

**THE IMPACT OF CLIMATE CHANGE ON COMMUNITY LIVELIHOOD IN
JOWHAR MIDDLESHABELLE REGION OF SOMALIA**

BY

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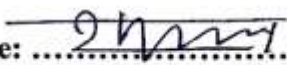
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**A DISSERTATION SUBMITTED TO SCHOOL OF NATURAL AND
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INTERNATIONAL
UNIVERSITY**

AUGUST 2023

DECLARATION

I Aided Hassan Ubeid, declare that this dissertation is my original work and has not been presented for a degree or any other academic award in any university or institution of learning".

Signature:.....

Date:.....

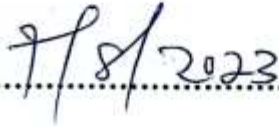
APPROVAL

I affirm that the research report under “Assessment of the impact of climate change on community livelihood in Jowhar lower shabelle region Somalia” has been under my supervision and is now ready for submission to the School of Natural and Applied Sciences of Kampala International University with my approval.

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Date: 

DEDICATION

This work is dedicated to my beloved parents for their sacrifice and support towards my education and this thesis; I say may Allah bless you.

ACKNOWLEDGEMENTS

I am delighted in completion of the dissertation work and acknowledge the people who have contributed to my study, and the completion of the thesis work that has enabled me handles the study.

First I thank the almighty Allah who has enabled me with strength and encouraged me to be able in completion of the research; I recognize my brothers, sisters and the management of Kampala International University. Specifically, I acknowledge my supervisor and all the respondents for participating in the study.

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ABSTRACT

The study set to conduct an assessment of the impact of climate change on community livelihood in Jowhar Middle Shabelle Region of Somalia. The information was attained from 320 respondents and 10 interview responses were the information was collected through questionnaires and interviews, descriptively analyzed and content analysis was assessed to determine the effect of climate change and community livelihood. The study findings indicated that the perceived causes of climatic changes in Jowhar Middle shabelle region of Somalia was deforestation, low levels of tree planting, weak environmental laws, agriculture and environmental encroachments and poor institutional Policy. Secondly results on the effect of climate change on livelihood of communities in Jowhar Middle Shabelle region was slightly majorly positive though negative effects have highly affected the livelihoods of communities in Jowhar Middle shabelle region of Somalia. Finally, the findings show that climate change strategies that can be employed to improve the community livelihood Jowhar middle Shabelle region Somalia are campaigns on disaster risk management, resettlement of people to less climatic hazards, climate change awareness campaigns and afforestation campaigns developed. The study reveal that climate changes were caused by environmental, human, policy and institutional factors which either positively or negatively induce the climate changes, poor environmental, poor human activities and weak institutional mechanisms exist which hinder the effective attainment good climatic conditions hence the prevalence of disaster. The study concludes that climate changes present both negative and positive effects on the livelihood of communities in Jowhar Middle shabelle region, Somalia. The study recommend for the implementation of afforestation and re-afforestation which can induce the environment for climate changes to induce tree planting, secondly the study recommends for the improved functionality of environmental protection efforts and policies by the government through afforestation and tree planting. Thirdly environmental awareness sensitization is necessary and different actors need to step up their efforts to improve the climate changes.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter is concerned with background of the study, statement of the problem, purpose of the study, objectives, research questions, scope, and significance of the study, and operational definitions of key terms.

1.1 Background of the study

1.1.1 Historical Perspective

Globally countries are coupled with the decisions in choosing a form of livelihood happening at the household level in many societies. These decisions depend on numerous factors among which is households' access to diverse forms of assets (capital), as well as the desires and priorities of specific households. Members of a household combine their proficiencies, abilities and knowledge with the diverse resources at their disposal to form activities that qualify them to achieve the best conceivable livelihood outcomes such as income, food, security and investments. For example, choices concerning family labour apportionment for farming, non-farming activities, schooling and so on occur at the household level (Yunez-Naude and Taylor 2014). In the mix of this context is climate change as one of the many aspects through which households operate to form livelihoods that require further investigations. When a person's livelihood is able to endure, cope or recuperate from stresses and shocks like climate change both now and in the future while not destabilising the natural base, it is sustainable.

Climate change has become a point of focus in livelihoods formation due to the far-reaching impacts on people and ecosystem functioning. For instance, developing countries depend on climate-sensitive activities and experience disastrous impacts (IPCC 2016). Atmospheric atmosphere have increased substantially in the last 150 years, leading to a 0.6 °C global temperature average in the past 100 years, and it may rise to 7.1 °C in the next 100 years (Swe et. al., 2015). Developing nations are already facing climate-related challenges. Any new challenges brought about by climate change are likely to be primarily through intensification of the

challenges that populace is already facing thus impacting livelihoods activities. Livelihood activities are rooted in natural resources onto which people are dependent both directly and indirectly. Consequently, there is close connection between livelihoods, the variability and productivity of the natural resource base, which is so broad to enable a wide choice of alternatives and diversification for the populace decision-making.

In Africa, Essentially, resources determine livelihood formation; however, a society like that of Uganda has to form livelihoods amidst climate-induced changes. According to Nsubuga and Rautenbach (2018), the impact of severe weather, climate trends and variability has been documented substantially in the last 20–30 years. Most studies indicated a rainfall decline and daily temperatures on the rise, while projections indicate a decline in rainfall and rise in temperature, both in the near and far future, the climate change and its effects on livelihood in Jowah district of Somalia. Environmental resources including climate play a crucial role for large populations, so any threat, for example, of climate change affects ecosystem functioning and integrity, hence undermining the security of livelihoods. For example climatic and non-climatic factors over which households may have little control affect a household's access to sufficient livelihood assets. Such as the example put forward by Badjeckv et al., (2010), climate change is evident in lake/sea level fluctuation, storm and flood frequency, which subsequently affect the physical capital of households or entire communities. They can destroy assets directly, can force people to abandon their home areas, dispose of assets prematurely and drain past savings. Rising seas levels, for instance, diminish the natural capital in ecosystems such as fisheries, mangroves and wetlands that are indispensable to the current livelihood forms of many deprived communities. Different motivators and barriers influence how people respond to climatic change impacts, exclusively on the choices that households make about using their assets.

Somalia is highly susceptible to the effects of climate change and extreme weather. Without anticipatory preventive approaches, these factors are likely to exacerbate existing vulnerabilities and reduce the people's livelihood options, which in turn may have negative impacts for stability and security in Somalia. More frequent and intense droughts and floods undermine food security and worsen livelihood conditions in Somalia, adversely affecting marginalized groups, fuelling grievances, increasing competition over scarce resources and exacerbating existing community tensions and vulnerabilities. This has complex and interlinked implications for the peace and

security situation in Somalia, including climate-related displacement and migration are likely to increase, particularly for those whose livelihoods are influenced by droughts and floods; that can fuel tensions at the community and national levels and disrupt ongoing conflict resolution initiatives. Internally displaced persons (IDPs) are particularly vulnerable to identity-related conflicts and armed group recruitment. Armed groups like Al Shabaab can take advantage of climate impacts by positioning themselves as service and relief providers following droughts and floods. Droughts and floods can link local resource conflicts to broader insecurity, as elites may exploit the impacts to advance their influence over communities and resources.

1.1.2 Theoretical Perspective

This study was guided by the empowerment theory adopted by Perkins & Zimmerman (1995). It presents a theoretical model for understanding the process and consequences of efforts to exert control and influence over decisions that affect one's life, organizational functioning, and the quality of community life. Empowerment theory provides principles and a framework for organizing our knowledge. The development of empowerment theory also helps advance the construct beyond a passing the provided information. The assessment of the state of deforestation is fundamental for enhancing or delimiting the community livelihood. The theory provides that the values that underlie an empowerment approach to social change and empowerment theory is necessary. The theory provides that livelihood of community can be improved through empowerment in the society.

1.1.3 Conceptual Perspective

Climate Change: Climate change refers to seasonal changes over a long period with respect to the growing accumulation of greenhouse gases in the atmosphere (Holzmann & Jørgensen, 2010). Tackling this phenomenon is of utmost importance given the pivotal role that climate plays in the formation of natural ecosystems and the human economies and civilizations on which they are based. Climate change is defined as a change in the climate system which is caused by significant changes in the concentration of greenhouse gases as a consequence of human activities. In addition to natural climate change that has been observed during a considerable period.

A community is a group of interacting people sharing an environment (IPCC, 2012). In human communities, intent, belief, resources, preferences, needs, risks, and a number of other conditions may be present and common, affecting the identity of the participants and their degree of cohesiveness.

Livelihood is a set of activities performed to live for a given life span, involving securing water, food, fodder, medicine, shelter, clothing and the capacity to acquire above necessities working either individually or as a group by using endowments (both human and material) for meeting the requirements of the self and his/her household on a sustainable basis with dignity. Ellis, 2009). Community livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term.

1.1.4 Contextual Perspective

Community livelihoods in Middle Shabelle region of Somalia is coupled with low income generation activities, health gaps and low level of food security due to these impacts of several recurrent shocks in the last 7 years includes lowest serial production, the trade disruption, massive IDPs, hyperinflation has reduced the livelihood of these population and increased humanitarian needs, stable and unstable food prices are continuing and increasing sharply and getting beyond the reach of their capacity they are also hosting IDPs in rural households Both food availability and its access abilities are among several constraints for the poor households due to devaluation of Somali shillings, increased transportation cost and conflict related divisions in trade, imported/export activities (Walch, 2018).

Poor water and sanitation conditions limits their health, increased food sharing and food access have led to high malnutrition this means that most of children, lactating/pregnant women and elderly in the rural are in very poor health conditions (Middleton and Eklöv, 2018). The population is acutely malnourished as they drink from the contaminated water in the catchments and face poor sanitation conditions which are the greatest risk of water borne diseases such as acute water diarrhea and other diseases. In solidarity of these communities, they have developed

their own traditional water sources such as water catchments these water catchments are used both human/animals consumption as the water sources is very limited and insufficient to this community. Water sources, poor farming practices and poor irrigation schemes are among their major constraints (Eklöw & Krampe, 2019).

In Somalia's 2013 National Adaptation Programme of Action on Climate Change (NAPA), the FGS concluded that extreme weather events are associated with loss of livelihoods and increased poverty. This has been further highlighted in the January 2020 FGSAU-UN Joint Threat assessment of Somalia (Mobjörk, 2017). Somali community leaders told the authors of the 2013 NAPA report that droughts fuel herder farmer conflicts because settled communities and livestock herders must compete for fewer resources. Loss of income from agriculture and pastoralism can also increase the risks of violent conflict: people believe that they have less to lose from using violence or joining armed groups when their livelihood is threatened.

Seasonal and weather phenomena are becoming harder to predict, given the increasing number of dust storms and droughts, stronger winds, and notably hotter temperatures over the past four decades(Ember et. al.,2014).For example, in late 2019, Cyclone Pawan and severe floods in the Horn of Africa created ideal conditions for desert locust breeding. Strong winds in2020 helped to spread locusts across the region; in March/April and November/December 2020, Somali agriculturalists faced two infestations that led to the loss of approximately 20 per cent of national crop yields (FAO, 2020).

1.2 Statement of the Problem

Communities especially the rural communities much base their way of life on the climate that support their agriculture, animal husbandry, trade among others (Kuria, 2019). However community livelihood in Jowhar Middle Shabelle Region Somalia is coupled with low levels of livelihoods such as poorly performing agriculture and crop growth in communities (Somalia Environmental Report, 2020).The occurrence of the low livelihood is not well explained as communities are coupled with food insecurity, the prevalence of poor health systems and low income generation activities generally due to low agricultural productivity and business performance activities which limit the communities from accessing a general reach of the communities (FAO, 2020).. However the area experiences sporadic climate changes that one would think is responsible for the community livelihoods. Weather related events such as erratic

rainfall, longer drought periods, landslides and floods are increasing in terms of both magnitude as well as frequency. Such events have negative impact on people's livelihood. Such events have been creating natural hazards. These could create an avenue for the enhancement of the community livelihoods. It 'was imperative that a study on climate change and community livelihood in Jowhar Middle Shabelle region Somalia be conducted to determine the status quo.

1.3 Purpose of the study

The purpose of the study was to assess the impact of climate change on the community livelihood of Jowhar Middle Shabelle Region of Somalia

1.4 Objectives of the study

- 1) To establish human perception the causes of climatic changes in Jowhar middle shabelle region Somalia.
- 2) To assess the effect of climate change on Livelihood of communities in Jowhar middle Shabelle region Somalia.
- 3) To establish the climate change adaptation strategies employed to improve the community livelihood in Jowhar middle Shabelle region Somalia.

1.5 Research Questions

- 1) What are the perceived causes of climatic changes in Jowhar middle shabelle region Somalia?
- 2) What are the effects of climate change on Livelihood of communities in Jowhar middle Shabelle region Somalia?
- 3) What are the climate change adaptation strategies that can be employed to improve the community livelihood in Jowhar middle Shabelle region Somalia

1.6.0 Scope of the study

1.6.1 Geographical Scope

The study was conducted in Jowhar is the capital city of Hirshabelle state of Somalia. Jowhar is also the administrative capital of Middle Shabelle region of Somalia. Along with Baidoa, it used

to form the joint administrative capital of the Transitional Federal Government, which it captured from the Islamic Courts Union. The city lies 90 km (50 mi) along a major road north of the national capital of Mogadishu.

1.6.2 Subject Scope

The study was done to establish the salient causes of climatic changes, effect of climate change on Livelihood of communities and to establish the climate change strategies that can be employed to improve the community livelihood in Jowhar middle Shabelle region Somalia.

1.6.3 Time Scope

The study considered an analysis of the climate change and community livelihoods of Jowhar for a period of 10 years from 2012 to 2021. The study has a time scope of 8 months which run from January to August 2020 to complete the study. The time was chosen is sufficient to enable the researcher collect reliable information for the study.

1.7 Significance of the study

The study helped to increase awareness among the livelihoods of communities influenced by climate change. Additionally, the study findings are expected to inform the policymakers about climate variability and the livelihood of the communities thus aiding them in making informed decisions.

The study will inform on the community livelihood constraints in Shabelle region Somalia continue to exist and hinder the growth and development of the people. These will be provided upon assessing the influence that the community livelihood is attained through climate changes in Jowhar Middle Shabelle region of Somalia.

The study will enable the determination of the state of livelihood in terms of farming productivity, animal Husbandry and trading/ Business continues to reduce the community support systems, although nothing is in place to explain the occurrence.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The chapter reviews literature that has been presented by the previous scholars on the research topic climate change and livelihoods in Jowar Lower Shabelle Somalia. The review of literature is done based on the specific research objectives of the study and their after the gaps in literature are identified and documented in the document.

2.1 Theoretical Review

This study was guided by the empowerment theory adopted by Perkins & Zimmerman (1995) presents a theoretical model for understanding the process and consequences of efforts to exert control and influence over decisions that affect one's life, organizational functioning, and the quality of community life. Empowerment theory provides principles and a framework for organizing our knowledge. The development of empowerment theory also helps advance the construct beyond a passing the provided information. The assessment of the state of deforestation is fundamental for enhancing or delimiting the community livelihood. The theory provides that the values that underlie an empowerment approach to social change and empowerment theory is necessary. The theory provides that livelihood of community can be improved through empowerment in the society and deforestation reduce the development of mechanism and avenues necessary by the different stakeholders in attaining and bridging development of the community.

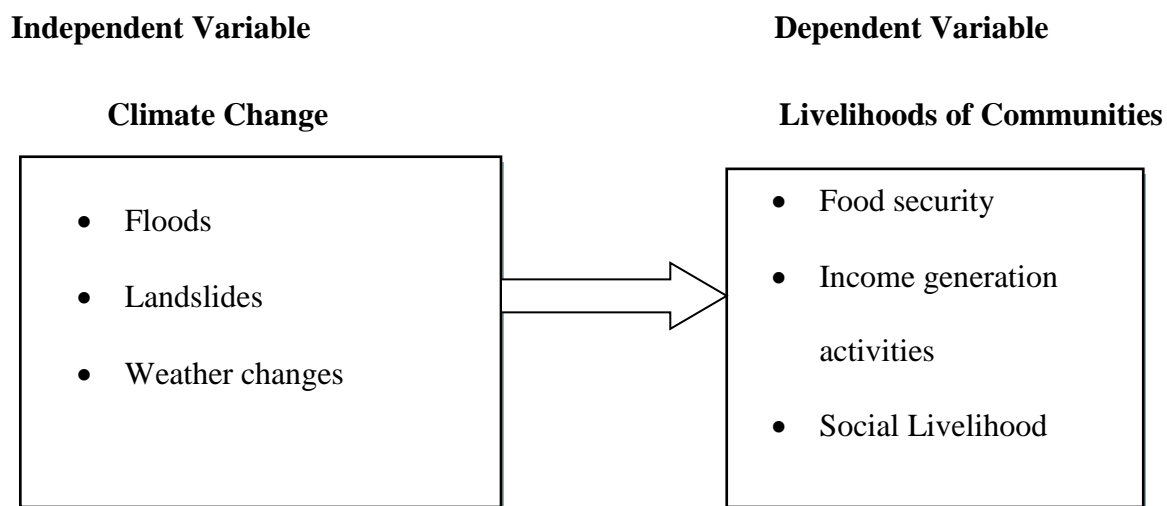
Empowerment is both a value orientation for working in the community and a theoretical model for understanding the process and consequences of efforts to exert control and influence over decisions that affect one's life, organizational functioning, and the quality of community life (Perkins & Zimmerman, 1995). A distinction between the values that underlie an empowerment approach to social change and empowerment theory is necessary. The value orientation of empowerment suggests goals, aims, and strategies for implementing change. Empowerment theory provides principles and a framework for organizing our knowledge. The development of

empowerment theory also helps advance the construct beyond a passing fad and political manipulation (Zimmerman & Warschausky, 1998).

2.2 Conceptual Framework

The conceptual framework diagrammatically shows the relationship between the different variables in the study. The independent variable is perceived as climate change and dependent variable is livelihoods of communities.

Figure 2.1: Showing the conceptual framework



Source: Researcher developed from Literature review, 2020

The study conducts an assessment of the impact of climate change on community livelihood in Jowhar lower Shabelle region Somalia. The independent variable is climate change which is measured through floods, weather changes and landslides while the dependent variable is Livelihood of communities measured through health Livelihood, food security and income generation activities. The framework shows that the presence of climate change is deemed to have a positive effect on the community livelihoods. The presence of positive climate change induces positive community livelihoods while the negative changes in the climate generally reduce the livelihood of the communities.

2.3 Human perception the causes of climatic changes

Over Population: The largest single threat to the ecology and biodiversity of the planet in the decades to come will be global climate disruption due to the buildup of human-generated greenhouse gases in the atmosphere. People around the world are beginning to address the problem by reducing their carbon footprint through less consumption and better technology (Berman et al., 2017). Many population experts believe the answer lies in improving the health of women and children in developing nations (Bhatta et al., 2018). By reducing poverty and infant mortality, increasing women's and girls' access to basic human rights (health care, education, economic opportunity), educating women about birth control options and ensuring access to voluntary family planning services, women will choose to limit family size. During that time emissions of CO₂, the leading greenhouse gas, grew 12-fold. And with worldwide population expected to surpass nine billion over the next 50 years, environmentalists and others are worried about the ability of the planet to withstand the added load of greenhouse gases entering the atmosphere and wreaking havoc on ecosystems down below.

Cutting trees: Deforestation is one of the main contributors to climate change. It comes in many forms: wildfire, agricultural clear cutting, livestock ranching, and logging for timber, among others (Elisante & Tungaraza, 2017). Forests cover 31% of the land area on Earth and annually 75,700 square kilometers (18.7 million acres) of forest is lost. Mass deforestation continues to threaten tropical forests, their biodiversity and the ecosystem services they provide. The main area of concern of deforestation is in tropical rainforests, since it is home to the majority of the biodiversity. Organizations such as World Wildlife Fund focus on the preservation of nature and the reduction of the most pressing threats to the diversity of life on Earth. Deforestation is the second largest anthropogenic source of carbon dioxide to the atmosphere, after fossil fuel combustion. Deforestation and forest degradation contribute to atmospheric greenhouse gas emissions through combustion of forest biomass and decomposition of remaining plant material and soil carbon. It used to account for more than 20% of carbon dioxide emissions, but is currently around the 10% mark. By 2008, deforestation was 12% of total CO₂, or 15% if peatlands are included.

Weak laws: In terms of the various sectoral regulatory frameworks in place in Uganda, the disaster preparedness and management and the health and environment (NEMA) sectors make provisions to tackle climate change (Ciani, 2011). In addition, the forest, land, water and energy sectors' regulatory frameworks are compatible with the climate change policy. However, many of the above policies and laws do not adequately address climate change. There is therefore need for broader analysis regarding the legislative and regulatory framework to come up with an enabling Legislative and Institutional Framework for Climate Change Response in Uganda (Deressa & Hassan, 2014). Global and national complex dimensions of climate change require very robust institutional and legal frameworks for addressing the growing challenges of climate and recommend enactment of an overreaching standalone legal framework for climate change as another option. This is also the preferred option by the CCU and the Ministry of Water and Environment and other stakeholders.

Destruction of wetlands: Destruction of wetland ecosystems will generate massive greenhouse gas emissions in coming years, warn experts convening at an international wetlands conference in Brazil. While they cover only 6 percent of the world's surface, wetlands marshes, peat bogs, swamps, river deltas, mangroves, tundra, lagoons and river floodplains are estimated to hold 771 gigatons of greenhouse gases, or 10-20 percent of the globe's terrestrial carbon (FAO, 2016). Beyond carbon storage, wetlands provide a range of environmental services, including water filtration and storage, erosion control, a buffer against flooding, nutrient recycling, biodiversity maintenance, and a nursery for fisheries. But drainage and destruction of these ecosystems is responsible for large amounts of carbon emissions (40 tons of carbon per hectare per year for drained tropical swamp forests) as well as degradation of the other services they provide. Wetlands are essential to life on earth, supporting more than 125,500 freshwater-dependent species (Foresight, 2011). They are also among the ecosystems most vulnerable to climate change. Some wetlands, including coral reefs, mangroves, swamps and those in high latitude and alpine zones, are especially at risk. Inland, freshwater wetlands are likely to be affected by increased temperatures and changes to precipitation and more frequent or intense droughts, storms and floods. Wetlands that are highly modified or degraded may be even more sensitive and less resilient to climate change (IPCC, 2017).

Green House emissions: Concentrations of the key greenhouse gases have all increased since the Industrial Revolution due to human activities. Carbon dioxide, methane, and nitrous oxide concentrations are now more abundant in the earth's atmosphere than any time in the last 800,000 years (Ogden, 2017). These greenhouse gas emissions have increased the greenhouse effect and caused the earth's surface temperature to rise. Burning fossil fuels changes the climate more than any other human activity. Carbon dioxide, Human activities currently release over 30 billion tons of carbon dioxide into the atmosphere every year. Atmospheric carbon dioxide concentrations have increased by more than 40 percent since pre-industrial times, from approximately 280 parts per million (ppm) in the 18th century to 414 ppm in 2020 (IPCC, (2018). Methane: Human activities increased methane concentrations during most of the 20th century to more than 2.5 times the pre-industrial level, from approximately 722 parts per billion (ppb) in the 18th century to 1,867 ppb in 2019. Nitrous oxide: Nitrous oxide concentrations have risen approximately 20 percent since the start of the Industrial Revolution, with a relatively rapid increase toward the end of the 20th century. Nitrous oxide concentrations have increased from a pre-industrial level of 270 ppb to 332 ppb in 2019 (Buebbles et al., 2017).

Changes in the Earth's Orbit and Rotation: Changes in the earth's orbit and its axis of rotation have had a big impact on climate in the past (Fahey et al., 2017). For example, the amount of summer sunshine on the Northern Hemisphere, which is affected by changes in the planet's orbit, appears to be the primary cause of past cycles of ice ages, in which the earth has experienced long periods of cold temperatures (ice ages), as well as shorter interglacial periods (periods between ice ages) of relatively warmer temperatures. At the coldest part of the last glacial period (or ice age), the average global temperature was about 11°F colder than it is today. At the peak of the last interglacial period, however, the average global temperature was at most 2°F warmer than it is today.

Variations in Solar Activity: Changes in the sun's energy output can affect the intensity of the sunlight that reaches the earth's surface. While these changes can influence the earth's climate, solar variations have played little role in the climate changes observed in recent decades (Fahey et al., 2017). Satellites have been measuring the amount of energy the earth receives from the sun since 1978. These measurements show no net increase in the sun's output, even as global surface temperatures have risen.

Changes in the Earth's Reflectivity: The amount of sunlight that is absorbed or reflected by the planet depends on the earth's surface and atmosphere. Dark objects and surfaces, like the ocean, forests, and soil, tend to absorb more sunlight. Light-colored objects and surfaces, like snow and clouds, tend to reflect sunlight. About 70 percent of the sunlight that reaches the earth is absorbed (IPCC. (2021). Natural changes in the earth's surface, like the melting of sea ice, have contributed to climate change in the past, often acting as feedbacks to other processes.

Volcanic Activity: Volcanoes have played a noticeable role in climate, and volcanic eruptions released large quantities of carbon dioxide in the distant past. Some explosive volcano eruptions can throw particles (e.g., SO₂) into the upper atmosphere, where they can reflect enough sunlight back to space to cool the surface of the planet for several years. These particles are an example of cooling aerosols. Volcanic particles from a single eruption do not produce long-term climate change because they remain in the atmosphere for a much shorter time than greenhouse gases. In addition, human activities emit more than 100 times as much carbon dioxide as volcanoes each year (Hayhoe et al, 2018).

Changes in Naturally Occurring Carbon Dioxide Concentrations: Over the last several hundred thousand years, carbon dioxide levels varied in tandem with the glacial cycles. During warm interglacial periods, carbon dioxide levels were higher. During cool glacial periods, carbon dioxide levels were lower. The heating or cooling of the earth's surface and oceans can cause changes in the natural sources and sinks of these gases, and thus change greenhouse gas concentrations in the atmosphere. These changing concentrations have acted as a positive climate feedback, amplifying the temperature changes caused by long-term shifts in the earth's orbit (IPCC, 2018).

Burning of fossil fuels and the conversion of land for forestry and agriculture. Since the beginning of the Industrial Revolution, these human influences on the climate system have increased substantially. In addition to other environmental impacts, these activities change the land surface and emit various substances to the atmosphere (Christiaensen& Boisvert, 2010). These in turn can influence both the amount of incoming energy and the amount of outgoing energy and can have both warming and cooling effects on the climate. The dominant product of fossil fuel combustion is carbon dioxide, a greenhouse gas. The overall effect of human activities since the Industrial Revolution has been a warming effect, driven primarily by emissions of

carbon dioxide and enhanced by emissions of other greenhouse gases (Ciani, 2011). The build-up of greenhouse gases in the atmosphere has led to an enhancement of the natural greenhouse effect (Deressa & Hassan, 2014). It is this human-induced enhancement of the greenhouse effect that is of concern because ongoing emissions of greenhouse gases have the potential to warm the planet to levels that have never been experienced in the history of human civilization. Such climate change could have far-reaching and/or unpredictable environmental, social, and economic consequences.

Reflectivity or Absorption of the Sun's Energy: Activities such as agriculture, road construction, and deforestation can change the reflectivity of the earth's surface, leading to local warming or cooling. This effect is observed in heat islands, which are urban centers that are warmer than the surrounding, less populated areas. One reason that these areas are warmer is that buildings, pavement, and roofs tend to reflect less sunlight than natural surfaces. While deforestation can increase the earth's reflectivity globally by replacing dark trees with lighter surfaces such as crops, the net effect of all land-use changes appears to be a small cooling. Emissions of small particles, known as aerosols, into the air can also lead to reflection or absorption of the sun's energy. Many types of air pollutants undergo chemical reactions in the atmosphere to create aerosols. Overall, human-generated aerosols have a net cooling effect on the earth. Learn more about human-generated and natural aerosols (Swe, Shrestha, Ebberts & Jourdain, 2018).

2.4 Effect of climate change on Livelihood of communities

The livelihoods worldwide are frequently faced with multiple stressors or shocks including variability in climate, environmental, socio-economic and even political instability, over-exploitation, development and also poor governance which together have high potential to impact on livelihoods while reinforcing on each other negatively (IPCC, 2021). Climate change is however, often acknowledged as the primary threat to livelihoods in the 21st Century especially, where it can undo years of development (Connolly-Boutin & Smit, 2019).

The IPCC, (2021) indicates that climate change has been established beyond reasonable doubt to be happening and even minor changes in precipitation amount or temporal distribution, short periods of extreme temperatures, or localized high winds are harming livelihoods. Poor people's assets are eroded by extreme events undermining their livelihoods regarding labor productivity,

housing, infrastructure, and social networks. Loss of farm income and jobs is a classic example of the loss of finances to climate change effects, which is compounded by increased cost of living, including higher expenses for food, health care, funerals and also over-dependence on nature based resources

According Dube & Phiri, (2018)'s study in Zimbabwe, increased temperatures and decreased precipitation were confirmed to alter the natural environment thus leading to the extinction of biodiversity that is depended upon by communities for sustenance. Also, climate change had adversely impacted on rural livelihoods in the country similarly to other parts of the sub-Saharan countries whose main livelihoods are largely confined to agricultural production and which is widely dependent on rainfall patterns. Dube & Phiri, (2018)'s results demonstrate that about 98% of the interviewees indicated that crop yields had declined due to low precipitation and rising temperatures while livestock had succumbed to droughts. Water availability, wild fruits, honey and Amacimbi-Mopane worm (ibid) and also tourism, forests, and wetlands which are other critical livelihood options in Zimbabwe, were reported to have adversely declined because of the impacts of the changing climate

In Nigeria, Onyekuru and Marchant (2018) cites weed infestation, increased diseases, reduced harmattan, floods and droughts, among others as the undeniable evidence of the changing climate. The failure to control climate change, it would continue to impact on the country's livelihoods including; agricultural production, forestry and fisheries among others. The alterations in rainfall patterns, farmlands destruction by floods, increases in pest and diseases due to increased temperatures, humidity and natural disasters will affect livelihoods and also harm life and damage properties. Climate variability and change are also found to indirectly influence the biophysical environment, especially water availability and temperature regimes that are interacting to reduce agricultural production and forest resource availability. The impact is said to likely become extreme particularly when it triggers migration of people from areas of impact such as those associated with desertification and sea level rise to areas of more limited forest cover, leading to excessive forest exploitation and potential conflicts

In many African countries, agricultural sector remains the lifeblood for more than 75% of the population (Kangalawe & Lyimo, 2019). It accounts for 45% of the gross domestic profit and which is also critical for ensuring food security and alleviating rural poverty. The sector's

productivity is, however, confirmed to have declined mainly because of natural factors such as drought, floods, and high winds among others. Crop yields were reported to be declining as species such as maize, finger millets, beans, cowpeas, and groundnuts were affected by droughts, incidences of insects and pests, diseases and vermin. Livestock production had declined regarding milk, meat, calves due to low rainfall conditions with decreased pastures. The other livelihood sectors mentioned having been impacted by climate change included, livestock, forestry, wildlife, wetlands and energy among others.

In Kenya, just like in many parts of the world, temperatures have increased throughout the country with increased frequency of extreme weather events mainly droughts and floods while rainfall patterns have become irregular and unpredictable and declining livelihoods. Many socio-economic sectors including agriculture, water resources, forestry, fisheries, ecological systems, human settlements and health among others have been affected by climate change, which consequently impacts on the national food security (Okoti, Kung'u and Obando, 2018). Agriculture remains the pillar of the country's livelihoods, yet it is the most prone to climate change. Most livelihoods, in particular in the rural settings have been affected by successive crop failure, water shortages, loss of livestock as a result of extreme weather events (Okoti *et al.*, 2018). Consequently, sudden floods triggered by the abnormal onset of the rainy seasons destroy infrastructure and hamper mobility, increase disease epidemics, damage crop fields, cause livestock deaths, cause soil erosion thus impacting on livelihoods. According to droughts degrade the environment increasing resource conflicts and desertification in the country. The increase in droughts frequency and severity aggravates aridity of the drylands, making them drier which affects ecosystems balance and impacting on resultant livelihoods (Ozor, N., Umunake, Ani & Nnadi, 2019).

Rising temperatures also worsen air pollution by increasing ground level ozone, which is created when pollution from cars, factories, and other sources react to sunlight and heat (Olivieri et al., 2010). Ground-level ozone is the main component of smog, and the hotter things get, the more of it we have. Dirtier air is linked to higher hospital admission rates and higher death rates for asthmatics. It worsens the health of people suffering from cardiac or pulmonary disease. And warmer temperatures also significantly increase airborne pollen, which is bad news for those who suffer from hay fever and other allergies (Sen, 2017).

Several areas of the country have experienced floods following on-going above normal heavy rains which resulted into landslides in localized areas of the country where steep slopes and mountain valley are presents. Basing on current situation of the landslides and flooding cases in Rwanda, there are so many losses of lives, property damages and environmental degradation in localized areas affected by these hazard events (Nordhaus, 2018). Having seen that most of households in affected areas are mostly living with agricultural and livestock activities, there is a need to know the effects induced by landslides and flooding events in affected communities that challenged the socio-economic and development of affected livelihoods.

Flooding in floodplains can be considered as an environmental concern in the affected areas (Lipper et al., 2010). The clogging of soil pores by water deprives roots of adequate oxygen subsequently leading to root and plant stress. This also affects soil pH and nutrient base, influencing the distribution of plants across space. With many of the Cuvelai residents being small scale subsistence farmers, with pearl millet (mahangu) being the main staple food in the basin, it is imperative that the impact of floods on plant and crop communities is understood and documented (Løvendal & Knowles, 2015). During the months of August and early September 2007, heavy rainfall led to severe flooding in Northern Ghana resulting in the loss of lives, displacement of vulnerable persons and the destruction of key infrastructure, food stocks and livestock throughout Bududa District. The floods coincided with the most critical time of the year, the lean (minor) farming season when Ghanaian families faced food insecurity.

2.5 Climate change strategies that can be employed to improve the community livelihood

The accumulation of greenhouse gasses (GHGs) for instance CO₂ in the atmosphere continues to promote global warming and consequently the variability in the climate, which impinges on livelihoods (IPCC, 2021). The rural people are however confirmed to develop adaptation practices based on their own local experiences. According to Onyekuru & Marchant, (2018), agro-forestry in Nigeria is one of the outstanding climate change impacts mitigation and adaptation practices for majority of the households in the country. It does not only meet their needs but also supplements main income activities, energy sources and also food in times of crop failure while mitigating GHGs. The households also adopted improved cookstoves, which they considered as a win-win option for the families since it does not only aid in abatement of climate

change but is also considered as cost effective. In addition, the households increasingly make use of wetlands where they take advantage of areas often flooded to plant vegetables and crops that are tolerant to floods and also use autonomous traditional knowledge and practices to mitigate impacts of climate change.

In Ghana, the communities are said to adopt conservation of biodiversity and management of water resources so as to reduce the effects of the climate variability and change (Boon & Ahenkan, 2012). In agricultural coping practices, the communities cultivate shorter gestation period crops which are also drought resistant and grow a range of improved cocoa, maize and cassava hybrids to counter impacts of dry spells. Through capacity building and sensitization programmes, the Sui FACs appreciate the value of planting trees on their farms to provide shade for the crops and NTFPs (ibid). With the gradual decline in provision of valuable NTFPs including herbal plants, the communities have been said to turn to production of honey, snail farming, mushroom and rabbit keeping among others to supplement their income sources and livelihoods. Tambo & Abdoulaye, (2017) also found that some communities opted to borrow from banks, relatives, withdraw children from schools, kept off hospitals and diversified their activities to generate income in quest to manage the rising costs as a result of agricultural failures.

In South Africa, Thomas, Twyman, Osbahr and Hewitson (2017) suggested that increased rainfall uncertainty had enhanced communities' dependence on livestock and poultry besides crops in about 80% of homes interviewed. Besides, people often move to coastal areas while also abandoning the rain-fed agriculture for aquatic livelihoods. According to Kuria, (2019)'s study in Kenya, the Kereita FACs grew drought resistant crops, fast maturing crops to respond to dry spells in particular and also practiced petty trading. The FACs shift more to charcoal burning, firewood collection, honey gathering, extraction of medicinal plants and also businesses during dry seasons to raise income for their survival while they cultivate more during wet seasons (Lesnoff, Corniaux and Hiernaux, 2012). In ASALs parts of the country, communities opt to reduce their herd sizes while some abandon keeping dairy cattle and sheep and embrace keeping beef cattle and goats which are perceived to be more drought resistant.

Many of the countries in sub-Saharan Africa are most exposed to the impact of climate change, due to high reliance on agricultural production and little adaptive capacity. Boko *et al.* (2007),

expatiated on the effects of climate change in sub-Saharan Africa, which are practically seen where the length of the growing season is reduced which inevitably forces agricultural business out of production. According to Deressa *et al.* (2014), adaptation measures used in the Eastern coast of Africa in maize farming were the utilization of different maize cultivars, irrigation and change of planting dates. Equally, Mary and Majule (2009) reported that in Tanzania the rural farmers adapt by simply changing the date of planting. Furthermore, rural household in Tanzania engage in the burying of crop residues to improve soil fertility and burning the residues to control pest infestation. Additionally, in SSA diversification of livelihood strategies to non-farm activities were practiced.

In Southern Africa, there are some adaptation measures that are used to improve the yield of maize. According to Zvigadza *et al.* (2018), it was reported that in Zimbabwe, traditional coping strategies were identified with the aim of adapting to the aftereffects of climate change. The use of water recycling on the farm, indigenous method of water conservation, practicing spiritual exercise requesting for rain were all used. According to Ndhleve, Nakin and Longo-Mbenza (2017) in South Africa, supplementary irrigation and change of planting date were identified for adaptation strategy. Farmers engage in adaptation by re-planning or shifting of the planting date to earlier or late to adapt, the use of forecasting and weather report were all measures used.

Climate change awareness is an imperative to achieve sustainability in developing countries. Lack of awareness is a significant barrier to climate change adaptation in developing countries (Mendelsohn *et al.*,2012). Raising climate change awareness at the local level is critical for Uganda as climate change impacts are exacerbating the number and extent of disasters in this disaster-prone country. Environmental awareness of individuals, organizations and firms is an indicator of how people respond to the negative impacts on their surrounding environment. Different studies in developed countries demonstrate that enhancing environmental awareness leads to better outcomes in planning and management of environmental resources (Nordhaus, 2011).

According to Nordhaus (2011), increased sense of awareness of and interest in disaster risk reduction in Pakistan can help to increase the disaster preparedness through developing and forecasting early warning and evacuation systems. As some of these disasters, like floods and

droughts, are related to climate change, it makes good sense to investigate what is known about climate change impacts and adaptation among various sections of society.

Most of the laws in Uganda do not have specific provisions addressing climate change adaptation and mitigation (Skoufias et al, 2011). The draft National Environment (Amendment) Act, 2014 has specific legal provisions for addressing climate change. In the clause on measures on climate change, the Bill mandates the National Environment Management Authority (NEMA), in consultation with the lead agency for climate change, to put in place guidelines and measures to address the impacts of climate change on ecosystems, including by improving the resilience of ecosystems; and to advise institutions, firms, sectors or individuals on strategies to address the impacts of climate change, including those related to the use of natural resources.

Environmental resources including climate play a crucial role for large populations, so any threat, for example, of climate change affects ecosystem functioning and integrity, hence undermine the security of livelihoods. For example, climatic and non-climatic factors over which households may have little control affect a household's access to sufficient livelihood assets. Such as the example put forward by Badjeck et al., (2010), climate change is evident in lake/sea level fluctuation, storm and flood frequency, which subsequently affect the physical capital of households or entire communities.

Resettlement can also bring development opportunities to people, bringing them closer to physical and social infrastructure, such as roads, schools and hospitals (Tol, 2017). However, there are also potential problems associated with resettling vulnerable populations. Recent examples from the natural hazards' literature suggest that resettlement as a disaster risk reduction strategy can hinder sustainable livelihoods formation amongst relocated people. Moreover, the extensive Development-Induced Displacement and Resettlement (DIDR) literature, which examines forced movement as a consequence of large-scale infrastructure projects, shows that involuntary relocation often leads to the impoverishment of those who are induced to move. There is consequently ongoing uncertainty over what the potential opportunities and constraints of resettlement as a climate change adaptation measure might be (Sango, 2018).

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter consists of the procedures and methods that the researcher used to conduct research on the study area. The chapter discusses how the respondents were selected, how data was collected and analyzed. The chapter also presents research design, population of study sample size, sampling technique, research instruments, data sources, reliability and validity, data gathering procedures, data analysis and limitations of the study.

3.1 Study Area

3.1.1 Location

Jowhar is the capital city of Hirshabelle state of Somalia. Jowhar is also the administrative capital of Middle Shabelle region of Somalia. Along with Baidoa, it used to form the joint administrative capital of the Transitional Federal Government, which it captured from the Islamic Courts Union. The city lies 90 km (50 mi) along a major road north of the national capital of Mogadishu.

As part of a 2004 agreement, Jowhar and the town of Baidoa were to form a joint administrative capital of the Transitional Federal Government, sited away from Mogadishu for security reasons. Continued fighting threatened to derail the peace process. However, in July 2005, President Abdullahi Yusuf Ahmed relocated to the town from his base in Bosaso, moving the process forward and joining Prime Minister Ali Mohammed Ghedi, who had already been resident in the town for a month. Part of the parliament became based in Jowhar, while some ministries were established in Mogadishu. By February 2006, despite Ghedi's security concerns, the two leaders had left to Baidoa, where it was decided the parliament would convene

3.1.2 Climate

Middle Shabelle region borders Mogadishu to the south, Lower Shabelle to the southwest, Hiraan and Galgaduud regions to the north, and the Indian Ocean to the east. Its population is

estimated at 514,901 with 80 per cent living in the rural areas. The region has four main administrative districts; Adanyabaal with 62,917 people, Balcad/Warsheikh with 136,007 people, Cadaale with 46,720 people, and Jowhar/ Mahaday with 269,257 people¹. Jowhar is the region's administrative capital while Adanyabal, Adale and Balad are the main towns. The region hosts an estimated 51,960 internally displaced people (IDPs).

Middle Shabelle is divided into five main livelihood zones. In central regions, agro-pastoralists produce cowpeas and graze sheep, goats, camels and cattle. In the coastal Deeh, rearing sheep is the predominant livelihood; while the agro-pastoral irrigated livelihood zones grow maize/sorghum and rear cattle. The agro-pastoral rain zone produces maize, cowpeas and sesame and rear cattle; the Shabelle riverine zone produces maize, fruits and vegetables.

The River Shabelle flows through the south western part of Middle Shabelle from the Hiraan region. The River is the lifeline for agriculture however it also brings devastation during flooding seasons. According to weather forecasts, the El Niño (September 2012 through early next year) is likely to affect some 113,000 people in Jowhar and Balcad districts due to increased rains in the Ethiopian highlands.

The food security situation in the Middle Shabelle region has shown significant improvements since Deyr season. Gu 2012 harvest is 26 per cent above the Post-War Average (PWA). Livestock is in good condition, and terms of trade combined with stable food prices contributed to improved food security. The coastal belt has received poor rains and the food security situation remained in emergency phase. A nutrition survey could not take place for the Gu cycle, however, the situation is believed to be in critical phase following a bumper Deyr harvest and an above average Gu Post War Average (1995-2011) crop.³

The region is still under Al-Shabaab (AS) control except for Balcad district. Insecurity remains a serious challenge in Balcad due to frequent AS hit-and-run attacks. Key humanitarian agencies are banned, however some 20 partners, mainly local NGOs, are engaged in a variety of cluster interventions.

3.1.3 Population

The district had estimated population of 359,251 as of 2022, a survey was done by (UNDP) in 2014 and it is primarily inhabited by Mohamed Muse clan (Abgal).

Figure 3.1: Showing Map of Jowhar



3.2 Research design

This study used cross-sectional research design. A cross-sectional research design is a type of observational study that analyzes data from a population, or a representative subset, at a specific point in time. The study employed both quantitative and qualitative approaches. Quantitative methods were used in data collection and analysis and general information on the subject matter was collected from the different stakeholders involved in the study. The qualitative approach used to climate change and livelihoods of communities.

3.3 Study Population

Mugenda & Mugenda (2003) defines population as a complete set of individuals, cases or objects with some common observable characteristics. The population of interest which comprised of all the local community, community leaders and environmental officers in the district. The focus will be in the communities in Jowar which are prone to the occurrence of the negative climate change. These areas according to reports from UNDP are close to 12,000 residents found in the affected areas.

3.4 Sample size

Sample size determination is the act of choosing the number of observations or replicates to include in a sample in an empirical study in which the goal is to make inferences about a population from a sample. The nature of data that has been generated required different techniques for better understanding of the research problem under investigation. Besides, the approach is also commonly known for achieving higher degree of validity and reliability as well as eliminating biases as per Amin (2015). The study used Sloven's formula to determine the sample size of the actual respondents. Sloven's formula states,

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

Where; **n** = sample size; **N** = target population; and **α** = 0.05 level of significance

$$n = 12,000 / (1 + 12,000(0.05)^2)$$

$$n = \frac{12,000}{1 + 12,000(0.0025)}$$

$$n = 387$$

Table 3.1: Structure of the study population

Category	Target Population	Sample	Selection technique
Top authorities of Jowar	25	10	Purposive Sampling
District Environmental Officials	5	05	Purposive Sampling
Local communities	11970	371	Random Sampling
Total	12,000	387	

3.5 Sampling Methods

3.5.1 Simple Random Sampling

The study also used random sampling on large populations for instance the community members/ local population so as to get equal representation of the respondents. In that way, every employee will have an equal opportunity to be selected.

3.5.2 Purposive Sampling

Purposive sampling involved selecting a number of Top authorities of the district, Environmental Officials. These were purposely selected because they work with the District local government and thus are believed to have sufficient knowledge on climate change and livelihoods of communities. This method was appropriate because the sample selected comprises of informed persons who provided data that was comprehensive enough to gain better insight into the problem.

3.6 Data Collection Instruments

3.6.1 Questionnaire

The study used questionnaires as the main primary source of data collection. Both Close ended and open ended questionnaires were used in the collection of data and these were distributed to the respondents involved in the study to provide answers. The instrument were purposely selected because it seeks personal views of the respondents and thus enabled the respondents to

use their knowledge in providing a wide range of data as they were never shy away in any way.

3.6.2 Interview Guide

The researcher organized key informant interviews with officials from the top authorities of the Jowar District with the use of interview guides. The researcher therefore did not have to interact with the respondents, face to face and ask them relevant questions to the study. The method was used purposely because it provides for a systematic flow of information due to the order of questions and it also helps in covering information that would be left out in the questionnaires.

3.7 Validity and reliability of the instrument

3.7.1 Validity

This instrument is mainly ensured through expert judgment and the researcher made sure the coefficient of validity to be at least 70%. After the assessment of the questionnaire, the necessary adjustments made bearing in mind of the objectives of the study. The researcher used the following formula to calculate the validity of the instrument was

$$CVI = \frac{\text{no of items declared valid}}{\text{total no of items}} \quad \frac{25}{29} = .86$$

3.7.2 Reliability

This is also another critical instrument that the researcher used as a measure of the degree to which a research instrument yields consistent results or data after repeated trials (Mugenda & Mugenda, 2015). The formula that the researcher used indicated below;

$$\alpha = \frac{n}{n-1} \left[1 - \frac{1}{\sigma^2} = \sum_{i=1}^n \sigma_i^2 \right]$$

Where σ^2 is the variance of the total scores and is the variance of the set of 0,1 scores representing correct and incorrect answers on item 1. The theoretical range of the coefficient is 0 to 1. Suggested guidelines for interpretation are < 0.60 unacceptable, 0.60–0.65 undesirable, 0.65–0.70 minimally acceptable, 0.70–0.80 respectable, and 0.80–0.90 very good, and > 0.90

consider shortening the scale by reducing the number of items. The reliability values attained was 0.890 indicated as a reliable tool for the study.

3.8 Data Analysis

3.8.1 Quantitative data analysis

The quantitative data involved information from the questionnaires only. Data from the field for proper interpretation. It was therefore be vital to put it into order and structure it, so as to drive meaning and information from it. The raw data obtained from questionnaires were cleaned, sorted and coded. The coded data was entered into the Computer, checked and statistically analyzed using the statistical package for social scientists (SPSS) software package to generate descriptive statistics.

3.8.2 Qualitative analysis

The researcher used manual coding on the transcripts to identify the significant statements across individual interviews. Subsequent readings of the significant statements helped in identifying sub-themes emerging within the patterns. For presentation of thematic findings, both textural and structural descriptions were used in the results section. Textural descriptions are significant statements used to write what the participants experience. Structural descriptions are the interpretation of the context or setting that influenced participants' experiences. For textural descriptions, the quotes of participants were given in italics with the respondent to whom that quote belongs marked with type. The structural descriptions as interpreted by the researcher were provided in plain text.

3.9 Ethical Considerations

The researcher carried out the study with full knowledge and authorisation of the top authorities of Jowar District. The researcher first acquired an introductory letter from the University which he used to eliminate suspicion.

The researcher thereafter went ahead to select respondents, and arrange for dates upon which he delivered questionnaires as well as pick them in addition to making appointments for interviews to

be conducted. The researcher was charged with a task of ensuring that she assured the respondents of their confidentiality as this is paramount to research.

Participation in the study was voluntary and the identity of respondents giving information was also made private and confidential to prevent any victimization.

3.10 Limitations of the study

The study was conducted at a time when the world was battling Covid-19. The researcher struggled with travel and data collection given the fact that there were travel restrictions in many countries.

Some respondents were hard to get because of their busy work schedules. As a result, this delayed the data collection process.

Some respondents feared to cooperate and provide all the required data thinking that it is a private investigation

Lastly, the researcher is likely to find challenges of designing reliable research instruments.

CHAPTER FOUR

PRESENTATION INTERPRETATION AND ANALYSIS OF RESULTS

4.0 Introduction

The data was collected from respondents, the study set to conduct an assessment of the impact of climate change on community livelihood in Jowhar Middle Shabelle Region of Somalia. The data was collected from 320 respondents through the use of questionnaires out of the 372 questionnaires that were supplied to the respondents. Qualitative responses were attained using interviews that were administered with Top authorities of Jowhar district and environmental officers who were 10 and provided qualitative responses to the study. The study objectives were establish the Perceived causes of climatic changes in Jowhar middle shabelle region Somalia, then secondly to assess the effect of climate change on Livelihood of communities in Jowhar middle Shabelle region Somalia and thirdly to establish the climate change strategies that can be employed to improve the community livelihood in Jowhar middle Shabelle region Somalia. To fulfill the objectives, the researcher provided responses based on frequency and percentages provided in the Tabulations provided here under and then thematic analysis based on the results presented in results below.

4.1 Demography of respondents

The demography data is presented on gender, education, age, marital status and time of stay in the study area.

4.1.1 Gender of respondents

The results on the gender are provided in the presentation in table 4.1

Table 4.1: Gender of respondents

Responses	Frequency	Percent
Male	195	60.9
Female	125	39.1
Total	320	100.0

Source: Primary Data, 2022

Results from the field reveal that major respondents for the study were 60.9% who were the majority and 39.1% of the respondents were females. The study results indicate that data was attained from across the gender grid, the data can't be doubted on the gender grounds, it's imperative that the gender issues be considered effectively in the study. This was in reference to Mbabazi (2008) who argued that survey data that incorporates responses from both sexes is reliable than from a single sex.

4.1.2 Age of respondents

Here the researcher sought to attain information from the study concerning the age of the respondents for the study. The information for the study is provided in Tabulation 4.2

Table 4.2: Age of respondents

Responses	Frequency	Percent
18-27	31	9.7
28- 37	93	29.1
38-48	97	30.3
48-57	41	12.8
58-67	40	12.5
68 Above	18	5.6
Total	320	100.0

Source: Primary Data, 2022

Results in table 4.2 reveal that majority respondents for the study were in the age of 38-47 years who were 30.3% of the respondents, followed by those of 28-37 years who were 29.1% then those of 48-57 years were 12.8%, then those of 58-67 years were 12.5%, then those of 18-27 years were 9.7% and finally those of 68 years above were 5.6% of the respondents. The study results indicate that majority respondents for the study were mature adults, they have an active memory information attained can be relied upon for effective decision making. The results therefore indicate that the majority of respondents were of mature and of experienced age which made the researcher to consider their views as valid and authentic in relation to the study. These findings concur with Amin (2005) who argue that majority age of above 18 years adds value to

the responses given that mature people are more and take time to think about a particular aspect of life given their wide exposure and experience.

4.1.3 Education of respondents

The results presented below provide the education of respondents for the study provided in the Tabulations provided in table 4.3

Table 4.3: Education of respondents

Education	Frequency	Percent
Masters	13	4.1
Degree	42	13.1
Diploma	29	9.1
Certificate	59	18.4
Secondary	127	39.7
Primary	50	15.6
Total	320	100.0

Source: Primary Data, 2022

The results in Table 4.3 indicate that the majority respondents were of secondary school leavers who were 39.7% of the study, then certificate holders were 18.4% of the respondents, then primary educated were 15.6% of the study, degree holders were 13.1% of the study, then diploma holders were 9.1% of the study and finally 4.1% of the respondents were master holders. The study results indicate that data was attained from the respondents based on the information attained from the study. It's prudent to argue that they are educated and understand the status for the study, information provided is suitable for decision making. This is supported by Uma (2000) who argue that it is important in social investigation research to involve people who have attained an acceptable level of literacy and numeracy in order to be in position to understand and interpret the content in questionnaire.

4.1.4 Time of stay in Jowar community

Table 4.4: Time of stay in Jowar community

Years	Frequency	Percent
1-8 Years	36	11.3
9-14 Years	64	20.0
15 Years above	220	68.8
Total	320	100.0

Source: Primary Data, 2022

The study results based on information attained reveal that majority of the respondents who constitute 68.8% of the respondents were 15 years and above in Jowar community while 20% respondents were of 9-14 years and those who had stayed for 1-8 years were 11.3% . The study results indicate that majority of the respondents of the respondents had been in the study area for a long period of time; information attained is significant for decision making. The people in the study area basically understand the climatic changes due to the time or period of their stay in the Jowar district.

4.1.5 Marital Status of respondents

Here the researcher sought to attain responses from the field concerning the marital status of the respondents provided in table 4.5.

Table 4.5: Marital Status of respondents

Responses	Frequency	Percent
Single	56	17.5
Married	243	75.9
Separated/ Divorced	16	5.0
Widowed	5	1.6
Total	320	100.0

Source: Primary Data, 2022

Results in table 4.5 show that majority respondents in the study were married who constituted 75.9% of the respondents while single respondents were 17.9%, widowed were 1.6% and finally 5% were separated in the marriages. The study results indicate that data was attained from responsible respondents. The information attained is suitable for effective decision making for the organizations.

4.1.6 Occupation of respondents

Table 4.6: Occupation of respondents

Responses	Frequency	Percent
Agriculture	86	26.9
Business	77	24.1
Public Service	76	23.8
Private Service	81	25.3
Total	320	100.0

Source: Primary Data, 2022

Results in Table 4.6 on the occupation of respondents indicate that the majority respondents were in agriculture representing 26.9% of the study, Business were 24.1% of the study, public service were 23.8% and finally private sector were 25.3% of the study. The results show that the majorities respondents are involved in the different occupations activities, hence have an adequate understanding of the study environment and the study is hence provided anchored on the different activities conducted among the people in the communities.

4.2 Perceived causes of climatic changes in Jowhar middle Shabelle region Somalia

The first objective of the study was to determine the perceived causes of climatic changes in Jowhar middle Shabelle region Somalia. The research objective was fulfilled and the researcher attained information concerning the study as provided in the tabulations provided here under.

4.2.1 Awareness of the perceived causes of climate change in Jowhar middle Shabelle region Somalia

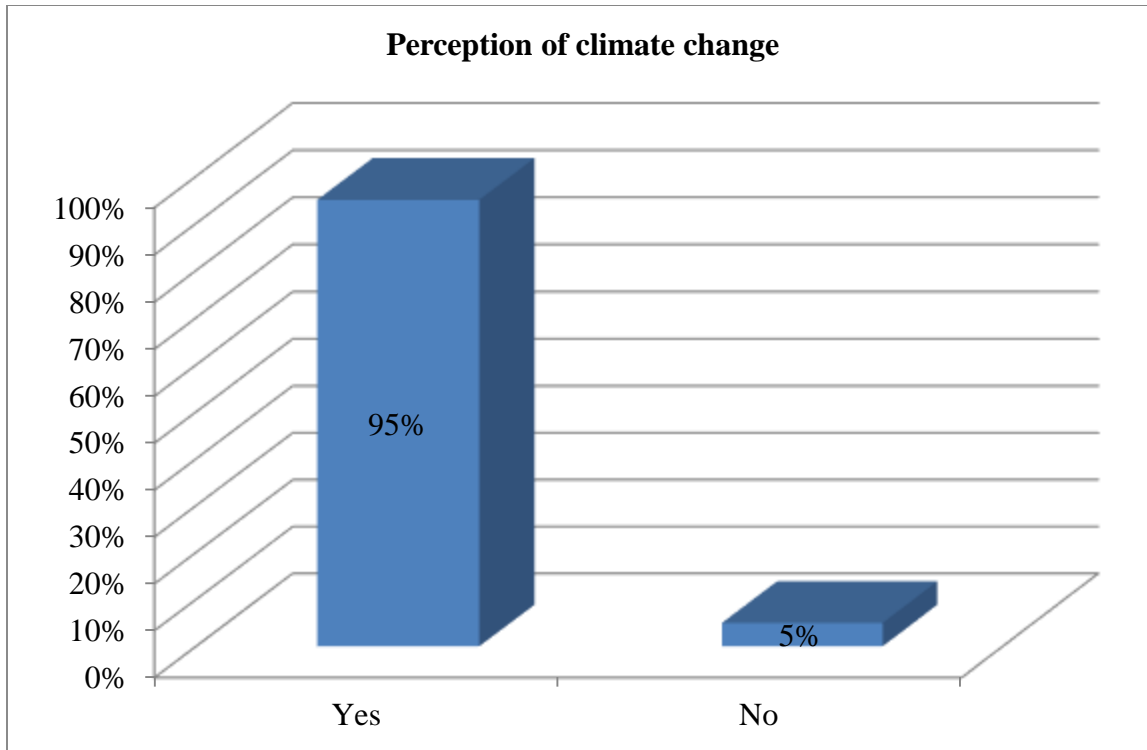
Table 4.7: Awareness of the perceived causes of climate change in Jowhar middle Shabelle region Somalia

Responses	Frequency	Percent
Yes	257	80.3
No	63	19.7
Total	320	100.0

Source: Primary Data, 2022

Results in Table 4.7 about the awareness on the perceived causes of climate change in Jowhar middle Shabelle region Somalia. The study results indicate that 80.3% respondents have a perception of the climatic changes in their area while 19.7% respondents are not aware. The study results show that the majority of the study respondents have a perception of the climatic changes frequently occur, information attained is significant for effective decision making in the Somalia region.

4.2.2 Perception of climate variability in Jowhar middle Shabelle region Somalia



Source: Field data, 2021

Figure 4.1: Show perception of climate variability in Jowhar middle Shabelle region Somalia

Results in table and figure above concerning the respondents perception of climate variability in Jowhar district, 95% respondents were in agreement while 5% of the respondents were in disagreement, the results never the less show that show that many respondents were having knowledge or perceptions of climate variability in Jowhar district, Middle Shabelle region Somalia , the study reveal that the respondents are in an appropriate venture to perceive climate variability in the district.

4.2.3 Environment factors which explain the occurrence of climate change in Jowhar middle

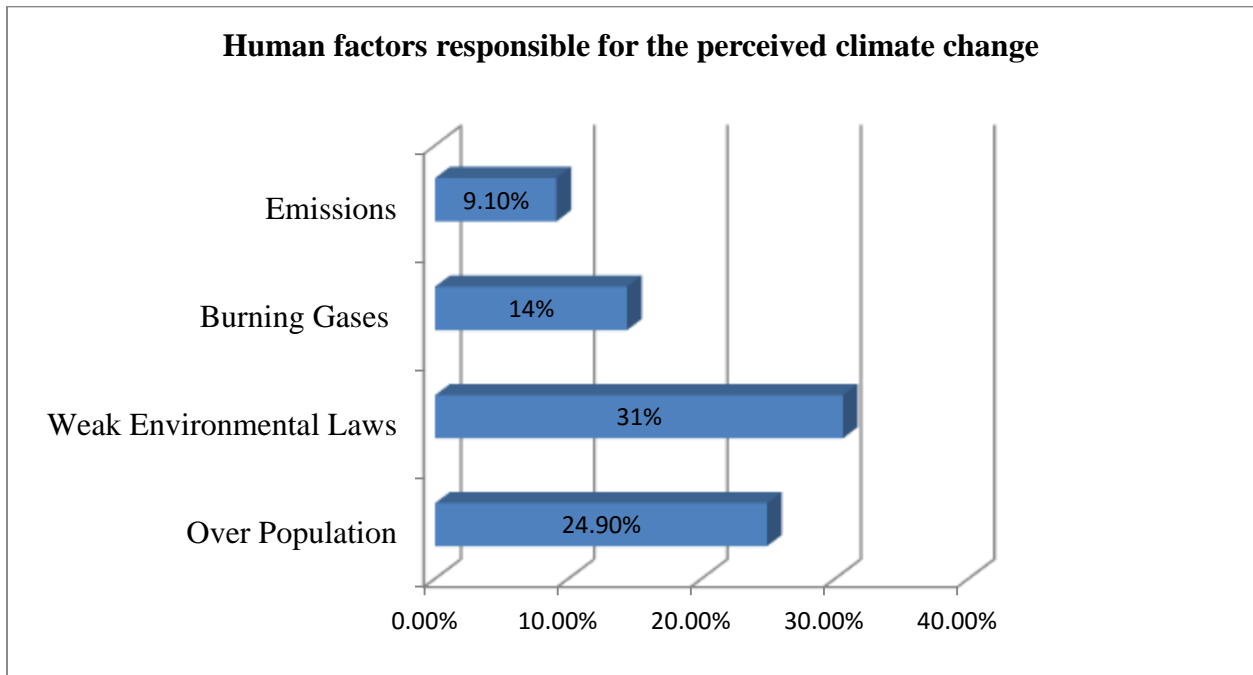
Table 4.8: Environment factors which explain the occurrence of climate change in Jowhar middle Shabelle region Somalia

Responses	Frequency	Percent
Deforestation	140	43.8
Average temperatures	47	14.7
Fluorinated gases	36	11.3
Low Afforestation	97	30.3
Total	320	100.0

Source: Field data, 2022

The results show that environmental factors responsible for the perceived climatic changes in Jowhar middle Shabelle region Somalia, the study show that deforestation accounted for the major cause with 43.8%, average temperature had 14.7% of the respondents in agreement, fluorinated gases had 11.3% and low Afforestation had 30.3% of the respondents. The study indicates that the environment is sufficient to changes in the climate. It's worthwhile stating that the environmental issues are responsible for the perceived changes in the climate in Jowhar middle Shabelle region Somalia. It means that any focus on adjusting the climate or controls can be appropriately handled through environment.

4.2.4 Human factors responsible for the perceived climatic changes in Jowhar middle Shabelle region Somalia



Source: Field Data, 2022

Figure 4.2: Human factors responsible for the perceived climatic changes in Jowhar middle Shabelle region Somalia

Findings in Figure 4.1 concerning the human factors responsible for the perceived climatic changes in Jowhar middle Shabelle region Somalia indicate that weak environmental laws had a 31% contribution to climatic changes in Jowhar middle while over population coupled with agriculture and environmental encroachments had 24.9%, then burning gases had 14% of the respondents and finally emissions had 9.1% of the respondents who agreed, compared to the findings, the researcher contend that the human factors are eminent in determining the climatic changes in the region. The human factors are significantly occurring with although limited degrees of the existence of the environment of the persons in the community.

When asked on the causes of climate variability in Jowhar middle Shabelle region

Somalia reveal that climate variability is caused by the deforestation, lack of

afforestation and population growth rates that are in existences with the stakes of the people in the environment.

KII with Environmental Officer, Jowhar district. 02.08.2022

4.2.5 Policy factors responsible for the perceived climatic changes in Jowhar middle Shabelle region Somalia

Table 4.9: Policy factors responsible for the perceived climatic changes in Jowhar middle Shabelle region Somalia

Responses	Frequency	Percent
Weak institutional Policies	80	25.0
Poor institutional capacity	177	55.3
Poor Personnel management	63	19.7
Total	320	100.0

Source: Field Data, 2022

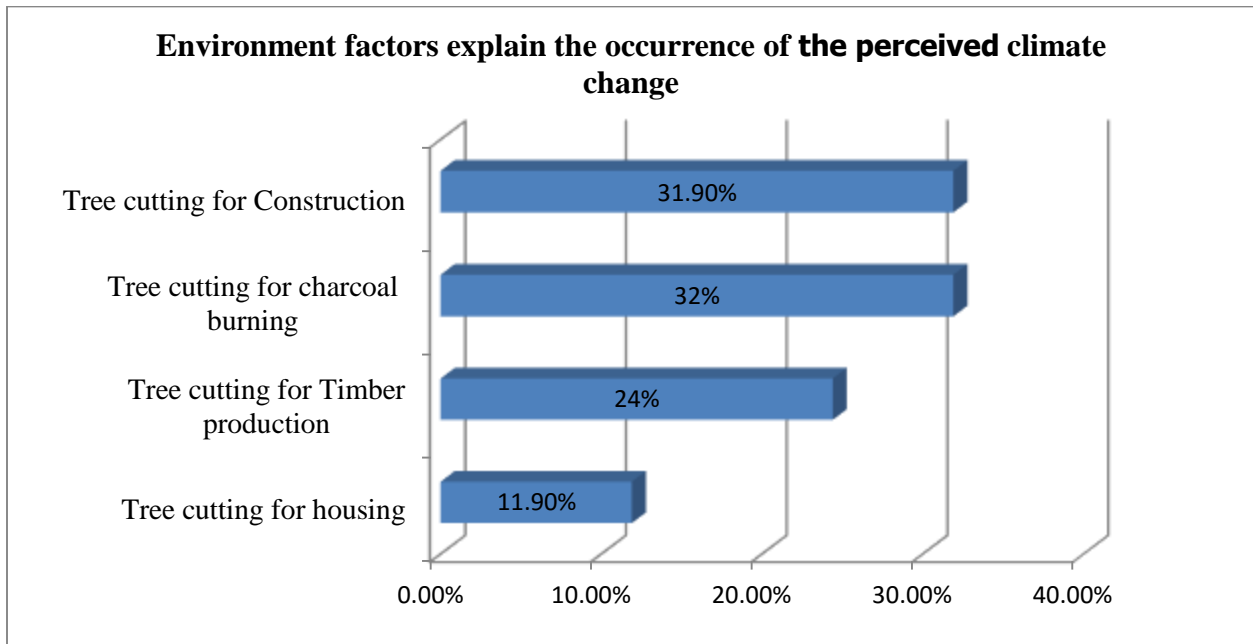
Findings in Table 4.9 on the policy factors responsible for the perceived climatic changes in Jowhar middle Shabelle region Somalia reveal that poor institutional capacity had 55.3% respondents of the study, weak institutional policies had 25% respondents and finally poor personnel management had 19.7% of the respondents. The study results show that the institutional poor arrangement have been responsible for the perceived climatic changes in Jowhar middle Shabelle region Somalia.

In the interviews, the researcher findings added that

There is no policy that require people here to observe climatic changes, the state of the climate is operating on the free will, even when there is a policy on the climate observations, the people are not well oriented, there is low implementation of the systems for enhancing climatic change in the communities.

KII with Environmental Officer, Jowhar district. 02.08.2022

4.2.6 How does the environment factors explain the occurrence of the perceived climate change in Jowhar middle Shabelle region Somalia

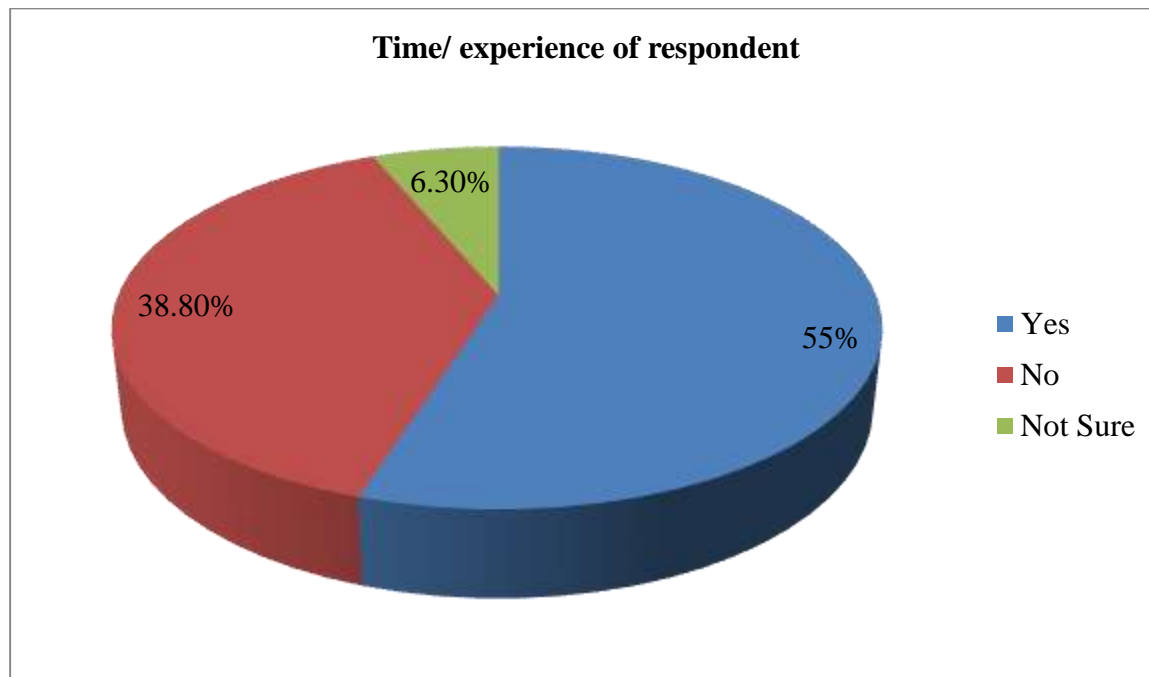


Source: Field Data, 2022

Figure 4.3: How does the environment factors explain the occurrence of the perceived climate change in Jowhar middle Shabelle region Somalia

Figure 4.3 show findings on how does the environment factors explain the occurrence of the perceived climate change in Jowhar middle Shabelle region Somalia, the study indicate that tree cutting for construction had 31.9% respondents, tree cutting for charcoal burning had 32% of the respondents while tree cutting for timber production had 24% of the respondents and finally tree cutting for housing had 11.9% of the respondents. The study findings indicate that the environmental factors have negated the perceived climatic changes through the destruction of the plant/ tree species for purpose of agriculture, animal husbandry and housing for the people.

4.2.7 Whether political climate contribute to the perceived climate changes in Jowhar middle Shabelle region Somalia



Source: Field Data, 2022

Figure 4.4: Whether political climate contribute to the perceived climate changes in Jowhar middle Shabelle region Somalia

Figure 4.4 on whether political climate contribute to the perceived climate changes in Jowhar middle Shabelle region Somalia, the results show that 55% respondents agreed, 38.8% respondents disagreed and finally 6.3% respondents were not sure, the study findings indicate that the majority respondents for the study are provided in agreement that climate changes is affected with the possible climate of the politics around the communities. These are possible through policies which seem to be not well focused into realization of the environmental goals for the communities.

4.3 Effect of the perceived climate change on Livelihood of communities in Jowhar middle Shabelle region Somalia

The second objective of the study was to assess the effect of climate change on Livelihood of communities in Jowhar middle Shabelle region Somalia. The study findings based on the issues set for investigation are provided in the tabulations and figures including the narrations provided here under.

4.3.1 The perceived climate change affects the livelihoods of communities in Jowhar middle Shabelle region Somalia

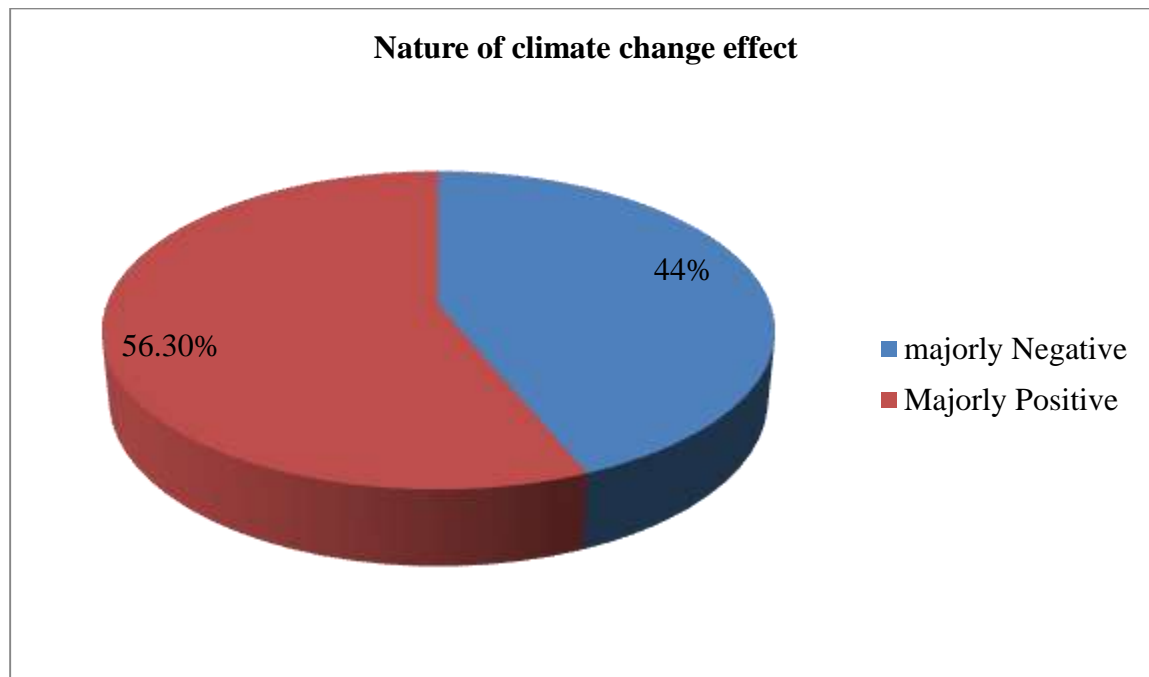
Table 4.10: The perceived climate change affects the livelihoods of communities in Jowhar middle Shabelle region Somalia

Responses	Frequency	Percent
Yes	304	95.0
No	16	5.0
Total	320	100.0

Source: Field Data, 2022

Results in Table 4.10 on whether the perceived climate change affects the livelihoods of communities in Jowhar middle Shabelle region Somalia indicate that 95% respondents agreed in the positive form while 5% disagree, on overall the respondents agree that livelihood of the people in the Jowhar district is highly affected by the perceived climate changes in the area, the information provide that the avenues for the information the study.

4.3.2 The perceived nature of climate change effects on livelihoods of communities in Jowhar middle Shabelle region Somalia



Source: Field Data, 2022

Figure 4.5: The perceived nature of climate change effects on livelihoods of communities in Jowhar middle Shabelle region Somalia

Table 4.5 show findings on the perceived nature of climate change effect on livelihoods of communities in Jowhar middle Shabelle region Somalia. The findings show that 56.3% respondents agree that the perceived nature of the effect on livelihood was majorly positive while the effect was found negative on 44%. The study results for the study show that the perceived nature of effect on climate change on the livelihood of the communities was more positive than negative though native effects are also cited in the study.

4.3.3 Positive effects of the perceived nature of climate change on the livelihoods of communities in Jowhar middle Shabelle region Somalia

Table 4.11: Positive effects of the perceived nature of climate change on the livelihoods of communities in Jowhar middle Shabelle region Somalia

Responses	Frequency	Percent
Increase in rainfall improve crop production	70	21.9
Rainfall facilitate growth of animal fodder	87	27.2
Temperature provide soil stability for agriculture	84	26.3
Increased rains provide water for livestock and people	79	24.7
Total	320	100.0

Source: Field Data, 2022

Results in Table 4.11 on the positive effects of the perceived nature of climate change on the livelihoods of communities in Jowhar middle Shabelle region Somalia. The study findings show that the perceived nature of climate change affect livelihood through Rainfall facilitate growth of animal fodder in the district with 27.2% of the respondents, 21.9% respondents provided that increase in rainfall improve crop production, the aspect of temperature provide soil stability for agriculture with 26.3% of the respondents and Increased rains provide water for livestock and people had 24.7% of the respondents. The study show that climate changes is majorly positive through supporting crop and animal husbandry in the communities necessary for enabling the people state of lives.

When asked in the interview on the positive effect of climatic changes, the respondents provided that *changes in the climatic environment are pivotal in increasing the food growth and especially coffee growing the district. The changes in the climate here support the growing of crops that the community feed on a sell to the different markets for the purposes of earning a living in the communities.*

KII with the District officer, 06th. 08. 2022

4.3.4 Negative effects of the perceived nature of climate change on the livelihoods of communities in Jowhar middle Shabelle region Somalia

Table 4.12: Negative effects of the perceived nature of climate change on the livelihoods of communities in Jowhar middle Shabelle region Somalia

Responses	Frequency	Percent
Flooding reducing agriculture and land	43	13.4
Flooding lead to loss of lives	122	38.1
High rainfall causes diseases	46	14.4
Increasing droughts risks public health	41	12.8
Rise in temperature worsens pollution	37	11.6
Drought causes lack of water	31	9.7
Total	320	100.0

Source: Field Data, 2022

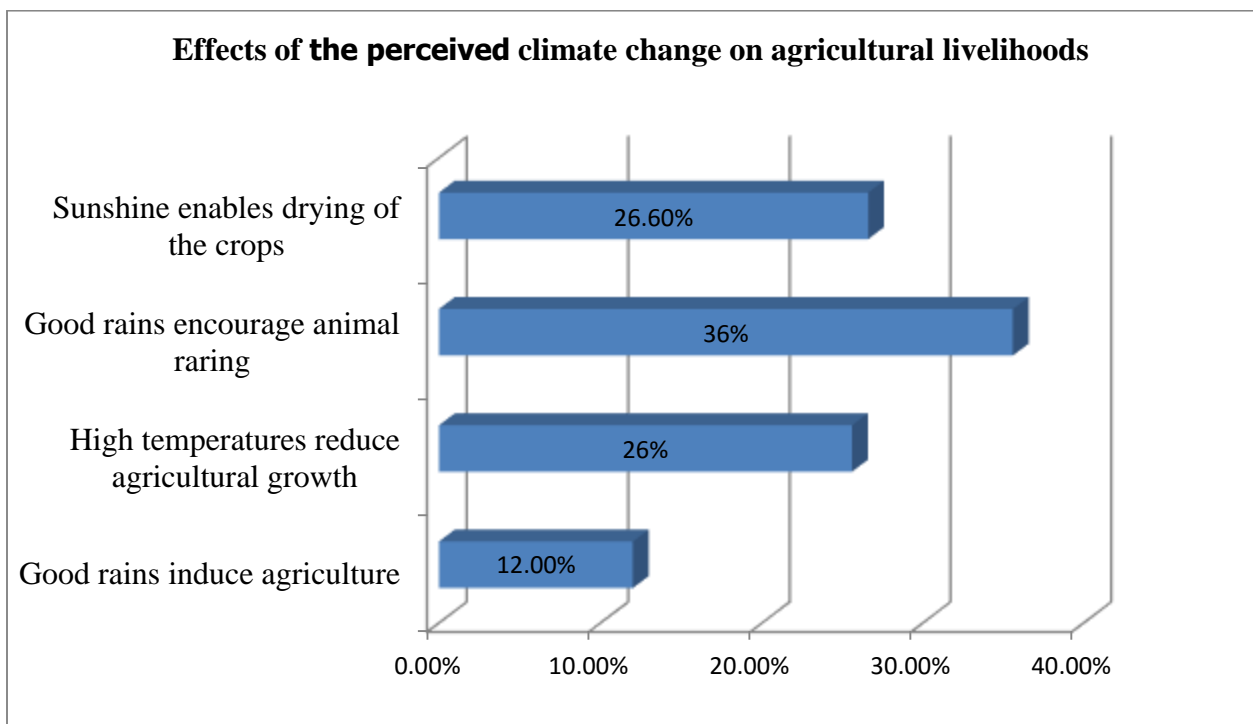
Table 4.12 show the negative effects of the perceived climate change on the livelihoods of communities in Jowhar middle Shabelle region Somalia. The study findings show that climate through flooding lead to loss of lives had 38.1% of the respondents, flooding reducing agriculture and land had 13.4% of the respondents, High rainfall causes diseases had 14.4% of the respondents, Increasing droughts risks public health had 12.8% respondents, the rise in temperature worsens pollution had 11.6% respondents and finally Drought causes lack of water had 9.7% respondents for the study. The study findings show that climate change significantly affects the livelihoods of the communities in Jowhar middle Shabelle region for Somalia.

Even the interviews conducted with the environmental officers reveal a similar aspect that climate variability in Jowhar district has been responsible for landslides that cause death, destruction of property and mass displacements, loss of arable land and the land becomes useless. The status of the environment hence limits effective means to increasing the functioning of the environmental flexibilities and limited scope of handling for the community.

Interview with the Jowhar district Official, 07th.08.2022

In a further interview, it was established that climatic change in form of much rainfall is responsible for the existence of negative effect on the livelihoods as people are affected in terms of living, businesses are disrupted and many people stay and exist without limited efforts in the stakes of living, there is existence of rainfall restraining the environmental considerations values and these lead to generation of the land values restricting the environmental access in the land

4.3.5 Effects of the perceived climate change on agricultural livelihoods in Jowhar middle Shabelle region Somalia



Source: Field Data, 2022

Figure 4.6: Effects of the perceived climate change on agricultural livelihoods in Jowhar middle Shabelle region Somalia

Results in Figure 4.6 on the effects of climate change on agricultural livelihoods in Jowhar middle Shabelle region Somalia reveals that sunshine enables drying of the crops according to 26.6% respondents, Good rains encourage animal rearing with 36% respondents, high temperature reduce agriculture growth 26% and good rains induce agriculture with 12% of the respondents. The study findings show that climate change induces the agricultural livelihood of

the livelihood through the supportive environment that is needed for the provision of the information concerning the study in the district.

4.3.6 Effect of the perceived climate change on business management in Jowhar middle Shabelle region Somalia

Table 4.13: Effect of the perceived climate change on business management in Jowhar middle Shabelle region Somalia

Responses	Frequency	Percent
Reduce agricultural business	22	6.9
Increases the performance of job	69	21.6
Good climate lead to increased working	124	38.8
Good climate Improves transportation	105	32.8
Total	320	100.0

Source: Field Data, 2022

Table 4.13 present results on the effect of the perceived climate change on business management in Jowhar middle Shabelle region Somalia, the study revealed that Good climate lead to increased working with 38.8% respondents, Good climate Improves transportation with 32.8% respondents and increases the performance of job with 21.6% respondents while poor climate change reduce agricultural business with 6.9% of the study responses, the study findings show that there effect on the climate change for the business management is quite significant, information attained reveal that climate changes present both negative and positive effects on the business management and the business environment.

4.4 Climate change strategies that can be employed to improve the community livelihood in Jowhar middle Shabelle region Somalia

The third objective of the study was to establish the climate change strategies that can be employed to improve the community livelihood in Jowhar middle Shabelle region Somalia. The objectives of the study were to determine the responses of the information based on the data provided in the tabulations.

4.4.1 Are there established best management systems to mitigate climate change in Jowhar middle Shabelle region Somalia

Table 4.14: Are there established best management systems to mitigate climate change in Jowhar middle Shabelle region Somalia

Responses	Frequency	Percent
Yes	102	31.9
No	218	68.1
Total	320	100.0

Source: Field Data, 2022

Table 4.14 on whether there are there established best management systems to mitigate climate change in Jowhar middle Shabelle region Somalia, the study findings show that 68.1% respondents agreed while 31.9% respondents disagree. The study results show that the established best management systems are insignificant in the mitigation of the climate changes in the district of Jowhar region of Somalia.

4.4.2 Who has developed the best management systems to mitigate climate change Jowhar middle Shabelle region Somalia

Table 4.15: Who has developed the best management systems to mitigate climate change Jowhar middle Shabelle region Somalia

Responses	Frequency	Percent
Community	61	19.1
Local government	61	19.1
Environmentalists	66	20.6
Central government	66	20.6
NGOs/ CBOs	66	20.6
Total	320	100.0

Source: Field Data, 2022

Results in Table 4.15 on who has developed the best management systems to mitigate climate change Jowhar middle Shabelle region Somalia, it was found that community was responsible according to 19.1% and Local government had 19.1% respondents, Environmentalists had 20.6% respondents, Central government had 20.6% and NGOs/ CBOs had 20.6% of the respondents. The study findings show that there are indeed developed best management systems for the mitigation in the climate changes in the district of Jowhar.

4.4.3 How effective are the climate change strategies that can be employed to improve the community livelihood in Jowhar middle Shabelle region Somalia

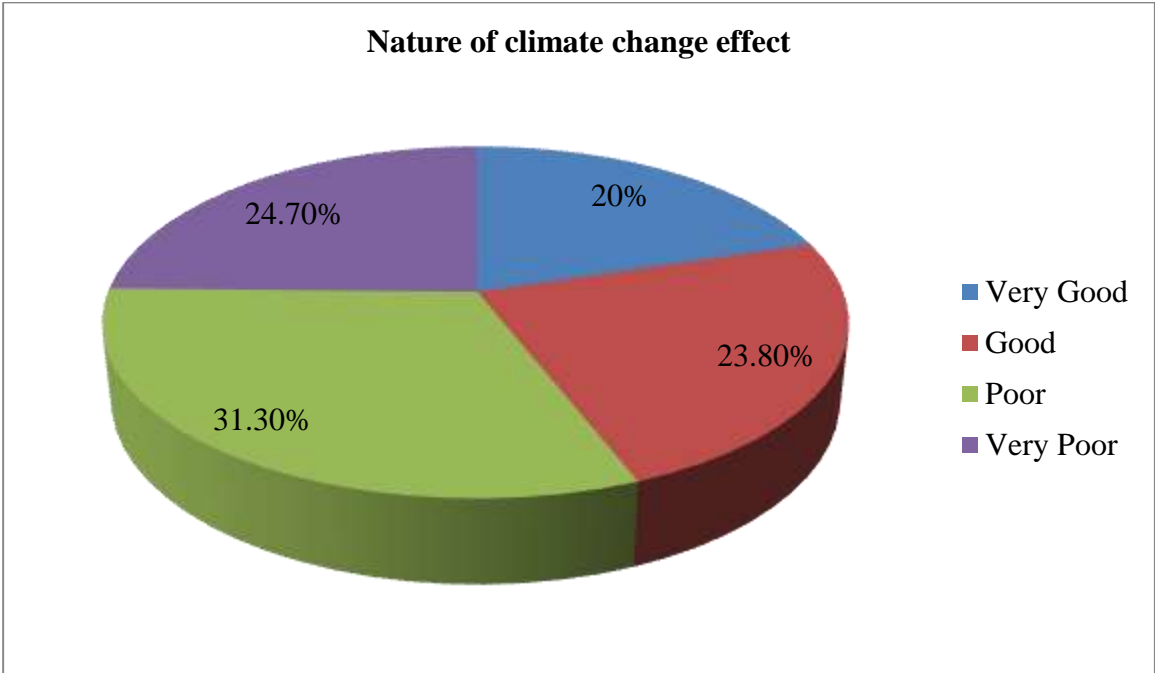
Table 4.16: How effective are the climate change strategies that can be employed to improve the community livelihood in Jowhar middle Shabelle region Somalia

Responses	Frequency	Percent
Very effective	54	16.9
Effective	68	21.3
Less effective	84	26.3
Very Ineffective	114	35.6
Total	320	100.0

Source: Field Data, 2022

The study findings in Table 4.16 show findings on how effective are the climate change strategies that can be employed to improve the community livelihood in Jowhar middle Shabelle region Somalia, the study showed that 35.6% respondents contend that the climate change strategies are very ineffective, 26.3% respondents argue that they are less effective while 21.3% respondents argue for effective and 16.9% respondents provided that they are very effective. The study findings show that the state of the climate changes strategies are generally under deployed in the enhancement of the environment standards in the community of Jowhar middle Shabelle region of Somalia.

4.4.4 Current state of community livelihood of vulnerable coastal communities in Jowhar middle Shabelle region Somalia



Source: Field Data, 2022

Figure 4.7: Current state of community livelihood of vulnerable coastal communities in Jowhar middle Shabelle region Somalia

The results in Figure 4.6 show that the current state of community livelihood of vulnerable coastal communities in Jowhar middle Shabelle region Somalia indicating that 20% respondents argued that the state of community livelihood is very good, 23.8% respondents provided that its good while 31.3% respondents argued it was poor and 24.7% respondents. The results indicate that on overall 56% respondents agreed that the state of the community livelihood is not well, the study results show that communities are quite vulnerable.

4.4.5 Forms of community Livelihood of vulnerable coastal communities in Jowhar middle Shabelle region Somalia

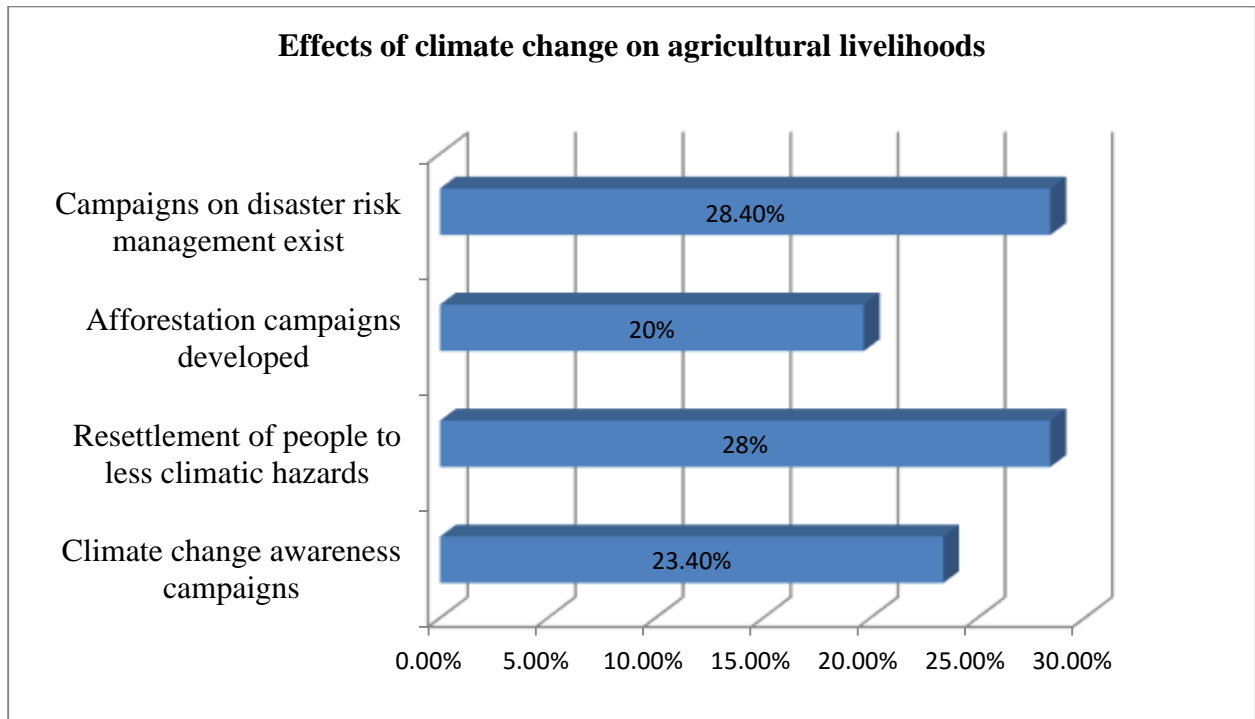
Table 4.17: Forms of community Livelihood of vulnerable coastal communities in Jowhar middle Shabelle region Somalia

Responses	Frequency	Percent
Agriculture	126	39.4
Business	104	32.5
Civil service	52	16.25
Fishing	15	4.70
Carpentry	23	7.10
Total	320	100.0

Source: Field Data, 2022

Results in Table 4.17 on the forms of community Livelihood of vulnerable coastal communities in Jowhar middle Shabelle region Somalia revealed that agriculture constitute the highest level of livelihood with 39.4%, business constitute 32.5% of the study, civil service had 16.3%, fishing had 4.70 and carpentry had 7.10% of the respondents. The study findings show that the community forms for the vulnerable communities are generally several though agriculture and business constitute the highest forms of livelihoods in Jowhar district.

4.4.6 Climate change strategies that can be employed to improve the community livelihood Jowhar middle Shabelle region Somalia



Source: Field Data, 2022

Figure 4.8: Climate change strategies that can be employed to improve the community livelihood Jowhar middle Shabelle region Somalia

Figure 4.8 show results on climate change strategies that can be employed to improve the community livelihood Jowhar middle Shabelle region Somalia, the study show that Campaigns on disaster risk management exist had 28.4% respondents, Resettlement of people to less climatic hazards had 28.4% respondents agreed, Climate change awareness campaigns 23.4% and Afforestation campaigns developed had 19.7% respondents agreed. The study results on overall show that the climate strategies employed in improving the community are prevailing, it implies that the state of the climate changes strategies employed are eminent in the improvement of the livelihoods in the middle Shabelle region of Somalia.

4.4.7 Challenges afflicted to the best management systems taken to mitigate climate change in Jowhar middle Shabelle region Somalia

Table 4.18: Challenges afflicted to the best management systems taken to mitigate climate change in Jowhar middle Shabelle region Somalia

Responses	Frequency	Percent
Poor implementation	67	20.9
Low institutional capacity	99	30.9
Poor Community cooperation	83	25.9
Low concerns of climate	30	9.4
Lack of community awareness	41	12.8
Total	320	100.0

Source: Field Data, 2022

Results in Table 4.18 on the challenges afflicted to the best management systems taken to mitigate climate change in Jowhar middle Shabelle region Somalia are that low capacity for the institutions had 30.9% of the respondents, 25.9% respondents argued that community poor cooperation had 25.9% of the respondents, 9.4% provided that low concerns on climate while poor implementation and lack of community awareness had 12.8% and 2-.9% respectively. The study research findings show that there are significant challenges hindering the best management systems taken in mitigating the climatic changes in the communities.

We have been unable to mitigate the issues afflicted to environmental changes because of inefficient organizations handling the environment. Low level of concerns for the people, limited effectiveness of the community in resources operationalization that hinder the range of activity that limit the prevalence of the community in climate handling mechanisms.

District Environmental Officials, Jowhar district.08th.08.2022

4.4.8 What further can be done to enhance the perceived climatic changes for best livelihoods in Jowhar middle Shabelle region Somalia

Table 4.19: What further can be done to enhance the perceived climatic changes for best livelihoods in Jowhar middle Shabelle region Somalia?

Responses	Frequency	Percent
There is need for environmental policy reforms	57	17.8
There is need for mobilization strategies that can attract local communities	61	19.1
There is also need for cutting emissions	67	20.9
Everyone should, therefore, be encouraged to plant a tree	62	19.4
There is need for sustainable management forests	73	22.8
Total	320	100.0

Source: Field Data, 2022

Table 4.19 provide findings on what further can be done to enhance the perceived climatic changes for best livelihoods in Jowhar middle Shabelle region Somalia, it was found that 17.8% respondents agree that there is need for environmental policy reforms with 17.8% respondents, There is need for mobilization strategies that can attract local communities with 19.1%, then There is also need for cutting emissions had 20.9%, Everyone should, therefore, be encouraged to plant a tree had 19.4% and There is need for sustainable management forests with 22.8% of the respondents. The study findings show that the state of the climate need further enhancement and changes in incorporation of the systems of governance significant for the community and development activities significant to warrant a livelihood of the communities.

Asked on the best mechanisms to mitigate the native consequences of the climatic changes for best livelihoods in Jowhar middle Shabelle region Somalia, there is need for the provision of agroforestry schemes, forestation schemes need to be

developed in the communities. There is need for pertinent concerns on the reduction of deforestation and improvement of the climate situations necessary for enabling the performance of the weather situations in the district.

Top authorities of Jowar, 08.08.2022

There is need for the development of a policy that can ensure environmental conservation efforts aimed at ensuring that efficiency of the management in the environment to control the development mechanisms for the development of the environment management controls in the district.

District Environmental Officials, Jowhar district.08th.08.2022

CHAPTER FIVE

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This final section of the report deals with the discussion of the findings presented in the preceding chapter. The discussion is made with reference to other similar works done in previous studies. The section then draws conclusions from these discussions after which it offers its recommendations. Finally, it suggests areas that are potential grounds for research that could not be completed in the body of this report.

5.1 Discussion of Findings

This section was further organized into three subsections with respect to the research objectives that guided the study

5.1.1 Perceived causes of climatic changes in Jowhar middle Shabelle region Somalia

The study findings indicated that the perceived causes of climatic changes in Jowhar Middle Shabelle region of Somalia was deforestation, low levels of tree planting, weak environmental laws, agriculture and environmental encroachments and poor institutional Policy. The results are in agreement with those of Elisante and Tungaraza (2017) who contend that deforestation is one of the main contributors to climate change. It comes in many forms: wildfire, agricultural clear cutting, livestock ranching, and logging for timber, among others. the disaster preparedness and management and the health and environment (NEMA) sectors make provisions to tackle climate change. In addition, the forest, land, water and energy sectors' regulatory frameworks are compatible with the climate change policy. However, many of the above policies and laws do not adequately address climate change. The results agree with those of FAO, (2016) who contend that destruction of wetland ecosystems will generate massive greenhouse gas emissions in coming years, warn experts convening at an international wetlands conference in Brazil. While they cover only 6 percent of the world's surface, wetlands marshes, peat bogs, swamps, river deltas, mangroves, tundra, lagoons and river floodplains are estimated to hold 771 gigatons of

greenhouse gases, or 10-20 percent of the globe's terrestrial carbon. The findings agree with those of Ogden (2017) who provided that Carbon dioxide, methane, and nitrous oxide concentrations are now more abundant in the earth's atmosphere than any time in the last 800,000 years. These greenhouse gas emissions have increased the greenhouse effect and caused the earth's surface temperature to rise.

5.1.2 Effect of climate change on Livelihood of communities in Jowhar middle Shabelle region Somalia

Results on the effect of climate change on livelihood of communities in Jowhar Middle Shabelle region was slightly majorly positive though negative effects have highly affected the livelihoods of communities in Jowhar Middle Shabelle region of Somalia. The positively climate change through rainfall facilitate growth of animal fodder, Increase drains provide water for livestock and people. Negatively climate affects the livelihoods of communities through flooding leading to loss of lives and displacements, agricultural and destruction of settlements among the people in communities. The study agree with those of Connolly-Boutin & Smit (2019) who provided that climate change is however, often acknowledged as the primary threat to livelihoods in the 21st Century especially, where it can undo years of development. Even in agreement with those of Dube & Phiri, (2018)'s study in Zimbabwe, increased temperatures and decreased precipitation were confirmed to alter the natural environment thus leading to the extinction of biodiversity that is depended upon by communities for sustenance. Also, climate change had adversely impacted on rural livelihoods in the country similarly to other parts of the sub-Saharan countries whose main livelihoods are largely confined to agricultural production and which is widely dependent on rainfall patterns. The results agree with those of Dube & Phiri, (2018)'s results demonstrate that about 98% of the interviewees indicated that crop yields had declined due to low precipitation and rising temperatures while livestock had succumbed to droughts. Water availability, wild fruits, honey and Amacimbi-Mopane worm (ibid) and also tourism, forests, and wetlands which are other critical livelihood options in Zimbabwe, were reported to have adversely declined because of the impacts of the changing climate, finally in agreement with those of Onyekuru and Marchant (2018) who argued that infestation, increased diseases, reduced harmattan, floods and droughts, among others as the undeniable evidence of the

changing climate. The failure to control climate change, it would continue to impact on the country's livelihoods including; agricultural production, forestry and fisheries among others. Then those of Okoti *et al* (2018) who contend that agriculture remains the pillar of the country's livelihoods, yet it is the most prone to climate change. Most livelihoods, in particular in the rural settings have been affected by successive crop failure, water shortages, loss of livestock as a result of extreme weather events consequently, sudden floods triggered by the abnormal onset of the rainy seasons destroy infrastructure and hamper mobility, increase disease epidemics, damage crop fields, cause livestock deaths, cause soil erosion thus impacting on livelihoods

5.1.3 Climate change strategies that can be employed to improve the community livelihood in Jowhar middle Shabelle region Somalia

The study findings show that climate change strategies that can be employed to improve the community livelihood Jowhar middle Shabelle region Somalia are campaigns on disaster risk management, resettlement of people to less climatic hazards, climate change awareness campaigns and afforestation campaigns developed. The findings agree with those of Ahenkan, (2012). In agricultural coping practices, the communities cultivate shorter gestation period crops which are also drought resistant and grow a range of improved cocoa, maize and cassava hybrids to counter impacts of dry spells. Through capacity building and sensitization programmes, the Sui FACs appreciate the value of planting trees on their farms to provide shade for the crops and NTFPs (*ibid*). With the gradual decline in provision of valuable NTFPs including herbal plants, the communities have been said to turn to production of honey, snail farming, mushroom and rabbit keeping among others to supplement their income sources and livelihoods. Also in agreement with those of Tambo & Abdoulaye, (2017) who found that some communities opted to borrow from banks, relatives, withdraw children from schools, kept off hospitals and diversified their activities to generate income in quest to manage the rising costs as a result of agricultural failures. The study findings agree with those of Thomas, Twyman, Osbahr and Hewitson (2017) suggested that increased rainfall uncertainty had enhanced communities' dependence on livestock and poultry besides crops in about 80% of homes interviewed. Besides, people often move to coastal areas while also abandoning the rain-fed agriculture for aquatic livelihoods. Even in agreement with those of Kuria, (2019)'s study in Kenya, the Kereita FACs

grew drought resistant crops, fast maturing crops to respond to dry spells in particular and also practiced petty trading. The FACs shift more to charcoal burning, firewood collection, honey gathering, extraction of medicinal plants and also businesses during dry seasons to raise income for their survival while they cultivate more during wet seasons. The findings agree with those of According to Ndhleve, Nakin and Longo-Mbenza (2017) in South Africa, supplementary irrigation and change of planting date were identified for adaptation strategy. Farmers engage in adaptation by re-planning or shifting of the planting date to earlier or late to adapt, the use of forecasting and weather report were all measures used.

5.2 Conclusion

The study set to conduct an assessment of the impact of climate change on community livelihood in Jowhar Middle Shabelle Region of Somalia. The objectives were to establish the perceived causes of climatic changes, secondly to assess the effect of climate change on Livelihood of communities and thirdly to establish the climate change strategies that can be employed to improve the community livelihood in Jowhar middle Shabelle region Somalia.

The study reveals through human perception on the causes of climate changes include environmental, human, policy and institutional factors which either positively or negatively induce the climate changes, poor environmental, poor human activities and weak institutional mechanisms exist which hinder the effective attainment good climatic conditions hence the prevalence of disaster. The study results conclude that there are institutional weaknesses, environmental hindrances the existence of good environmental prevalence in Jowhar district of Middle Shabelle region.

The study concludes that climate changes presents both negative and positive effects on the livelihood of communities in Jowhar Middle Shabelle region, Somalia. The study affirms that changing climate has led to the occurrence of the landslides, environmental destruction and displacements. The occurrence of climatic change have limited agricultural production, animal husbandry and hindered mechanisms of community growth and expansion.

Thirdly, the study results show that climate change strategies can be employed to improve the community livelihood in Jowhar middle Shabelle region Somalia with campaigns on disaster risk

management, resettlement of people to less climatic hazards, climate change awareness campaigns and afforestation campaigns developed. The study conclude that the employment of the different strategies is significant in generate the improved livelihoods amongst the communities in Jowhar district Somalia.

5.3 Recommendations

The study recommends Afforestation and re-afforestation will reduce the effect of climate change on the environment. Also, there is need for effective management and control of constructions. Therefore, construction should be avoided on slopes of mountains.

Environmental awareness programs and projects are essential for sensitization of different actors on impacts of climate change. There is need for engagement of irrigation and drought resistant crops in order to avail the communities with food production systems.

There is need for improvement of the functionality of environmental protection efforts and policies of the government through enforcement programs.

5.4 Areas for further research

Through the study, the following areas are identified for future research. They are

- Policy mechanism for managing climatic conditions
- Climate changes and food security
- Policy and institutional framework for the management livelihoods

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APPENDICES

Appendix I: Research Questionnaires

Dear respondent,

I, am a student of Kampala International University pursuing master's degree of environmental Management **Am** conducting a study on assessment of the impact of climate change on community livelihood in Jowhar middle Shabelle region of Somalia. As part of my academic fulfillment. Please your response will be kept strictly confidential. The information provided will only be used for academic purposes in this study.

Thank you very much for your time and cooperation.

Section A: Bio-Data of respondents (Pick the appropriate response)

1. Gender	
Male	
Female	
2. Highest level of qualification	
Primary	
Secondary	
Certificate	
Diploma	
Degree	
Post graduate	
3. Age	
Masters	
Degree	
Diploma	
Certificate	
Secondary	
Primary	
4. Time in/ near the community	

Less than 1-8 year	
9-14 years	
15 year	
5. Marital Status	
Single	
Married	
Separated/ Divorced	
Widowed	
6. Occupation	
Agriculture	
Business	
Public service	
Private Business	
Any other, Specify	

Section B: Salient causes of climatic changes in Jowhar middle Shabelle region Somalia

<p>1.Are you aware about the causes of climate change in Jowhar middle Shabelle region Somalia</p> <p>Yes</p> <p>No</p> <p>Not sure</p>
<p>2. What are the environmental factors responsible for climatic changes in Jowhar middle Shabelle region Somalia?</p> <p>Heavy Rainy</p> <p>Flooding</p> <p>Heavy winds</p> <p>Any other</p>

<p>3. What are the human factors responsible for climatic changes in Jowhar middle Shabelle region Somalia?</p> <p>Deforestation</p>
<p>Agriculture</p> <p>Crop growth</p> <p>Any other</p> <p>.....</p> <p>.....</p>
<p>4. What are the policy factors responsible for climatic changes in Jowhar middle Shabelle region Somalia?</p>
<p>Lack of government policy</p> <p>Low implementation of policies</p> <p>Lack of government concentration</p> <p>Any other</p> <p>.....</p> <p>.....</p>
<p>5. What is your comment on the occurrence of climate change in Jowhar middle Shabelle region Somalia?</p> <p>.....</p> <p>.....</p> <p>.....</p>
<p>6. How does the environment factors explain the occurrence of climate change in Jowhar middle Shabelle region Somalia?</p> <p>Deforestation</p> <p>Tree cutting for Charcoal burning</p> <p>Tree cutting for Timber production</p> <p>Tree cutting for Housing</p> <p>Tree cutting for Construction</p>

7. What are the mechanisms for the enhancement of the climate change among the communities in Jowhar middle Shabelle region Somalia?

.....

.....

.....

.....

8. Does the political climate contribute to climate changes in Jowhar middle Shabelle region Somalia?

Yes

No

Not sure

If, Yes, How does it, mention.

.....

.....

.....

Section C: Effect of climate change on Livelihood of communities in Jowhar middle Shabelle region Somalia.

9. Does climate change affect the livelihoods of communities in Jowhar middle Shabelle region Somalia?
Yes
No
10. If yes, is the effect negative or positive?
Positive
Negative
Majorly Negative
11. The following are the positive effects of climate change on the livelihoods of communities in Jowhar middle Shabelle region Somalia?

Increase in rainfall improve crop production
Rainfall facilitate growth of animal fodder
Temperature provide soil stability for agriculture

Increased rains provide water for livestock and people
Any Other positive effect, Please mention them
.....
.....
.....

12. What are the negative effects of climate change on the livelihoods of communities in Jowhar middle Shabelle region Somalia?

Flooding lead to loss of lives
Flooding reducing agriculture and land
High rainfall causes diseases
Increasing droughts risks public health
Rise in temperature worsens pollution
Drought causes lack of water
Any negative effect, please mention

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

13. What are the effects of climate change on agricultural livelihoods in Jowhar middle Shabelle region Somalia?

Good rains induce agriculture
High temperatures reduce agricultural growth
Good rains encourage animal raring
Please mention

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

14. What is the effect of climate change on business management in Jowhar middle Shabelle region Somalia?

Reduce agricultural business

Increases the performance of job

Good climate lead to increased working

Good climate Improves transportation

15. What are the major effects of climate change on livelihoods of communities in Jowhar middle Shabelle region Somalia?

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

Section D: Climate change strategies that can be employed to improve the community livelihood

16. Are there established best management systems to mitigate climate change in Jowhar middle Shabelle region Somalia?

Yes

No

Not Sure

17. Who has developed the best management systems to mitigate climate change in Jowhar middle Shabelle region Somalia?

Community

NGOs/ CBOs

Local government

Environmentalists

Central government

Any other, please mention, them

18. How effective are the climate change strategies that can be employed to improve the community livelihood in Jowhar middle Shabelle region Somalia?

- Very effective
- Effective
- Less effective
- Very ineffective

19. What is the current state of community livelihood of vulnerable coastal communities in Jowhar middle Shabelle region Somalia?

- Very Good
- Good
- Poor
- Very Poor

20. What are the forms of community Livelihood of vulnerable coastal communities in Jowhar middle Shabelle region Somalia?

- Agriculture
- Business
- Civil service
- Fishing
- Carpentry
- Any other mention

21. What climate change strategies that can be employed to improve the community livelihood Jowhar middle Shabelle region Somalia?

Climate change awareness campaigns
Resettlement of people to less climatic hazards
Forestation campaigns developed
Campaigns on disaster risk management exist
Any other mention

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

24. What are the challenges afflicted to the best management systems taken to mitigate climate change in Jowhar middle Shabelle region Somalia?

Poor implementation
Low capacity for institutions
Community poor cooperation
Low concerns of climate
Any other Mention.

.....
.....

25. What more can be done to enhance climatic changes for best livelihoods in Jowhar middle Shabelle region Somalia?

There is need for environmental policy reforms
There is need for mobilization strategies that can attract local communities
There is also need for cutting emissions
Everyone should, therefore, be encouraged to plant a tree
There is need for sustainable management forests in order to enhance the absorption of carbon from the atmosphere.
Any more, Mention.

.....
.....

END OF QUESTIONNAIRE, THANKS

Appendix II: Interview

- 1) What are the perceived causes of climatic changes in Jowhar middle Shabelle region Somalia?
- 2) What is the effect of climate change on agriculture in Jowhar middle Shabelle region Somalia?
- 3) What is the effect of climate change on business and trade in Jowhar middle Shabelle region Somalia?
- 4) What is the effect of climate change on settlements in Jowhar middle Shabelle region Somalia?
- 5) What climate change strategies have been employed to improve the community livelihood in Jowhar middle Shabelle region Somalia?
- 6) What are the climate change strategies that can be employed to improve the community livelihood in Jowhar middle Shabelle region Somalia?