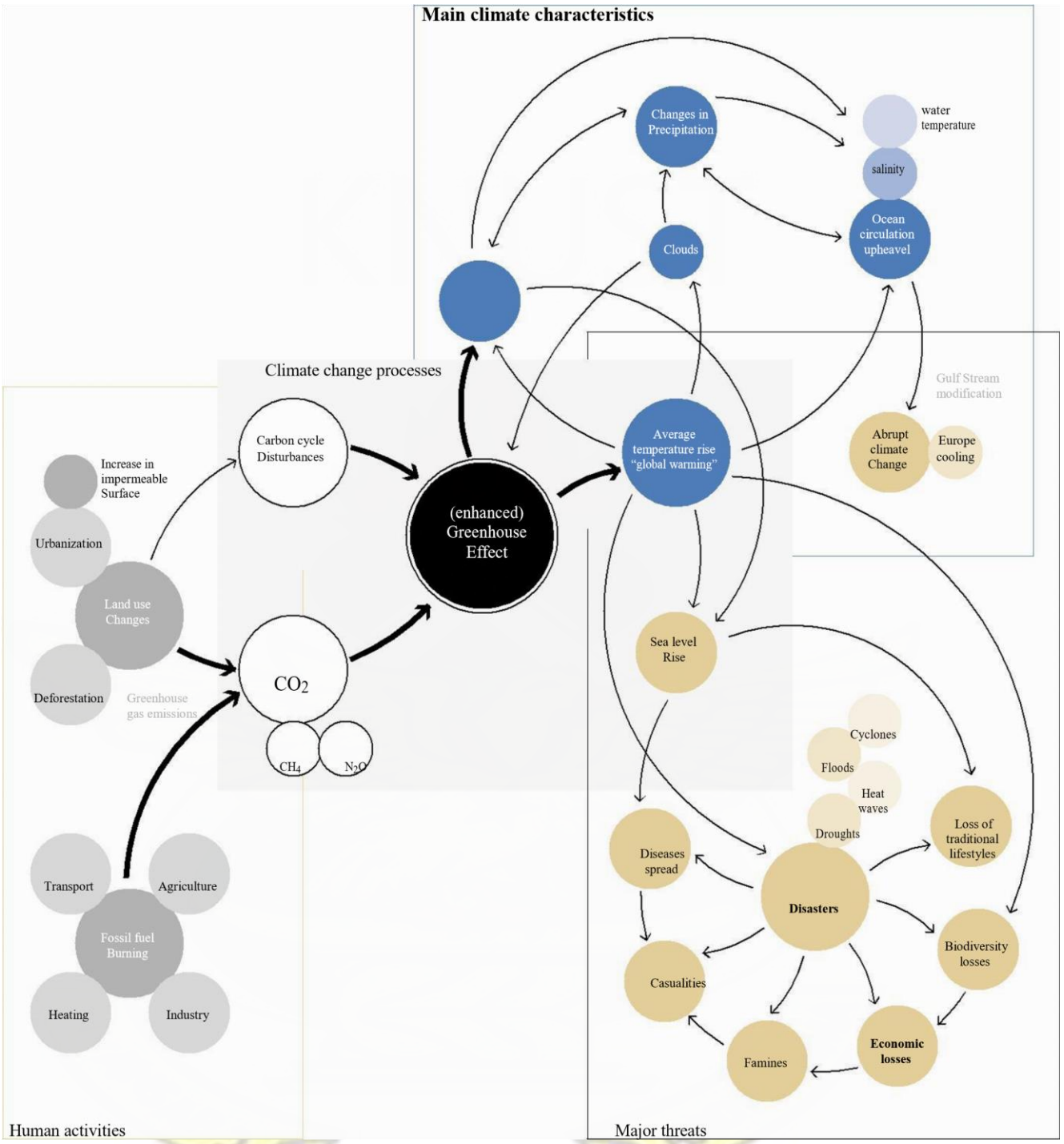

Figure 2.1-Climate change: processes, characteristics and threats
Source: UNEP/GRID–Arendal Maps and Graphics Library, 2005

2.2 Climate Change and Sustainable Development

Sustainable development is defined as "development that meets the needs of the present without compromising the ability of the future generations to meet their own needs"

(WCED, 1987). This does not mean cutting our economic growth in favor of protecting the environment but rather promoting economic growth as a necessary tool for enhancing the quality of the environment. The Sustainable Development Goals, were created to replace the MDGs, and will shape global development priorities for all countries till at least 2030. While the MDGs target developing countries, the SDGs are aimed at all countries, including industrialized ones (Ansuategi, et al., 2015). Rio+20 Conference on Sustainable Development in 2012 initiated a UN process to create the post-2015 Sustainable development goals (Osman-Elasha, 2009) also known officially as Transforming our World: The 2030 Agenda for Sustainable Development (Ansuategi, et al., 2015). These goals are 17 in number with 169 targets. Climate change has the potential to affect almost all the seventeen goals from ending poverty to revitalizing global partnership for sustainable development and vice versa. It is therefore not surprising that SDG 13 is aiming to combat climate change and its impact (Ansuategi, et al., 2015) which might be the key to achieving the rest of the goals by 2030.

The connection between climate change and sustainable development comes from the fact that it is a major restriction to development, and sustainable development is a key to building countries capacities for mitigation and adaptation to climate change. Sustainable development is needed, desirable, and environmentally beneficial but the problem of climate change poses a threat for Less Developed Countries to achieve sustainable development as it threatens resources, deepens existing problems, poses new problems, and makes solutions more difficult and expensive (Munasinghe, et al., 2003). It is an established fact that developing countries are susceptible to climate change due to increased frequency of storms, floods and other extreme events change in cropping patterns, loss of livelihoods

from fishing and farming, uprooting and migration due to submergence and increased cooling costs (Osman-Elasha, 2009).

Climate change and sustainable development has direct impacts on each other. That is a strict adherence and compliance of nations to sustainable development would mean countries adopting a green growth development mechanism which would in turn minimize the emissions of co2 causing climate change and hence reduction in the impacts of climate change which will lead to preservation of developmental gains. On the other hand, climate change if not controlled will lead to increase in poverty (SDG 1), food insecurity (SDG 2), health complications (SDG 3), destroy vegetation's and biodiversity (SDG 15), less and expensive source of energy (SDG 7), drying up of water bodies and flooding (SDG 6 & 14) etc. these impacts will have a trickling down effect on other goals such as increase in inequality between people and nations (SDG 10), increase human insecurity (SDG 11) and unsustainable consumption and production (SDG 12). This impacts indicate clearly the risk and influence climate change has with regards to achieving the sustainable development goals by 2030 and hence the need for building climate resilient communities.

2.3 The Concept of Resilience and Climate-Resilient Communities

Resilience was derived from the Latin *resalire*, thus to spring back. Definitions for resilience differs across the various disciplines and has become an important term in the

language ranging from psychology to ecology (Community and Regional Resilience Institute, 2013). There have been various definitions of resilience since the 1970 as documented in the CARRI (2013) report. Below are some of the definitions of resilience in the CARRI 2013 report.

Table 2.1: Definitions of Resilience

Author	Domain	Definition
Bodin,	Physical	"The speed with which a system returns to equilibrium after displacement irrespective of how many oscillations are required"
Resilience Alliance	Ecological systems	"The capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure and feedbacks—and therefore the same identity."
UN/ISDR	Community	"The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure"

Source: (Community and Regional Resilience Institute, 2013)

These various definitions shown in Table 2.1 indicate clearly the difficulty in coming out with one accepted definition for resilience and that every definition is related to its background of study. But one idea that cuts across all the definition is that "the system" should be able to "withstand" shock or disaster. Therefore basing on these ideas, the operational definition for resilience for the purposes of this work would mean the communities ability to;

> "Anticipate, minimize and absorb potential climate stresses or destructive forces and has the ability to recover or 'bounce back' after a climate related disaster"

This definition indicates that a climate resilient community should have the capacity to predict future impacts of climate change on their community and through that find possible mitigation solutions by either minimizing, absorbing or totally preventing the anticipated impact. Moreover in situations where they are caught unaware and are hit by a climate related disaster, have the capacity to recover from it without losing their basic structures and functions.

2.3.1 Resilient Community

According to Centre for Community Enterprise, 2010 in their community resilience manual, they define a resilient community as a "community that takes intentional action to enhance the personal and collective capacity of its citizen and institutions to respond to and influence the course of social and economic change". This definition has similarities with that of the PASI Institute on Climate Change and Hazards, 2010, which states that "resilient communities take deliberate action to reduce hazard risks, prepare for, and accelerate recovery in the face of disasters…" Both definitions agree to the fact that there must be a "conscious effort "on the part of the community to prepare, reduce and recover from hazards.

It must be noted that, that no two communities may be exactly alike in terms of how they define the concept and apply different weights to factors that they consider to foster resilience and the conditions in which their resilience is manifested, perceived, evaluated, and improved (PASI Institute on Climate Change and Hazards, 2010) and therefore in order to address increasing climate change related hazards, a comprehensive approach to minimizing their impacts which must be context specific must be developed. That is, an approach is needed that emphasizes the characteristics of communities that allows them to

absorb impacts from a variety of stressors, including weather and climate, and adapt to adverse conditions during and after a disturbance. Such an approach must incorporate strategies that address climate change science and incorporate the global, regional, and local knowledge domains of disaster risk reduction and adaptation (Sperling & Szekely, 2005).

Despite these assertions, there have been various frameworks and manuals that have been developed by various institutions to serve as a sort of blueprint approach for building resilience. Examples of these include The Community resilience manual (2000) by Center for Community Enterprise, a Framework for Community Safety and Resilience, 2008 by International Federation of Red Cross and Red Crescent Societies Disaster policy and preparedness department and Climate-Resilient Development: A Framework for Understanding and Addressing Climate Change 2014 by USAID.

2.3.2. The Community Resilience Manual

This manual was developed by the Centre for Community Enterprise in 2000 for British Columbia's towns which were economically unstable to serve as a simple, practical resource that could aid them in achieving resilience. The idea was to create a resource that could make better decisions about how to invest their limited resources efficiently and effectively (Centre for Community Enterprise, 2000). The communities of Powell River, Port Alberni, Houston, Smithers, Burns Lake and Revelstoke were used as study areas. The aim of the manual was to help rural communities cost-effectively to assess their own state of resilience and establish priorities for strengthening.

According to the manual, a resilient community is “one that takes intentional action to enhance the personal and collective capacity of its citizens and institutions to respond to and influence the course of social and economic change”. The manual is basically structured in five (5) broad steps;

- Understanding the Concept of Resilience
- Assessing your Community Resilience
- Documenting your Results in Portrait of Community Resilience
- Making decisions- using the community portrait to set local priorities for investing community resources more effectively
- Creating a plan to address community priorities and strengthen your resilience The resource further listed 6 main key characteristics of a resilient community and they are;

1. They take different kinds approaches to achieve or make sustainable development systems within the community.
2. Maximization use of limited resources through careful planning to get the greatest benefit out them.
3. They develop ideas that combine social and economic goals and build local capacity.
4. They organize and prioritize important sectors of the community.
5. In order to achieve their goals, they concentrate their energies on finding outside resources in addition to their financial and human resources.
6. They have set up a critical mass of co-operating organizations through which locally based decisions are fulfilled and judged and evaluated.

2.3.2.1 The 4 Dimensions of Resilience (Resilience Model)

The model comprises of two information levels and is based on how communities work successfully. The model has four dimensions of resilience as indicated in figure 2.1 and each dimension is vividly explained in detailed characteristics of resilience. Both the dimensions and characteristics are based on the ideal but it should be noted that no community fits the “”ideal” completely. These dimensions are people in the community, organizations in the community, resources in the community and community process.

1. **People in your Community**: **Attitudes and Behaviors**

   This dimension helps to discover attitudes and behaviors related to leadership, initiative, education and optimism. Resilient communities are open to new ideas and alternatives and have a “can do” attitude that can be seen in their quick response to change.

2. **Organizations in your community: Attitudes and Behaviors**

   Resilient communities ensure they have sufficient organizational capacity or influence in access to equity and to credit, human resource development, research and planning and advocacy. There is collaboration between social and economic organizations in order to engage society in resilient communities.

3. **Resources in your Community: Awareness and Use**

   Resilient communities are aware of their resources and hence build on their strength whiles seeking external resources in addition to achieve their aims. They make effort to be dependent and maintain community sustainability. This dimension

therefore helps communities to balance relationship between internal and external resilience

4. Community Process: Strategic Thinking, Participation and Action

Resilient communities take time to research, analyze and plan for their future. They have a widely shared vision for their future, involve key sectors in implementation of the goals and measure results on a regular basis. They also examine local process of planning, participating and implementation of community economic development.

Figure 2.1 Four (4) Dimensions of Resilience Model

Source: Centre for Community Enterprise, 2000.

2.3.2.2 The 23 Characteristics of Resilience

The four dimension are further analyzed and disaggregated into series of more detailed "characteristics of resilience". According to the manual, these qualities are the specifics factors that are considered in a community to assess the level of resilience. Further research

and analyses can be conducted on these qualities. The characteristics in the manual are not exhaustive and that most characteristics are community specific and hence different communities will experience different levels of resilience in each of the characteristics. Below are the 23 characteristics; (Community and Regional Resilience Institute, 2013)

1. There is a balanced representation in leadership irrespective of culture, age or gender.
2. They have leaders who have vision, delegate's power and were elected by the community.
3. There is community participation in decision making.
4. There is a sense of pride in the community.
5. The people anticipate a brighter future.
6. There is a spirit of mutual assistance and cooperation in the community.
7. Community members feel a connection to their community.
8. They depend on their own resources to solve major issues.
9. Education is supported at all levels.
10. There are types of community economic development organizations in the community such that the key functions are well served 11. There is a collaborative partnership between organizations.
12. There is diversified employment.
13. Major employers in the community are locally owned.
14. The community has a strategy for increasing independent local ownership.
15. Community is opened up to different ways of livelihood opportunities.
16. They search and find resources that will solve areas of identified weakness.
17. There is awareness of community's position on the broader economy.

18. Their development is well planned using their CED plan.
19. Vision and goals of the community are created by community members.
20. There is on-going action towards achieving the goals in the CED plan.
21. Evaluations are regularly done to ensure development is in accordance with their strategic goals
22. Organizations use the CED plan to guide their actions
23. There is total community participation involving all parts of the population.

It should be noted that there can be more characteristics based on the community in question and that there may be others that are not included in these stated ones. Moreover no community can have all these qualities and that communities maybe stronger in some characteristics than others and hence resilience is community specific.

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CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the study area; describes the approaches that were adopted for the study; sample and sampling techniques; data sources, data collection and analysis tools.

3.2 Study Area

The study took place in the Offinso-South municipality which is located at the north western part of the Ashanti region (5°59′N 1°46′W). The Offinso-South municipality unlike other districts have not experienced much climate related disasters except few months of drought and changes in rainfall pattern which is a common phenomenon related to climate change globally but the fact remains that climate change is happening and every place is being and will be affected. Hence there is the need for developing resilience in all communities and not only in communities where impacts of climate change is high. Apart from this fact, the 2010 census by Ghana Statistical Service (2010) reveals that over 50.0 percent of the employed within the Offinso-South Municipality are skilled agricultural forestry and fishery workers meaning that their livelihoods are directly related to climate and hence any changes to the weather will have a direct impact on their livelihoods.

The topography of the municipality is generally undulating with an elevation of about 277.8 metres above sea level. It is drained by four main rivers, Offin, Anyinasu, Ode and the Pro Rivers.

The municipality has a bi-modal rainfall pattern. The rainy season occurs during the months of April to June and in September and October. A feature of rainfall in the semiequatorial zone is its variability within the year and over time. Mean annual rainfall is 103.8 millimeters. The variability in Rainfall pattern can adversely affect agriculture since

farming in the municipality is rain dependent (Ghana Statistical Service, 2014). The vegetation is characterized by the moist semi-deciduous type of forest, with interspersed thick green cover. Major tree species found in the forest are wawa, cedar, odum, ofram, emire among others (Ghana Statistical Service, 2014).

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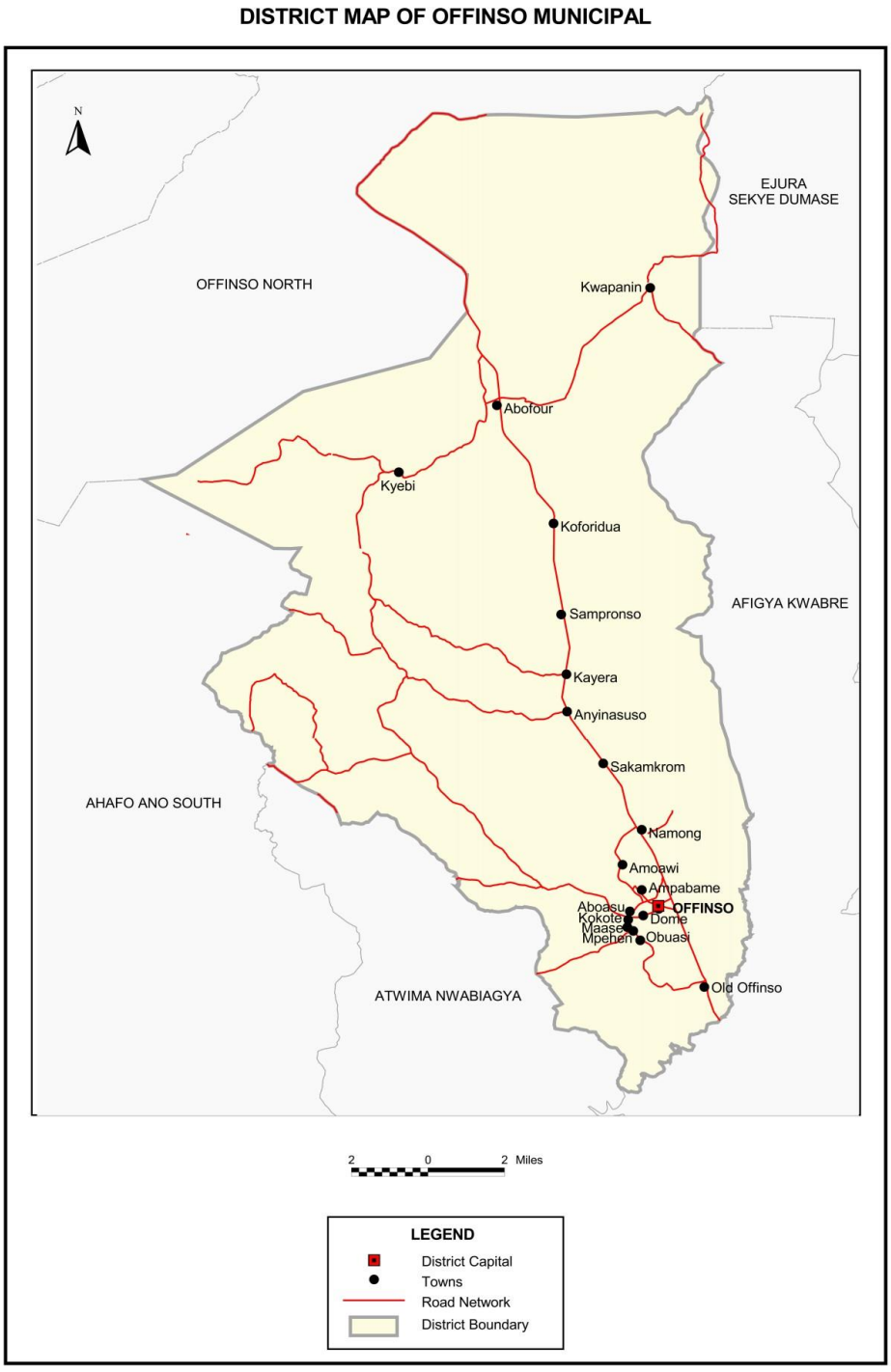

Figure 3-1: District map of Offinso south

3.3 Methods

3.3.1 Research Design

This research study used the quantitative approach to research as the major research design but was also aided by the qualitative design to help in explaining some perceptions and hence it combined different research techniques. A representative quantitative survey was administered and a qualitative approach (Elliot & Timulak, 2005) was used to obtain an understanding and interpret communities understanding of climate change and ways through which resilience can be achieved.

Survey research includes the collection of information from a sample of individuals through their responses to questions (Research Design and Data Collection, n.d). A case study method was also be selected for this research as it focuses on the topic, and accommodates several data-gathering techniques.

3.3.2 Target Population

This research targeted adults from the ages of 28 and above who have lived in the selected communities for more than ten (10) years. Ten (10) years was set as the minimum residency year because in order to appreciate climate change, the change should have lasted not less than a decade (International Panel on Climate Change, 2014) with the base year being 18 years as at the year 2005

3.3.3 Sampling Techniques

This included all the stages and the processes involved in reaching the respondents.

According to Twumasi (1986), the first step in the selection of a sample is to consider sampling technique. In this research the sampling technique used was the multistage sampling technique. With multi stage sampling, a sample was selected using a combination of different sampling techniques at different stages. It is also known as the two-stage technique (West, n.d.). Simple random sampling was employed at both stages to select respondents. Simple random technique was used because it gave every community and every respondent equal chance of being selected for the study. For the first stage simple random technique was used to select the five (5) communities out of the 20 communities by randomly picking the communities from a shuffled list. In selecting the 308 respondents households were randomly chosen during field visits.

3.3.4 Selection Of Study Areas

The Offinso municipality is divided into 20 communities namely; Kwapanin, Abofour, Kyebi, Koforidua, Sampronso, Dome, Fawoma, Kayera Anyinasuso, Sakamkrom, Namong, Amoawi, Ampabame, Aboasu, Kokote, Maase, Mpehem, Oboase and Old Offinso (Ghana Statistical Service, 2014). Five (5) communties were randomly selected as part of the stage in the multi stage sampling used. These communities were Mpehen, Kyebi, Kayera, Amoawi and Obuasi.

3.3.5 Sample Size

A sample size of 308 households was selected from a population of 1343 households using the Yamane sample size calculation formula with a 95% confidence level.

$ny = N/1+Ne^2$ where N=

Population size e=

confidence level

nY= Yamane Sample

Table 3-1: Distributions of Sample Size

Community	Number of Households	Sample Size
MPEHEN	217	50
AMOAWI	334	77
OBUASI	283	65
KAYERA	247	56
KYEBI	262	60
Total	1343	308

Various distributions were done using proportions to ensure adequate representation; thus No. Household/Total No. of Household × Total Sample Size.

One person each from the Meteorological department, Offinso Municipal Assembly and Head of Farmers Association will be interviewed as key informants on their knowledge about climate change and how climate resilience can be achieved.

3.3.6 Types and Sources of Data

Qualitative and quantitative data were used for this study. These were obtained from primary and secondary sources. Data collection techniques such as focus group discussions, observational walks, semi-structured interviews (Joubish, et al., 2011) and questionnaires were administered to gather data on characteristics and perceptions of the research participants.The primary sources included both officials and selected members in

the communities. The secondary data was obtained from journals, articles, reports, research papers, internet and other related sources.

3.3.7 Data analysis procedure

In relation to data analysis, descriptive method of data analysis was used to analyse the quantitative data whiles the qualitative data (Braun & Clarke, 2006) was used to support the quantitative data in the form of quotes. Microsoft excel was used in the design of graphs, tables and charts.

3.3.8 Study limitation

The major limitation of the study was the fact that secondary data from the meteorological department on certain climatic statistics of the Offinso South district and food commodities were not available. This made it difficult to be able to compare facts.

Secondly, the period in which this study was conducted was in the dry season and hence might influence people's perception or judgment on climate change and hence might affect the results of the study.

CHAPTER FOUR

ANALYSIS AND DISCUSSION OF FNDINGS

4.0 Introduction

This chapter presents demographic characteristics of the respondents in the survey and their perceptions of changes in climatic parameters. It analyses respondents' perception on causes of change and possible ways by which respondents can be resilient to the changes (changes in rainfall and temperature and the observed manifestation impacts of the perceived changes in climate).

4.1 Demographic Characteristics

4.1.1 Sex Distribution of Respondents

The sex characteristics of the respondents are presented in table 4.1 and it shows the females are slightly in majority with 50.3% with the male respondents accounting for 49.7%.

Table 4.1 Sex Distribution of Respondents

SEX	Number	%
MALE	153	49.7%
FEMALE	155	50.3%
TOTAL	308	100%

Source: Field survey, 2016

4.1.2 Age Distribution of Respondents

Majority of the respondents were between the ages of 28-37, making up 46.1% as shown in table 4.2 below. This is closely followed by the 38-47 age group as the second largest

group accounting for 21.8% of the population with only 0.3% of the respondents falling within the 88-97 age category. The study shows that the study area has a youthful population which is also shown in the population pyramid for the municipality consisting of a broad base of children which tapers upwards to a small number of the elderly (Ghana Statistical Service, 2014). The youthful characteristics of the study area holds good prospects for farming activities in the study area.

Table 4.2-Age Distribution of Respondents

Age	Number	%
28-37	142	46.1
38-47	67	21.8
48-57	53	17.2
58-67	26	8.4
68-77	15	4.9
78-87	4	1.3
88-97	1	0.3
Total	308	100.0

Note: Modal Age= 28-37 Median age= 38-47

Source: field survey, 2016

4.1.3 Occupation of Respondents

The study shows that 44.5% of the respondents were farmers followed by government workers who made up 23.7% as shown in table 4.3. These government workers were mainly teachers, nurses, district assembly workers and security personnel. The analysis

show that 18.2% were traders. It was observed that the traders were once farmers but have now moved into trading because of the unpredictability in farming of late. Given the structure of the occupational distribution in the study area it can be deduced that climate change would have a negative impacts on the people in the study area since most of them are farmers.

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Table 4.3 Occupation Distribution of Respondents

Occupation	Number	%
Farmer	137	44.5
Trader	56	18.2
Government worker	73	23.7
Unemployed	21	6.8
Artisans	19	6.1
Others	2	0.6
Total	308	100.0

Source: field survey, 2016

4.1.4 Education Level of Respondents

From figure 4.1, most of the respondents were literates with only 12% being illiterates. 53% had attained education up to the basic level followed by 24% completing tertiary education. A higher level in the education of the respondents indicates a positive

characteristics of a resilient community (Community and Regional Resilience Institute, 2013) and hence it can be a key platform for building resilience.

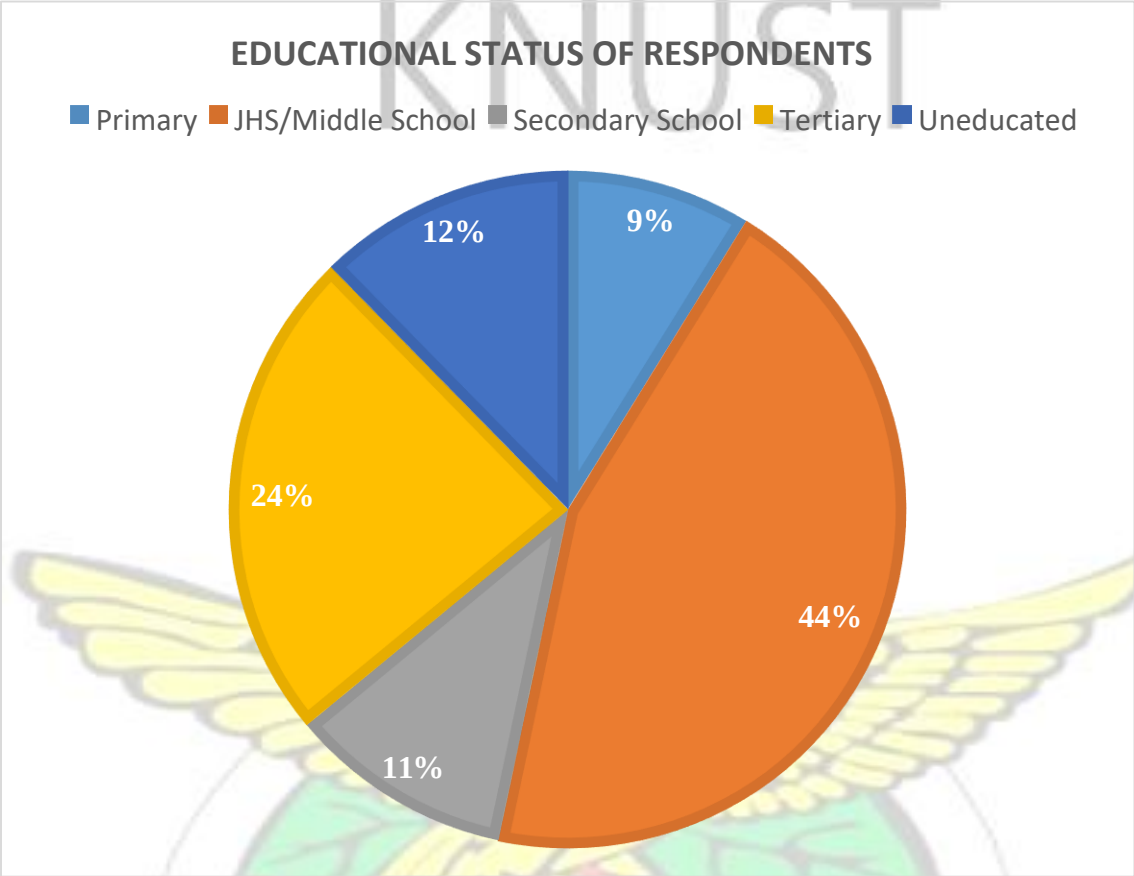

Figure 4.1: Educational Status of Respondents

Source: field survey, 2016

4.2 Respondents' Understanding of Climate Change

4.2.1 Respondents' Understanding of Climate Change

Climate change is defined by International Panel on Climate Change, (2014, page 4) as change in "the state of the climate that can be identified (e.g., by using statistical tests) by

changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer."

The study sought the perception of respondents on climate change and 26% described climate change as a "change in weather condition" as indicated in the table 4.4. Almost all of the respondents mentioned climate change as a "change" in one or more elements of the weather or temperature. The understanding of respondents on climate change as a change in weather condition excluded the element of time which is very crucial in defining climate change. That is the change should have lasted a period not less than ten (10) years (International Panel on Climate Change, 2014). Only 8.8% of the respondents mentioned that climate change referred to "change in weather over a period of time" without committing themselves to a definite time period. A further 2.3% of the respondents indicated that they had no idea what climate change was.

Table 4.4: Respondents Understanding of Climate Change

Respondents Understanding of Climate Change	Number	%
Change in weather condition	80	26.1

Change in weather pattern	60	19.5
Change in rainfall and sunshine	32	10.4
Change in weather over a period of time	27	8.8
Relationship between sunshine and rainfall	5	1.6
Difference between dry season and rainy season	15	4.9
The coldness and hotness of weather	10	3.3
Atmospheric changes	25	8.1
Changes in weather elements	14	4.6
No idea	7	2.3
Changes in human lifestyle	7	2.3
Rise in average surface temperature of the earth	5	1.6
Increase in drought	18	5.9
Total	305	100.0

NB: No response=3

Source: field survey, 2016

4.2.2 Occupation and Understanding of Climate Change

Table 4.5 displays the top three occupations in the study area and their perception of climate change. Climate change affects some occupations more than others. According to Smith et al (2007), agricultural activities, particularly crop farming will be the most affected by climate change. Despite institutions developing resistant crops and farming strategies for

farmers to improve their resilience, farmers in the sub Saharan Africa will suffer most of these impacts of climate change because they rely mainly on rainfall for water on their farms. It is therefore not surprising that 24.8% of farmers indicated that there had been a change in weather condition. A further 21.8% of farmers also indicated that there had been a change in the pattern of the weather. It was observed that the change in rainfall pattern has affected most of the farmers in the study area who have farmed over the years. This is because they plant their crops according to already established rainfall patterns they are conversant with but because of climate change, these rainfall patterns have changed and is now highly impossible to predict. Apart from this, farmers have to adopt new ways through which they can cope with changes in the weather conditions like extreme hot temperatures and reduced rainfall intensity so that their crops can thrive. Most of the traders also understood climate change as a change in weather condition just as the farmers. This can be attributed to the fact that most of them were once farmers but are now into trading because of the unpredictability in farming due to climate change. The understanding of climate change as change in weather condition seems to be across occupations with 32.8% of government workers also having the same understanding. It is worth noting that 16.4% of government workers also understood climate change as a "change in weather over a period of time" which is almost in line with International Panel on Climate Change (2014) definition for climate change as a change in weather for a decade and over. The only difference is that the International Panel on Climate Change gave a definite time period whiles the government workers did not. Data from the meteorological service was not available to compare if truly there had been a change in rainfall pattern and weather condition at the Offinso South district due to the fact that their office had been closed down for a while.

In conclusion, the study revealed that the respondents had a fair knowledge of what climate change was which can be attributed to their educational level as indicated in Table 4.5 with majority of the educated thus 75 and 53 respectively indicating it was a change in either weather condition or pattern with only 4 of the educated respondents indicating it was a change in lifestyle which deviated from the definition of climate change.

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Table 4.5: Respondents Educational Level and Their Understanding of Climate Change

Respondents understanding of change in climate	**EDUCATED**	**UNEDUCATED**	**TOTAL**
Change in weather condition	75	5	80
Change in weather pattern	53	7	60
Change in rainfall and sunshine	23	9	32
Change in weather over a period of time	27	0	27

Relationship between sunshine and rainfall	4	1	5
Difference between dry season and rainy season	14	1	15
The coldness and hotness of weather	9	1	10
Atmospheric changes	23	2	25
Changes in weather elements	11	3	14
No idea	4	3	7
Changes in human lifestyle	4	2	7
Rise in average surface temperature of the earth	5	0	6
Increase in drought	6	4	18
No response	12	0	2
Total	272	38	308

Source: Field Survey 2016

Table 4.6: Top 3 Occupations and their understanding of climate change

Respondents Understanding of Climate change	Occupation					
	Farmer	%	Trader	%	Government worker	%
Change in weather condition	34	24.8	14	25	24	32.8
Change in weather pattern	30	21.8	9	16	13	17.8

Change in rainfall and sunshine	20	14.5	6	10.7	4	5.4
Change in weather over a period of time	6	4.3	4	7.1	12	16.4
Relationship between sunshine and rainfall	4	2.9	0	0	0	0
Difference between dry season and rainy season	3	2.1	5	8.9	1	1.3
The coldness and hotness of weather	2	1.4	3	5.3	4	5.4
Atmospheric changes	10	7.2	7	12.5	6	8.2
Changes in weather elements	6	4.3	5	8.9	0	0
No idea	3	2.1	1	5.3	1	1.3
Changes in human lifestyle	5	3.6	1	12.5	1	1.3
Rise in average surface temperature of the earth	0	0	0	8.9	6	8.2
Increase in drought	14	10.2	1	1.7	0	0
Total	137	100	56	100	73	100

Source: field survey, 2016

Respondents were asked whether they had experienced or observed any changes in the weather over the past ten (10) years and above based on their understanding of what climate change was as indicated in table 4.5. The analysis indicated that 98% were positive that climate change had occurred in their various communities with the 2% out of the remaining respondents claiming “climate has been same from year to year”.

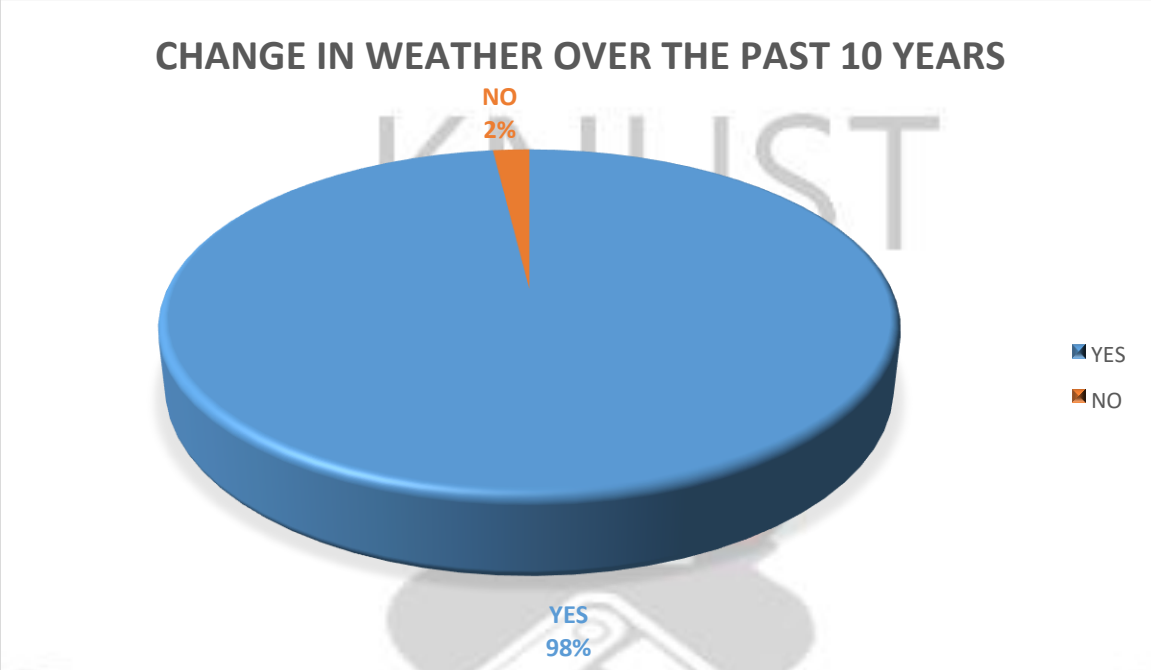

Figure 4.2: Change in weather pattern over the past 10 years

Source: field survey 2016

4.2.3 Observed Changes in Climate

In support of their claim of climate change 33.6% of the respondents mentioned that they have observed a change in rainfall, change in sunshine and dried up water bodies as shown in table 4.6. A further 22.5% believed that there have been a change in only rainfall. It is interesting to note that, all of the respondents mentioned that they have observed a change in the weather components such as rainfall, temperature, sunshine and wind intensity which can be ascribed to climate change. These observed changes mentioned by the respondents are all key characteristics in communities where climate change have occurred (Royal Society, n.d). According to the respondents these changes have caused lots of negative impacts on them and the study area as a whole. Example of these impacts include but not

limited to low yield in crops, increased hardship, rampant bushfires, health impacts, food shortage, withered leaves, dust in the atmosphere and reduced forest cover. According to center for development, (2000), these impacts are as a result of climate change and is not surprising because the major threats of climate change include flooding, famine, economic losses, biodiversity loss, droughts and loss of traditional lifestyle (see figure 2.1).

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Table 4.7: Observed Changes in the Climate

Observed Change	Number	%
Change in rainfall	69	22.5
Change in sunshine	15	4.9
Drying up of water bodies	9	2.9
Change in temperature	32	10.4

Decrease in rainfall, increase in sunshine and drying up of water bodies	103	33.6
Drying up of water bodies and increase in temperature	1	0.3
Decrease in rainfall and drying up of water bodies	23	7.5
Increase in wind intensity	7	2.3
Decrease in rainfall and Increase in Sunshine	28	9.1
Decrease in rainfall, increase in sunshine and increase in temperature	12	3.9
Increase in sunshine, Drying up of water bodies and in temperature	1	0.3
Total	300	100

NB: No response=8

Source: field survey, 2016

4.2.4 Respondents' Perception on Causes of Climate Change

Climate change has two main causes, notably anthropogenic and natural causes. Table 4.6 shows respondents' perception as to the main causes of climate change and their reason for their choice. One hundred and eighty two (182) respondents claimed climate change was a natural phenomenon and that climate change is a normal part of the Earth's natural cycle. This is also supported by National Oceanic and Atmospheric Administration National Weather Service, (2007) which also indicates that climate change is related to interactions among the atmosphere, ocean, and land, as well as changes in the amount of solar radiation reaching the earth which is part of earths natural variability. 98 out of the 182 respondents

believed climate change was part of God's natural creation since the beginning of time whiles the remaining 61 believes it's a natural occurrence in the earth cycle i.e. as the earth ages, climate will continue to change with time. The remaining 22 out of the 192 believed these current changes in climate was God's punishment to mankind because of our sins and the changes indicated signs of the end time. 96 respondents attributed climate change to actions of human beings such as indiscriminate tree felling, bush burning, farming close to river banks etc. These practices increase the atmospheric carbons which are responsible for climate change. The Climate change information resources-New York metropolitan region, (2005), states that the increase in atmospheric carbon dioxide is related to two main causes thus anthropogenic (human) causes such as mainly digging up and burning of coal, oil and burning of forests (deforestation) and natural causes such as volcanoes etc. These difference in opinion as to which agent is responsible for climate change goes on to fuel the debate as to whether climate change is a natural phenomenon or anthropogenic.

Table 4.8: Causes of Climate Change and Reasons for their Choice

Reasons	Causes/Agents of Climate Change			
	Human beings	Natural	Both (Human & Natural)	Total

Climate change is a natural occurrence in the earth's cycle	0	61	0	61
Because God created these changes since creation	0	98	1	99
Humans are being punished for their sins	10	9	1	20
Bad human practices such as bush burning, deforestation	79	0	3	82
Because God controls change but human actions also contribute to the change	0	1	8	9
Signs of end times	1	13	1	15
Total	90	182	14	285

NB: No response=23

Source: Field survey, 2016

4.2.5 Climate Related Hazard in the Study Area

Changes in climate are associated with numerous hazards, it can increase poverty or even reverse development successes already achieved (United Nations, 2013). According to 24% of the respondents, food shortage and drought together were the most prevalent hazards in the communities. This can be attributed to their high reliance on rains as a source of water for both household use and farming. This was followed by drought making 22.4% and food shortage making 20.8% respondents. Majority of respondents complained of drought because most of the people in the study area are farmers (see table 4.2) and their

agriculture is rain fed. The drought is also a catalyst to increased food shortage because a reduction or no rains will result in crops failure leading to food shortage. The hazards pose serious threat to achieving sustainable development goal 2 which aims to end hunger and food security whiles improving nutrition (Ansuategi, et al., 2015).

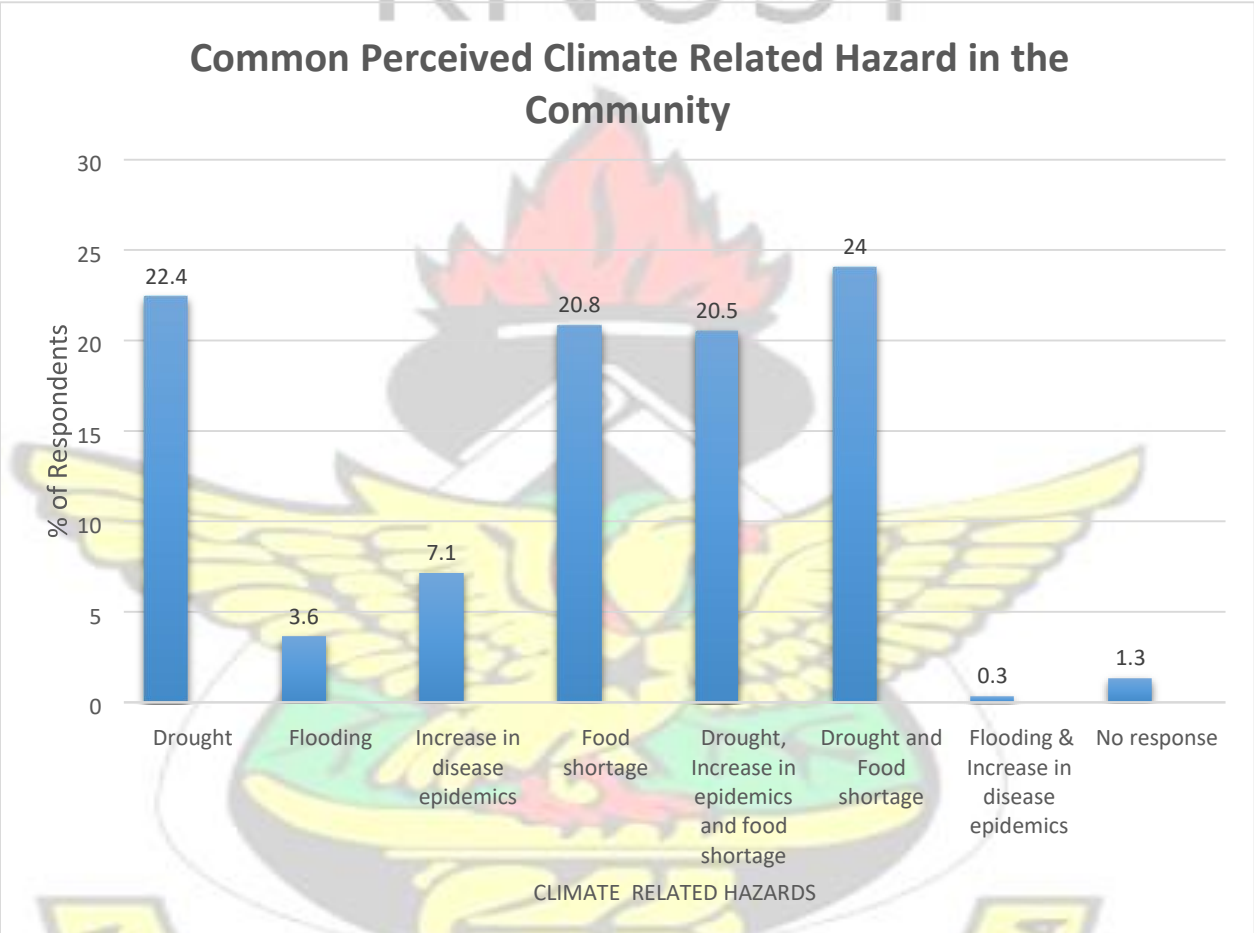

Figure 4.3: Common Climate Related Hazard in the Community

Source: Feld survey 2016

4.3 Communities and Individual Response to Climate Change

Most measures which have been adapted by Governments, communities and individuals to minimize the impacts of climate change have been detected to be reactionary and ultimately

costly. They therefore are not able to solve effectively impacts that are long term anticipated. (UNEP/UNDP, 2012).

4.3.1 Impact of Climate Change on Individual and Study Area

Climate change is associated with numerous impacts which are associated with varying effects. Table 4.8 indicates the effects of climate change on the respondents' whiles' table 4.9 indicate the effects of climate change on the study area.

Table 4.9: Climate Change Impact on Individual

Impacts	Number	%
Increased poverty	124	40.4
Damage to property	61	19.9
Shift in Livelihood	19	6.2
Increased poverty, damage to property and shift in livelihood	30	9.8
Increased poverty and damage to property	53	17.3
Increased susceptibility to diseases	15	4.9
Increase in expenditure	1	0.3
Total	303	100

NB: No response=5

Source: field survey 2016

Table 4:10 Impact of Climate change on Community

Impact	Number	%

Increase in disease epidemics	27	8.8
increased poverty	86	27.9
Biodiversity loss	25	8.1
Food Shortage	40	13.0
Increased in disease epidemics, poverty and biodiversity loss	10	3.2
Increase in disease epidemics, poverty and food shortage	39	12.7
Water shortage	2	0.6
Increased poverty, biodiversity loss and food shortage	53	17.2
Increased poverty & biodiversity loss	18	5.8
Damage to properties	3	1.0
Total	303	100

NB: No response=5
Source: field survey

Community's and individual inability to deal with climate change hazard tends to have negative impacts on them (Bockel et al, 2009). Table 4.8 and table 4.9 both shows how climate change has impacted on the individual and the community respectively. The most dominant impact on the individual was poverty with 40.3%. The same trend appears in the community level with poverty making 27.9%. At the individual level, respondents mentioned poverty and damage to property such as farms and houses as the second

dominant impact with 19.8%. These properties were mainly farms which had been destroyed because of bush fires or lack of rains and hence their crops had dried and died. Other impacts mentioned at the individual level include shift in livelihood, increased susceptibility to diseases with increase in expenditure being the least mentioned by 0.3% of the respondent.

Increase in poverty, biodiversity loss and food shortage was mentioned by 17.2% at the community level as the second most dominant impact of climate change as perceived by the respondents. A relationship can be identified between individual farms being damaged, biodiversity loss and food shortage. That is farms are part of biodiversity and hence it loss equals biodiversity loss. Farms are also made to produce food so when they are destroyed by fire or long drought, then it means there will be food shortage. At the community level increase in epidemics, water shortage and damage to properties were mentioned as part of their impacts. These impacts as stated by IFAD, 2015 in promoting the resilience of poor rural households are parts of shocks rural communities are exposed to and further worsened by climate change.

Considering that eradicating poverty was the first goal in the Millennium Development Goals and also first in the Sustainable development goals indicates the urgency with which world bodies want to reduce poverty at all cost (Ansuategi, et al., 2015) but with respondents indicating that poverty was on the increase due to climate change indicates the fact that climate change is and will be a stumbling block in the achievement of these goal.

4.3.2 Response to Climate Change

Humans in their quest to ensure their continuity find several ways to survive against dangers which threatens their survival such as famine, diseases, drought etc. (CARE, 2012). It is therefore surprising that 45.6% of individuals and 72.4% of the community as shown in table 4.10 and table 4.11 respectively did "nothing" about these impacts of climate change which had increased their vulnerability and put their survival at risk. According to Center for Community Enterprise, (2000), for communities to grow resilient to climate change, effort must start within to identify and tackle their vulnerabilities before external help is sought. At the individual level, 10.7% of the respondents said they were praying to seek spiritual intervention since they believed God is the giver of rain and that no man can or actions of man can make the climate change in their favor. 6.2% and 5.2% individuals respectively had changed their jobs or diversified them. The remaining respondents had either tried other farming method which had failed them, changed their diet because the staple foods were no longer available, stored food, changed their lifestyle, sort medical help due to infections related to climate change or were relying on their social relationships to survive.

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Table 4.11: Individual responses to climate change

Response	Number	%
Nothing	140	45.6
Changed jobs	19	6.2
Diversified jobs	16	5.2
Tried other farming practices	11	3.6
Praying	33	10.7
Changed diet	5	1.6
Sort help from relatives	17	5.5
Cut in expenditure on food	1	.3
Changed lifestyle	8	2.6
No idea	29	9.4
Seek medical help	7	2.3
By storing foodstuff	2	.7
By advising people	2	.7
Total	308	100

Source: Field survey, 2016

At the community level, only a few people thus 2.9% of respondents indicated that alternative water sources had been provided to provide potable water for the community and that the community united to help members who were negatively affected by climate change such as community members whose farms had been destroyed etc. due to long

drought or bush fires. Respondents also indicated that the community sort for external help which they barely had. They also enacted by laws in the community to prevent bad practices which would increase their vulnerability to climate change.

Table 4.12: Community Response to Climate Change

Response	Frequency	%
Nothing	223	72.6
Borehole drilling/well drilling	9	2.9
Change in community diet	8	2.6
diversified crops planted	3	1.0
Community unite to help financially, communal labor etc.	11	3.6
By-laws to prevent illegal lumbering, bad farming practices etc.	8	2.6
Sort for external help	7	2.3
Diversified job	1	.3
No idea	9	2.9
Total	279	97.1

NB: No response=28

Source: field survey, 2016

4.3.3 Community Sensitization/Education on Climate Change

For an individual or community to take actions in improving their resilience towards climate change or any disaster, they need to have access to information or adequate knowledge about the event. As indicated by the Centre for Development (2000), getting information is the first step in building resilience. Thus only when you have information then you can anticipate and prepare towards a particular hazard. From figure 4.4 88.6% of the respondents said "no" institution or individual had ever talked to them about climate change and its impact. 10.7% of the respondents said institutions like churches and Fire service had been occasionally educating them on climate change and its impact.

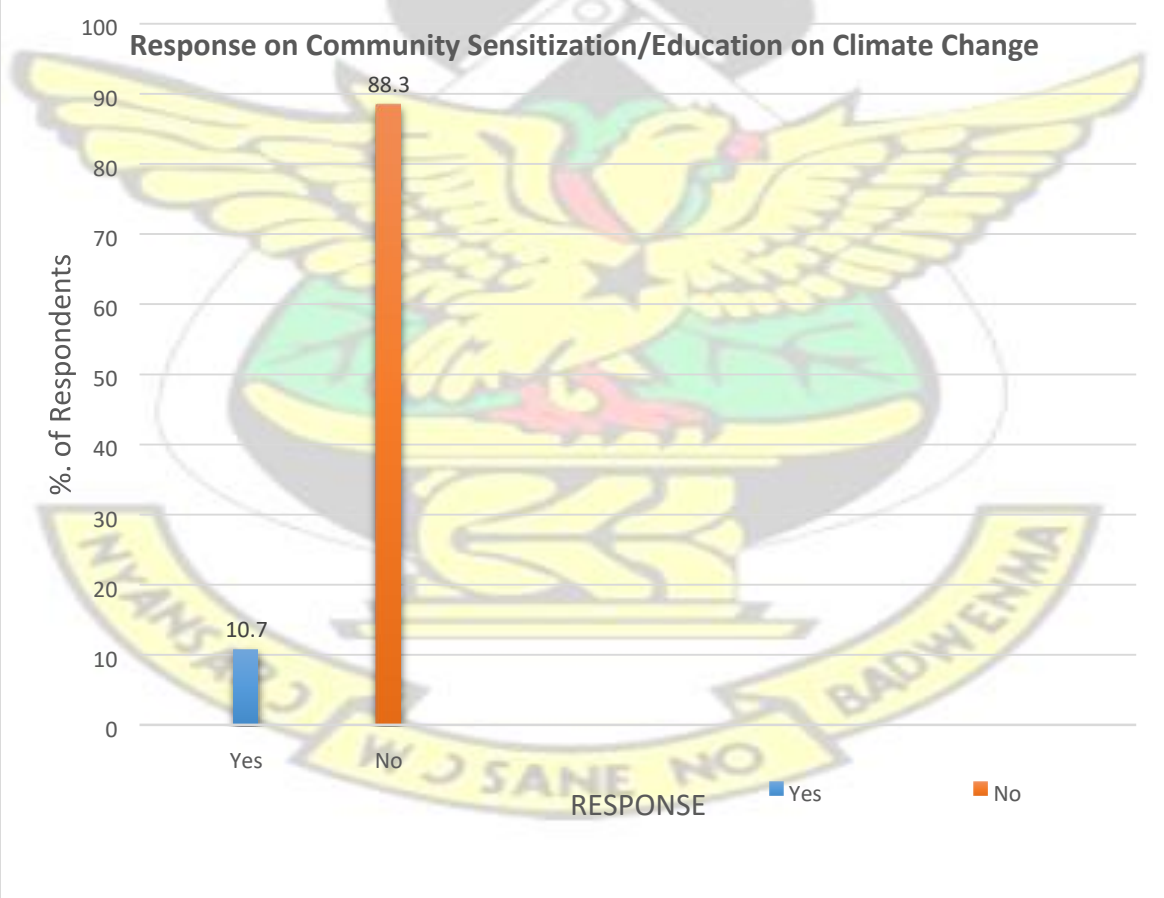

Figure 4.4: Response on Community Sensitization/Education on Climate Change

Source: field survey 2016

In conclusion it can be realized that respondents in the study area perceived they were already suffering severely from the impacts of climate change but because of their less knowledge on climate change they did not know actions or pathways they could possibly take to increase their chances of survival or resilience.

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4.4 Respondents' Perception on how to be Climate Resilient.

People in the face of adversity develop strategies to improve their well-being. This looks at communities' perception on how they can further improve their resilience in addition to actions they are already taking.

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4.4.1 Medium through which respondents hear of impending climate related threat

Information plays a vital role in the process of communities achieving resilience. In order for community to build resilience towards climate change they need to have access to information so that they can make informed decisions pertaining to activities that will increase their resilience. According to 68.8% of the respondents, they received information on weather changes and climate via radio. Most of them used radio because they believe it's less expensive and can be powered using batteries. Moreover since most of them are usually on their farms, they carry their radios along since it is portable. The respondents also claimed that weather forecasts on radio are mostly told in the local dialect and hence made understanding easier. This in a way means that if the community or individuals are to be enlightened on how to improve their resilience, the radio would be the best medium through which information can be disseminated. 13.6% of the respondents also said they heard updates on the weather via both TV and radio. The remaining media through which other respondents got information on weather and climate change include natural observation, extension officers, information centers, schools and internet.

Table 4.13: Medium through which respondents hear of impending climate related threat.

Medium	Number	%
Friends	6	1.9
Radio	212	68.8
Television	25	8.1
Extension Officers	1	0.3
Natural observation	11	3.6
Radio and Television	42	13.6
None	3	1.0
Information Centre	5	1.6
School	2	0.6
Internet	1	0.3
Total	308	100.0

Source: field survey 2016

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4.4.2 Perceptions on Future Incidence of Climate Related Impacts

In order to build a climate resilient community, the individual or community must be able to identify and anticipate future hazards related to climate change in order to make the necessary preparation towards either reducing or being able to recover from disasters quickly (Centre for Community Enterprise,2010). In order to explore their perception on this, community members were asked to rank whether there will be more, less or no difference in the incidence of major climatic impacts as shown in table 4.12. From the table 294 of the respondents believed considering the rate at which rainfall has been reducing and water bodies have been drying up, in the next 10 years there is going to be severe drought and water shortage. Climate change has been predicted to bring along significant changes in seasonal patterns and even now these changes are being felt (Pasteur, 2011). Severe droughts and water shortage would serve as a catalyst to increase loss of livelihood and food shortage which were mentioned by 231 and 237 respondents respectively. This is because most of these rural communities are engaged in farming and are rain dependent to supply their farms with water. Based on a 20-year baseline climate observation, it is forecasted that maize and other cereal crop yields which form the most dominant food around the world will reduce by 7% by 2050 (UNEP/UNDP, 2012). This goes on to support respondents perception that food shortage is going to be on the rise in the next 10 years. These impacts come together to increase poverty which was mentioned by 244 respondents. The analysis further showed that 209 respondents indicated there will be more diseases and epidemics. Apart from climate change bringing along its own pest and diseases, other infections such as high blood pressure, malnutrition etc. resulting from

stress and worry are going to be prominent because of poverty, food shortage and livelihood losses (Pasteur, 2011).

Table 4.14: Respondents perception on future incidence of climate related impacts

Type of Impact	Incidence			Total
	More	Less	No Difference	
Drought and Water Shortage	249	38	14	300
Famine/food shortage	237	45	22	304
Loss of Livelihood	231	42	30	303
Increase in Poverty	244	40	21	305
Disease and Epidemics	209	47	50	306

Source: Field Survey, 2016

4.4.3 Perceptions on How to Improve their Resilience

Respondents believe in order to improve their resilience against future threats such as poverty, food shortage, drought etc. they must be educated on the causes and impacts of climate change. Not only on that but also on all possible ways that could enhance their resilience. 26.6% respondents indicated that public education and sensitization on climate change would put them on a better scale in the fight against these impacts. As the English proverb by Robert Greene's a notable discovery of coosnage says "to be foretold is to be forearmed", the community believes educating them on climate change would serve as an advanced warning of which would be an advantage because they would know how to

prepare for these impacts. The community further believes that in order to improve their resilience, government interventions are needed as shown in table 4.13 with 24% of the respondents indicating that the government should support them in the form of job creation, business loans etc. They believe government should create more job opportunities that are not climate sensitive so that even if their farms failed, they would have other source of livelihood. Not only job creation but also financial and technical help to help them adapt and make better life choices. Afforestation was also mentioned as a long term solution to climate change and improve their rainfall. Other factors they believed could improve their resilience as shown in table 4.13 include safety practices, improving food storage capacity, provision of water, effective leadership, adopting better farming practices, government change etc.

Table 4.15: Respondents Perception on how to improve their resilience against

future Climate Change Threats

Respondents Opinion	Number	%
Practicing afforestation	48	15.6
Public education on causes and impacts on climate change	82	26.6
Government intervention (financial support, job creation etc.)	74	24.0
Safety practices (protecting water bodies etc.)	21	6.8
Improving food storage capacity	11	3.6
Provision of water (drilling boreholes, wells etc.)	15	4.9
Practicing Saving	2	.6
Effective Leadership	9	2.9
Building Infrastructure	8	2.6
Adopting better farming practices	14	4.5
Nothing	13	4.2
Change government	1	.3
Building unity	4	1.3
Total	307	100

NB: No Response=1 Source:
Field survey, 2016

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4.4.4 Rankings of Resilience Characteristics

According to Center for Community Enterprise, 2010 for a community to be resilient, it must have peculiar characteristics and these characteristics are different from community to community. Normally communities build their resilience from their strongest

characteristics. From the table 4.14, the community ranked livelihood diversification as the most important characteristics if they want to be climate resilient. This was also mentioned in table 4.13 where community required of the government to create more employment opportunities so that they will not be over reliant on farming which is very sensitive to climate change (Pasteur, 2011). Livelihood diversification is key in building climate resilient communities especially in rural communities who are solely reliant on farming as their main livelihood. This is because farming in the community is vulnerable to climate change and thus the slightest change in the quantity, pattern or even intensity of the rainfall can have devastating effects on the crops since planting is done in timing with the coming or quantity of the rain. It is therefore important for the study area to have other source of income in addition to their farms so that if there are shocks to their crops due to climate change they can still survive. The second most important characteristics perceived by the community to be necessary in building resilience towards climate change was willingness to learn new things, thus new farming practices, new sources of making income, new knowledge etc. thus respondents believe in order to boost their resilience, they must learn new ways of doing things that were making them vulnerable to changes in the climate. Community unity is core to building resilience and this was indicated as the 3rd most important characteristic for the community to build resilience. Without unity in community with regards to decision making, resource allocation etc. any attempt for resilience would prove futile as stated by one respondents "if we are not united nothing will work for us. Even if the government wants to help us and we are not united how can he help us". As the old adage goes, "United we stand" and hence the bedrock for building community resilience to climate change and other disasters is unity.

Respondents further indicated that connectedness thus both government and external donors, effective leadership, community participation were important in building resilience towards climate change with them being fourth, fifth, sixth and seventh respectively in their rankings with building local capacity and good infrastructure and services ranking 7th with 53 respondents mentioning it respectively. No one characteristics is very important than the other but depending on the communities strength, values and resources the characteristics are prioritized (Centre for Community Enterprise, 2000).

Table 4.14: Respondents Ranking of Resilience Characteristic

RANK	CHARACTERISTICS	No. of Respondents
1	Livelihood diversification	98
2	Willingness to Learn new things	78
3	Building Unity	70
4	Connectedness (Government/External)	62
5	Effective Leadership	61
6	Community Participation	60
7	Building local Capacity	53
8	Good infrastructure and Services	53

Source: field survey, 2016

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

It is well accepted now both scientifically and politically that climate change is occurring (Ladislaw *et. al.*, 2008) and studies (Kates 2000; Mendelsohn *et al.* 2007; Thomas and Twyman, 2006) point to the fact that poor, natural resource-dependent rural households will be the worst hit by adverse climate impacts. It is therefore necessary to know the perceptions of these rural communities about climate change and resilience before any programs or policies are designed for them. This would suit and improve their resistance rate against the impacts of climate change. This chapter presents the summary, conclusion and recommendation of the study.

5.2 Summary of Findings

The study sought to gather perceptions from respondents in the Offinso South District on climate change, ways they are coping with the changes and possible ways of growing resilient to climate change. In order to achieve this aim, the study sought to understand community's perception on climate change, explore various ways through which the Offinso community has been responding to climate change and lastly to explore how communities can become climate resilient.

The study used the multi-stage sampling technique to select a sample size of 308 respondents from five communities in the Offinso South district thus Mpehen, Amoawi, Obuasi, Kayera and Kyebi.

Data for the study was collected basically using structured questionnaires and observation. The data was also analyzed using SPSS version 21 and data was also presented using graphs and tables.

The study revealed that almost all the respondents had an idea as to what climate change was, that is they knew it referred to a form of change in the weather condition whether in the amount or intensity of rainfall or intensity in sunshine etc. The problem with their understanding of climate change was the absence of the element of time which is the main key in explaining what climate change was. To further buttress their understanding of what climate change was, they indicated that they had observed changes in rainfall and other elements of the weather such as sunshine and wind intensity. As a result of these changes in the climate, there had been a decrease in rainfall and increase in sunshine, which had led to drying up of water bodies within the region.

Respondents further indicated that climate change was a natural phenomenon and that it was part of God's creation. Moreover the changes indicated signs of the end times that have been prophesied.

The study revealed that drought and famine were the most common climate hazard the study area were prone to due to decrease in rainfall. This has led to an increase in poverty in both individuals and the community as a whole. There had been an increase in poverty because despite the threats facing them because of the changes in climate both the individuals and community did nothing about their situation and hence this increased their vulnerability. This was not surprising because they insisted no individual or organization sensitized or educated them on these climate issues.

But then most of them indicated that they heard updates on the weather via radio and that was the only means through which they heard something about climate change. In their predictions for the next 10 years, they expect drought and water shortage, famine and food shortage, livelihood losses, poverty and disease and epidemics to be on the rise and that the only way they can improve their resilience against these threats was to be educated on causes and impacts of climate change and possible ways to withstand these impacts. They believe knowledge is power and hence having knowledge of how these impacts can affect them and ways they can withstand the changes would help them improve their resilience.

Finally, they also ranked livelihood diversification as the most important characteristics that could improve their resilience to climate change and reduce their dependency on farming as their main source of livelihood.

5.3 Conclusion

Climate change is now well accepted both scientifically and politically. It has become very clear that people have already started feeling the impacts of climate change and the worst.

Changes in both rainfall pattern and intensity, changes sunshine and drying up of water bodies were major observations in the study area. These changes have severe impacts on people with low yield in crops, drought, increased hardship, health related issues and food shortage being part of these impacts.

These impacts have accelerated poverty, damaged properties, increased water shortage and increased peoples' susceptibility to diseases both on individuals and study area as a whole. These impacts pose serious dangers towards people and especially with world bodies such as the international monetary fund, United Nations and others targeting a reduction in

worldwide poverty to the barest minimum, climate change stands as a stumbling block to achieving this target. Although a lot of efforts are being put in place to tackle climate change at the global level, nothing or little is being done at the local or rural level to improve their resistance to climate change. People are not being educated or sensitized on climate change and its impacts neither are they being educated on possible ways of achieving resilience towards climate change hazards.

This therefore indicates the need for government and other developmental bodies to embark on climate change sensitization programs through media such as radio, television and information centers in rural communities to broaden their knowledge. Job opportunities should also be provided in these rural communities who solely rely on farming for their livelihood.

Truth be told if these measures such as practicing afforestation, job creation, community participation and livelihood diversification are not embarked upon in the rural areas, it would be difficult to achieve the Sustainable development goals.

5.4 Recommendation

These are the recommendations from the research;

1. Central government should intensify education on climate change to broaden and enlighten people on the impending dangers of climate change.
2. Research should be conducted further on climate change and its impact in the various communities or regions so that context specific solutions can be prescribed for communities.

3. Serious attention should be paid to rural communities who serve as the countries source of food in the face of climate change so that food production levels can be maintained.
4. NGO's and the central government should provide alternative livelihood sources to communities by educating and training them so that they will not be over reliant on only farming for their sustenance.

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APPENDIX A: QUESTIONAIRE

KWAME NKRUMAH UNIVERSITY FOR SCIENCE AND TECHNOLOGY MPHIL SUSTAINABLE INTEGRATED RURAL DEVELOPMENT IN AFRICA CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT: A PERCEPTION SURVEY INTO CLIMATE CHANGE AND RESILIENCE ACTIONS IN THE

OFFINSO SOUTH DISTRICT

QUESTIONNAIRE FOR DATA COLLECTION

SECTION A: INTRODUCTORY DATA

i. Sex 1. Male [ ] 2. Female [ ]

ii. Age of Respondents……

iii. Occupation 1. Farmer [ ] 2. Trader [ ] 3. Government Worker [ ] 4.

Other……..

iv. Marital Status 1. Single [ ] 2. Married [ ] 3. Divorced [ ] 4. Others [ ]

v. Educational Status 1. JHS/Middle School [ ] 2. SHS [ ] 3. Tertiary [ ]

vi. Religion 1. Christianity [ ] 2. Islam [ ] 3. Traditional [ ] 4.

Others……..

vii. Community of Residence……

viii. Years of Residence……..

SECTION B: RESPONDENTS UNDERSTANDING OF CLIMATE CHANGE

1. In your view what is your understanding of changes in climate?

……
……
……
……
…
……
……
……

2. Have you experienced any changes in the weather pattern over the past 10 years and above? 1. Yes [ ] 2. No [ ]

3. If yes what are some of the observed changes (respondents can choose more than 1 answer)
    1. Decrease in rainfall [ ] 2. Increase in sunshine [ ] 3. Drying up of water bodies [ ]
4. Increase in rainfall [ ] 5. Decrease in sunshine [ ] 6. Increase in temperature [ ] 7. Decrease in temperature [ ] 8. Other (specify)……

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4. If No explain
    ……
    ……
    ……
    ……
    ……
    ……
5. What is the observed impact of this changes in the climate
    ……
    ……
    ……
    ……
6. What do you think are the causes of the changes in the climate?
    1. Human beings [ ] 2. Natural [ ] 3. No idea [ ] 4. Others……

7. What is/are the reasons for answer in question 6?
    ……
    ……
    ……
    ……
    ……
    ……
    …
    ……
8. What is the most common climate related hazard the community or you are prone to?
    1. Drought [ ] 2. Flooding [ ] 3. Increase in disease epidemics 4. Famine [ ]

SECTION C: HOW ARE RESPONDENTS RESPONDING TO CLIMATE CHANGES AND ITS IMPACTS?

9. How has these changes in climate impacted on you (livelihood, properties, etc.)?
   1. Increased poverty [ ] 2. Damage to property [ ] 3. Shift in livelihood [ ]
   4. Others……

10. How did you react to these impacts caused by climate change?
……
……
……
……
……

11. How has these changes impacted on the community?
   1. Increase in disease epidemics [ ] 2. Increased poverty [ ] 3. Biodiversity loss [ ] 4. Food shortage [ ] 5. Others ……

12. How did the community respond to the impact?
……
……
……
……
……
……
……

13. Does any institution talk to you about climate change and their impacts?
……
……

SECTION D: RESPONDENTS PERCEPTION ON DEVELOPING RESILIENCE TO CLIMATE CHANGE

14. Through what medium do you hear of impending threats such as heavy rainfall, severe drought etc.?
    1. Friends [ ] 2. Radio [ ] 3. Television [ ] 4. Extension officers 5. Others……

15. In the next 10 years do you think there will be more or less of the following if nothing is done?

    a. Drought and water shortage 1.More [ ] 2. Less [ ] 3. No difference [ ]

    b. Famine/food shortage 1.More [ ] 2. Less [ ] 3. No difference [ ]

    c. Loss of livelihood 1.More [ ] 2. Less [ ] 3. No difference [ ]

    d. Increase in Poverty 1.More [ ] 2. Less [ ] 3. No difference [ ]

    e. Disease and epidemics 1.More [ ] 2. Less [ ] 3. No difference [ ]

    f. Others…….. 1. Many more [ ] 2. A few more [ ] 3. No difference [ ]

16. In your opinion what do you think can be done to help the community to improve their resilience against these future threats?

    ……

    ……

    ……

    ……

    ……

17. Rank these characteristics in order of importance to building resilience to climate change starting from 1 as the most important?

CHARACTERISTICS	RANKING
Livelihood diversification	

Building local capacity (ability to identify problems, establish priorities etc.)	
Building unity	
Community Participation in times of shocks and stressors	
Good infrastructure and services	
Effective leadership (proper management of natural assets etc)	
Connectedness (Government/external help)	
Willingness to learn new things	

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