The Impact of Climate Change on Somali Pastoral Communities

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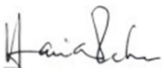

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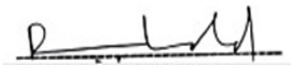

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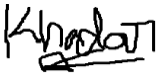
KHADAR ABDIRAHMAN	ID: 213-49-093	
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ABSTRACT

This study explores the impact of climate change on Somali pastoral communities, and on how agro-pastoralists perceive climate change and available adaptation strategies was gathered from Somali-pastoral communities in the rural districts of Sool and Sanaag in Somalia, a country in the east of Africa and the horn of Africa that extends from just south of the equator northward to the Gulf of Aden and occupies an important geopolitical position between Sub-Saharan Africa and countries of Arabia and southeastern Asia. The research was carried out in northern Somalia, which is currently the self-proclaimed and unrecognized republic of Somaliland, particularly in the eastern regions of Togdheer. The study employed a qualitative research design to investigate the effects of climate change on Somali pastoral communities, how it affects their ways of life, whether positively or negatively, and the available adaptation measures. The findings reveal that destocking, diversifying livestock feeds, modifying animal breeds, and relocating animals to new locations are all important adaptation techniques for livestock producers. Expanding the herd and introducing new breeds are two options for achieving desired adaptability. One of the most significant barriers to adaptation is a lack of financing or money, followed by a lack of land and inputs. Farmers' adaptation is hampered by a lack of markets, especially for purchasing additional animals or different breeds or species.

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CHAPTER ONE

INTRODUCTION

1.1 Background

Climate is the conditions of weather in particular place of the earth for long-term aspects. For instance, the amount of rainfall received, the level of hotness and coldness, the amount of moisture in the atmosphere, and wind patterns can be calculated over a long period. The Word Meteorological Organization as the measurement of the average defines the climate and differences existing certain weather conditions such as the temperature of a place, precipitations received and winds blowing in area over a period may be months or hundreds of millions of years long. Climatic conditions either positively or adversely affect the existence of life in that place. Both human and animal populations are greatly dependent on weather conditions. They make decisions about which mode of life is suitable for different climatic conditions, for example, the type of animals raised and crop cultivations as well as harvesting times. It maintains the ecological balance and allows the various species of biodiversity to remain stable and follow their normal life cycles. Humans made forecasts to adjust weather conditions and their lives to avoid any hazards or inappropriate things happening to them. Climate is the primary factors that makes both human and animals continue surviving in the natural and human environment and if any variations happen it will lead to obstacles to their normal life cycles. The world has come together, and the issue of climate change is crosscutting because it has influence on every aspect of life. As a result, the global communities have established the Sustainable Development Goals set by the United Nations General Assembly to achieve by 2030.

The world has realized that they have common targets to make the planet stable without any disturbances from corner to corner and to work together for their realization. Among the most important of these is goal 13 of sustainable development, which states that nations should take vital action to address the changing climate and avoid its negative impacts on human life on the planet. It is agreed to make the work of addressing climate change at local, national, and international levels, and international issue. To continue achieving the goals, the world has developed strategies, forums, organizations, and networks to discuss and address the adverse effects of climate change, developing suitable coping mechanism and sharing information to be

up to date. The United Nations is the largest organization that lead all the initiatives aimed to reduce the impact of climate change on the planet through organizing meeting, making research, and allocating funds to fight it. The United Nations organization with its partners across the globe made it universal obligation to contribute measures towards making the planet prosperous a peaceful place where both human and animal life can survive and both human and natural settlements are conserved.

Climate change is the shift that happens to weather patterns, primarily temperature, rainfall, and winds. For instance, the amount of rainfall as well as the expected timing vary, causing disturbances for agricultural production and livestock rearing in pastoral communities. For example, if the growing season of crops and the breeding season of animals were a definite month of the year, such as March or April, in which people expected rain to fall, It shifts to June or July. This makes the schedule of growing crops and animal breeding unadjusted. In addition, the amount of rainfall has changed, making it challenging for some crops and animals that grow or drink more water to continue surviving. Cattle are called vulnerable animals because they need abundant water and pasture. Since the industrial revolution, human life has shifted from rural to urban and from handmade materials to automated or processed ones. The industrial revolution started in England in 1760–1840; since then, it has spread to neighboring countries in Europe and even to America. The industrialization process continued, and every time improvements were made in the capacity and production of industries, On the other hand, industries contributed to urban shifts in life, population growth, and the increase of greenhouse gases in the atmosphere. The increase in the number of populations has resulted in damage to nature, and they settled everywhere without any consideration of environmental conservation, for example, cutting trees and burning them for firewood, which contributed to deforestation and desertification of the land. Then ultraviolet sunlight directly reached the bare surfaces, causing more heat and high temperatures. In addition, the industries emitted greenhouse gases, e.g., carbon dioxide, to the atmosphere, which damaged the ozone layer that traps ultraviolet solar radiation. This also increased global warming, which affected both human and natural life on earth (UNCA, 2020).

The impacts of climate change around the globe differ from continent to continent or country to country. Some countries are experiencing heat waves, while glaciers and icebergs cover others. Some others are suffering from air pollution and smog released by industries, vehicles, and the burning of fossil fuels. Again, other countries are frequently over flooding where recurrent droughts are hitting them. Moreover, some countries are densely forested, making humans and traffic inaccessible to certain places if disasters occur, while others are facing environmental degradation, deforestation, soil erosion, and desertification. The climate change has both pros and cons across the globe, but the common thing is that it is beyond the capacity of human being to deal the changes of the climate. For example, over flooding, which is an excessive amount of water in streams, can cause both human and property loss. On the other hand, drought, which is a lack of rain and water, can still cost the same. This implies that the excessiveness and imbalance of weather conditions cause disasters for humans. The change in weather patterns are the driving forces off all above-mentioned aspects, Greenhouse gas emissions such as carbon dioxide and methane are good examples of climate change causes. They are mainly released from gasoline for driving cars, burning coals for heating, burning, and clearing land and forests. Other sources that produce huge amounts of methane and carbon dioxide include energy production, manufacturing industries, and transportation (greenhouse gas emissions, 2020).

Greenhouse gases are the highest level in 200 million years this has resulted the earth to become warmer as it was in 1800. As many people think temperature rise is the primary contributor to climate change as the earth system is, connected changes can influence and induced each other IPCC (2014).

The issue of global warming is being debated in forums all over the world, and if greenhouse gas emissions are not reduced, the temperature will rise, contributing to ice melt in the poles and raising sea and river levels. This may cause some coastal areas to drown and people to relocate to other areas. In addition, air pollution will increase that will put risks to human life for breathing clean oxygen, acid rains and damage of ozone layer which protects us the harmful ultraviolet lights from the sun. Droughts as a result of climate change are also affecting people, making them vulnerable to famine that will increase their movement and suffering in the future. Several reports from the UN, scientists and government reviewers come up the same conclusion of controlling and limiting rise of temperature to no more than 1.5°C which they described as the

suitable level to protect from the terrible climatic impacts and maintain a convenient climate that makes living suitable. However, based on the recent plans on national climate, global warming is predicted to reach around 3.2 °C at the end of this century.

Every part of the world produces emissions that are causing climate change and affecting everybody, and yet some countries are considered to be the top producers of emissions compared to others. For example, countries that produce the least generate around 3 percent of the emissions. The top ten countries of largest production of emissions contribute 68 percent. Everybody must take action to improve the climate situation. In addition, the countries with the highest production of emissions must take greater responsibility and pay more attention to creating and employing climate actions that are leading to preventing climate change impacts.

Changes in the climate forced people to relocate on a regular basis and to seek ways to adapt to the varying conditions of the climate. This further increased human pressure on the environment, destroying virgin land and opening up rangelands. The population increase has increased the burden of negatively utilizing the land without proper conservation. This has resulted in environmental degradation in which soils are damaged through the movement of people, animals, and transportation everywhere. Forests are cut for firewood and other means of timber utilization. Deforestation and wanton destruction of trees is significant contributing factor to desertification and aridity. If the land become arid and the top fertile soil is removed. They will not be grasses for feeding the animals to survive and they continue dying. This also increase the change of no or little rainfall. The economic and social conditions of huge portions of the communities are profoundly impacted by environmental deterioration to varied degrees. In many parts of the world, extreme poverty is a result of environmental unsuitability and resource degradation. Due to unfavorable changes in the land brought on by human activities like farming and habitation, land degradation has become a global issue. As one-third of Somalia's land good for plowing and cultivation has faced degradation and lost its high fertility, land degradation in the country is escalating rapidly. Topsoil loss, soil erosion, loss of vegetation due to overgrazing, and tree cutting for construction materials and charcoal production are the main types of degradation in Somalia (FAO, 2009).

In this situation droughts increase particularly in rural societies including pastoralists and farmers which are highly dependent on the yields from their farms and livestock. The cultivation of land has become impossible, and low farm yields are observed because of poor soils and water shortages. Livestock also dies due to a lack of adequate pasture and water to survive. This causes socio-economic decline in both rural and urban communities. Since products from livestock and farms are transported from rural to urban areas, The global warming as a result of climate change, primarily from the greenhouse gases released into the atmosphere, increased the heat waves on the land, which promoted the evaporation and transpiration of water sources and plants, leading them to dry up. People and animals lack water to drink and use in their daily lives. As rivers dried up, this forced humans and their animals to migrate, putting pressure on other areas. The variabilities of the climate and the reliability of patterns made the globe unstable place and caused disturbances to food chains and normal life cycle on earth. The rural life, which is predominantly related to livestock rearing and the cultivation of various crops, is greatly affected. Further resulting food insecurities and imbalances of social and economic status of the people. Life became difficult to continue, and it forced more people to migrate to urban centers and become internally displaced people inside and outside of the town.

The observable and enormous impact of climate change is drought, which is common for the last years in East Africa and Somalia in particular. In Somalia, drought recurrence is a persistent issue. For the past three years, the most recent one has been going on. Even though the "muted Gu" rains that occurred between April and May gave some little relief, the depressed quality of this important precipitation means the effects of the drought are still being felt strongly throughout the nation. a minimum rainfall does not signal the end of the drought for the herding community. Failure to get rain is typically considered the main reason for a drought shock. Furthermore, there is overuse degradation of natural resources, particularly the vegetative cover (Hussien. S.M.S, Nov 2018).

The climate of Somalia is mostly semi-arid, except in some areas in the south that experience tropical weather patterns. This makes it vulnerable to any changes in the climate that worsen the situation of the country’s rural and pastoral life. The mode of life is also another factor contributing to the negative impacts of the climate. The land is semi-arid with no permanent sources of water. The only sources of water are Berked, dams, and shallow wells. All these

sources depend on rainfall to come and fill them. If the rainy season is missed once or twice, water becomes scarce or unavailable. This makes the life of rural areas very difficult for both people, animal life and cultivation of crops. Since the lives of rural people are directly related to the products and byproducts of animals and farms, they face stressful situations of malnutrition, food insecurity, increased poverty, human inequality, and low living standards.

The calendar of Somalia rainfall is two rainy seasons and two dry seasons annually which means Gu'(Spring) and Dayr (Autumn) are rainy seasons while Xagaa (Summer) and Jilaal (Winter) are dry, windy, and cold seasons without no rains in almost parts of Somalia. It means to Somali people a time they can prepare for cultivating lands and animals are ready for breeding. Significant rains occur in July through August, which is the "spring." The second rainy season (Deyr) is characterized by a shorter duration and lower amounts of precipitation in the months of October to the end of November (World Bank Group, 2021).

The climate change has resulted disturbances in the Somali calendar of rains and increased the variabilities of weather patterns, then lack of rains has further affected to the increase of risks related to the life of pastoral communities. It became difficult for both pastoral communities and their livestock and crops to adapt to the changes in rainfall patterns, which caused disturbances to their existence and survival. Changes of rainfall led to water shortage shortages and grasses for animal and human this results the death of mass number of animals and failure of crop cultivation. Food insecurity and the high mobility of rural people are frequently observed.

Pastoral societies felt hard to adjust to the change and variabilities of climate for instance to make rescheduling of animal breeding and cultivation of crops due to knowledge gap and negative perceptions. This forced them to relocate to towns and nearby areas as internally displaced people to access necessities available in urban centers. As a result of recurrent droughts, rural people started using alternative ways to get their daily needs and survive, including cutting trees for wood and coal. This is also linked to deforestation, desertification, and land degradation. This means the impacts of climate change are also leading to more damage to the environment, human life, and biodiversity. Except during droughts, the land has degraded, making it a desert with no grass to feed animals and no place for wildlife. Deforestation and

desertification decrease the chance to receive more rainfall compared to forests and woodland areas as evapotranspiration from plants and water sources causes cloud formation and rain.

The climate change impact is not only in Somalia but has similar effects in sub-Saharan Africa and particularly in the East. However, these countries are better organized, have a strong central government, and have at least some disaster coping mechanisms. They also have better knowledge on how to build resilient communities. The difficulty of continued efforts to reduce poverty will rise because of climate change. People whose livelihoods are more closely entwined with local resource basis and thus more climate sensitive will be severely harmed. Livelihood systems based on agriculture and fishing are particularly vulnerable. This indicates the urgent need for a greater awareness of vulnerabilities and an enhanced understanding of them so that effective adaptation measures can be put into place right away (USAID, 2015).

1.2. Statement of the problem

Climate change is global problem that that effected all aspects of life. For instance, ice in the poplars is melting and water volume is increasing while the seal level will rise, and some coastal areas will be drowned forcing people to move to higher lands. Terrible weather conditions including over flooding, frequent storms, hot temperatures, air pollutions and droughts become very common. A drought is a usual and temporary deficit of water availability caused by the combination of lack of precipitations and more evaporation due to high temperature (EU Strategy on Adaptation to Climate Change 2021).

The central government of Somalia collapsed in 1991. All institutions and infrastructures were destroyed through the civil war. Since then, no strong central system exists so far. Somalia become vacuum where different Islamic groups and warlords come to power. The country split into south central, Puntland and Somaliland, Regions the northern part proclaimed a separate government as the Republic of Somaliland. The south-central part lacked formal government until 2012 as the Federal republic of Somalia and with its federal states; they are still struggling to secure peace and stability. This makes Somali pastoral communities and rural live very difficult and vulnerable to global and local disasters induced by the changes and variabilities of the climate.

About 13% of Somalia's 637,540 square kilometers of land is arable; only 8% of that land has been farmed, while 98% of Somalia is made up of rangelands. The principal economic activity in the nation is the production of livestock, which accounts for more than 80% of export earnings and almost 50% of the nation's gross domestic production. About 55% of people in the country practice nomadic pastoralism, while 80% are involved in some form of livestock raising. Since approximately 55% of Somalis are pastoralists and approximately 65% reside in rural areas, the utilization of land for grazing is vital to both the quality of life and the economy in that country. Most of the population remain nomadic either pastoralist or agro-pastoralist. The second most frequent occupation is agriculture. Agro pastoral and settled farmers in Somalia reside in villages or small towns with stable water sources, whereas nomadic pastoralists are on frequent movement with their livestock periodically based on pasture and water availability.

The lives of pastoral communities in Somalia are getting worse, because of climate change related shocks, where the country experienced recurrent droughts of every ten years. Pastoral rangelands are worsening, desertification started many fertile grassland areas, land degrading and deforestation arose due to cutting trees and changing into charcoal, and some areas are receiving heavy abnormal rains causing destructive flash foods. There are four consecutive failed rains in the country till September 2022, pasture and water getting scarce, pastoralists are doing a constant in and out migration by crossing the national and international regional borders by searching pasture and water for their livestock.

Livestock body conditions are getting poor, unable to sell livestock, and they could not be able to cope with livelihoods, Significant number of livestock died, pastoralists are facing acute food insecurity, malnutrition cases are increasing, infants' deaths are reported in every health facility. According to CCCM Cluster, reports on refugee operations and internally displaced people in Somalia pastoralists who lost their entire livestock are converging to areas near urban centers, creating small camps to have access to water and food aid from humanitarian organizations. For every time since 2017 when droughts hit Somalia very pastoral displacement is seen and new IDPs are formed. Recurrent droughts in Somalia particularly in the regions where pastoralists are abundant, the influx of IDPs is increased in dramatic number. Pressure is put on scarce communal resources such as rangelands and water points, which creates conflicts and the insecurity. Climate change is making adverse effects in all aspects of life and the Somali pastoral

communities are more vulnerable compared to other countries due their lack of proper policies, knowledge, and disaster preparedness mechanism to cope with impacts of climate. That is why they are suffering the most Several studies were conducted to investigate the impacts of drought in the lives of pastoral communities in Somalia for instance Candlelight for Health, Education and Environment which is local NGO based in Somaliland invested several studies including "The impact of climate on pastoral societies in Somaliland and the impacts of climate change on pastoralism in Salahley and Baligubadle districts of Somaliland. Other study was also conducted by Action Aid International titled the impact of climate change on agricultural production in MaroodiJeh and Gabiley regions of Somaliland. All the research were mostly invested for the purpose of humanitarian repots and to get background study for humanitarian funding to implement as projects instead of broader academic wise. They are also conducted the research on areas that all locate in northwestern of Somalia which are predominately occupied by farmers and settled societies with small percentage living in pastoralism mode of life. None of the studies conducts any study in regions of predominant rural and pastoral communities, which are always reported to suffering recurrent effects of climate change with all its forms.

A This research will investigate the impacts of climate change in the pastoral communities in Sool and Sanaag regions in the northern eastern regions of Somalia (Currently Somaliland) which host the largest population of pastoralism and rural life and mostly experiencing visible impacts of climate change for instance frequently occurring droughts, land degradation, deforestation, and desertification. The research will focus to figure out the impacts of climate change on pastoralist societies, highlight the socio-economic and livelihoods impacts of climate and finally to identify climate change adoption options in pastoralist society in Sool and Sanaag regions.

1.3. Objectives of the study

The general objective of the research is to investigate the impact of climate change on the lives of pastoral communities in Sool and Sanaag region of northern Somalia (Currently Somaliland).

1.3.1. Specific objectives of the study

i. To investigate the people's understanding of climate impacts on pastoral communities in Sool and Sanaag regions

ii. To figure out the socio-economic and livelihood impacts of climate change on pastoralists in Sool and Sanaag regions
iii. To identify possible climate change adaptations options in pastoralist communities

1.4. Research questions

The following questions will guide our investigation of the study

i. What is the people's understanding of climate change impacts on pastoralist communities in Sool and Sanaag regions?
ii. What are the socio-economic and livelihood impacts of climate change on pastoral communities in Sool and Sanaag regions?
iii. What are the possible climate change adaptation options in pastoral communities?

1.5. Significance of the study

The study is very crucial for various aspects and institutions as climate change is directly and indirectly affecting our lives across the globe. The study will be very useful for government institutions such as ministries dealing with environment, climate change, livestock, and agriculture as it's directly related to their role and will provide detailed information on the current issues of climate change on the various areas of their scope of work. Which will be helpful for policies and strategies formation as well as their implementation. It will allow them to get baseline information to build up for the design and implementation of any project. This will help them face with better approaches in dealing with climate change aspects. Other government can also use it for better planning and implementation of operations the pastoralist communities will take advantage of the study as its addressing climate change impacts that are frequently affecting their lives. It will give those opportunities to get understanding of real problems from the climate change and mitigation measures for sustainable life in rural areas. The study will be source of information for international and national organization who are dealing with climate change issues to get data to make interventions for reducing the risks of changes in the weather patterns. The most important is to conduct the study to find out the real impacts of climate change on socio-economic and livelihood aspect of pastoral communities and to come up with possible solution to mitigate for sustainable and resilient life in the rural areas. The study will

contribute to add more information on exiting knowledge on the issue of the research and for additional remarks. In conclusion, the study will help policy formulators, implementers, evaluators, pastoral communities, civil society, climate experts and researchers a common understanding on the climate change and its impact on the pastoral communities.

1.6. Scope of the study

The geographical scope of the study is limited to Somalia particularly in northern part of Somalia currently Somaliland with special focus on eastern regions of the country which accommodate the largest population of pastoral communities and livestock. these regions are vulnerable to climate disasters such as droughts due to their geographical build up and semi-arid climate. The study will cover the impact of climate change on pastoral communities in sool and Sanaag regions in Somaliland. The information will be collected various areas concerning the problem of study including government institutions and policy makers for example ministry of environment and climate change, ministry of agriculture development, ministry of livestock and ministry of rural development, local and international organization, pastoral communities as well as other institutions, organizations, and experts. The study will cover four months for the collection of data, analysis, interpretation and writing the final thesis paper.

1.7. Definition of operation term

Drought: a situation characterized by drier conditions due to lack of rainfall that cause water shortages, lack of pasture for livestock which last for months and years.

Climate Change: refers to modifications in the weather patterns such as rainfall, temperature and winds that adversely affects human and animal life as well as environment and biodiversity.

Pastoralism: mode of life in rural areas for keeping livestock that involves mobility for searching pasture and water to feed the livestock.

Global Warming: rise in global temperature because of burning fossils which cause more heat waves that cause more harms to human and animal life for instance melting of polar ice and rise in sea level.

Deforestation: clearance of forests that involves wanton removal of trees, which make the areas barren with no trees. This contributes to soil erosion, desertification, and aridity.

Land degradation: the decline of land productivity due natural and human induced process. The land becomes unproductive for instance soil is eroded, formation of gullies and aridity.

Agro-pastoral: mixed form of both growing crops and rearing of animals in the same place.

1.8. Organization of the Study

The study contains of five chapters. The first one is included background of the study, statement of the problem, objectives of the study, research questions, significance of the study, scope of the study, and definition of operational terms and organization of the study. The second chapter entails the literature, which highlights what has been previously said or written of impacts of climate change on pastoralism, causes of climate change, and any other information and studies on it as well as the conceptual framework of the study. The third chapter focuses on the methodologies used for the study such as the date collection methods, sampling, and sample sizes. The fourth chapter contains the data presentation, analysis, and discussion. Chapter 5 is conclusions and recommendations of the study. The final part is bibliography or references.

Chapter 2

Literature Review

2.1 Introduction

This chapter analyzes the existing knowledge, literature review and what scholars, and researchers have said about the climate change impact on the lives of Somali pastoral communities in general, and particularly the impact of Sool & Sanag region which are two eastern regions of Somaliland self-declared government (initially North regions of Somali Republic), This document will also be revealing the gap and limitation in the existing literature review of the topic and chance to investigate it deeply and facilitate to mitigate the effects in more viable and practical manner in the future. The research variables are addressing the climate change impacts to the lives of pastoral communities in Sool & Sanag region, such as recurrent droughts, flash floods, cyclone flashes, deforestation, desertification, land degradation, livestock loss, crop failure, economic disruptions, resources-based conflicts, migration and displacement. The research is emphasizing the consequences of the climate change impacts as a conceptual framework and to summarize the literature reviews of the topic.

Climate change impact on pastoral communities in Salahley and Baligubadle "is the basis of the impact of climate change on pastoralism in Somaliland, that states and reveal climate change impact, however, their study is specific to some districts in the western part of the country but is an initial point to start a deep research on the impacts of other districts, and regions across Somaliland in general. This research study aims to analyze deeply to the impact of climate change on the lives of pastoral communities in Sool & Sanag region (Ingrid, Awale & Sugule ,2009).

Climate change is the shifts that happens to weather patterns primary temperature, rainfall, and winds in the long run. For instance, the amount of rainfall as well as the expected time varies making disturbances for agricultural production and livestock rearing in pastoral communities. Climate change is global problem that that effected all aspects of life. For instance, ice in the polars is melting and water volume is increasing while the seal level will rise, and some coastal areas will be drowned forcing people to move to higher lands.

Terrible weather conditions including over flooding, frequent storms, hot temperatures, air pollutions and droughts become very common on Pastoral societies felt hard to adjust to the change and variabilities of climate for instance to make rescheduling of animal breeding and cultivation of crops due to knowledge gap and negative perceptions. This forced them shocks such as prolonged drought, which is unusual and temporary deficit of water availability caused by the combination of lack of precipitations and more evaporation due to high temperature.

2.2 Climate change impacts

2.2.1 Climate change and drought

There are recurrent droughts in Somalia for the last 10 years, where every five years interval are occurring compared with previous years as it has been experiencing for every 10 years interval, In the last 12 years there are about three massive droughts, such as the droughts in 2011, drought in 2016 and drought in 2022. Drought is defined as a period of months or sometimes years when an area or a region experiences a deficiency in water supply due to consistently below average precipitation. Climate change impact on pastoral communities in Somaliland. Increase of global temperature and reduction of precipitations are expecting to be the real contributors of recurrent severe droughts in Somalia, resulting a massive destruction to pastoral livelihood activities such as livestock loss, crop failure and depletion of assets (Ingrid, Awale & Sugule, 2009).

"The rain is more likely to be erratic than previously and drought periods are likely to occur more frequently now than before" The study also shows the pastoral households in the study area perceived an increasing trend in annual temperature and decreasing trend in annual and seasonal rainfall (Tigist & Muluken, 2020) The result of the study revealed that six droughts(1 severe droughts and five moderate droughts) were observed for a period of 1983-2017, and therefore, the meteorological impact in the study area could be highly associated with the increased temperature, recurrent drought, irregular distribution of rainfall with in a season and year.

S/N	Drought Name	Year
1	Xaarame cune	1914
2	Hawaara	1924
3	Adhigaba	1934
4	Siiga case	1954
5	Gaadhi-gaadhi Saar	1964
6	Daba-dheer	1974
7	Dhibi-jaale	1984
8	Soor & Biyo waa	1994

Table 1: Major drought in Somalia has accrued every 10 years,

2.3 Climate change and desertification

Climate change had been logically associated with desertification, due to soil and water erosion processes, happening on the surface of the ground, and wiping out the fertile and nitrous soft sand that are facilitating to vegetation and plant growths. Desertification also called desertization, is the process by which natural or human cause reduce the biological productivity of dry lands (Stuart, 1988).

The reduction of biological productivity has been linked with the effect of climate change and it is consequences, such as cutting trees as human copying strategies, making income earning sources by buying as a fire woods and charcoal burning, resulting a deforestation, overgrazing of livestock to rangelands causes the decline of productivities, as they graze in certain land for a long term period due to failure of usual rainy seasons, finally poverty and instability are key contributors of desertification as low income communities could use a source of income, and displaced people of conflicts create residences by clearing vegetation's and cutting trees.

Due to consecutive droughts and failed rainy seasons "Vegetation does not reach the flowering period or dries up during the flowering period, therefore, the sexual reproduction fails, the biomass of the whole plant is reduced and does not cover the ground properly, therefore exposes

more water and soil erosion. The study has also revealed that the global warming has changed the quality of drought and resulted a permanent stress, destructed the regenerative capacity of human environmental system, as vegetation does not reach the stage of reproduction, as the rainfall distribution is too erratic, too short during growing season, so In nutshell these are the signs of desertization (Ingrid, Awale & Sugule, 2009).

Communities also stressed for soil erosion and land degradation, which are two other factors caused by the impact of climate changes in Somalia, increased for the last years and as a result of many interrelated contributing factors of overgrazing, deforestation, proliferation of rural areas, and increase of frequencies of droughts and flash floods (Aden, 2014).

2.4 Climate change and crop yields

Agra- Pastoral communities in Sool & Sanag regions have been experiencing a crop yield reduction for the last decades, and some years they felt a total crop failure, they stated that these are caused by the recurrent droughts, failed rainy season, locust infestations, and other local pests, eating plants and damaging crops. To these Agra-pastoral communities loss crop yield has faced a high food consumption gap in the last six years starting form 2016, and in these regions people depends on humanitarian assistance of food aids, where many humanitarian food agencies are working on them by giving food assistance of in-kind and cash and voucher assistances (CVA). "Droughts and delays in the onset of rains, have made the farmlands drier and difficult to plough, caused stunted growth of crops and slow germination of seeds resulting and early wilting of crops and decline in crop yield. The study also indicated that the impact of climate change variability has resulted crop failures, reduced livestock assets, water scarcity, food shortage and loss of income (Tigist & Muluken, 2020).

Assessment of climate change impacted by households conducted in many different Agra-pastoral villages in Maroodi-jeex & Gabiley regions has indicated majority of households that Sorghum yield, milk production per lactating animal and fodder production per farm all decreased by the last twenty years (Aden, 2014).

2.5 Climate change and livestock

Livestock is an integral part of living for pastoral communities in Somalia in generally as they are about 60% of the whole population in the country, and specifically Sool & Sanag regions rely on which are research study areas as they are purely practices traditional pastoral method of living. Livestock is the most important livelihood sector in the country and is the major export along with it is by products. The livestock production contributes around 60% of GDP and around 85% of foreign export earnings, Ministry of national planning and development (2012) Somaliland National development plan 2012 -2016. The common livestock species rearing on the country are sheep, goats, camels, cattle, and donkeys. Pastoralists rely on livestock and livestock products as source of feeding and income, by selling livestock and livestock products by trading, the milk, butter, and livestock skins.

The prolonged droughts resulted by the climate changes had reduced the livestock assets holding per households, due to the low pasture, grasslands, vegetation's and water. These makes pastoral communities to displace their residences and create camps near large town by closing with water and humanitarian assistances. "About 81% of Agra-pastoral and 100% of pastoral communities felt climate change reduced by their livestock number and productivity (Tigist & Muluken, 2020). It obvious that drought related diseases such as Pneumonia, anthrax, and pox are felt during drought and many livestock died with these diseases apart from the lack of pasture and water. The global warming, rising temperature and recurrent droughts resulted by a shortage of water, pasture, as well as spread of livestock infection diseases, brought poor body condition of livestock and finally livestock loss and death, Akerlof et. Al (2013) in dry land areas. The Agra-pastoral in Maroodi-jeex and Gabiley survey in the study, derive livelihood from livestock, cultivating Sorghum, and maize under rained conditions, as well as producing vegetables and fruits as cash crops. The livelihood of these communities have been increasingly affected in recent decades in more frequent droughts, flash floods, declining ground water resources and spread of invasive, exotic plant species in their farm land (Aden, 2014).

2.6 The climate change and socio-economic impact

2.6.1 Food shortage

Recurrent droughts lead a food insecurity to both pastoral and Agra-pastoral communities, as the livestock rearing by pastoral communities lost during the droughts, and those left are in a poor body condition to sell them, and could not produce a milk for lactating animal, as well as not producing a butter. These makes pastoral communities to faced acute food insecurities and households start to do a copying strategy index such as reducing food meal portions, skipping meal frequencies, cutting trees as firewood, and burning charcoal, selling household assets such as land and migrating cross borders.

For Agra-pastoral communities drought periods and changes of temperature in climate changes, resulted a crop failures or decline during harvesting periods, poor soil fertilities and low productivity for farm products. An in-depth interview sample of 143Hhs in two villages located in Maroodi-jeex & Gabilay conducted by households has found that, Food shortages were reported among the majority of Agra-pastoral households (60.32%) and 97% of pastoralists due to livestock deaths and crop failures during a drought period, (Tigist & Muluken, 2020).

2.6.2 Income loss

The impact of climate change such as prolonged droughts and failure of rains, reduces the productivity of livestock by making a low calving rates, high mortality, and loss, reduce milk production, poor body condition and risk of disease. The livestock prices will go down and the purchasing power of pastoral communities become low. The only source of income for pastoral communities is livestock, and climate change impacts smashes the pastoral investment and the capacity to cover their basic household needs.

A research conducted by Paul Lepenoi Lakapana (August, 2013), Social economic impact of drought on pastoralists, their copying strategies, and government interventions in Marsabit County, Kenya (Past, 76), had concluded that, Drought impacts on the livelihood of pastoral communities such as loss of livestock due to depletion of water and pasture, and drought related livestock diseases have run to a decline of livestock ownership, food insecurity and farming. This scenario made the pastoral household in the study to rely on emergency food aid. Finally, the

poor livestock quality in the drought seasons resulted a drastically decline of livestock prices and low purchasing power of pastoralists and then lack of livestock had a stopped a livestock trade in the market.

2.7. Climate Change Adaptation options

2.7.1 Free Grazing rangelands

Pastoral communities have potential free grazing rangelands that enable them to feed their livestock without paying any charge and they can move on with their livestock and search for good pasture and water.

2.7.2 Relocation of livestock

Pastoralists have the potential to migrate with their livestock to areas where they are getting good pasture and water as the grazing and rangelands are free communities are friendship during drought periods.

2.7.3 Destocking

Pastoralists sell a number of livestock during drought avoiding to lose due to the harsh conditions, these a kind of commercial destocking to reduce the number of livestock assets and easy to manage the rest. This document is about the literature review of the impact of climate change to the lives of pastoral communities in Sool & Sanag region. We had found that the last two decades the global is getting worm, and the temperature increasing, this makes weather condition is changing and some areas are becoming dry and hot. There is a recurrent drought in Somalia for the last two decades, and millions of livestock had been wiped out where a million of tons of crops were lost, the lives of pastoral communities were getting worse and livestock sales and trades were stopped. Hundreds of pastoral communities displaced and created camps into near large town by closing basic social needs such as water, and near humanitarian assistances. Displaced communities are started copying strategies such as cutting trees for firewood, burning trees for charcoal, exploiting them as a cheap labor, and risk for many human protection cases, such as child labor, rape, trafficking, and exploitations.

CHAPTER THREE

METHODOLOGY

3.1. INTRODUCTION

This chapter deals with the methods and tools the researchers used in data collection and analysis. It describes the research design that was used by the researcher, data sources and collection tools, processing, analyzing and the challenges that the researchers faced. It contains the methods used by the research, the target population of the research, the sample size taken as well as the sampling techniques used, how the data is collected, and which data collection instrument is employed. Moreover, data analysis methods and techniques, reliability, and validity of the research and finally the ethical considerations and the limitations of the study.

3.2. Research Design

The study used qualitative research design, which involves collecting data to determine whether and to what degree effects exists between two or more qualitative variables. The study investigated the impacts of climate change on Somali pastoral communities and how it influences their ways of life either positively or negatively and the possible adaptation measures available.

3.3. Study Area

The study area is Somalia which is a country Somalia eastern country of Africa of the horn of Africa, is extends from just south of equator northward to the Gulf of Aden and occupies and important geopolitical position between sub-Saharan Africa and countries of Arabia, and southeastern Asia. The study was conducted in the northern part of Somalia currently the self-proclaimed and unrecognized republic of Somaliland particularly the eastern regions of Togdheer, Sool and Sanaag, which are pastoralist communities who are experiencing the impacts of climate, change for the last years. The three regions are far away from the capital of Hargeisa around 280 Km, 530Km and 700Km respectively.

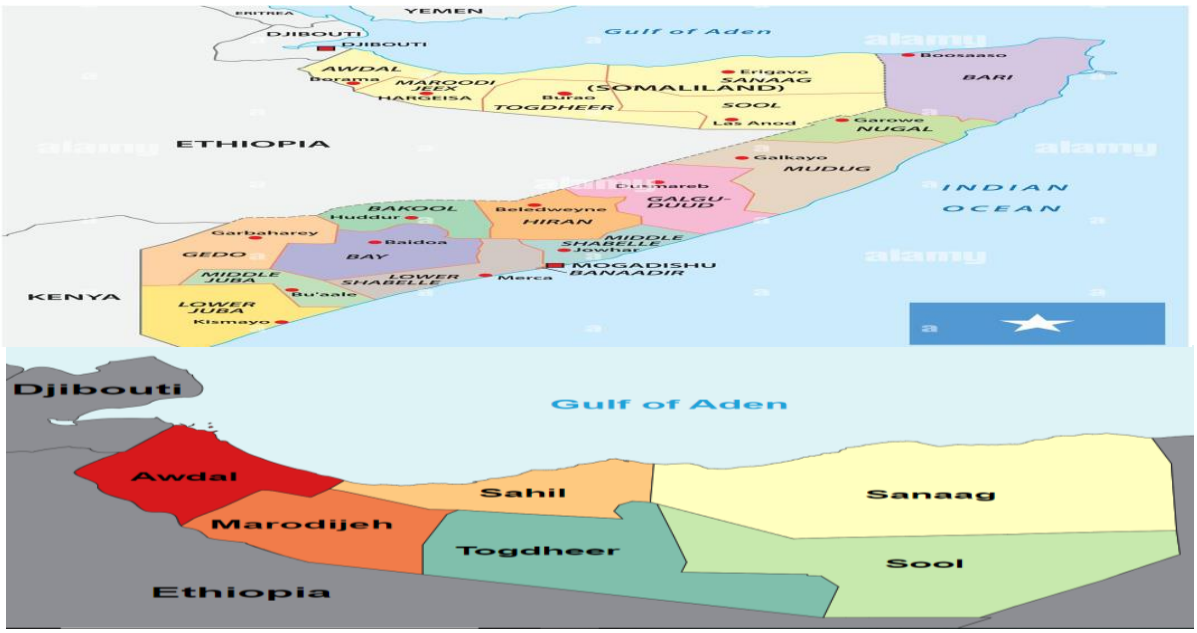

Figure 1: Shows the map of Somalia and the regions under the study

3.4. Data collection methods and Techniques

The researchers organized questions that are intended to get required and in-depth information from the target respondents in the three regions of the study. The data has been collected using both primary and secondary data sources. The primary data was collected from firsthand through survey questions and interviews to the target respondents and key informant interviews who have the knowledge and experience of climate change impacts in the study areas. Direct observations were also conducted visiting some rural areas prone to disasters and experienced the impacts of climate change and institutions working in climate change. The secondary data has been collected from articles, journals, and books written on climate change impacts on pastoral communities in Somalia and neighboring countries such as Ethiopia and Kenya.

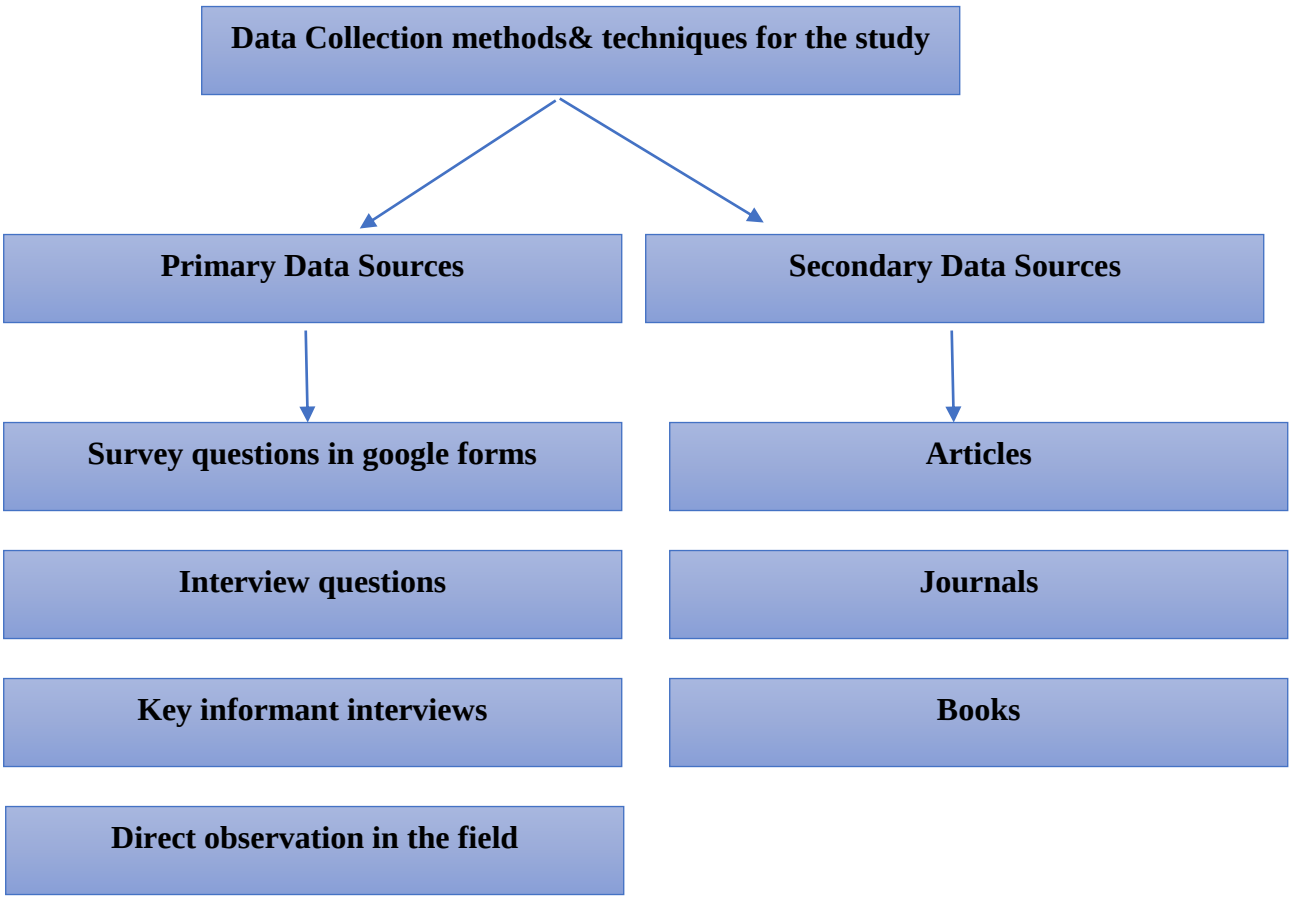

Figure 2 Data collection methods and techniques used in the study

3.5 Data Analysis

It was confirmed that all data is collected and completed from all target respondents of the study then the group divided themselves and checked all survey questions sent are received and any data captured in notes is complete. Then started reading the information, reviewing the answers from the different people flowing making categories of each question with most answers for it. Final screening was made to all questions to avoid any errors and missing during analysis and interpretations of the data. Using the excel sheet each question was put into frequency distribution table with the most answers received from the respondents and converted into percentage form for easier and understandable e interpretation and decision making. Finally, each question is inserted a chart and brief interpretation is made for the findings for proper comprehension.

3.6. Target Population of the Study

The study was selected to get information from the right people who have the relevant information on the topic of study. The topic of climate change required people who are well informed of the issue and its impacts including environmental and climate experts, government officials, NGO workers, village heads of pastoral communities and pastoralist people themselves both female and male. The respondents were predominately found in the three regions of the study who are directly or indirectly involved or impacted by the climate change in these areas. The target groups have in-depth information of the area of study and give us required information to conduct our research and reach the objectives of the study.

3.7. Sampling Strategy and Size

The study reached 50 respondents who involved directly or indirect of climate change and its impacts. They were selected purposively as they have detailed information and experience in the topic of study which is the impact of climate change on pastoral communities. They included people from various areas for instance environmental and climate change experts, government officials, NGO workers and pastoralist communities both female and male across the three regions of Togdheer, Sool and Sanaag.

This sample size was computed using the Slovene's formula, which state that for any given population the required sample size is given by.

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

Where; n =the required sample size; N = the known population size; and e= the level of significance, which is = 0.05

Summary of the respondents

S/N	Respondents	Total Number
1.	Environmental Experts	5
2.	Climate Change specialists	10
3.	Government officials	10
4.	NGO Workers both international and local	**10**
5.	Pastoralist communities	**15**

Table 1 Study population/respondents

3.8. Ethical Issues of the study

During our data collection, we had set a principle that guides research practices and design, which will be a code of conduct to our studies, such as protecting the rights of participants, enhancing research validity, and maintaining scientific integrity with informed consent, confidentiality, and voluntary participation. We keep the ethical issues of our research as we had sent our research questions to the head of departments to receive ethical approval before data collection. We also clearly explained the objectives of the study to each respondent of concern to avoid any suspicion and get accurate and detailed information. Participation of gender is respected and each person who participated the study was appreciated and acknowledged. For the areas to visit it was made good planning and informing people the date and time of visit to avoid disturbing their schedule or cause inconveniences.

3.9. Limitations of the study

Conducting the study has lot of challenges since the topic of study was not conducted much academic research and finding relevant data was hard to reach and taking more time and efforts. During the data collections some people misunderstood the questions and answers were irrelevant. Some other asked favor to participate the study which hindered the smooth conducting of the study. Limited time to conduct the study compared and minimal relevant literature of the topic

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND FINDINGS

4.1. INTRODUCTION

This chapter contains the analysis and the presentation of the data that is collected from the respondents in the form of interview, which was direct questions asked to various people, which are related to the topic of impacts of climate change of Somali pastoral communities. The data is analyzed using available statistical tools then the findings are presented in the form of charts and graphs. The data collected from the target respondents is organized in sections such as the first section is to get the profile of the respondents then public understanding of climate change by the people flowed by the impacts of climate change on Somali pastoral communities and finally the possible and available options to adopt the impacts of climate change

4.2 Demographic profile of the respondents

The figure 3 displays the distribution of respondents in the study which is (**60%)** male and (**40%)** female meaning male respondents are more than female. These people constituted environmental experts, climate change specialists, NGO workers, Government officials, Village heads, Pastoral people, and others. This shows that the study questions were asked to the right people who have the required information and experiencing the impacts of climate change.

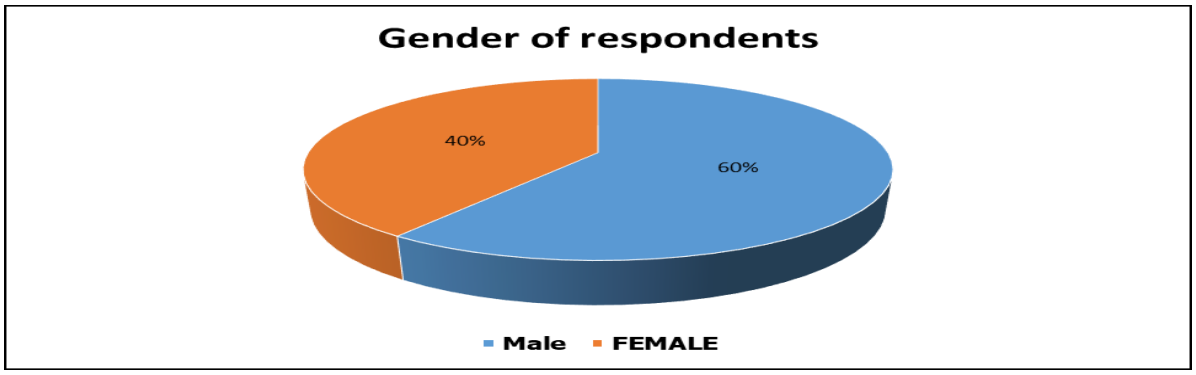

Figure 3 Gender status of respondents

The figure 4 shows that the age of 20-39 constitute (45%) of the respondents whereas 40-59 is (33%) and (22%) is a 60. The age group of 20-39 are the leading in the respondents since they are active group who are found in all areas of work force and have shown they have adequate and reliable information of the topic of study meaning they are dealing with climate issues directly or indirectly.

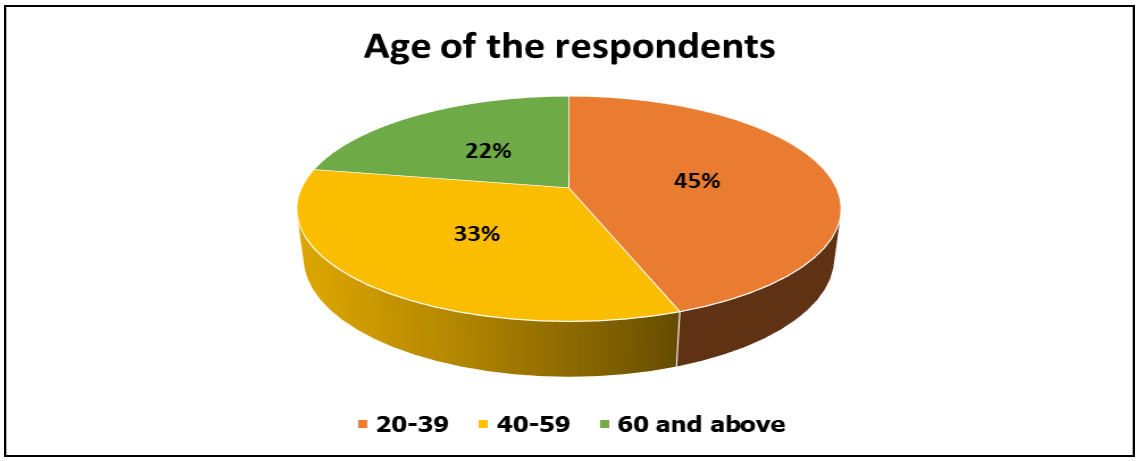

Figure 4 Age of the respondents

The figure 5 exhibits the qualification of the respondents which contains secondary (24%), diploma (22%), bachelor (36%) and master (18%). The largest number who involved the study completed bachelor's degree and the next were secondary. Meaning the topic of study required people with experience and related academic background in different institutions. Most people visited and emailed were bachelor holders both male and female across various places and institutions.

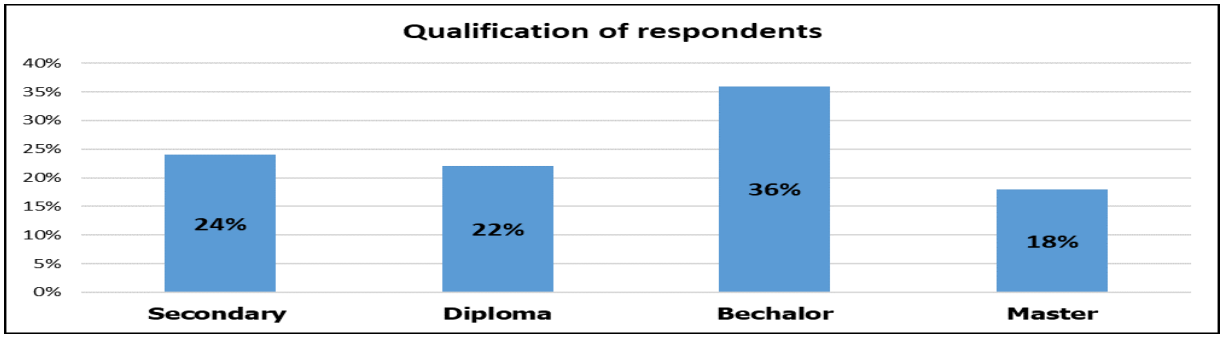

Figure 5 Qualification of respondents

4.3. Public's understanding on climate change

The figure 6 summarizes the responses from the people who were asked their understanding of climate change. They expressed their understanding in various ways including that (32%) of the respondents said that climate change is change of the temperature and rainfall whereas (24%) described it as shifts in weather patterns, other (16%) regarded it as weather getting hotter, another (14%) said that climate change is consequences from natural and human activities. Finally (14%) described it as global issue affecting social and natural ecosystem.

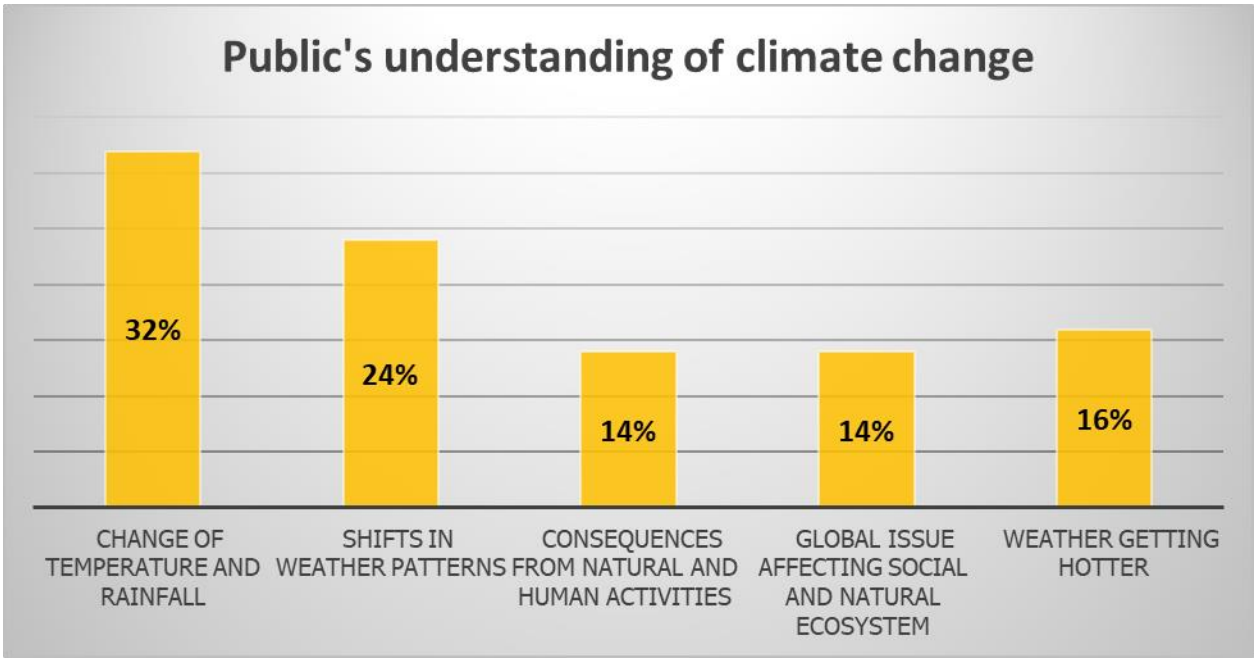

Figure 6 Public's Understanding of Climate change

The responses collected from the various people are almost very close, but everyone used to describe climate change from different angle. But the most responses which constitute **(32%)** and **(24%)** respectively clearly indicated that changes in weather patterns of temperature and rainfall are the main weather patterns that are subject to change. Other groups also mentioned that climate change is the results of both natural and human activities and global problem which has impact on both human and natural life on earth. In conclusion, the table clearly states that the public have good understanding of what climate change is, where they feel the changes, what is causing the changes of the weather to them and how the issue is global phenomena that has affected every body's life.

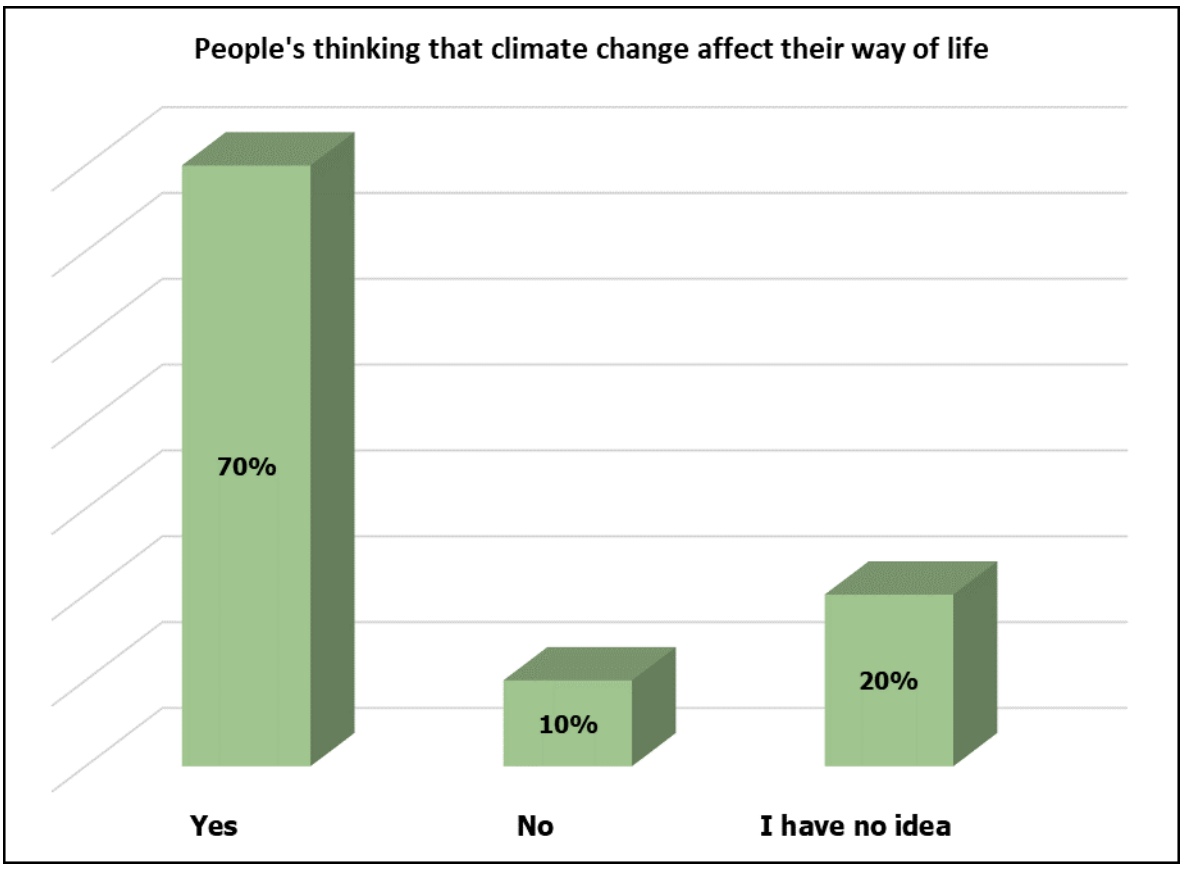

Figure 7 People is thinking that climate change affects their way of life

The figure 7 explains how people reacted to when they are asked if climate change affects their way of life or lifestyle. About (70%) answered that climate change can affect their way of life while (10%) answered no meaning it is not affecting their lifestyle and the lastly (20%) of the respondents are not sure whether it can affect their way of life or not. But most of the respondents of the study agreed that climate change have effects on the way they live meaning that climate change can make disturbance to the way of living and particularly negatively impacting them.

4.4. Causes of the climate change

This study also reveals the reasons of the climate change. The figure 8 demonstrates that respondents were asked to answer the questions of what the main causes of climate change are. They answered differently based on how everyone sees it including (32%) answered greenhouse gases emissions, (26%) said tree cutting and deforestation, (18%) identified air pollution, (14%)

replied populations increase and finally (10%) stated raising large herds of animals. This indicates that people confirmed the main causes of climate change as the greenhouse gases emission released from industries, car exhausts and burning of fossils is the main factor contributing to the changes of the climate across the earth. The second main cause is cutting trees which leads to deforestation of the land leading to desertification that negatively contributed to low rainfall and hot temperatures.

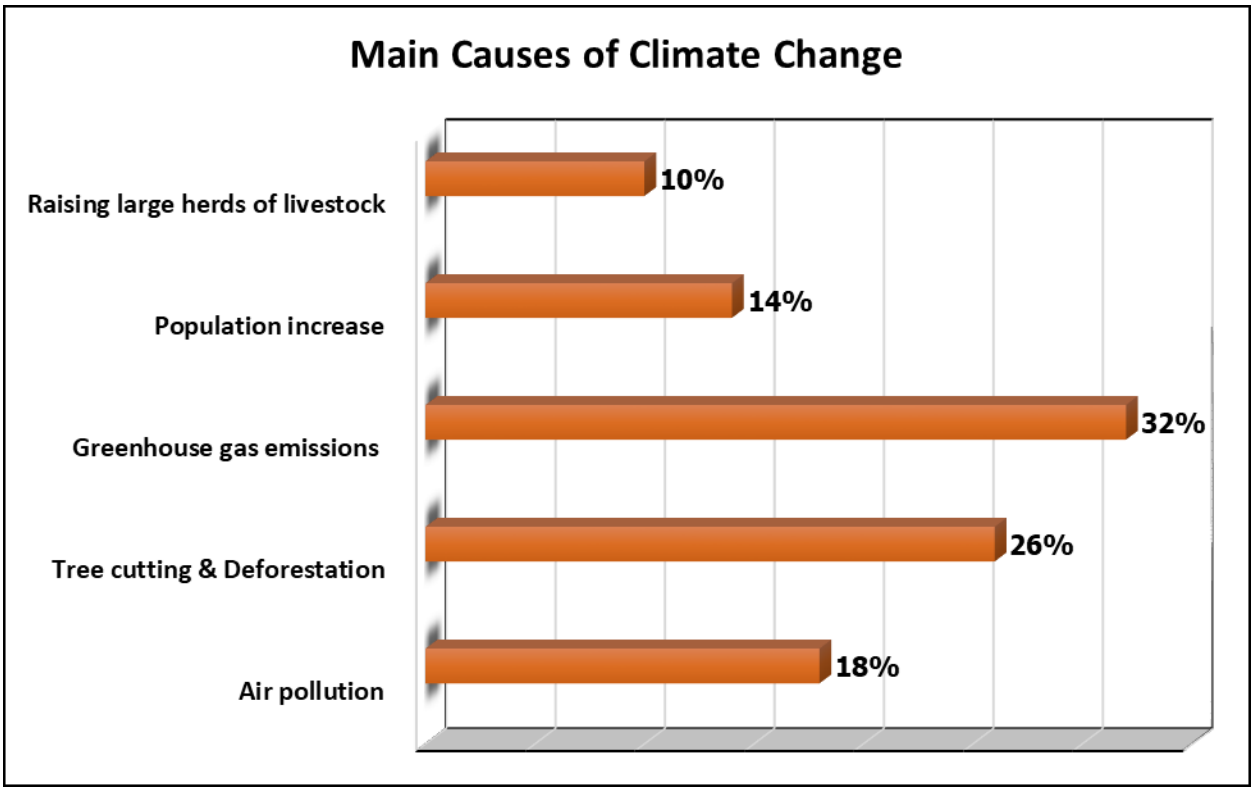

Figure 8 Main causes of climate change

To sum up the respondents identifies six main cause of climate change both natural and human activities and mainly human made ones as result of world populations increasing and putting more pressure on resources and ways to utilize it without proper conservation is causing harms that lead to shifts in the patters of weather mainly temperature and rainfall.

4.5. Impact of climate change

The figure 9 illustrates the answers given by the respondents on the impacts of climate change and they answered that (28%) said droughts, (18%) of worsening livelihood and food insecurity, (14%) raising temperatures, (12%) loss of livestock, (10%) environmental degradation, other

(10%) said displacement of people. As seen from the responses the primary impact of climate on pastoralist communities is droughts which are recurrent and happening every 2 to 3 years.

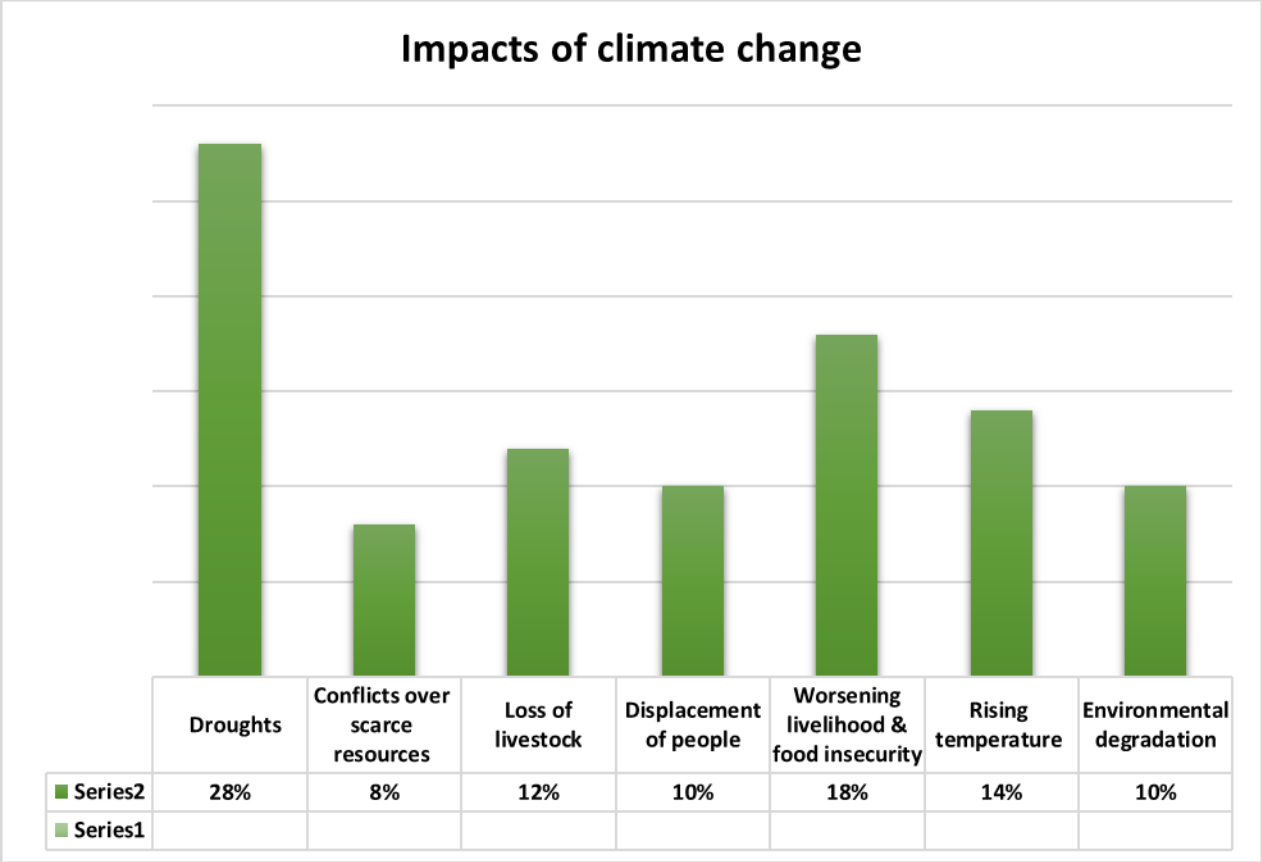

Figure 9 Impacts of climate change

These droughts are characterized by no or little rainfall and hot weather in the last years which contribute to all other factors in the figure. Other impacts included food insecurity and livelihood vulnerabilities which makes the food shortage, unavailable and difficult to access this leads to people suffer from hunger, acute and chronic malnutrition that further contributes to death of people.

As revealed in the table climate change results rising and hot temperature which are not suitable both human and animal and cause the eruptions of disease and drying of soils for agriculture. People are also in constant movement searching pasture and water for their livestock which makes them restless and relocate from their original places. Other impacts said by respondents include conflicts over resources which are very scarce as result of climate change and causes

fights and casualties among pastoral communities. Livestock die as they have not enough water and pasture, and rangelands are almost overgrazed. Overall environment is damaged which makes disturbances for the availability of resources and inadequate to satisfy.

4.5.1. Social impact

The figure 10 shows the social impacts that climate change has on pastoralists' communities. As indicated here, almost (24%) of the respondents confirmed increased vulnerability among people while (20%) said rural urban migrations, other (18%) mentioned lack of basic services whereas (16%) stated weakling social cohesions, around (12%) said family separation and finally (10%) answered land conflicts. This means that the most primary social impact of climate change is increased vulnerability among the pastoral communities which make up (24%) responses in total respondents meaning climate change increased the likelihood that society is prone to any kind of disasters which affects them immediately. People are exposed to face and suffer any harm both natural and human in their life. Which means they are very weak and unable to cope with disasters as they occur on them and time to recover will be very long.

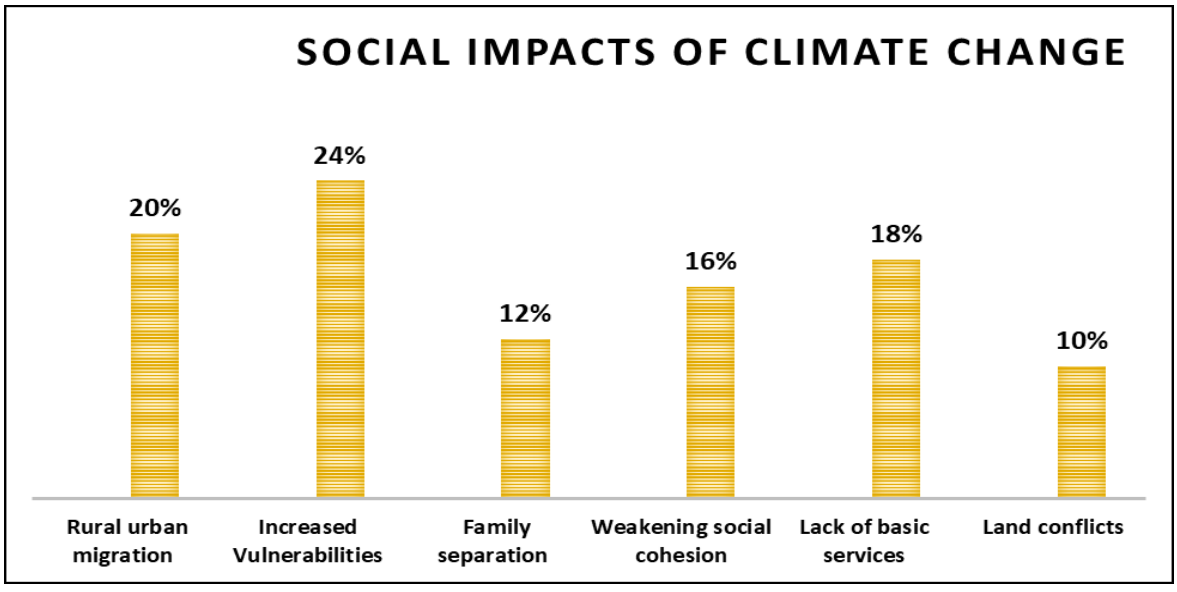

Figure 10 Social impacts of climate change

The other social impact worth to mention is that people move from rural areas to urban centers to survive and adopt to the impacts of the climate change. As impacts of climate change continues disorders happen in the way that society lives and interacts which causes all basic services such

as health and education affected and unable to access. Families move continuously and separations may occur due to seeking of survival and leads to weak social cohesion and unrest in the society. Land conflicts is seen particularly water points and rangeland that both people and livestock need to survive and cope with severe impacts of climate change on pastoral societies.

4.5.2. Political impact

The figure 11 explains the political impacts that climate has pastoralist communities, the majority of respondent selected Movement from polling stations that affect right to vote rate 34%, second majority of respondents rate 28% selected cross border fights and disputes , rate 12% of respondents selected lack of government institution, rate 10% of respondents selected political impact as political instability due to unemployment and loss of livestock and same rate 8% of respondents selected lack of policies on climate change and change in land tenure and land use system.

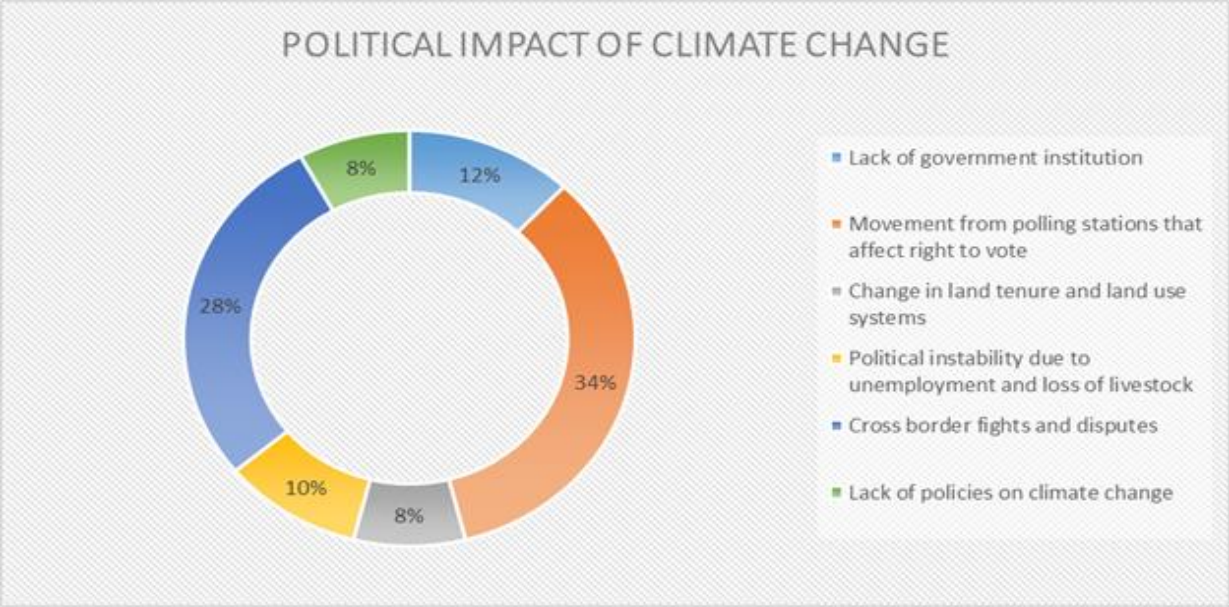

Figure 11 Political Impact of Climate Change

4.5.3. Environmental impact

This figure 12 shows Environmental impacts of Climate change in Somali pastoralist communities, Somalia has been an increase In severe climatic events since 1990, The majority of

respondents rate 29% selected Drought - this year drought severe in Somalia affects more than 6.7 million people, Second majority of respondents rate 17% selected Loss of biodiversity and third of majority of respondents rate 15% selected Soil erosion, rate 14% of respondents selected Desertification and rate 13% of respondents selected pest and diseased.

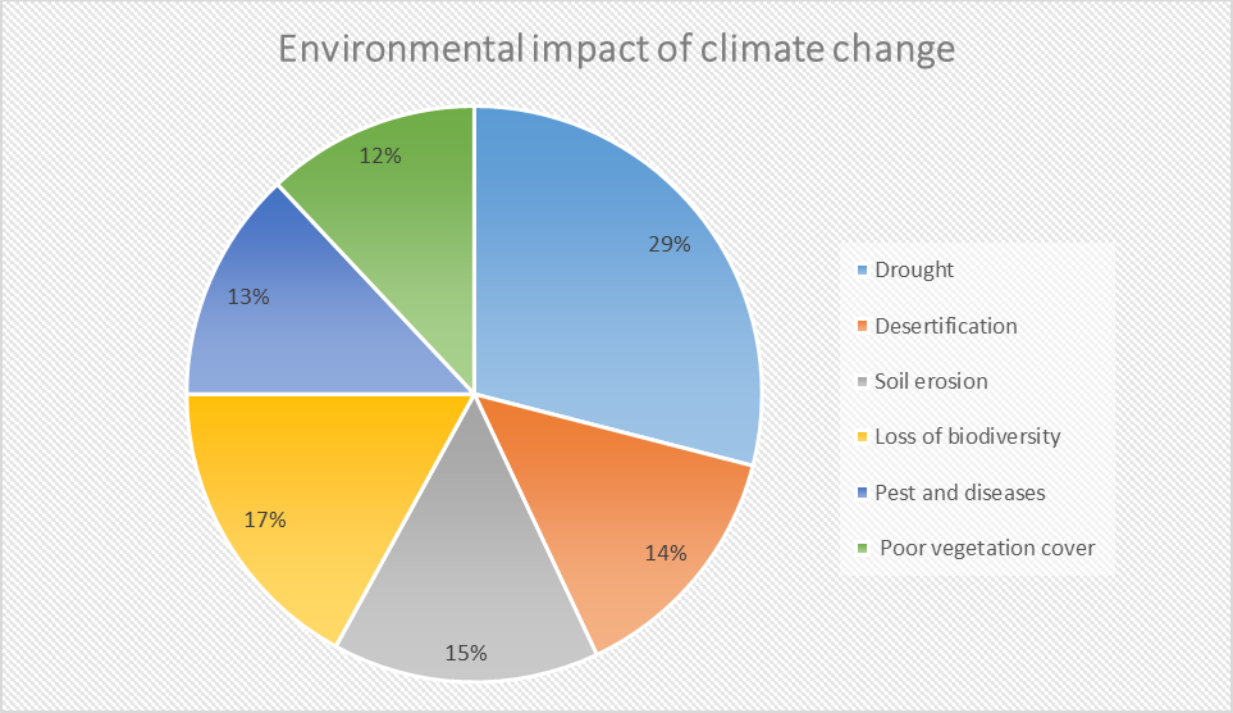

Figure 12 Environmental Impact of Climate Change

4.5.4. Economic impact

The figure 13 reveals the economic impact of climate change on pastoralist communities. The majority of respondent rate 40% selected Loss of livestock, Second majority of respondents rate 18% selected engagement and sale of charcoal and wood, third of majority of respondent rate 17% selected higher cost of livestock keeping , rate 13% of respondents selected No market for livestock and rate 12% of respondent selected failure to crop cultivation.

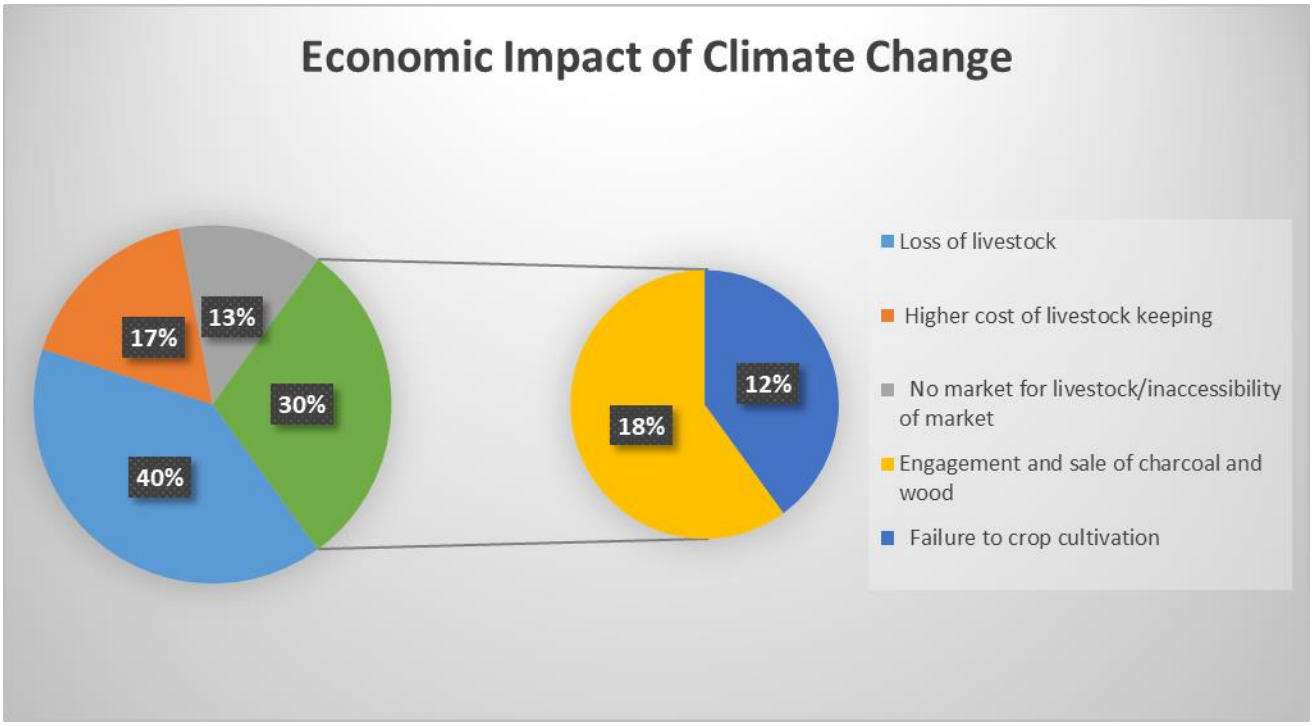

Figure 13 Economic Impact of Climate Change

Due to Somalia's reliance on natural resources for its economy and the degradation of those resources caused by human activity, such as charcoal manufacturing and Livestock and the crop production, the nation may become increasingly vulnerable to poverty and food insecurity as an outcome of climate change.

4.5.5. Agricultural impact

The figure 14 shows Agricultural impact of climate change in pastoralist communities In Sool and Sanaag region. The majority of respondent's rate 19% selected reduced yields from farms, rate 18% second majority of respondents selected Loss of fertile land and third majority of respondents rate 17% selected Disturbances of food viability , rate 13% of respondents selected shortage of rainfall during growing season and finally respondents rate 11% selected Pest and disease. In Somalia, the climate risk effected the production and suitability of major crop.

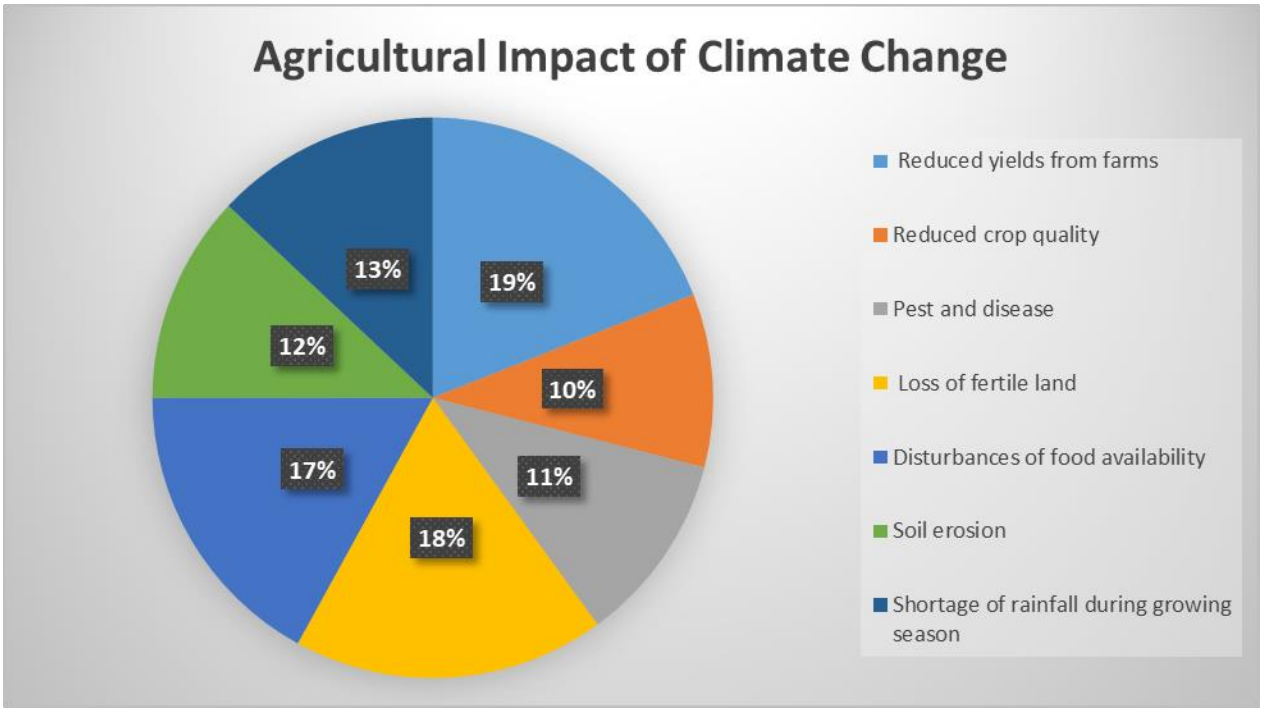

Figure 14 Agricultural Impact of Climate Change

4.5.6 Possible climate change adaptation

The figure 15 explains the respondent's opinions of the possible climate change adaptions options in pastoral areas , the majority opinions of respondents rate 32% selected Tree farming ad stop deforestation, second majority of respondent opinion's selected To build dams/ investing alternative water sources rate 30%, rate 12% of respondents selected To ensure environmental protection , rate 11% of respondents opinion's selected Destocking and finally rate 8% of respondents opinion's selected Development of inclusive adoption strategies.

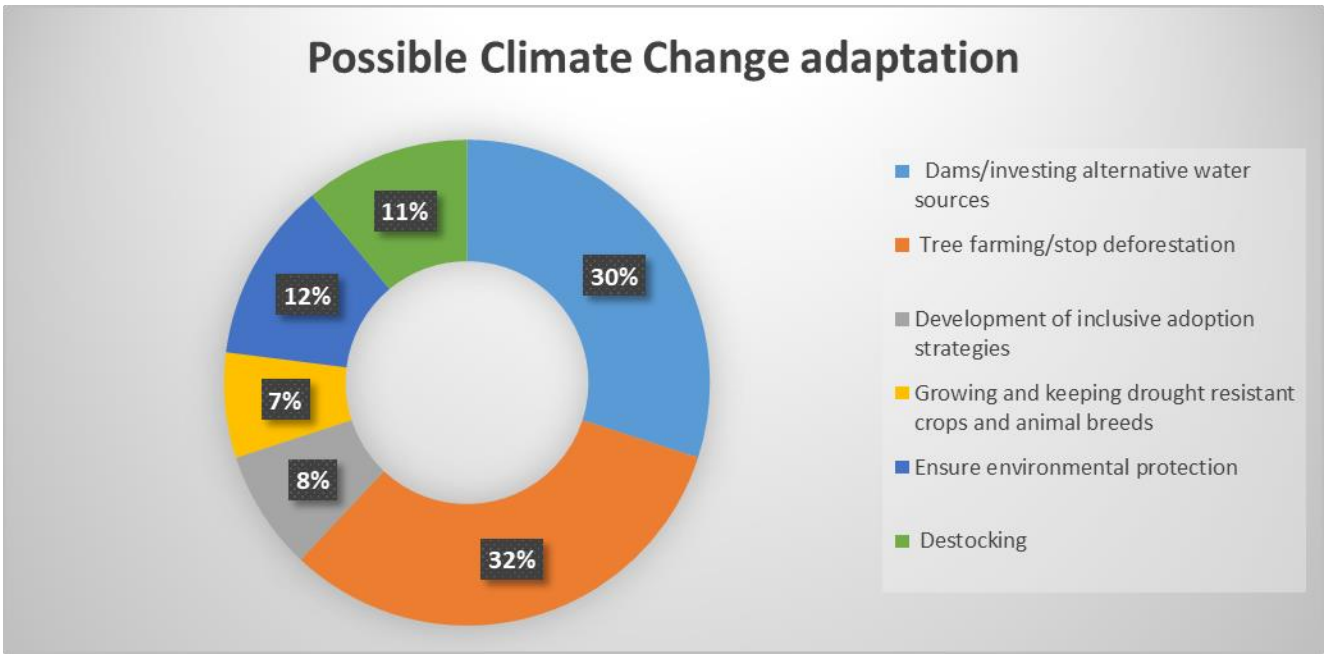

Figure 15 Possible climate change adaptions options in pastoral areas

4.6. Roles of governments, civil society, NGOs and development actors

The figure 16 explains the respondent's opinions of the kind of rules to do governments, civil society, NGOs and development actors play climate change adaptions options in pastoral areas.

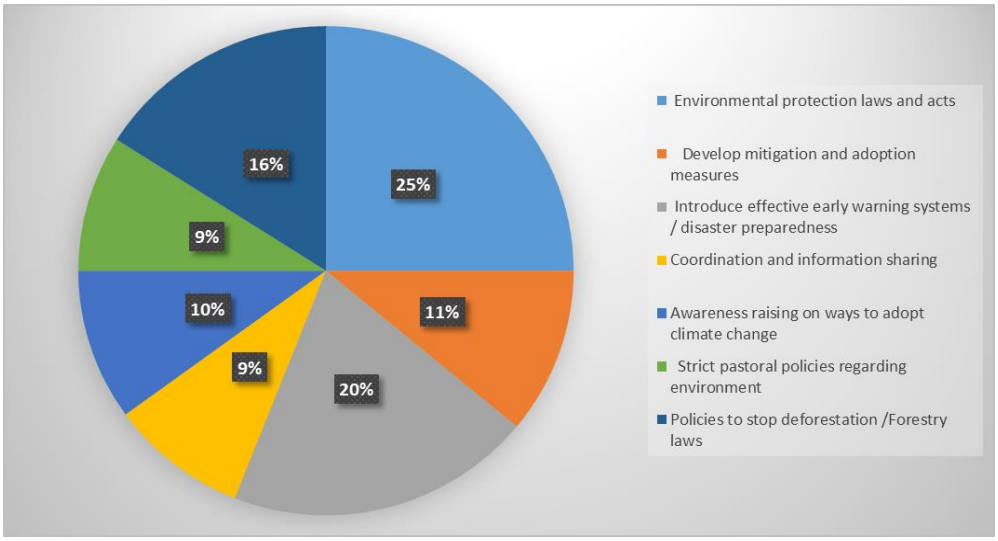

Figure 16 Roles of governments, Civil Society, NGOs and Development Actors

The majority opinions of respondents rate 25% selected Environmental protection laws and acts, second majority of respondent opinion's selected introduce effective early warning systems/ disaster preparedness rate 20%, rate 16% of respondents selected Policies to stop deforestation/Forestry laws, rate 11% of respondents opinion's selected Develop mitigation and adaption measures and finally rate 9% of respondents opinion's selected strict pastoral policies regarding environment.

CHAPTER FIVE

DISCUSSION, CONLCUSION AND RECOMMENDATIONS

5.1. INTRODUCTION

This chapter contains the summery of findings, conclusion, and recommendation of the study. It is very useful as it gives conclusion of finding from study in very brief way that is easily understandable to everyone interested. The study was investigating the impact of climate change on Somali pastoral communities and was conducted in three regions of Togdheer, Sool and Sanaag in the northern Somalia currently the self-proclaimed and unrecognized republic of Somaliland. The target population was who participated were 50 people who directly and indirectly involve climate change and pastoralism issues including climate and environmental experts, government officials, NGO workers and pastoralist communities themselves.

5.2. Discussions and Conclusion

The objectives of the study were first to investigate the understanding of public about climate change and whether it has impacts on their lives or not. The respondents who participated the study showed they have adequate understanding of what climate change is and about 70% agreed it is affecting their way of life or lifestyle. They described climate change as shifts in weather patterns mainly temperature and rainfall that is caused by both human and natural activities on earth since humans are increasing and they are putting pressure on earth to utilize the resources to satisfy their needs. They are also negatively damaging the environment inducing natural process to increase and disturb the earth's climate. They indicated that climate change is global problem problems affecting both human and natural ecosystems, The participants of the study mentioned the main reasons behind the shifts of earth's climate in several ways including industrialization of the world that are releasing smoke and greenhouses gases to the atmosphere which are contributing to global warming and air pollution as well as wanton cutting of trees for human use which leads to deforestation. Population increase and keeping large herds of animals are another contributing factor mentioned by the respondents.

All above causes are making weather hotter and negatively influence the human, animal and natural existences on the earth making them more vulnerable to any disasters and events. The respondents of the study were also asked to mention the impacts that climate change has on their overall lives and surroundings. They indicated that droughts are the main impacts of climate change on pastoralist communities. It is a situation where rainfall is not received that people, livestock, agriculture, and environment suffer from the prolonged droughts that water become scarce which affects pastoral mode of life and makes more unstable and vulnerable. Food shortages occur making livelihoods at higher risks, which may lead to malnutrition and death of both human and animals. This leads to movement of people for seeking pasture and water for survival, which causes conflicts over scarce resources between pastoralist communities. Moreover, climate variability causes hotter temperature that negatively influences human, animal, and plant life as well as environmental degradations increases.

The study further investigated how climate change has impacts on every sector of life of pastoralist communities in terms of social, political, environmental, economic, and agricultural production. The respondents mentioned several social impacts that climate change have on their lives including increased vulnerabilities among the societies prone to climate change disasters which makes them easily suffer from any variations in the weather and hard to cope for Adaptations. They start moving mainly from rural areas to urban to get access to basic services for survival including health and education. This advances to families' separations in different locations and waking social cohesion among them. Such movements from disasters creates conflicts among displaced people and host communities for land to settle or for grassing animals

Variability in the climate has political impacts on pastoralist communities because it is difficult to get stable planning and implementation of all political interventions and rights for example people are in constant movement to cope with changes in weather this makes them unstable and permanent to stay in polling stations to exercise their political rights of voting to electing the right people representing them. This makes difficult for the government to establish and run government institutions, implement policies in pastoralist communities. The unrest also makes pastoralist societies not to access the basic services from the government, increased unemployment rates and regular in border and cross border disputes among pastoralist communities.

The study also found that climate change has impacts on the environment, which is the surroundings that determine suitability and existence of life over certain places on earth. These impacts on environment have great influence on pastoralist communities as they reported during the discussions. They pointed out several impacts including droughts, which is the biggest factor that is damaging the environment, and encouraging all other ones, loss of biodiversity, which negatively affects ecological balance, soil erosion and desertification, pest, and disease, which is treat to both animal and crop growing and finally poor vegetation covers on land since degrading, has increased.

The climate change has visible impact on the economic situation of pastoralist communities as indicated in the findings from the research. The respondents mentioned how modifications in the weather patterns has effects on their overall economic. They lost livestock, which is the backbone in of their economic production, which put huge burden on the sustainability of their lives as well as food security, and livelihoods in pastoralist communities. The cost of keeping livestock also become very high since they need water and pasture to be bought. the remaining livestock have no quality which makes them inaccessible to markets to get revenue for survival. Like livestock, crop growth become failed. When people lost all sources of income generation to sustain their lives, they engaged other activities such as cutting trees and burning charcoal to get their daily life which contributed to increase environmental devastation and risks of climate change.

Pastoralist communities mentioned the agricultural impacts from climate change which disturbed production and food chains from the farms. They figured out that both crop quality and yield has reduced considerable due to lack of enough rains and suitable temperature. The climate change has increased the risks of pest and disease such as locust, which has great damage to farm production and harvesting. Soil erosion and loss of fertile land is other impacts that respondents reported. The agricultural impacts of climate change have resulted disturbance to the availability and reliability of food, which is very important for human and animal survival.

The other objectives of the study were to figure out the possible options for climate change Adaptations. The respondents of the study shared their answers and listed several options that can be taken as possible mitigation and adaptation choices to cope with changes in the weather

patterns. They suggested alternative water sources and dams must be prepared since water is life and responsible for the survival of human, animal, and plant life during droughts. Scarcity of water can be managed, and life can survive if this option is in places. It helps access to water to reduce risks of dying and moving for water. Tree farming or afforestation and reforestation programs are also preventing deforestation, which makes the environment safe and suitable to life for pastoralist communities. Development of inclusive adoptions strategies as well as ensuring environmental protection will be among the coping approaches of the impacts of climate change. Other important measures to mitigate climate change risks mentioned by the respondents are growing and keeping drought resistant crops and animal breeds. Destocking programs are useful coping mechanism in which the government makes plan to weather forecasting and if they see drought is coming, they allocate funds from the government budget and buy livestock from the pastoralist to reduce the risk of dying livestock and again when the situation become normal, they do restock or giving back livestock to pastoralist communities.

Finally, the respondents shared their opinions of what kind of rules that government, NGOs, development actors and other civil society groups can play climate change adoptions options to pastoral communities. They highlighted several key areas they can initiate and contribute including development of policies and laws on environmental protection, raising awareness on changing climates with Adaptations measures and finally coordination for information sharing.

5.3. Recommendations

The following recommendations are necessary to put in place to all concerned parts of climate change:

- The government through concerned ministries must initiate mainstreaming climate change. Various stakeholders must put climate sensitive programs within the community, Climate financing program in place. Increasing awareness to promote public's understanding on climate changes implications
- To unite all efforts national, regional, and international on climate change risks and mitigations. Increasing the resilience of pastoral communities to adopt climate variations and Increasing environmental education and conservation.

- Establishment of effective early warning mechanism and disaster risk reduction, mitigation, and management measures, Provision of rural development and pastoral economics programs.
- Establishment of sustainable storage mechanism of water and food among communities. Increasing community knowledge on water harvesting and water catchments during wet season and Creation of rangelands for relocating livestock during dry seasons.
- Development of national adaptation program of action, Introducing governmental and institutional programs intended towards climate change adaptation and Empower pastoralist communities to influence policy and implementations at the national level.
- Create positive diversification for pastoralist and alternative livelihood, Development of climate change mitigation and adaptation policies and laws. Mainstream climate-change adaptation and mitigation into all relevant national policies.

The study is suggesting that investment is put on further research studies on climate change mitigation and adaptation measures in pastoralist communities. More studies will create climate sensitive and resilient pastoralist communities. Government and other stakeholder to conduct studies on how climate change is turning rural life into urban.

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