

Assessment of climate change-induced hazards, impacts and responses in the southern lowlands of Ethiopia

FSS Research Report No.4

Aklilu Amsalu & Alebachew Adem



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The views expressed in this report are those of the authors and cannot be considered as reflecting the views or position of CORDAID or FSS.

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Abbreviations and Acronyms

ACORD	Agency for Cooperation and Research in Development
AFD	Action for Development
AMCEN	African Ministerial Conference on the Environment
AMREF	African Medical and Research Foundation
CBOs	Community Based Organization
CBPP	Contagious Bovine Pleuropneumonia
CCPP	Contagious Caprine Pleuropneumonia
CSOs	Civil Society Organizations
CORDAID	Catholic Organization for Relief and Development Aid
CSA	Central Statistical Agency (of Ethiopia)
DFID	Department for International Development (UK)
DPPA	Disaster Prevention and Preparedness Agency
EMA	Ethiopian Mapping Agency
EPA	Environmental Protection Authority (of Ethiopia)
EPaRDA	Ethiopian Pastoralist Research and Development Association
FAO	Food and Agricultural Organization of the United Nations
FGD	Focus Group Discussion
FSS	Forum for Social Studies
IPCC	Inter-Governmental Panel on Climate Change
MEDaC	Ministry of Economic Development and Cooperation
MoA	Ministry of Agriculture
MOFED	Ministry of Finance and Economic Development
NASA	National Aeronautics and Space Administration
NGO	Non-Governmental organization
NMSA/NMA	National Meteorological Services Agency

OECD	Organization for Economic Co-operation and Development
ORDA	Omo Rural Development Association
PASDEP	Plan for Accelerated and Sustainable Development to End Poverty
PRSP	Poverty Reduction Strategy Paper/Program
SNNPRS	Southern Nations, Nationalities, and Peoples' Regional State
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
URT	United Republic of Tanzania
WB	World Bank
WHO	World Health Organization

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1. Introduction

1.1. Background

There is now clear scientific evidence that the earth's climate is changing (Reid and Huq 2007, IPCC 2007). The change occurs mainly because of disturbance in the atmospheric system due to increasing concentration of greenhouse gases that are emitted from the various activities of human beings. The problem is recognized as one of the most serious global challenges of the 21st century with multiple effects on basic human support systems such as agriculture (crop and livestock production), forests, water resources, and the ecosystem.

Although no country is immune from the potential impacts of climate change, the impacts are highly variable over space and time. In particular, climate change will present a significant challenge for developing countries (IPCC 2007). Developing countries who have contributed least to the emission of greenhouse gases are among the most vulnerable. These countries have limited adaptive capacities than that of developed countries because of their limited financial resources, skills and technologies, high levels of poverty, and their excessive reliance on climate sensitive economic sectors such as agriculture (Reid and Huq 2007). Further, poor communities are not only located in high-risk areas, but the lack of economic and social resources mean they are ill-equipped to adjust to the long-term changes in climate (Orinda and Murray 2005). Therefore, climatic phenomenon such as catastrophic droughts, vigorous hydrological cycles, tropical storm surges and disease burdens more often become tragedies in these countries. In many of the poorer countries,

these disasters are already destroying environments, lives and opportunities further reinforcing global and regional inequality.

It is widely recognized that poor communities who live in marginal areas and whose livelihoods are highly dependent on natural resources are especially vulnerable to the impacts of climate change (Macchi 2008). They have limited capacity to cope with existing climate variability and future changes. Recent studies undertaken in several developing countries indicated that temperature increase and changes in the rainfall pattern reduced agricultural productivity and availability of natural resources (Morton 2007, Kurukulasuriya and Rosenthal 2003, Jones and Thornton 2003, Dinar et al. 2008, Thomas and Twyman 2005, Mendelsohn and Dinar 1999, Davidson et al. 2003). Moreover, changes in the mean climate have brought direct negative impacts on livelihood assets, health, food, and water security. Increased pressure on local coping strategies, social protection measures, and the ability to recover from shocks in many instances have led to resource degradation and scarcity, social tension, and conflicts.

Among the poorest regions, Africa's biophysical and socio-economic environments are highly vulnerable to the impacts of climate change and weather extremes. Today recurrent extreme climate events such as floods, cyclones, and droughts are devastating most economic, social and environment systems in Africa (Davidson et. al. 2003; DFID 2004; WHO 2003). The impacts of future climate changes in Africa will be very devastating, and will certainly dwarf regional and national poverty reduction efforts. Within the African region, the Horn countries are among the most vulnerable but least prepared countries for adverse global environmental change in the world with a very weak economy, climate-sensitive livelihoods

and fragile agro-ecological conditions. As a result, poverty, catastrophic droughts, vigorous hydrological cycles, and famines have been the hallmarks of these countries (AMCEN/UNEP 2002). Most of the people throughout the region are living through a period of rapid and dramatic changes in ecological conditions, land use patterns, and socio-economic conditions. The pace of change in the pattern of climate and different forms of environmental hazards in the region often exceeds the capacity of national and local institutions to mitigate the effects of such changes. This is especially true in drier, more fragile Zones where catastrophic drought and famine have become increasingly common occurrences. Among the Horn countries, Ethiopia is one of the most poverty-stricken, ecologically fragile and socially diverse countries whose growing population and feeble economy are heavily impacted by climatic events.

Ethiopia is one of the poorest nations of the world vulnerable to the impacts of climate variability and change. High dependence on natural resources and climate sensitive livelihoods coupled with the existence of rampant poverty and variable weather events put the country in most vulnerable position. The country's environmental resources including water, forests and range resources, and major socio-economic sectors (including agriculture and health) are vulnerable to climate change and variability, with huge impacts on the local ecosystem and the socio-economic well being of the population. The limited economic, institutional and logistical capacity to mitigate and adapt to climate change exacerbates the vulnerability of many people and communities to climate hazards that are occurring through global climatic changes and land use/cover transformations. The impacts range from recurrent droughts and catastrophic floods to declining livestock and food production (NMSA 2001, 2007). This is manifested in the magnitude of disasters, land use and cover

changes, economic stumbles, and prevailing environmental resource related conflicts that are driving vulnerability further. Some of the challenges of this environmental change such as local and regional food insecurity and hunger are still high on the agenda of Ethiopia's development goals.

1.2. Statement of the problem

Ethiopia is the third most populous country in Africa, with a very weak economy and fragile agro-ecological conditions. According to the recent census report, the population is estimated at about 74 million (CSA 2008). The country's economy is heavily dependent on rain-fed subsistence agriculture. Over the past several decades, the country has been hit by repeated droughts, famine and epidemics that relate to changing climatic condition. The Ethiopian lowlands were particularly affected by these problems that have been occurring recurrently. The people in the lowlands are among the most resource-deprived and the most geographically and politically marginalized. Hence, the magnitude and impact of the hazards in these areas has been intensifying.

The simple relationship which used to exist between the social and natural environment in the lowland areas has become complicated due to the enhanced demands (arising from high population growth) and reduced supplies (depletion of the natural resource bases). As the intensification of hazards was taking place gradually in the past, people had adequate time to adapt to the new circumstances. Since recently, however, the pace of those changes has gained momentum and the adaptation mechanisms of the past have become obsolete or inadequate. Most of these hazard factors are attributed to global warming, for which the poor have a negligible input. The problem is further complicated due to extreme poverty, resource degradation

and disruption of local coping mechanisms. The main climate change impacts are on water resources, food security and agriculture, natural resources depletion, biodiversity and human health.

Despite government recognition regarding vulnerability of the country to the impacts of global climate change, there is limited research-generated knowledge on impacts of the change, locally available adaptation and mitigation measures and community responses. Although an enormous amount of resource, time, and energy have gone into reactive disaster response measures, poverty reducing and agricultural production boosting strategies, poverty, food insecurity, and catastrophic environmental hazards such as droughts, floods, diseases and pests remained the major threats to the overwhelming majority of the country's populations and regions. Very little attention has been given to empirically analyze the root causes of the complex and multifaceted developmental challenges of the country posed by the threat of climate change. In the absence of such empirical research generated knowledge, however, attempts to improve the quality of life of poor households and bring about development through attaining food self-sufficiency would be unrealistic especially in the hazard-prone areas of the country.

So far, efforts in Ethiopia to respond to the problem of growing climate change-induced hazards seem to have been locked in a disaster-relief-disaster syndrome. Despite the increasing funds for disaster response, damages from natural hazards continue to rise. Damage mitigation, emergency preparedness (especially for climate related hazards) and forecasting have not received the necessary attention. The mitigation plans have been reactive rather than preventive. Besides, there has been inadequate enforcement of policies in

Ethiopia. Recent flood hazards in South Omo and forest fires in Guji have all demonstrated the weak or non-existent nature of relevant institutions in the drought prone areas of the country.

Unlike the case of developed nations, who are compelled to mitigate their carbon emissions through the adoption of Kyoto Protocol, the practical measure expected from Ethiopia is to cope with the threat of climate change through the development of local adaptation measures by vulnerable households while lobbying for mitigation options, international solidarity and climate justice. Adaptation to climatic variability may not be new for the Ethiopian lowland pastoralists and highland farmers as there has always been variability in the weather patterns. The challenge, however, is to respond to both a rapid and strong change in the current climate system. In the lowland parts of Ethiopia, it is easy to envision a range of coping strategies in times of stress. The problem, however, is unless a diverse portfolio of location specific and sustainable adaptation options are made available, those available to the poor and which are friendly to the environment are likely to be more restricted and less resilient.

In the absence of research-generated adaptation measures, however, attempts to improve the quality of poor households and bring about development through attaining food self-sufficiency would be unrealistic especially in the hazard-prone areas of the country. Furthermore, these impacts could have the potential to destabilize development activities in the country. Hence, there is an urgent need for understanding the local level impacts of climate change and the realistic adaptation options to reduce the vulnerability of environment, strengthen society livelihoods and economic systems, and cope with the consequences of current extreme climate variability and future climate change

in Ethiopia. Cognizant of this situation, the Forum for Social Studies (FSS) in cooperation with Cordaid initiated a research project to carry out an assessment of the impacts of climate change-induced hazards and the response by drawing cases from the southern lowlands of Ethiopia.

1.3. Objectives of the study

The main objective of this study was to fill in the knowledge gap on the local impacts of climate change-induced hazards and the responses that contribute to development activities and policy formulation. The specific objectives were:

1. To understand the patterns of the local climate based on rainfall and temperature records and map out trends;
2. To assess and document the type and intensity of existing and newly emerged hazards related to climate change and variability;
3. To identify the impacts of the hazards on people, resources and the environment;
4. To examine individual and community responses against the impacts and adaptation mechanisms; and
5. To appraise institutional responses and identify key areas of policy and development intervention.

1.4. Methodology

This study is exploratory attempting to assess climate change-induced hazards by focusing on their localized impacts and the responses of various actors. The study was carried out within three selected Zones in the southern lowlands of the country: Borena and Guji Zones of the Oromia Region and South Omo Zone of the Southern Nations, Nationalities, and Peoples Region

(SNNPR). Table 1 presents sample Woredas, Kebeles and households included in the study.

Table 1. Sample Woredas, Kebeles and number of households included in the study

Region	Zone	Woreda	Samples	
			Kebeles	Households
Oromia	Borena	Arero	Wachile	60
		Yabello	Surupha	49
		Subtotal		109
	Guji	Liben	Hadhessa	43
			Mucho	41
		Wadera	Sokora Jide	40
		Subtotal		124
	SNNPR	South Omo	Hamer	Assele
Arborie Erbore				38
Dasenech			Delegnimore	47
Subtotal			126	
Grand Total				359

Data sources

Data for the study were collected from both primary and secondary sources. Primary data were obtained through a household questionnaire survey, focus group discussions (FGDs) with community representatives, key informant interviews, in-depth individual case study, direct observation, and expert interviews.

The study selected six Woredas from the three Zones (two from each Zone) and focused on eight rural Kebeles purposively selected from the Woredas. The selection was basically considering the prevalence of the problem, availability of Cordaid partner NGOs, and the presence of pastoral and agro-

pastoral households. A total of 359 households were drawn by employing a systematic random sampling procedure from the selected Kebeles for the household questionnaire survey. The sampling was done by using Kebele registration lists whenever these were available and in consultation with Kebele officials and community elders where lists were not available. Households included in the study were interviewed using a structured survey questionnaire. A detailed household survey questionnaire was employed to collect information from the households. The questionnaire covered topics that range from household demographic and socio-economic profile to the occurrence and effects of climate change-induced hazards, impacts, adaptation strategies, and institutional responses.

In addition, 16 FGDs were conducted with selected members of the community. Eight of the FGDs were gender separate (females only) and the rest mixed groups. Sixteen household heads (8 men and 8 women) were selected for the in-depth individual case study. These individuals were thoroughly interviewed using a checklist of guiding questions. The key-informants interviewed included experienced people and community elders. Experts at the various sector offices at the Zone and Woreda levels were interviewed in order to gain enhanced explanation of the problems, the causes and impacts. Discussions and group interviews with Woreda and Zonal administrators, officials and experts from sector offices as well as NGOs operating in the study area were conducted. On the other hand, secondary data were procured from available meteorological records, published and unpublished documents of theoretical and empirical nature, and various activity reports of governmental and non-governmental institution. Although not complete, long-term rainfall and temperature records for some selected stations that cover 3 to 5 decades were obtained from the National

Meteorological Services Agency (NMSA). Further, relevant federal and regional government policies, strategy documents, and proclamations were reviewed and used.

Data analysis and presentation

Data acquired from various sources were analyzed using qualitative and quantitative data analysis techniques. Qualitative analysis usually relies on inductive reasoning processes to interpret and structure the meanings that can be derived from gathered information (Merriam, 2002). The qualitative information gathered using interviews, observations and narrative stories was first translated, affixed codes and categorized into various themes identifying preliminary patterns, themes and relationships. Following such identification and categorization, a more focused investigation of observed commonalities and differences was conducted. Analysis of the individual cases helped to capture insights about the lived experiences of the research subjects and to present the important details of their insights and experiences in a vivid and visually descriptive manner. The quantitative data collected from the questionnaire survey, meteorological data and other secondary sources were analysed by employing SPSS (Statistical Package for Social Sciences) and Microsoft Office EXCEL software.

1.5. Justification and significance of the study

It is widely recognized that Ethiopia is vulnerable to the impacts of climate change and variability. In particular, communities who heavily depend on climate sensitive livelihoods are most vulnerable and affected. The problem is creating social and economic challenges to the development efforts of the country. The challenge stands as a major blockade to achieving the country's Millennium Development Goals that are aimed at eradicating hunger and

poverty, combating diseases and ensuring environmental sustainability. Hence, the direct and indirect negative impacts of climate change on the realization of these goals cannot be understated.

Nevertheless, previous and current investments and disaster responses in the country are more focused on recovery from prevailing disasters than the development of adaptation strategies and enhancing adaptive capacities. This indicates the need to reconsider the disaster intervention strategies of the country which should shift from investing more on emergency and recovery operations to reducing vulnerabilities and strengthening the adaptive capacity of individuals and communities. Such efforts should, however, be based on studies that generate empirical information regarding the problem at the local level in order to guide policy formulation and the development of pragmatic strategies.

To the best of our knowledge, this study is the first of its kind in the country attempting to deal with the problem at such a spatial scale and level of detail. The information generated is expected to contribute to the existing body of knowledge about the local level impacts of climate change. More specifically, it would raise visibility of the actual and potential impacts of climate change on vulnerable groups and regions in the country. It is necessary to build capacity and resilience to enable women and men to cope with the negative impacts of climate change, and to mainstream gender into climate change discussion. In addition to shedding light on what has been a grey area, the study would contribute to the development of suitable adaptation and mitigation strategies and practical measures. It is hoped that the study will be useful not only for communities in disaster-prone lowlands, but also to government policy makers and other stakeholders interested in hazard

mitigation (donors, CSOs/NGOs, members of the research community and advocacy groups).

1.6. Scope and limitations of the study

The study focused on the southern lowlands of Ethiopia as the area is one of the most severely and frequently affected parts of the country with climate change related hazards and impacts. Within the southern lowlands, the study focused on specific sites considering the seriousness of the problem and presence of Cordaid partner organizations operating in the area. The study is basically exploratory and its scope is limited to the assessment of climate change related hazards, impacts and responses. The study could have been much more comprehensive and interesting had it been possible to include more districts and sub-districts in the southern lowlands and beyond. However, for practical reasons such as administrative and resource considerations, the study relied on very few selected areas in the southern lowlands of Ethiopia. This, however, doesn't limit the relevance and generalizability of the findings of the study to other neighboring districts and communities under comparable settings.

2. Literature Review

2.1. Global climate change: An overview

In recent years the term “climate change” has become a core issue in various developmental, environmental and political forums at the national, regional and international level. Many regional summits worldwide have dedicated discussion sessions on climate change based on the recognition that global climate is subject to increasing change and this has become more evident in recent years. In its fourth assessment report, the Intergovernmental Panel on Climate Change (IPCC 2007) concluded that climate change is already happening with its multifaceted effects on human society and the environment. Since the industrial revolution, the concentration of greenhouse gases in the atmosphere has risen steeply owing to increased anthropogenic or human activities for industrial, transport, construction, agricultural purposes and energy production (IPCC 2007). Carbon dioxide, ozone, methane and water vapor constitute the main greenhouse gases. Carbon dioxide contributes 9 – 26%, methane 4 – 9%, ozone 3 – 7% and water vapor 36 – 70% of the greenhouse effect (IPCC 2001, UNEP and UNFCCC 2002). Other greenhouse gases, though with small contributions, include aerosols produced from microscopic particles and droplets in the air, nitrous oxide, sulfur hexafluoride, and chlorofluorocarbons.

Based on climate models and limited observations, the IPCC confirmed that during the last 50 years the atmospheric concentration of carbon dioxide and ozone has increased each by 35% and the global average temperature has risen by about 0.6°C, and the concentration of methane has increased by 151% since 1970 (Ennis and Marcus 1993; IPCC 2001). Further, climate models

project that the mean annual global surface temperature will increase by 1–3.5°C by 2100, global mean sea level will rise by 15–95 cm, and changes in the spatial and temporal patterns of precipitation would occur (IPCC 1996).

2.2. Causes and impacts

Under natural conditions, climate change occurs as a result of internal variability within the climate system due to natural geologic, hydrologic, atmospheric and biotic factors. Nevertheless, anthropogenic factors could disturb the normal climatic phenomena and cause severe climatic anomalies with drastic impacts on people, economies and ecosystems. Scientific and empirical evidences yet clearly indicate that human activity is the main contributor of the currently prevailing global climate change (Schneider 1990, IPCC 1996, 2007, Ribot 1996, Rayner and Malone 1998, UNEP 2006, UNDP 2007).

The human factor contributes to the change in the form of greenhouse gas emissions and land-use/cover changes. These activities have considerably contributed to global warming (the greenhouse effect) and the depletion of stratospheric ozone. Such increases in the level of greenhouse gases emissions are likely to change the yearly average values and annual patterns of temperature and rainfall around the globe.

Population growth and economic expansion have intensified the pressure on the global climate system through industrialization, increased use of fossil fuels, transport development, and land use/cover changes. During the past years, industrialization has led to the release of a considerable amount of greenhouse gases into the atmosphere, with subsequent changes in the global temperature and weather systems (Orinda and Murray 2005). Indeed,

industrialization has contributed to increased technological and economic development although the issue of sustainability remains largely a challenge. According Huq et al. (2006), unsustainable development is the underlying cause of climate change, and development pathways will determine the degree to which social systems are vulnerable to climate change

The direct effects of climate change include changes in rainfall, temperature, soil moisture, and sea level. These changes could have adverse effects on ecological systems, human health, and the various social and economic sectors. The impacts in countries of the world may range from sea-level rise, melting ice caps and glaciers in the polar and coastal regions along with increased incidences of catastrophic drought, flooding and disease burdens in the tropics and sub-tropics (Eriksen et. al. 2008; IPCC 2007). However, the most problematic impacts would occur in poor countries that are heavily dependent on climate sensitive economies and have least adaptive capacities to the changes. Studies show that, agricultural production, human and livestock health, environmental resources, and socio-cultural systems are fundamentally linked to climate (UNEP 2006).

Agriculture is the basis for the livelihood of millions of people in the developing world. However, changes in the normal pattern of climate affects agricultural production (crops and livestock) by reducing the length of growing periods and forcing marginal areas out of production. According to reports of the IPCC (2007), the projected yield reduction due to climate change in some poor countries could be as much as 50% by 2020. This is a burden that would aggravate the poverty situation in many of the food insecure and ecologically and geographically vulnerable countries. For instance, a third of Africa's population lives in drought-prone areas and is

vulnerable to the impacts of climate change (World Water Forum 2000). Droughts have had severe impacts in Africa, mainly in the Sahel, the Horn of Africa and southern Africa since the 1960s and 1980s thus increasing the dependency on food imports and food aids. Rising temperature and recurrent droughts have caused changes in the incidence, reproduction, migration patterns, and survival rates of pests and pathogens. This affects agricultural production as damage from disease causing pathogens and insects will be more serious and weaken the resistance of host plants and crops (IPCC 2001).

Climate change impacts have the potential to undermine national efforts targeted at poverty reduction and improving socio-economic well-being in sub-Saharan Africa. According to the estimates of UNEP (2006), yields of some important cereal crops in Ethiopia, Eritrea, Sudan, Zambia, Gambia and Ghana will decline by up to 5% by the 2080s due to climate change. Another estimate by URT (2003) also showed that there would be a significant decline in the production of certain agricultural food crops in Africa (millet yields by 20 – 76% and sorghum by 13 – 82% in Sudan, maize yields by 33% in Tanzania). NMSA (2001) predicted a reduction of wheat yield by 10.6% to 18.5% in central Ethiopia. Other studies also demonstrated that the decline in agricultural yield would cause rising grain prices which will expose many people in sub-Saharan Africa to hunger and malnourishment (NASA 2001). The negative impacts of global climate change in the sub-region are compounded by a multitude of existing socio-economic and political problems, including widespread poverty, human and livestock diseases, poor environmental management records and poor governance, which is estimated to increase the demand for water, food, and feed resources within the next three decades (Davidson et al. 2003, see also Simms 2005).

According to WHO (2003) and IPCC (2001), climate change affects livestock and human health due to weather extremes (exposure to heat waves and cold), increase in extreme weather events (vigorous hydrological cycles such as floods and storm surges, cyclones, droughts) and increased production of aeroallergens (spores and moulds) and certain air pollutants. Climate change also affects health by speeding up the transmission of many infectious diseases (especially water, food and vector-borne diseases) and reducing the productivity and availability of food and feed resources. It is believed that climate change alters the ecology of some disease vectors and their spatial and temporal transmission. Common human diseases linked to climate change include malaria, dengue fever, meningitis and cholera, among others (IPCC 2001; Zhou et. al. 2004, Patz et al. 2005). Exposure to ozone may cause damages to lung tissues and affect the health of people through chest pains, nausea, and pulmonary congestion (WHO 2003, IPCC 2001). Furthermore, changes in the rainfall amount and disturbance in the patterns of distribution causes flood hazards. Devastating floods caused by such changes have been affecting many places of the world. Through increased frequency and intensity of flooding hazards, water-borne diseases such as cholera could become more prevalent. Flooding also causes the pollution of streams, wells and other traditional water sources in rural areas and leads to the outbreak of various kinds of human and livestock diseases (IPCC 2001).

Climate change causes degradation and loss of important natural resources and ecosystems. The most important of these resources sensitive to climate change include soils, rangelands, water, forest ecosystems, and wetlands. Climate change affects biodiversity by influencing species distribution, composition and function directly and indirectly. Global climate change is particularly expected to significantly alter the ecosystem composition and

function and the species diversity of biological resources in sub-Saharan Africa as species struggle to adapt to rising temperature and shifting rainfall regimes (Hely et al. 2006, Lovett et al. 2005, Solomon and Kirilenko, 1997, Sykes and Prentice, 1996, Vanacker et al. 2005). Recent estimates show that by 2080, the proportion of dry lands in Africa will increase by 5-8% endangering between 25 and 40% of mammalian species in the national parks (Boko et. al. 2007). The most significant and immediate consequences of climate change on water resources relate to changes in the spatial and temporal distribution of rainfall and soil moisture regimes. Studies indicated that climate change could exacerbate periodic and chronic shortfalls of water, particularly in arid and semi-arid areas in the developing world (IPCC 2001, Lovett et al. 2005, Hulme et al. 2001). According to projections, the population at risk of increased water stress in Africa will be between 75-250 million and 350-600 million people by the 2020s and 2050s, respectively (IPCC 2007).

2.3. Global responses to climate change

Several international meetings have been held and conventions adopted during the past decades to address the issue of climate change and its impacts. The United Nations Framework Convention on Climate Change (UNFCCC)¹ is one of the key conventions aimed at preventing dangerous interference with the climate system and hence the stabilization of greenhouse gas emissions at acceptable levels within a specified timeframe. As a framework treaty, the convention set no mandatory limits on greenhouse gas emissions for individual nations and contained no enforcement provisions; it is therefore

¹ UNFCCC was adopted in May 1992 in New York and signed by over 150 countries at the Rio Earth Summit in 1992. More than 190 countries finally ratified it on March 21, 1994.

considered legally non-binding. Rather, the treaty included provisions for updates (called "protocols") that would set mandatory emission limits. The principal update is the Kyoto Protocol, which has become much better known than the UNFCCC itself. The Kyoto Protocol was adopted in 1997 and ratified by 182 countries with the main objective of providing mandatory targets on greenhouse-gas emissions. The Kyoto Protocol, which entered into force in February 2006, commits industrialized countries (called Annex I Parties in the Protocol) to reduce their overall emissions of six greenhouse gases by at least 5.2% from 1990 levels between 2008-2012 (the first commitment period), with specific targets varying from country to country. The targets range from an obligatory reductions of emissions from the EU by 8% to permission to increase emissions by 10% to Iceland. No obligatory targets were set for developing countries, including Brazil, China, and India beyond monitoring and reporting emissions.

The UNFCCC and the Kyoto Protocol have faced several challenges to achieve their prime objectives of reducing emissions. Among others, lack of will and political commitment has been a series impediment caused by some of the most developed nations like the USA. For instance, the US has been against effective action on climate change due to its reliance upon fossil fuel for its economy (UNEP 2006). Furthermore, the conflicting interest of special interest groups including the multinational corporations has been deterring international climate negotiations. On the other hand, some developing economies such as China and Brazil are concerned about the impacts of the convention on their economic growth and insist that they should not be penalized for climate change problems largely caused by the industrialized countries. Critics also point to some defects in the Kyoto Protocol itself pointing out that emissions trading regimes in the Protocol will allow for

notional pollution reductions, the difficulty of establishing full accounting and verification procedures for carbon sinks and the accounting maze that will complicate monitoring and enforcement and encourage national governments to play around with statistics (Retallack 2006).

After the catastrophic droughts and famine that ravaged the Sahel in the 1970s, a United Nations Conference on Desertification (UNCOD) was convened in 1977 to develop a comprehensive program against desertification. Later on in June 1994, the United Nations Convention to Combat Desertification (UNCCD)² was adopted and came into effect in December 1996. This has been a major progress in the fight against drought and environmental degradation. The Convention also aims to encourage affected countries to set up national action plans to combat desertification by promoting grass-roots participation and the crucial role of women in the management of fragile ecosystems. A significant component of this approach is the protection, promotion and use of relevant traditional knowledge and local technology. Nevertheless, there has been a limited partnership between developing and developed nations against desertification mainly because of the perception of desertification and its impacts as developing nation's problem.

Climate change has been the cause of some of the world's deadly disasters leading to the loss of many lives, livelihoods and destruction of infrastructures. Even with substantial scientific and technological

² Desertification is comprehensively defined in the UNCCD as land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities.

advancement, disaster risk is still a threat to human society. Hence, the importance of promoting disaster risk reduction on the international and regional levels as well as the national and local levels has been recognized in the past few years in a number of key multilateral frameworks and declarations. In line with this, the World Conference on Disaster Reduction was held in January 2005 in Japan (Hyogo in Kobe) and adopted the Hyogo Framework for Action 2005–2015. The framework emphasized that disaster prevention, mitigation, and preparedness are more effective than disaster response alone in vulnerability reduction. Moreover, the framework considers the importance and incorporation of an integrated multi-hazard approach to disaster risk reduction into policies and strategies related to sustainable development, relief, rehabilitation, and recovery activities.

In general, global responses to climate change are categorized into mitigation (addressing causes) and adaptation (addressing effects), with the former receiving most of the attention until recently (Nelson et al. 2008). Although climate change negotiations are still dominated by concerns about reducing emissions amongst industrialized nations (mitigation), there are few attempts to operationalize climate change into the wider development agenda (Huq et al. 2006). As the magnitude of the problem and its impacts on vulnerable communities become intense, issues of climate change adaptation and adaptive capacity are emerging as major concerns in development debates, policy decisions, and political circles (Adger et al. 2003). However, adaptation alone without meaningful mitigation could not help to adequately solve the problem, as there are limits to it. In recognition of this fact, the interaction between adaptation and mitigation that has been overlooked is currently receiving greater attention because of the potential synergies and trade-offs (IPCC 2007).

2.4. Climate change impacts and responses in Ethiopia

Ethiopia is especially vulnerable to climate change because of its greater reliance on climate sensitive economic sectors like subsistence crop cultivation and livestock production. In addition, a large part of the country is arid and semiarid and is highly prone to desertification and drought (NMSA 2001). IPCC's regional review of the impacts of climate change has identified three vulnerable areas in Ethiopia; food security, water resources and health (IPCC 2001). Droughts, famines, epidemics and floods are also very common occurrences in Ethiopia. In most instances, these disasters are associated with climatic variability and change. Several studies (e.g. Mesfin 1984, Dessalegn 1991, Nicholls 1993, Coppock 1994, Webb and von Braun 1994, Dagnew 1995, Beruk 2002, Mahmoud 2003, Carter et al. 2004) pointed out increased frequency of incidence of these disasters in many places of the country. The disasters have claimed the lives of millions of people, destroyed crops, and contributed to the death of many livestock over the past decades.

Drought is widely recognized as a major climatic hazard and a key development challenge in Ethiopia. While opinions vary on the severity and frequency of drought in the historical past, recent reports show that droughts have increased in frequency and intensity in recent times. In particular, the southern lowlands are extremely vulnerable to drought and there have been notable droughts in this part of the country over the past several decades (Pankhurst 1966, Tesfaye 1988, Webb and von Braun 1994, Getachew 2001, Taffesse 2001). Many (including Quinn et al. 1987, Kaplan 1988, Tesfaye 1988, Glantz et al. 1991, Nicholls 1993, Funk et al. 2005) believe that the Ethiopian drought is caused by El Niño-Southern Oscillation (a coupled air and ocean phenomenon with global weather implications) and sea surface

temperature anomalies in the Southern Atlantic and Indian Oceans combined with anthropogenic activities.

Flooding is also a problem in many places of the country. Major flood hazards have occurred in 1988, 1993, 1994, 1995, 1996 and 2006 leading to considerable loss of life and property (NMSA 2006). For example, the 2006 catastrophic flood led to the death of more than 650 people and the displacement of more than 35,000 people in Dire Dawa, South Omo and West Shewa and caused huge destruction of infrastructure (NMSA 2006). Similar situations were experienced in Afar, Western Tigray, Gambella and the low-lying areas of Lake Tana. Associated with the floods, Acute Water Borne Diarrhea (AWD) and malaria outbreaks have caused many more deaths. On the other hand, changes in temperature and rainfall have had many negative impacts on human and livestock health. For example, serious disease outbreaks including cholera, AWD, meningitis, and malaria have been reported due to altered temperature patterns and rainfall regimes (NMSA 2006, Assefa 1996, McMichael et al. 2006). Changes in disease vector habitats will expose livestock to diseases such as schistosomiasis, trypanosomiasis, yellow fever and tick-borne hemorrhagic fevers. NMSA (2001) noted that the growth of the country's economy is highly influenced by climate change, particularly drought, and indicated the need to take these changes into account in development policies and programs.

IPCC (2007) noted that climate change is causing major social and economic development setbacks in Ethiopia and urged the need to pay attention to the problem. Indeed, the Ethiopian government has recognized climate change as a threat to its national development aspirations. Thus, the country ratified the UNCCD (in June 1997), UNFCCC (in May 1994), and Kyoto Protocol

(February 2005). Within these frameworks, Ethiopia prepared National Adaptation Programs of Action (NAPA) against the impacts of climate change and desertification. There are also a number of environmentally oriented policies, strategies and action plans that can directly or indirectly contribute to the objectives enshrined in the UNFCCC. These policies, strategies and action plans include Environmental Policy, Conservation Strategy of Ethiopia, Health Policy, Population Policy, Energy Policy, Agricultural Policy, Water Policy, Forestry Action Plan and Disaster Prevention and Preparedness and Early Warning Policy. Such policies are expected to contribute to fight against climate change and desertification in the country. However, climate change impact-mitigation was not translated into the policies and programs of the country. For instance, Environmental Policy (1997), Water Resources Management Policy (1999), PASDEP (2002), Pastoral Development Policy (2002), Environmental Impact Assessment Proclamation (2002), Rural Land Administration and Land Use Policy and Strategy (2004), Wildlife Policy (2004), Forest Conservation and Utilization Policy and Strategy (2007), Biodiversity Conservation and Research Policy (1998), National Policy on Ethiopian Women (1992), Health Policy (1993) and other rural development policies and programs have hardly captured the threat of climate change. In particular, the national policies and programs give limited attention to vulnerable societies in climate sensitive, drought and flood prone areas of the country.

3. The Study Area

3.1. The Southern lowlands of Ethiopia

Ethiopia is a country of diverse topographic and climatic Zones. Broader divisions are between the highlands and the lowlands. While the highlands are located largely in the central parts of the country, the lowlands occupy a peripheral geographic position. The lowlands account for about 60 – 70% of the country's total area and 12 -15 % of the population (Beruk 2002, EPA 2007, MoA 1998). The climate is dominantly of arid and semi-arid types with annual rainfall below 700 mm and a growing period of up to 180 days. The population is pastoral and agro-pastoral largely depending on livestock production. The southern lowlands are dominated by the lowlands of Oromia and SNNPR regions extending from South Omo in the SNNPR to Guji and Borena in Oromia. The area is one of the most vulnerable regions to global climate change and associated natural hazards. Although many places of the country are prone to the adverse impacts of climate variability and change, the effects are much more felt in the southern lowlands. As mentioned earlier, the study has been carried out in three Zones within the southern lowlands of the country; Borena, Guji, and South Omo Zones.

3.2. Description of the study sites

3.2.1. Location and Extent

Borena and Guji Zones are located within the Oromia Regional State, while South Omo is located in the SNNPR. Table 2 presents total area and population of the three Zones. Borena Zone is one of the 17 administrative Zones in the Oromia region and is divided into 10 Woredas. It is bordered by in the south Kenya, in the west SNNPR, and in the north Genale River.

Borena Zone covers a total area of 48,743km² and has a total population of 966,467. Guji Zone is divided into 12 Woredas and covers a total area of 35,000km². The population of Guji Zone is about 1.4 million. The Zone is bordered by Borena Zone in the south, Burji, Koyra and Gamo in the southwest, Arsi Oromo in the East and Gedee, Sidama and Wolaita in the North (Negera 2005). Yabello is the capital of Borena Zone and Negele Borena that of Guji Zone. In both Borena and Guji Zones, females account for about 49% of their respective total population.

Table 2. Population and total area of the study Zones

Zone	Population ('000)			Total area (‘000km ²)	Density (persons/ km ²)
	Male	Female	Total		
Borena	489	477	966	48.7	20
Guji	714	699	1,413	35.0	40
South Omo	288	289	577	24.3	24

Source: CSA 2008

South Omo is one of the 9 administrative Zones in the SNNPR and it is bordered by Kenya in the south, Benchi Maji in the west, Keficho Shekicho in the northwest, North Omo in the north, Dirashe and Konso in the northeast, Borena Zone in the east. The Zone is named after Omo River which descends from the central highlands of the country. South Omo covers an area of 24,378 km² and is divided into 8 Woredas. Females account for about half of the total population in the Zone. Jinka town is the capital of South Omo Zone. Though the population densities of the three Zones are less as compared to the country’s density, Guji is relatively densely populated than South Omo and Borena Zones. This is because Guji Zone is settled with considerable number

of agricultural and agro-pastoral people where food and cash crop productions are very important.

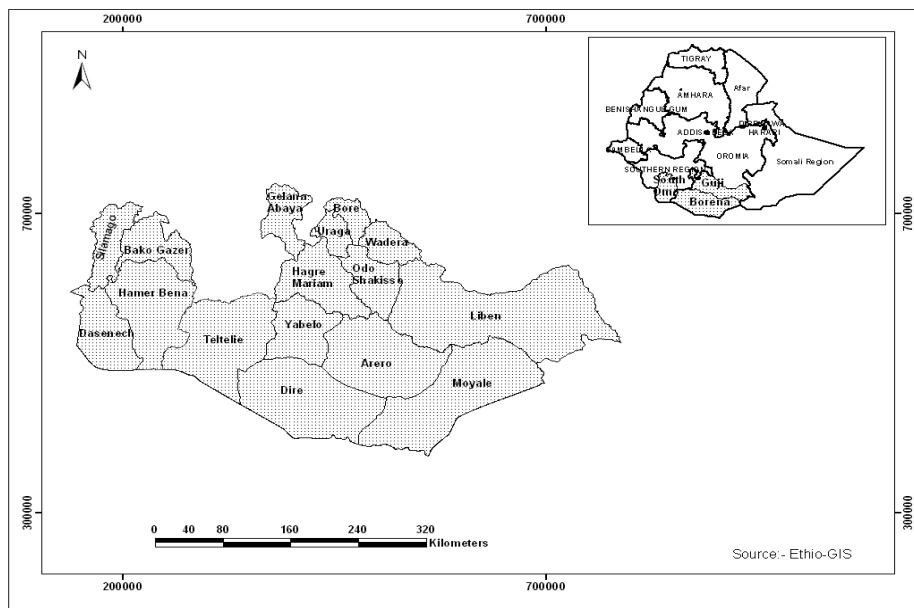


Figure 1. Location of the study area (Shaded)

3.2.2. Biophysical condition

The physiographic setting of the study area is characterized by an extensive plain land with scattered hills and mountains. Elevation is generally below 1500m a.s.l. and some places are as low as 800 m a.s.l. Borena Zone has an extensive lowland area widely located in its southwest and eastern parts that are known as the southern rangelands. The physiography of Guji Zone varies from gently undulating plains to hills and mountains. The Zone has more mountains and hills as compared to Borena Zone. South Omo is also dominated by a fairly flat topography. The climate of the study area is of semi-arid and arid type with average annual rainfall ranging between 350 and 800mm and average annual temperature between 19 and 29°C. The area

belongs to the dry sub-humid to the semi-arid moisture regimes. In some places, annual rainfall reaches up to 1000mm in the highland parts of the study area, like in the highland of Guji Zone. The rainfall distribution is bimodal with long rains occurring during March to May and short rains from September to November. The long rains account for about 60% of the total annual rainfall in many places of the study area.

Both perennial and seasonal streams characterize the drainage system of the study area. While there are few perennial streams, the seasonal streams are countless. The major perennial rivers include Dawa, Woito, Segan, Omo, and Genale. Dawa River drains Borena Zone which originates from the northwestern parts of Borena and flows in the direction of northeast to the lowlands transecting Guji Zone to join Genale River at the Ethio-Somalia border. The Segan River also drains Borena Zone. Omo and Woito are the major rivers draining South Omo Zone. Omo is one of the largest rivers in the country and flows down south from the central highlands and joins Lake Turkana. The vegetation pattern of the study area varies according to moisture gradient. The vegetation type is largely dominated by woodland savanna composed of shrubs, thorny bushes and various species of grasses.

3.2.3. Socio-economic characteristic

Borena and Guji Zones are dominantly inhabited by the Oromo people. These places are also considered as the cradle of Oromo people and reservoir of their culture and tradition (Asmarom 1973). Although the Oromos are dominant in Borena and Guji Zones, there are a number of other ethnic groups living interspersed with the Borena and Guji: Geri, (predominantly in Moyale), Gebra, Degodi (Somali clan around Moyale), Konso, Arbore and Hamar (in Teltelle and Dire Woredas of Borena Zone). However, people of diverse ethnic groups

inhabit South Omo; about 16 ethnic groups are known to live in the Zone with a diversity of cultures and traditions. Hamar, Arborie, Dasenech, Nyangatom, Ari, Bena, Karo, Kwegu, Mursi, Tsemay, Dime, and Bodi are some of the major ethnic groups in the Zone.

Majority of the people in the three Zones are engaged in livestock based livelihoods. Although crop cultivation is practiced in some places, pastoralism is the main economic activity of the area. In Borena Zone, for instance, livestock production is largely the dominant activity mixed with intermittent cultivation of crops. The low-lying parts of Guji Zone focus on pastoralism while the uplands are agro-pastoralists. In South Omo, while pastoralism is the main engagement, there is also river side cultivation along the lower courses of Woito and Omo rivers. However, this system of production is limited in scope and contributes little to the overall subsistence needs of the people. Livestock herding and opportunistic cultivation are supplemented by honey production, collection of leaves and berries, as well as hunting. These supplementary livelihood practices are carried out as coping mechanisms particularly during drought seasons. As shown in Figure 2, Guji is the leading Zone in livestock production with cattle constituting the largest portion of the household herd followed by Borena and South Omo. Camels and equines constituted a very small proportion of the livestock in the three Zones.

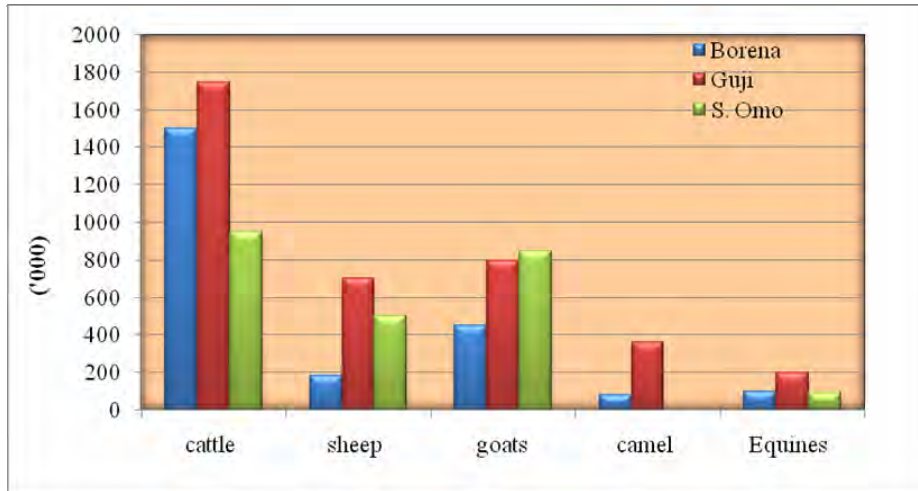


Figure 2. Type and distribution of livestock in the study Zones
(Source: Zone offices of Agriculture 2008)

According to information obtained from the Zonal Agriculture and Food Security Offices, the land use system in Borena and Guji Zones show that grazing/browsing land covers about 1,871,190 ha and 396,000 ha,, respectively while bush and woodland cover an estimated area of 155,050 ha and 154,000 ha, respectively. Cultivated land of the area covers an estimated 342,040 ha (Borena) and 430,000 ha (Guji). Livestock exports from the study area normally contribute substantially to national foreign exchange earnings. The area provides high quality livestock to the highland areas for traction power and as a valuable genetic base for inter-breeding. Land degradation, bush encroachment, deforestation, and livestock diseases (such as black leg, anthrax, CCPP, CBPP, camel diseases) and land use conflict were among the major challenges in the three Zones. Furthermore, poor infrastructure, limited social services, scant opportunities for income diversification and poor terms of trade are major impediments affecting the potential gains from pastoral and agro-pastoral activities. As the livelihoods of pastoralists and agro-pastoralists

depend on key resources such as land, water, forests, wildlife, livestock and pasture, the environment poses particular challenges to their survival. These resources are diminishing from year to year, intensifying competition over resources and causing insecurity, and tensions and conflicts between ethnic groups.

4. Results and Discussions

This chapter presents and discusses local evidences of climate change and variability, induced hazards, and the impacts and responses in the study area based on results obtained from household survey, historical rainfall and temperature data, and qualitative information generated from various groups of the community and concerned officials.

4.1. Profile of the respondent households

Of the total respondents included in the sample, 18% were female-headed households. The age distribution of the respondents ranges from 20-80 years with an average age of 42 years. However, half of the respondents are below 40 years of age and 75% below 50 years.

As shown in Table 3, more than two-thirds (69%) of the household heads were illiterate with no formal education of any kind and thus are unable to read and write. Only 10% of the respondents stated that they can read and write while only one-fifth of the respondents (21%) have some form of formal schooling. Illiteracy rate is relatively the highest in South Omo (91%) and the lowest (48%) in Guji Zone. This is not surprising as available educational services and the attitude of local people in South Omo towards formal education are minimal.

Table 3. Characteristics of the respondents (% of households)

Characteristics	Borena (n=109)	Guji (n=124)	S. Omo (n=126)	Total (n=359)
Sex				
<i>Male</i>	76	85	84	82
<i>Female</i>	24	15	16	18
Age				
<i>Average age (yrs)</i>	42	41	45	42
<= 50 years	75	84	72	75
Education				
<i>Illiterate</i>	67	48	91	69
<i>Read & write</i>	17	12	2	10
<i>Primary (Grades 1-6)</i>	5	29	6	14
<i>Post primary</i>	11	11	1	7
Occupation				
<i>Pastoralist</i>	80	39	23	46
<i>Agro-pastoralist</i>	20	61	77	54
Land holding				
<i>Average size of cultivated land (ha)</i>	2.1	4.3	0.6	2.3

Source: Field survey 2008

In terms of occupation, about 46% of the respondent households are pastoralists while 54% of them are agro-pastoralists engaged in both crop and livestock production. Indeed, it is difficult to establish a clear demarcation between purely pastoral and agro-pastoral activities in the study area as households often transcend to any of these activities. Instead, the categories are made considering a focused and continuous engagement of households in either of the activities. The average size of cultivated land is 2.3ha. Households in Guji own relatively more land for cultivation (4.3ha) compared to those in the other Zones. Small land holding sizes in South Omo is partly explained by the lack of potentially favorable cultivable land owing mainly to the moisture stress except on the flood plains and riverbanks of the Woito,

Segan and Omo rivers. On the other hand, grazing land is communally owned in the study area. However, households sometimes fence a plot of land for private use during the dry season in a way of establishing a sort of private ownership. An overwhelming majority of the households (88%) complained that they do not have enough grazing land for their livestock.

Table 4 summarizes the activities of the households in the study area. Over three-fourth of the households largely depend on livestock and livestock products as main sources of household income. However, the contribution of crop cultivation, charcoal and firewood selling, bee keeping, and incense and natural gum selling to household income is not insignificant. This indicates that households tend to diversify their income sources in order to avoid the risks of excessive dependence on livestock production. However, some of these activities such as charcoal and firewood selling are unsustainable income sources that might exacerbate ecological destruction and climate change.

Table 4. Major income generating activities of households (% of respondents)

Income generating activities	Borena	Guji	S. Omo
Livestock selling	86	88	82
Selling livestock products	69	76	76
Bee keeping	6	23	37
Crop cultivation	25	49	59
Production and selling vegetables	2	12	7
Making and selling charcoal	8	7	23
Selling firewood	12	12	36
Selling water	8	3	5
Incense and natural gum selling	23	14	25
Selling minerals	2	7	3

Source: Field survey 2008

4.2. Patterns of the local climate

In general, meteorological data for most of the stations in Ethiopia is very scanty and incomplete. Nonetheless, an attempt has been made to decipher the long-term climatic patterns based on available rainfall and temperature data from three stations within the study area that have relatively long term records; Yabello (Borena), Negele (Guji), and Dimeka (South Omo).

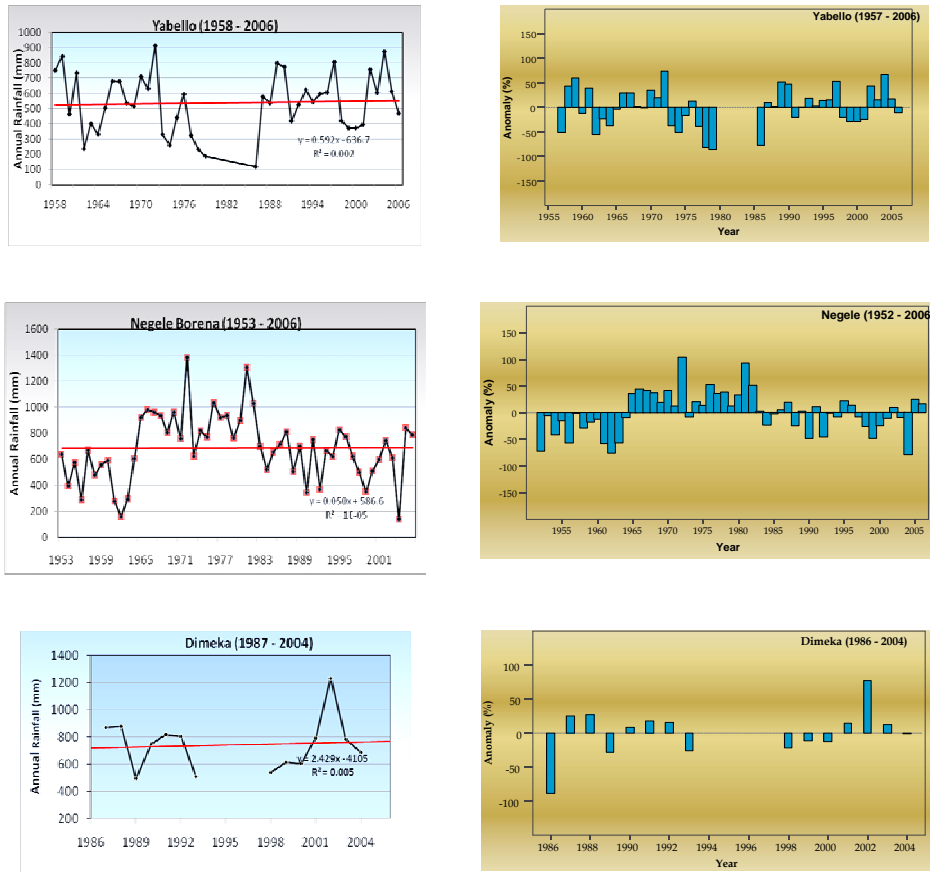


Figure 3. Patterns of rainfall distribution in the study area

Rainfall variability and trends

The average annual rainfall in the area ranges from 400 to 700mm, with wide temporal and spatial variation. The rainfall pattern is extremely variable, unpredictable and uneven in distribution over time and space and erratic, which is characterized by late onset, early cessation and sometimes complete failure. The graphs in Figure 3 show distribution of the annual rainfall and the anomalies³ over the past 3 to 5 decades. Rainfall distribution in the study area is generally characterized by high degree of inter-annual variability over the past years. Analysis of the linear trend of annual rainfall indicates a slight increase in Borena and South Omo Zones, but a decrease in Guji Zone. As shown in the anomalies, there were considerable deviations from the long-term annual average in all the three stations. Since the 1980's most of the anomalies at Yabello were positive while the deviations at Negele Borena were largely negative. According to NMSA (2007), the average annual rainfall trends in the past four or five decades showed a declining trend in the southern lowlands and other water stressed regions of the country.

An assessment of the performance of the *Ganna* (main rainy season) in Borena Zone conducted from May 28-06 June 20008 also found that rainfall received during the main rainy season was very low and scanty. The rainfall was not only below normal but also late by more than two weeks and stopped too early to enhance the normal growth of crops, grasses and herbaceous species in the Zone. The rain lasted from only two days in some pocket areas to about fifteen days in others. The report further indicated that the erratic and

³ The anomaly is calculated as percentage deviation between the annual rainfall for each year and the long-term annual mean.

uneven distribution of the rain was such that there were some pocket areas which have received no rain at all⁴.

Temperature variability and trends

The average annual temperature is 25.8°C at Yabello, 26.2°C at Negele Borena and 31.8°C at Dimeka station. Temperature distribution in the study area is characterized by a general increase and certain inter-annual variability. Reports indicate a general trend of atmospheric warming in Ethiopia. According to the National Meteorological Agency (NMA 2007), the average maximum temperature in the country has been increasing by 0.1°C per decade. The temperature in the Ethiopian highlands has been increasing by 0.3°C per decade (Muna 2006). A similar pattern is observed in the southern lowlands of the country. Fig.4. shows the patterns of annual temperature for the three stations. As can be seen from the figure, all the three areas have experienced increasing trends of temperature over the past decades. It is well recognized that small increases in temperature can result in measurable impacts on the health of human beings and livestock as well as the availability of water, food and feed resources.

⁴ Final report of the Borena Zone 2008 pastoralist and agro-pastoralist (low and highland) area food security assessment (final report, May 28-06 June 2008. Borena Zone Disaster Prevention and Preparedness Committee

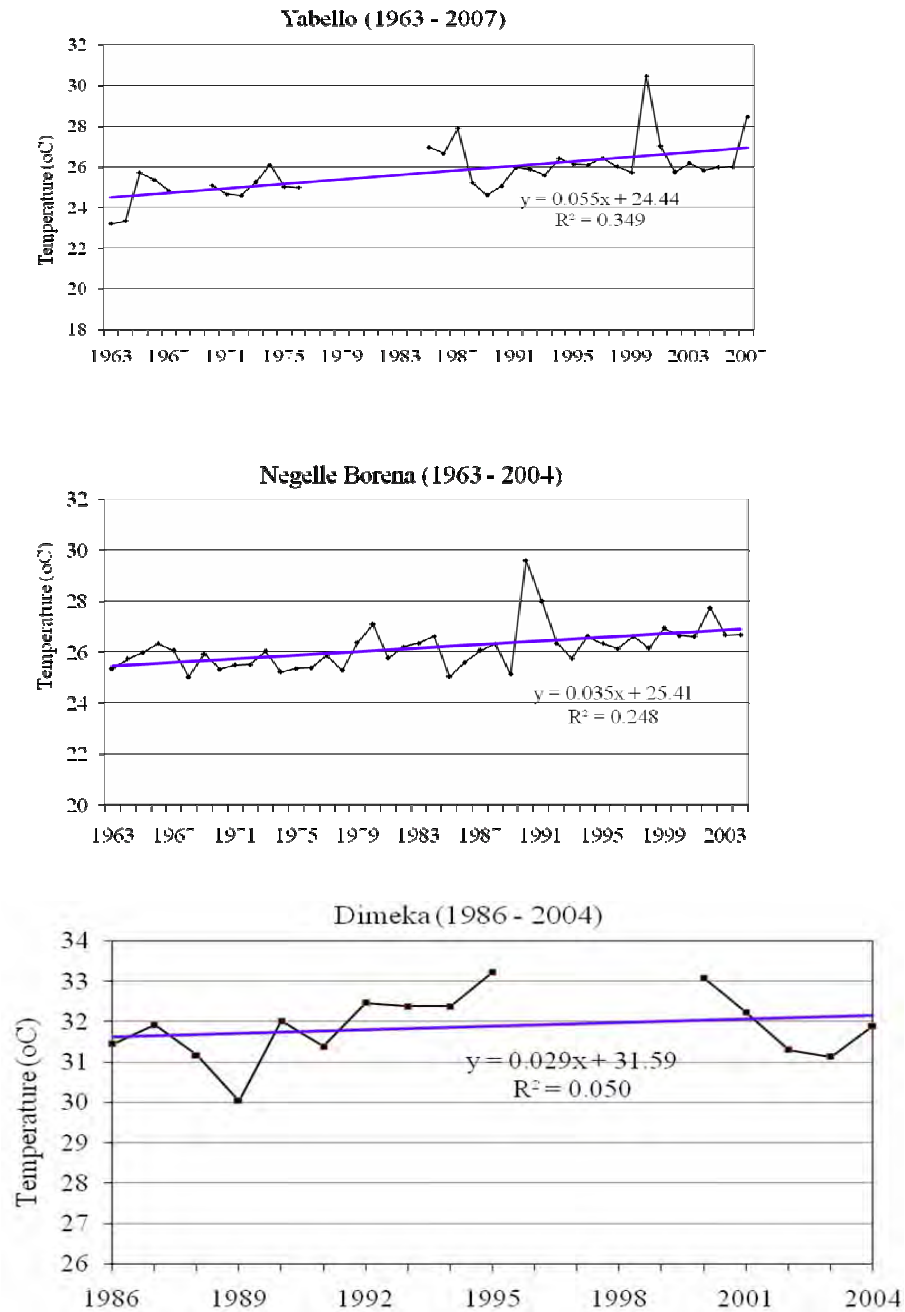


Figure 4. Patterns of annual temperature distribution in the study area.

4.3. Community perspectives of the local climate

In the discussions and interviews, community representatives indicated that since the past few years the rainfall pattern has changed and shown a decreasing trend in amount and distribution. They described about the “good old days” when the rains were very normal and pastures and water resources relatively sufficient for their livelihood activities. However, according to them, this is a thing of the past; even "good" rains these days are very erratic, insufficient and unevenly distributed. There has also been a general increase in the local temperature and elders have explained this in terms of burning sunlight, powerful sunrays, very dry and windy days and extended dry spells. They bitterly complain about the long dry and hot days they are experiencing in recent times, which is a challenge to themselves and their livestock since it is difficult to get shade trees around.

Individual responses captured in the household survey on the patterns of climate change also reflect the views held in the discussions. About 95% of the households confirmed that they have experienced changes in the patterns of the local climate in the form of increased temperatures, declining rainfall amount, and reduced rainy days (Table 5). This is in agreement with the rainfall data presented in the previous section. About 91% of respondents in all Zones reported that the rainy seasons are increasingly becoming short with time and the number of the rainy days is getting fewer and fewer. Even then, the rains received in the main rainy seasons are neither dependable nor predictable as the seasonality and irregularity of the rains is getting worse over time (93% of the respondents confirmed so). In the discussions, the participants in South Omo described the irregularities and vagaries of rainfall

Assessment of climate change-induced hazards, impacts and responses

in terms of late onset and early cessation of the main rains that should start in January/February but now shifted to April and stops early than was the usual.

Table 5. Perception of changes in the local climate (% of households)

	Borena	Guji	S. Omo	Total
Changes in the local climate				
<i>Yes</i>	92	94	98	95
<i>No</i>	8	-	2	3
<i>Not stated</i>	-	6	-	2
Changes in rainfall amount	19	7	12	12
<i>Increased</i>	81	93	88	88
<i>Decreased</i>				
Changes in the number of rainy days	6	8	6	7
<i>Increased</i>	94	92	94	93
<i>Decreased</i>				
Temperature condition over time	96	88	95	93
<i>Hotter</i>	4	12	5	7
<i>Colder</i>				

While scientific explanations of climate changes have mainly concentrated on anthropogenic greenhouse gas emissions, local interpretations of observed climate changes are often much more varied and encompassing. Some people consider adverse weather conditions as punishments from God for their wrongdoings. When asked to explain the causes of climate variability and change, “only God knows” is their usual response and they are uncertain about their situation in the future. Community representatives, local administrators and experts believe that the good times of the past which the people of the study area have been experiencing is unlikely to return at least in the near future.

However, in some of the discussions held with the community, other factors than those linked to spiritual causes were mentioned. They recognized the contribution of human activities such as deforestation, annexation of land for cultivation, overgrazing, expansion of settlements and demographic pressure. For instance, a community elder in Guji Zone explained the situation as follows.

Pointing to the bare, undulating hills located at a distance, the old man said: “Do you see that hill over there? It used to be covered with forests. In the dry season it was a place where we could always find water. There were shades, there were wild fruits...” But now, there is nothing good to be seen on those hills anymore. If you go there now, you will find no trees, no shades. They were all gone”.

4.4. Climate change induced hazards

The study area has been exposed to several climate change-induced hazards. The most prominent of these hazards include droughts, flooding, diseases and pests.

4.4.1. Drought

Drought is not a new phenomenon in the study area. The area has experienced severe droughts over the past years. Severe droughts occurred once every 2-3 years. Earlier reports indicate that droughts do occur once every 4 to 5 years in the area. However, the drought cycle has changed in recent times and become more frequent, 2 to 3 years, giving no time to recover from its impacts. In its March 2008 food security assessment report, the Agriculture Office of Borena Zone disclosed the prevalence of droughts every year. In addition, community representatives and experts indicated the persistence and

unrelenting nature of recent droughts in the area. Particularly, the last ten years have seen more frequent and prolonged droughts. According to the informants, drought prevailed in the years 1998/9, 2000/01, 2003/04, 2006/7 and 2007/8. During the recent drought, the rains were not only insufficient but also extremely unpredictable. For example, the rainfall during the main rainy season of 2008 was late by more than two weeks and stopped too early. The rain lasted from 2 to 15 days in most of the places of the study area and there were some areas which have not received rainfall at all.

Box – 1

Gnemer Lobet, Dassenech

Gnemer is an elderly agro-pastoralist from Assele village in South Omo. He is one of the informants who explained the increased frequency and intensity of droughts in South Omo. He bitterly complained that the sun is becoming hotter and the extent of dryness is increasing. The rainfall amount is decreasing from time to time and its distribution has become very irregular and unpredictable for our activities. He says, long time ago we had rain continuously from year to year. There was no drought of the kind we are now experiencing. The cattle were fat. We also fetch excess amounts of milk and butter that can support our family. There were also some flowers in the pasture. We did not even move long distances to get water because we had ample supplies and traditional wells in our village were in a good state. But these days we get rain only for few days. Sometimes the rain fails and a continuous dry season prevails for consecutive years. And when it rains, it doesn't prevail during the normal rainy season and starts late and ends very early disturbing the normal growing season. When we expect better yield, our farm dries up and we don't get anything. I believe that this kind of drought is a punishment from God. How many rainless days, weeks, months and years will have to pass before we realize that God is in control of everything?

4.4.2. Flooding

Flooding is one of the major climate change induced hazard in the study area. In particular, South Omo Zone is most flood-prone as it is drained by big perennial rivers (Omo and Woito) that descend from the humid central highlands of the country. Repeated flash and seasonal floods from the Omo River have caused widespread destruction of life and property mainly in Dasenech Woreda. Major floods in Dasenech Woreda occurred in 2006 and 2008. In August 2006, the Ethiopian government reported the death of 364 people and 3000 livestock and the displacement of 15,000 more people in 14 villages in the area. The flooding claimed the lives of more than 2700 heads of cattle. Many more villages were destroyed in which houses, infrastructure, and agricultural crops were wiped out. This is one of the most notable disasters ever happened in the region. Apart from the direct loss of life and property, the floods led to the outbreak of fatal diseases such as diarrhea (acute watery diarrhea) and malaria. The floods of 2007 also caused the displacement of about 3800 people.

In Hamer Woreda, flooding occurs along the Woito river and cause considerable damage to cropland and livestock. For instance, in 2007 unexpected heavy rains caused severe flooding that displaced people and destroyed crops. In this incident, nearly 4000 people were displaced and about 444 ha of land under maize and sorghum were damaged in Hamer. Further, the floods hindered land preparation activities for the next cropping season. In spite of these damages, however, the people in Hamer district consider the flooding of the Woito River as a means to cultivate crops on the flood plains and hence it is not that much felt as a problem by the local people. They use the moisture on the riverside to cultivate maize and sorghum.



Plate 1. Bridge damaged by flash floods (left) and people displaced due to the flooding of Omo River in November 2008 (right)

Very recently, major zonal towns like Yabello (Borena) and Jinka (South Omo) were hit by unexpected and unusual flash floods which caused mild destructions and disruptions of economic and social activities. In Guji, households from Wadera Woreda (Sokora Jide Kebele) were also affected by the loss of crops and livestock from flash floods. In 2008, unexpected heavy rains that fall during the main harvest season produced heavy flooding and huge damage to crops and farmlands. It has also hindered land preparation efforts for the next season.

On the other hand, hydropower development activities along the Omo River would intensify the risks of flooding in the downstream area. There are already two dams (Gilgel Gibe I and II) constructed and a third one (Gilgel Gibe III) is underway. Gilgel Gibe III is a big dam with huge water storage capacity. Although such an effort significantly contributes to the development of the country's energy sector, it has been severely criticized for not taking environmental and socio-economic impacts into account.

Box – 2

Yiryama Loyitakirs: Devastating floods

Rainwater and the Omo River are the main sources of water for the Dassanetch pastoralists in Omorate, South Omo. The community practice small-scale flood retreat opportunistic cultivation following the flooding of Omo. But in recent times floods have claimed many lives and caused serious damages to livelihoods and infrastructures. Although the elderly Dasenech agro-pastoralist Yiryama Loyitakirs has lived through droughts and floods, he remembers the worst in August 2006. “The flood that hit our area in 1999 EC had the worst impact. We opted to die by the flood than leave the Omo plains, as there was no grass at other locations. The flood has damaged my maize and bean crops... I have lost 17 heads of cattle and above 30 goats. Before the flood attack I was not a poor man. But after the flood that damaged my crops and killed my livestock, I am destitute now.

4.4.3. Diseases and pests

Climate change has direct and indirect impacts on prevalence and spread of diseases and pests. Over the past years, the incidence and distribution of diseases and pests has changed due to climate change in the study area. Estimates show that 77% of South Omo is exposed to malaria, and 61% to Tsetse fly (World Bank, 2004). Existing diseases known in the area are expanding and new types are emerging which some of the types are not yet identified. Major human health challenges identified during discussions include occasional outbreak of epidemic diseases, malaria, AWD (acute watery diarrhea), measles, Rift Valley fever, and cholera outbreaks. Community representatives and experts in the study areas indicated that climate change has resulted in increased incidence and spread of diseases in recent years. The causal link between climate change/variability and outbreak of human diseases such as malaria, cholera, Rift Valley Fever and meningitis

is established (Bouma et al. 1997, Patz et al. 2005, Haines et al. 2006, McMichael et al. 2006, Sachs and Malaney 2003). Small increases in temperature and changes in precipitation can result in measurable impacts on malaria, diarrhea, and diseases related to floods and malnutrition (Haines et al. 2006). In the study area, malaria is a common disease in Dasenech and Hamer (South Omo), Liben (Guji) and Wachile (Borena) Woredas. However, in recent times the disease is widely spreading in other areas that have been least affected before, for example in Wadera Woreda. Even in places where malaria was common, the disease has become more severe and fatal. Reduced immunity due to malnutrition and change of diet has contributed to higher morbidity and mortality rates as a result of malaria. Furthermore, the community indicated that new diseases that include cold, respiratory and intestinal diseases are affecting them. Due to drought and food shortages, people had to depend on previously non-edible wild fruits, leaves, and roots. These changes in diet cause certain health abnormalities. A good example is diarrhea to the extent of containing blood which occurs widely at times of severe droughts.

Climate variability and change posed increasing risks to livestock production in the study area. According to community representatives and district level experts, with recurrent and extended droughts, existing and newly emerged livestock diseases are causing more illness and livestock deaths. For example, these newly prevalent diseases affect camels and goats that are considered most resistant to drought. It is common to observe discharge of blood and mucus coming out through the noses of camels and cattle. Coughing of camels and cattle to the extent of affecting their breathing system is widely observed. These in turn affected the mobility of livestock under severe heat conditions and sometimes result in death. Tick and skin diseases on camels,

cattle, goats and sheep are increasingly becoming common problems during drought crisis. Table 6 shows major endemic and newly emerged livestock diseases identified in the study area.

Table 6. Major livestock diseases in southern Ethiopia

Livestock types	Existing diseases	Newly emerged diseases
Cattle	Foot and Mouth Diseases Contagious Bovine Pleuropneumonia (CBPP) Black leg Anthrax Lumpy skin diseases Rabies External and internal parasites	Many tick borne diseases Dermatophilosis Brucellosis Pasteurellosis Malignant Catarrhal Fever (MCF) Bloody diarrhea
Shoats	Contagious Caprine Pleuropneumonia (CCPP) External and internal parasites Sheep pox Goat pox	Tick borne diseases PPR (goats) Nairobi sheep disease Coenurus Lung diseases (goats) Worms causing lung and liver diseases Mastitis Anthrax
Camels	Trypanosomiasis Camel pox	Respiratory diseases External and internal parasites Unidentified new disease
Equines	Strangles External and internal parasites	African Horse Sickness (AHS)

Source: Field Survey and Yabello Regional Health Centre 2008

The newly emerged diseases are locally known with different names. For instance, *timbero* (new disease affecting cattle and goats in Hamer), *sirgo* (new goat madness disease in Guji), *eido* (fatal bloody cattle in Borena), *harkaa* and *hudha* (new varieties affecting lungs and respiratory system of livestock and shoats), *ciita* (anthrax), *dhukuba dudda* and *tetete* (disease affecting the bones) were reported. There are also unidentified new diseases that are causing sudden death of camels and goats. They link such newly

emerging and expanding diseases with the change in wind conditions, temperature and rainfall regimes and blame recurrent and long droughts. Moreover, during severe droughts household are forced to move their livestock to distant places, potentially exposing their herds to different environments with health risks to which they have never been exposed. Occasional flooding causes livestock deaths and deadly water-borne diseases.

Changing patterns of the local climate has caused crop damages and failures due to moisture stress, diseases and pest infestations. This is particularly a significant challenge to agro-pastorals of the study area who partly depend on crop production. For example, in Wadera Woreda (Guji zone), due to late onset and insufficient rains, there happened total destruction of crops during the 2006/7 cropping season. In Liben Woreda of Guji Zone, significant crop losses and destruction of pasture have resulted due to the prevalence of unusual armyworm infestations. According to the Borena Zone office of Agriculture, croplands and most important potential grazing areas in Yabello, Arero and Abaya districts have been devastated by locust and African army worm (*Spodoptera exempta*). Similarly disasters have damaged cropland in South Omo as well.



Plate 2. African army worm (*Spodoptera exempta*) infestation on wheat field in Liben woreda in 2008.

Households were asked to indicate the prevalence of livestock and crop diseases over time (Figure 5). More than 70% of the households in South Omo and Guji, and 56% in Borena indicated that livestock diseases have intensified in recent years compared to the past and have caused increased loss of livestock. Declining rangeland and crop productivity is reducing the amount and quality of already scarce forages and crop by-products, which in turn reduced the productivity and reproduction of livestock. Less water is making the situation more complicated. Regarding crop diseases and pests, more than half of the households in all the three Zones said that the prevalence of crop diseases and pests has increased with time. Zonal and Woreda agricultural experts also share a similar view regarding the increased intensity of crop diseases and pests in the area.

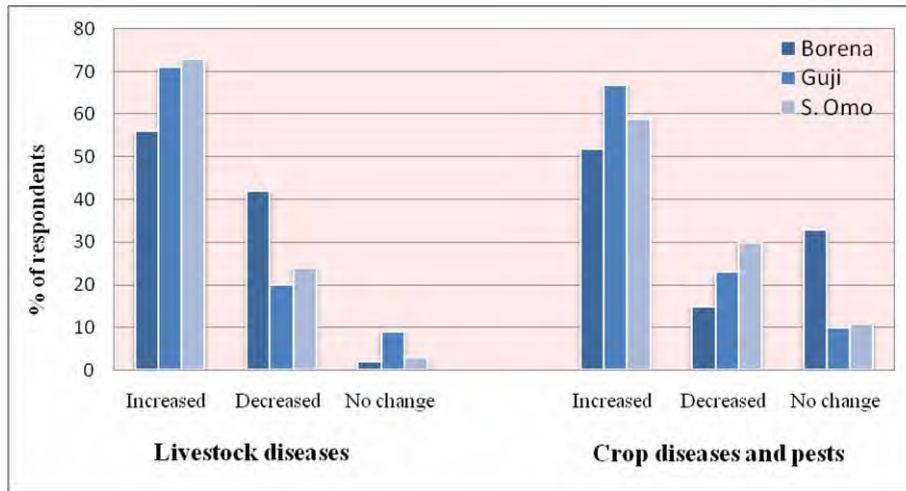


Figure 5. Change in livestock and crop disease and pest during the past years

4.5. Impacts of climate change induced hazards

The hazards induced by climate change have diverse impacts on the people and the environment. The various impacts induced by these hazards are

discussed under four headings: impacts on livelihoods; impacts on social relations; impacts on women and children; and impacts on natural resources and the ecosystem.

4.5.1. Impacts on livelihoods

Climate change and variable weather conditions have had serious impact on livestock and crop production in the study area. Since much of a pastoral household's consumption requirement is derived from livestock or exchange with livestock products, the loss of livestock is a serious risk for the livelihoods and socio-cultural fabrics of the communities. As discussed in the previous section, droughts and diseases are resulting in loss of livestock and erosion of basic household assets. To most households, loss of milking cow, goat or camel means loss of important source of food or income to sustain their life. According to informants in Guji (Hadhessa), Borena (Wachile) and Hamar (South Omo) the decline in livestock productivity and reproductive capacity is the most serious risk they are facing today. They narrated their experience in terms of underfeeding of livestock and falling productivity.

“In the past we had good pastures around. Now the fields are barren and availability of pasture is limited to few pockets. In the past, a young cow used to conceive at age of three years and gives birth to calves frequently. Now cows stay four to five years without giving birth. This is purely due to lack of fodder. They do not give us as much milk as we require. Even if they do give birth to calves, they can't feed them, let alone provide extra milk for us. In addition, the aroma, taste, color and thickness of milk has changed and become poor in quality. This is the result of climate change and reduced supply of pasture and water resources in our areas”.



Plate 3. Livestock affected by the recent droughts of 2008.

An assessment of the livestock possession of pastoral households in the last 20 years is given in Figure 6. Average ownership of livestock per household in the sample shows that pastoral households have experienced downward spiral and erosion of livestock assets. For instance, the average number of livestock in Borena has declined from 10 oxen, 35 cows and 33 goats 20 years ago to 3 oxen, 7 cows and 6 goats at present. Similarly, in South Omo the number of livestock per household decreased from 30 cows, 38 goats and 36 sheep 20 years ago to 21 cows, 23 goats and 21 sheep at present. This shows a downward spiral in the livestock possession of households. Nevertheless, in some of the most drought prone areas such as South Omo, households tend to focus on the production of drought resistant livestock types like goats.

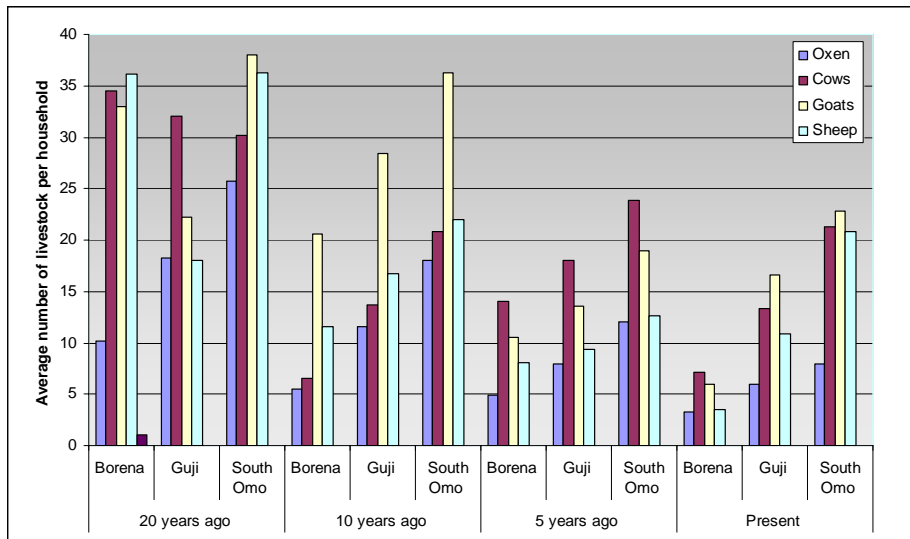


Figure 6. Livestock possession of households during the past 20 years

Shortage of adequate fodder and underfeeding of livestock increased vulnerability to disease risks associated with drought and climate stress. The problem is exacerbated by shortage of health facilities, services and poor infrastructure. Table 7 shows drought-induced livestock deaths during 2006 and 2008 in Borena Zone. Severe livestock deaths were reported in 2006. The total livestock deaths during the two years were relatively more in Arero and Yabello Woredas. Deaths were also significant in 2007 particularly camel. According to information obtained from the office of Agriculture of Guji Zone⁵, about 3000 cattle and 3000-4000 camels have died in Liben Woreda alone in 2007/08. The death of camels has happened just in a matter of one month (March-April, 2008) and such unprecedented incident was caused by unidentified disease. This was shocking to the people as well as local experts and officials.

⁵ Personal communication with Mulatu Woubshet, expert at Guji Zone Agriculture office (date, 08-05-2007)

Table 7. Drought-induced livestock deaths in Borena (2006/07 and 2007/08)

Woreda	Cattle		Goats		Sheep		Camels		Total	
	2006	2008	2006	2008	2006	2008	2006	2008	2006	2008
Arero	19,537	8,102	7,565	1,899	1,100	325	2,014	283	30,216	10,609
Yabello	600	7,396	250	1,552	93	-	13	-	956	8,948
Teltelle	2,937	1,099	6,818	200	3,405	-	19	-	22,127	2,598
Dire	56,464	-	31,038	-	18,942	-	943	-	107,387	-
Miyo	41,022	2,174	18,328	464	7,231	-	362	-	66,943	2,638
Moyale	22,842	747	5,000	1,798	235	-	3	77	30,718	2,622
Total	143,402	19,518	68,999	5,913	31,006	325	3,354	360	246,761	26,116

The household survey data confirms that there is a declining trend in the production and availability of food crops in the study areas (Figure 7). Generally, the household production data tells that crop harvest was relatively better in the past (some 20 or even 10 years ago) than in recent years. A general decline in the production of crops was reported in the study area. Poor production due to crop diseases, worm infestations and damages by pests and complete failure due to lack of sufficient and seasonal rainfall are the major reasons. For instance, complete crop failure occurred in Wadera Woreda during the 2006/07-production year.

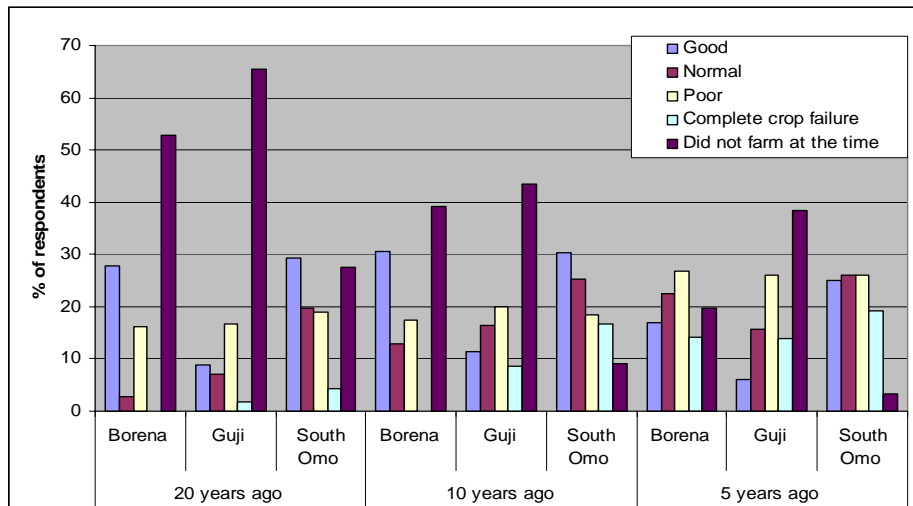


Figure 7. Performance of crop production over the past 20 years

An interesting aspect of the data in Figure 7 is that with the change in the climate system and the uncertainties surrounding livestock production more and more pastoralists are shifting towards agro-pastoralism. For instance, some 20 years back, nearly 53% of the respondents in Borena, 66% in Guji and 28% in South Omo were pure pastoralists. However, the number of pure pastoralists has declined to nearly 20% in Borena, 38% in Guji and 3.5% in South Omo. Such shift from pure pastoralism to agro-pastoralism, despite a declining trend in crop production, as a means of income diversification is a clear sign that pastoralists are becoming desperately poor and food insecure because of erosion of assets and the unsustainable incomes from pastoral livelihood activities.

Box- 3

Alka Urgema: Our life is tied with our livestock, but we are losing them terribly

Alka Urgema is a Hamar agro-pastoralist from Assele Kebele. He has 4 children, none of them attending school. He said “I am a respected old man in this Kebele. I have seen so many changes and new incidents in my life. But I have never seen a time as this season when livestock disease spread without control causing significant loss of our livestock. I have also seen new livestock diseases; camels are dying with symptoms of illness. This is my first ever experience to see a drought that led to camel death. I would say this is a very cruel dry season which killed goats. If things continue like this, we will all die.

He further said, “...drought is occurring frequently. The sun is becoming hot, the day drier and the winds intense and destructive. Once we were rich families in the recent past. But drought inflicted damage on my livestock and crops and reduced the productivity and value of my herds. As a result milk was not sufficient for the family. Water is severely scarce and there is no grass for our livestock; we have nowhere to go. Our life is tied with our livestock, but we are losing them terribly. When the cattle are fat, we get fat; when they are emaciated, we get scared...our women used to make decorations from leather and livestock products. But this is not available. We are worried how to save our herds from death because of the drought.

Arbore community:

Although both (livestock and farm produce) are for our consumption, livestock products are preferable for our strength and health... Nowadays the cattle don't give us much milk because there is no grass around here. There is no butter. We produce very little from many livestock. We have survived on tea since the drought started. The little milk we get, we add to tea, and feed our children. There are diseases particularly affecting children: there is bloody diarrhea, there is TB. There is also

Assessment of climate change-induced hazards, impacts and responses

flu. There were no such diseases previously; they arose with the drought. Our children and women become very skinny, weak and unhealthy. Our productive cows gradually become emaciated, less productive, and barren. They also die. There was no such thing before. Women used to drink as much milk as they could after fetching water and collecting fuel wood. Now they get nothing. Previously, they kept butter to use in the dry season. When there was shortage of rain, pregnant women eat meat together with the butter... Now when there's no rain, instead of slaughtering livestock we take them to market.

Overall, the households in the study area are facing serious challenges to continue with their agricultural activities due to changing climatic conditions. As a result, crop and livestock production is highly constrained and hardly meets basic household requirements. The situation is worsening from time to time thereby exposing a considerable portion of the households to food shortages. Over two-thirds of the interviewed households indicated that increased intensity of drought and food insecurity in their localities. District level reports also show increased frequency and magnitude of droughts in recent times. This has been leading to rising trends in poverty levels and dependency on external aid, both food and non-food assistance.

Table 8.
Population in need of emergency food aid in Borena Zone (June-November, 2008)

Woreda	Population in need of food aid	% of needy population
Arero	44,000	10.3
Moyale	52,530	12.4
Teltele	50,761	11.9
Yabello	52,000	12.2
Total (Borena)	425,138	

Source: Borena Zone DPPA 2008

Table 8 portrays the number of people in need of emergency food aid between June and November 2008. Arero, Moyale, Teltele and Yabello woredas were the worst hit in the Zone. Poorly developed rural markets that have weak links to facilitate the exchange of livestock with food crops exacerbate the situation and other basic needs. Hence, households lose their assets and thus get exposed to hunger, malnutrition and food insecurity.

Box- 4

Sura Waqqo's problems

Sura was one of those pastoralists in Wachile (Borena) who felt the stress of climate change. He says, "We are under difficult circumstances. We are facing the stress from repeated drought and acute water shortages. Cattle are sufficient for a good life but water and grass are totally essential. Years ago, my grandfather told me that they had a very prosperous life and before that for generations, life was great. The rain was sufficient, the water wells full and tall grass abundant. In recent years things are changing. Rainfall has been decreasing and our water sources dwindling. The change is very serious nowadays. If it were not for relief rations (water and fodder from government and local NGOs) many cattle and children would have died. With the long absence of rain, pastures also failed and the livestock died of fatigue and weakness

Muhammed Guyyo: Unidentified and unbeaten diseases

Muhammed Guyyo was one of our informants from Surupha in Yabello district. We asked him "How do you define climate change or what do you think the causes of climatic variability are in your locality? His response was that "It is shortage or complete absence of rain like this year. It is shortage caused by God. In fact drought and diseases are killing our livestock and destroying our lives. We have surrendered to them. They have defeated all us. Last year (2007) unidentified new cough like disease has affected three of my family and lack of milk and meat

caused the traditional treatment trials ineffective. The drought and insecurity situation meant that the family couldn't treat those affected. I have sold three camels (sign of worse situation and family desperation). Tribal conflict from fierce competition for land and water with Guji and Borena Oromo tribes caused loss of two of my camels and three of my goats. Two of my camels died of unidentified and untreatable disease. Our traditional healers used to treat and save out livestock, but the disease this time was beyond their capacity and knowledge to treat them.

4.5.2. Impacts on social relations

Escalating conflicts and tension

Degradation of natural resources creates competition and might eventually leads to conflict and tension. In the study area, conflicts have existed in different forms for centuries and are not new phenomena at all. However, the conflicts have intensified in recent years mainly due to recurrent droughts and feed scarcity. Households were asked to indicate the link between conflict and drought in their locality. More than 60% of the households in South Omo and 50% in Borena and Guji stated drought as the main cause for most of the conflicts. Households were worried about the escalating conflict in the area. All the interviewed households in Borena and 93% in Guji indicated that the effect of recent conflicts on their lives and livelihood activities are very serious. Surprisingly, the majority of the interviewed households (68%) in South Omo said that they are not much affected by the conflicts.

Discussions held with zonal police and security officials, administrators, and community representatives of the study area reveal that recent conflicts were between Borena and Guji; Borena and some Somali clans (the Geri and Degodi); Borena and Gebra (northern Kenya); Konso and Borena; Burji and Borena; Hamer and Borena; Arbore and Borana; and Guji and Burji; Borena and Hamer; Hamer and Nyangatom; Nyangatom and Dasenech; and Borena

and Konso. The conflicts are usually triggered during dry seasons that cause increased mobility as the competition for water and pasture becomes stiffer. Fighting is initiated around the grazing areas and watering points that serve as common boundaries between ethnic groups. According to the Borena Zone DPPA office, recent violence which broke out between Borena and Konso (in the Segan's River valley) in March 2008 has led to the loss of many lives, the displacement of 27,000 people and raiding and looting of 1500 heads of cattle. In Borena, Surupha, Teltele and Arero areas are most affected by conflict. In Surupha, for example, the repeated conflicts have caused several social and economic instabilities.

Livestock raiding

Livestock raiding has become more serious in recent years in the study area. Loss of livestock from raiding following conflicts and attacks is common in Arero (Wachile), Yabello (Surupha), Hamer and Dasenech (South Omo), and Liben (Guji) Woredas. Ninety-six percent of the households in South Omo, 73% in Guji and 58% in Borena stated the problem as a common experience (Table 9). As regards to the seasonality of cattle raiding, 72% of the households in South Omo linked serious raiding to drought. However, in Borena and Guji most of the households did not link serious livestock raiding to drought. Rather, raiding is pronounced during good rainy seasons when the livestock are in good physical and productive state. More than 44% of the sampled households in South Omo and about one-fourth in Borena and Guji have suffered from conflict related raiding in the last five years (2004-2008). For instance, in Borena a household has lost on average 20 goats and one camel, in Guji 19 oxen and 5 camels and in South Omo 6 oxen, 6 cows and 13 goats. A closer look at the household data shows that in Borena a household has lost up to 70 cows, 60 goats, 50 sheep and 45 oxen. In Guji, the maximum

number of livestock raided per household in the last 5 years was 45 oxen, 40 cows and 30 sheep. Overall, a household has lost up to 150, 92, and 80 heads of livestock in Borena, South Omo and Guji, respectively. The impact of livestock raiding on the social and economic status of households is more pronounced and serious when it involves raiding of camels. Camels are most socially valued, most expensive, and relatively drought resistant. The loss of camels is thus most serious that puts a pastoral household in a most depressing and vulnerable position. It also shows the bitterness and climax stage of conflicts as the loss of camel cannot easily be forgotten rather complicates social relations and escalates tensions in the future.

Table 9. Incidence of livestock raiding and number of livestock lost

	Borena	Guji	S. Omo
Is cattle raiding common in your locality? (% of households)			
<i>Yes</i>	73	58	96
<i>No</i>	27	42	4
Season livestock raiding is serious? (% of households)			
<i>During dry season</i>	28	35	72
<i>During good rainy season</i>	61	56	14
<i>Not specific to drought conditions</i>	11	9	13
Lost livestock due to raiding during the last 5 years? (% of households)			
<i>Yes</i>	22	21	44
<i>No</i>	78	79	56
Average number of livestock households lost due to raiding in the last 5 years			
<i>Oxen</i>	12	19	6
<i>Cows</i>	12	15	7
<i>Goats</i>	20	11	13
<i>Sheep</i>	33	9	8
<i>Camels</i>	1	5	-

Source: Field survey 2008

On the other hand, the long-standing culture of retaliation has a compounding effect and sustains the conflict cycles. Pastoral and agro-pastoral communities feel profoundly humiliated if raiding of livestock or physical attack of a family is not revenged. Retaliatory acts receive positive reactions and are often rewarded by most pastoral communities. Such conflicts have long-term social, economic and environmental impacts. Apart from the loss of human lives, damage to property and disruption of livelihood activities, the conflicts induce sustained tensions between ethnic groups and limit free movement and interactions in order to effectively use available resources and networks. In the past, conflicts were less devastating as they mainly involved the use of traditional weapons such as bows, arrows and spears. However, small arms and light weapons are widespread in the area these days and have caused fatal conflicts.

Box- 5

Alka Argiema from Hamer, South Omo

Alka said that repeated conflict with neighboring ethnic groups (Borena, Arborie, Dasenech, Mursi) and livestock raiding were major causes of insecurity and poverty in his area. According to him they cannot focus on their livestock and seasonal farms because they have to safeguard themselves and their herds from the frequent attacks launched by other tribes. "Conflicts are nothing new... But in recent times the frequency of attacks and the costs associated with the conflicts have become intolerable. Many of these groups have forced us from our land. They rob and set fire to our assets. We cannot move anywhere for fear of the killings they perpetrate. That is why we are now into famine. It is our neighbors who are taking our cattle. They are the ones who caused the famine. Our culture is weakening. In times of drought such conflicts become more frequent and deadly. Our elders and traditional leaders are facing pressure to maintain peace and preserve our culture.

Sura Waqo from Wachile, Borena

Sura was one of our informants who reflected on the drought that has been recurring for the last 30 years in his area. He associated the drought with the on-and-off nature of God's rain. According to Sura the major problem in the past 20 years has been movement restriction due to settlement and farm encroachment. There were three dry-land grazing areas in Borena where most of the land is not arable. Those areas are now being taken over for farming. Therefore the livestock movement is restricted and we are facing a problem.

The land is not suitable for farming and still there is a problem of farm encroachment. But much more serious is the problem of livestock raiding. As a result of ethnic conflicts arising from the mobility of livestock and the competition for scarce water and pasture resources, Sura says, he has lost most of his cattle. "As a result of ethnic conflicts with the neighboring Somali tribes in the last 10 years, I have lost up to 50 of my cattle and more than 100 sheep and goats. From the drought, about 10 of my cattle died. The conflict also claimed the life of 5 of my relatives (2 of my son-in laws and 3 of my uncles died while fighting with the Somali tribes"

Weakening socio-cultural organization

Climate change and extreme weather events in the form of frequent drought, flooding, and diseases and pests can possibly impact the traditional mode of social-cultural organization and the cultural practices in pastoral communities. The strength of some traditional authorities, socio-cultural practices and modes of social organization and resource management systems may be weakened. For example, one of the most important drought coping and wealth distribution mechanisms among the Borena pastoralists is *Busa Gonofa*, which is an indigenous social safety net mechanism for resource sharing and

redistribution of assets. This has evolved over centuries and is an integral part of Borena culture. It is a system of community self-help or social safety net at times of droughts, famine and conflicts. If someone loses many cattle then their close relatives and clan will contribute a number of cattle if it is declared that it is not the personal fault of the owner who lost so many cattle. However, repeated droughts and loss of livestock assets weakened this traditional community support system. Particularly, increasing number of food insecure and 'livestock destitute' households in the community limited the capacity of the traditional institution over time.

The communities in Borena, Guji and South Omo used to have strong traditional resource management institutions. However, these institutions are getting weaker to enforce local resource management strategies such as rotational grazing and water resources management. Traditional leaders have become less powerful and less heard compared to the past. . According to community elders in Guji and South Omo, the reasons include increased intensity of droughts, displacement due to flooding, population pressure, expansion of settlements and cultivation, modern education, and the introduction of various religious and world outlooks. For example, the *Gada* system, though it is still well recognized, it is not able to implement its responsibilities related to the management of natural resources and resource-based conflicts. On the other hand, the establishment of formal local administrations contributed to the weakening of traditional institutions. Table 10 portrays the effectiveness of conflict management institutions in the study area. Eighty-one percent of the households in Borena indicated that the traditional conflict management institutions have become weak, ineffective and less credible. On the other hand, in South Omo, 85% of the households stated that traditional institutions are still intact and effective in managing and

resolving conflicts. In spite of this, however, it is only 14% of households in South Omo who appeal to the traditional institutions at times of conflict; the remaining households appeal to formal government institutions mainly to the local militia, and wereda and zonal administrations).

Table 10. Effectiveness of conflict management institutions (% of respondents)

	Borena	Guji	S. Omo
State of traditional conflict management institutions	19	52	85
<i>Still intact and effective</i>	81	48	15
<i>Not effective and lost credibility</i>			
Common places of appeal at times of conflict			
<i>To elders and community leaders</i>	38	33	14
<i>Local militia</i>	56	44	77
<i>Woreda administration</i>	3	1	7
<i>Zone administration</i>	3	21	2

Source: Field survey 2008

4.5.3. Impacts on women and children

In the study area, pastoral women have several household responsibilities; taking care of children, managing young calves, looking after sick and old livestock, milking livestock, fetching water and collecting firewood, and cooking. Climate change induced hazards create additional burdens on women in many ways and make them vulnerable to its impacts. Households were asked to indicate whether women are more vulnerable to the risks of climate change than men in the study area. About 80% of them confirmed that women are more vulnerable and affected by the impacts of changing climatic conditions. Particularly, during drought years, the workload on women increases to meet their household responsibilities. For instance, in Arero Woreda of Borena Zone, women have to spend on average four to six hrs a day to fetch water and fodder for small ruminants and calves. The burden is even more for poor women since the responsibility of feeding family

members largely rests on them by collecting wild fruits, plants, berries and edible roots. A pastoral woman in Arero Woreda explains the overall situation as follows.

“There is nothing that we pastoral women do not do... the entire task from cooking to building huts waits for us...I spent most of my time looking for water. Especially during severe droughts I wake up very early in the morning, around 2:00a.m, to fetch water. I reach the water source after traveling long distance tired and exhausted. And there I have to queue waiting for my turn. It is already about mid-day when I get back to my village. There the usual chores wait for me that I should carry out during the rest of the day...”



Plate 4. The multiple responsibilities of pastoral and agro-pastoral women

Table 11 shows participation of household members in basic household activities of fetching water and collecting firewood. Mainly women and children carry out these routine household activities. Apart from being routine, these activities involve travelling long-distances and thus causes extra burden.

Table 11. Participation of household members to fetch water and collect firewood

Activity	(% of responses)				
	Female adults	Male adults	Children	Female elders	Male elders
<i>Fetch water</i>					
Borena	88.5	42.5	8.0	8.0	6.9
Guji	84.8	19.0	20.3	27.8	10.1
S. Omo	70.0	42.9	42.9	48.6	27.1
<i>Collect firewood</i>					
Borena	89.3	20.3	4.8	1.2	-
Guji	88.5	15.4	20.5	30.8	5.1
S. Omo	81.7	28.2	29.6	36.6	18.3

Source: Field survey 2008

The problems associated with climate change not only affect women but also children. In the study area, children, especially girls, are forced to drop out of school during droughts, flooding and conflicts. They move with their families at times of disasters dropping out of schools. According to reports of the Borena Zone DPPA, recent conflicts March/May 2008 have caused massive displacements and school dropouts in the Zone; 1538 school children were forced to drop out of school. Further, in some places of Borena and Guji Zones where there happens chronic food shortage, young children assist their parents by collecting wild fruits and roots for household consumption and to generate income.

When the hazards occur women usually evacuate later than men as they have lack of information to early warning information than men. As a result, they are the first to be affected by the hazards in most cases. As indicated in the Table 12, about 58% of the respondents in South Omo, 92% in Borena and 55% in Guji Zones indicated that women evacuate later than men. In relation to this, 88% of the respondents in South Omo, 90% in Borena and 77 in Guji noted that men have better access to early warning information than women. This indicated how women are highly endangered by the hazards due to lack of information and less public life.

Table 12. Access to early warning information and evacuation (% of responses)

	Borena	Guji	S. Omo
Women have limited access to early warning information			
<i>Agree</i>	90	77	88
<i>Disagree</i>	10	23	12
Women evacuate later than men			
<i>Agree</i>	92	56	59
<i>Disagree</i>	8	44	41

Source: Field survey 2008

Increased workload and resource shortages put poor pastoral women in the study area under pressure to meet household food requirements. When women fail to avail these requirements, they get into disputes with husbands that strain intra-household relations. In extreme situations, such disputes often lead to divorce and eventually to destitution of pastoral women (Discussions with the heads of Women's Affair Office of Wadera and Hamer Woredas).

Box – 6

Chake Arbo: Daughters dropped out of school

Chake Arbo is a 45 years old agro-pastoralist in Mucho Kebele of Guji Zone. He has 11 children of whom 9 of them are girls. Four of his children including one of the boys go to school. Chake used to have more than 20 cattle, several goats and sheep 5 years ago. However, because of recent droughts and diseases he lost most of his livestock and he is now depending on crops for supporting his family. Last year, in 2007, his crops (wheat, maize and beans) were totally damaged due to rainfall failure.

His wife died 4 years ago. This coupled with the loss of most of the family's livestock and crops exposed his family to food insecurity and destitution. As a result, his daughters were forced to drop out of school and support the family at home, in small trade activities, and in the field while the boy continued attending school.

In order to overcome the problem of drought-induced feed and water scarcity, pastoral households move their livestock to places where they find these resources. At times when part of the family is moving, usually women and children remain behind. Though women shoulder the family responsibility they cannot take critical decisions on the remaining household resources, mainly livestock. They cannot sell livestock at times of even most need. On the other hand, most of the households in the study area are polygamous. This adds extra burden on women as resources are shared and attention of the household head divided.

From our observations and discussions with teachers in Guji and Borena (in Hadhessa, Surupha and Mucho primary schools) attendance of children is

very much influenced by recurrent drought and resource use conflicts which normally arise during the dry season. Prolonged droughts and conflicts force school attending children to drop out of school and move with their families and the livestock to faraway places in search of water and pasture. Others are also forced to drop out of school to engage in small trading activities like the collection and sell of wild fruits and roots, as was the case in Sokora Jide (Guji) and Arborie and Dasenech (South Omo). According to Borena Zone DPPA, about 9354 school attending boys and girls have dropped out of school in four Woredas of the Zone due to conflicts triggered by the 2008 droughts.

Fetching water for young livestock and the family will also be a daunting task of children and women especially during drought seasons. At times of conflict and violence, pastoral women also suffer from other negative consequences. For instance, in the absence of men, they have the sole responsibility for sustaining the household which increases their workload. Many women and young girls also fear going out of their villages, as they are often the targets of attacks, and this makes it difficult for them to fetch water, collect firewood or go to the market. Boys are also vulnerable to any attack.

4.5.4. Impacts on natural resources and the environment

Range degradation and feed scarcity

Climate variability and change affect the productivity and carrying capacity of rangelands through weed and bush encroachment on potential grazing lands. The aggressive encroachment of undesired thorny and woody species on grazing areas result in an imbalance in the grass-bush ratio and a decrease in biodiversity and the carrying capacity causing severe economic and ecological losses for pastoral communities. Bush encroachment is particularly severe in

Borena and Guji Zones. Estimates indicate that about 40% of the Borena rangelands were affected by bush encroachment by the mid-1980s (Assefa et al. 1986; Coppock 1994). It is widely believed that the official ban on bush fire by the government in the 1970s has facilitated the process of bush encroachment (Bille and Eshete 1983; Corra 1986, Coppock 1994). Recent estimates indicate a 52% increase in bush cover (Gemedo-Dall 2004). The phenomenon of bush encroachment can be seen as part of the process of desertification. Discussions held with informants and experts in the study area confirmed that bush encroachment is the single most important factor degrading range resources. According to them, the problem appears to be beyond their control and has become a serious threat to livelihoods. It is indicated in the PASDEP document of Ethiopia that rangelands across the pastoral areas of the country are increasingly encroached by thorny shrubs and unwanted trees. The document estimates that invasive weeds and bushes erode grass fodder availability in the pastoral areas at a regressive rate of at least 0.5% annually (MoFED 2006: 193).

Some of the invasive species affecting rangelands in the area include *Acacia drepanolobium*, *Acacia brevisopica*, *Prosopis juliflora*, Kombatta (vernacular), Gomoretie (vernacular), and Terketie (vernacular). The expansion of unpalatable and thorny species undermined the extent and quality of rangelands leading to the loss of palatable and nutritious indigenous grass species such as *Cynodon dactylon* (iddo or serdo), *Pennisetum mezianum* (Ogondho), *Enteropogon somalensis* (Alalo), *Cenchrus ciliaris* (Matguddesa), Alchiso (vernacular), and Birurie and Titita (vernacular). According to pastoral elders, the loss of these species has reduced milk yield and quality while also exposing livestock and goats to diseases which some of the types could be fatal.



Plate 5. A widely encroaching bush type (*Acacia drepanolobium*)

About 90% of the households in Borena and Guji and 75% in South Omo gave their strong confirmation that the condition of rangelands is deteriorating over time (Table 13). Most of the high potential grazing areas particularly in Arero (Borena) and Liben districts (Guji) are heavily affected by the threat of recurrent and prolonged drought and moisture stress. Such areas have lost much of the locally known fodder species exposing the pastoral population to increased food insecurity and increasing reliance on food aid and feed rationing. The replacement of the productive and highly valued grass species with low quality feed resources and unpalatable weeds have greatly reduced available consumable herbage accentuating the problem of poor pasture and feed scarcity. Feed scarcity is a serious threat as livestock malnutrition is causing high miscarriage rates and distress, reduced reproduction and production rates and mortality of weak livestock. Pastoralists believe that shortage of feed has resulted in long calving period, weak physical condition and less yields (milk, meat, blood, lower market values) and reduced reproductive capacity. On the other hand, it would be difficult and damaging for these cultures to abandon pastoralism in the event that it becomes climatically, environmentally, or economically unviable.

Table 13. Condition of rangelands over time (% of the responses)

Condition of range lands	Borena	Guji	S. Omo
Deteriorated	91	89	75
Improved	4	9	20
Remained the same	6	2	5
Total	100	100	100

Source: Field survey 2008

Dwindling water resources

Water scarcity is a serious problem in the study area. Reduced rainfall and rising temperature affects the volume of runoff and the amount of water accumulated in wells, ponds and springs. In the study area, stress from water scarcity is increasing over time. Household members, mainly women and children, travel long distances to fetch water for livestock and household consumption; they often travel from 18 to 26 kilometers a day (Table 14). Pastoralists depend on the water from traditional wells (called *ellas* in Borena) since time immemorial. These traditional wells never get dry, but during severe droughts the volume of water in the wells dwindles and become difficult and laborious to water livestock. However, other traditional ponds dried up and could not be available for use. In Guji zone, the elders reported that about seven streams, most of which were tributaries of Genale River, have completely dried up over the past year.

Table 14. Average distance traveled (km) to get water and pasture for livestock

	To water livestock			To get pasture		
	Borena	Guji	S. Omo	Borena	Guji	S. Omo
Drought season						
<i>During the last 3 Years</i>	18.4	24.4	25.6	18.6	27.4	29.0
<i>During the last 10 years</i>	12.9	20.0	24.9	12.5	21.6	27.8
<i>During the Derg period (1974-91)</i>	19.8	16.1	26.6	17.2	12.5	27.9
Non-drought years						
<i>During the last 3 Years</i>	7.2	14.9	24.7	7.7	14.7	9.5
<i>During the last 10 years</i>	9.3	10.7	5.1	12.8	10.4	7.2
<i>During the Derg period (1974-91)</i>	8.8	25.8	5.8	9.0	5.0	7.0

The average distance traveled by a pastoral household to water and graze livestock during drought and rainy years show great disparity. During drought years, pastoralists are forced to travel far in order to graze and water livestock as these resources become scarce during the dry season. On average, in the past three years a pastoral household in South Omo needed to travel for 29 kms to get access to good pastures and 26 kms to water his/her livestock. The corresponding figures in Guji are 27 and 24 kms while in Borena on average a pastoralist covers about 18kms to get access to grazing and watering points during dry seasons. However, compared to the last three years, water and pasture resources were relatively available in nearby areas in the past. This means that with climate variability and change as well as increasing pressure on natural resources, water and pasture resources are being depleted and becoming less available or scarce. The data show that distance trekked to water and graze livestock has been more than doubled during drought years since the 1980s.

Environmental degradation

Table 15 shows households' assessment of the state of environmental resources in their locality. Sixty-seven percent of the households in Borena, 94% in Guji and 47% in South Omo indicated that the forest cover has shrunk over time. As most of the respondent households in Guji Zone are from once forested areas (like Wadera), they easily noticed the changes. The major causes of forest destruction are expansion of cultivation and settlements, charcoal making and wildfire. Forest fire is particularly severe at times of severe and prolonged droughts in the area. Although many places in the study area are prone to the risks of wildfire, Wadera Woreda is the most affected by repeated forest fires. In February 2000, for example, about 7000 hectares of bush and forest land was destroyed by wildfire⁶. Increased deforestation coupled with increase in rainfall intensity accelerated the problem of soil erosion in the area. In addition, flash floods destroy rangelands and agricultural fields. The problem is pronounced in Guji and South Omo Zones; 77% of the households in Guji and 46% in South Omo indicated increased severity of soil erosion in the area.

⁶ According to government sources, in the year 2000 alone, 95,000 ha of forest area were affected by wild fire in Oromiya (Borena and Bale Zones). Borena and Bale Zones reportedly lost 1,226 ha of wild coffee, 112 houses, 8 029 beehives, 352 domestic and 335 wild animals (antelope, lions, colobus monkeys, etc) (Million and Berhanu, 2001).

Table 15. Households' assessment of environmental resources (% of households)

	Borena	Guji	S. Omo
Change in forest cover with time			
<i>Decreasing</i>	67	94	47
<i>Increasing</i>	22	5	53
<i>No much change</i>	11	1	-
Problem of soil erosion over time			
<i>Decreasing</i>	39	21	23
<i>Increased</i>	27	77	46
<i>Remained the same</i>	34	2	31
Do you agree deforestation aggravated current flooding and soil erosion problems?	47	62	70
<i>Yes</i>	53	38	30
<i>No</i>			
Is there a link between deforestation and climate change?			
<i>Yes</i>	66	92	82
<i>No</i>	34	8	18
Changes in water availability			
<i>Decreasing</i>	93	79	39
<i>Increased</i>	7	19	36
<i>Remained the same</i>	-	2	25

Source: Field survey 2008

In order to assess the link between deforestation, soil erosion and climate change, informants were asked to indicate their views. Overall, the households in Guji and South Omo appear to have understood the link between the state of environmental resources and climate change (Table 15). Further, discussions were held with community representatives, Woreda and zonal experts at the relevant rural/pastoral development and food security offices in order to gain insights on the state of local environmental resources. Demographic pressure, settlement expansion, inappropriate policy initiatives (such as banning of controlled fire for clearing unwanted bushes and concentration of water points at few locations), farm encroachment, collection

of firewood and tribal conflicts were cited as additional factors. These indirect drivers of changes are particularly important, as they tend to exacerbate the impacts of climate change through the generation of practices that are not compatible with the local climatic and rangeland conditions.

4.5.5. Complicating factors

The impacts of climate change does not just depend on the actual variations in temperature, precipitation etc. themselves, but also on the social and economic systems of affected communities to cope with the impacts of the changes. In addition to the direct impacts of climate change induced-hazards, various other factors complicate the problem and reduce the adaptive capacity of communities to the changes. The main complicating factors in the study area include weak livestock market, lack of preparedness, demographic pressure, unfavorable socio-cultural practices, lack of social services, lack of education and early warning information.

Pastoralists are highly dependent on markets, where they sell their livestock and livestock products and purchase food and other household requirements. However, the physical and market infrastructure is poorly developed or non-existent in the study area. Most of the markets in these areas are poorly connected with bad roads and inadequate transportation. For example, most pastoralists in South Omo take up to 3 days to reach the nearby primary market (discussion with the community). Long traveling distances in turn result in loss of livestock weight, weak bargaining power and reduced prices. On the other hand, during drought years, the prices of cereals rise while livestock prices fall. This has worsened the terms of trade for pastoralists, resulting in reduced food availability in the household and thus limited adaptive capacity. Although early warning units and committees are present at

the Kebeles and Woreda levels, they are poorly organized and inefficient with negligible impact. Lack of awareness and limited availability of educational and health services constrained communities to prepare against and adapt to the impacts of the changes.

In the study area, there are unfavorable socio-cultural perceptions and practices which make some household members more vulnerable to the impacts. Socially ascribed roles determine women and men's responsibilities within most communities. Although women have immense responsibilities in the productive, reproductive and social spheres, they lack control over important household assets such as cattle and camel, land, beehives, and cash reserves. When the husband is deceased, male child (despite his age) or other male relative of the husband is entitled to inherit the resources. Early/unwanted marriage, rape and beatings are socially deep-rooted and enforced practices that create additional pressure on women. Such 'harmful' socio-cultural practices hindered the development of women-friendly climate change adaptation mechanisms. Specifically, the knowledge and experiences of women that they have accumulated about cattle, range management and the environment is rarely acknowledged and utilized.

4.6. Responses to climate change

4.6.1. Local responses

For thousands of years, life for pastoral communities in the study area has been a constant struggle against the impacts of diverse types of localized hazards. In order to cope with the situation, pastoral societies have long accumulated experiential local knowledge base, systems of resource management, and social networks and economic strategies. However,

increased intensity of the impacts of climate change induced hazards has limited the capacity of local strategies to continue effectively coping with and adapting to the problem.

Opportunistic farming

With the increasing pressure from climate related hazards and declining livestock productivity, crop cultivation is spreading to rangelands and areas that have never been under cultivation. Community representatives and experts in the study area linked the emergence of crop cultivation with the decline in range resources as well as a decrease in both livestock numbers and productivity, which are all results of climate change induced hazards (drought, rising temperature, weeds and diseases).

According to information obtained from Wadera Woreda sector offices, there was little cultivation in the Woreda until very recently. There has been increased chopping of trees and clearing of bushes for cultivation in the Woreda since the 1980's. In Borena, the land use conversion was very severe in response to the 1984/85 and the 1993-1995 drought periods when most pastoralists lost their livestock and switched to opportunistic farming. In the 1990s, between 2 - 3.4% of the pastoral lowland region of Borena was estimated to be under cultivation (Gufu 1998). However, according to the current land use data of Borena Zone Agriculture Office, the area under cultivation is estimated to be 3.4% of the total area (see Table 16). In South Omo, an estimated area of 656,105ha has been under crop cultivation. In the same Zone, particularly in Dasenech Woreda, crop cultivation has reached nearly 40% of the total area of the Zone. In Guji, the area under cultivation is estimated at 430,000 ha, i.e. 12% of the total.

Table 16. Total area and area under cultivation (ha) in the study area

	Total area ('000)	Cultivated area ('000)	% of cultivated land
Borena	6,550	223	3.4
<i>Arero</i>	109	5	5.0
<i>Yabello</i>	555	12	2.2
Guji	3,500	430	12.3
<i>Liben</i>	895	18	2.0
<i>Wadera</i>	94	24	26.0
South Omo	2,438	656	26.9
<i>Hamer</i>	732	8	1.1
<i>Dasenech</i>	293	117	39.9

Source: Zone Agriculture Offices and Finance and Economic Development Offices 2008

However, from our observation and discussions with key informants in Guji Zone it was clear that indigenous pastoral/agro-pastoral communities are not the only ones that practice cultivation of marginal areas. Local officials, urban elites, businessmen, and migrants are also widely engaged in crop cultivation (Personal communication with experts at the zonal sector offices). For example, in Liben Woreda around the vicinity of Negele Borena town, there is expansion of mechanized cultivation into grazing areas. Especially, pastoral households consider opportunistic farming as a strategy to avoid potential risks of sole dependence on livestock.

Forced selling of livestock and livestock products

Pastoralists sell their livestock rarely. Since livestock number is socially valued, they rather prefer to keep as much livestock as possible. In recent times, although there are certain developments in market infrastructure for pastoral communities, livestock marketing in the area is not well developed. However, with severe droughts and other climate related risks, households in

the study area have become increasingly under pressure to sell or exchange their livestock. According to survey results, about 78% of the households in Borena, 40% in Guji and 33% in South Omo reported an increasing trend of livestock selling since recent times (Table 17). Normally, households start responding to the problem by selling small ruminants, mainly goats and sheep. However, with increased intensity of the hazards, households are forced to sell cattle that are the main sources of their livelihoods and social prestige in the community. Hence, the sale of livestock is differentiated not only by types but also by sex. For instance, camels and cows are sold at last when the situation worsens and all other options are exhausted (see details in Table 17). Livestock products are marketed in the nearby small towns and market places. According to our observation and discussions with the community, there is increased pattern of selling livestock products such as milk and butter. In some places, like Dasenech, pastoralists rarely sell milk and milk products. But now, these products are increasingly marketed and become important source of income. Particularly, women are involved in the marketing of milk and milk products.

Table 17. Patterns of livestock selling due to drought and related climate risks (% of households)

	Borena	Guji	S. Omo
Changes in livestock selling due to climate related hazards over time			
<i>Increased</i>	78.0	40.4	33.3
<i>Decreased</i>	14.0	31.2	22.2
<i>Remained same</i>	8.0	28.4	44.5
Livestock sold first at times of climate related hazards?			
<i>Oxen</i>	23.5	33.7	23.0

<i>Cow</i>	1.0	5.6	-
<i>Calves</i>	30.4	7.9	-
<i>Goats</i>	38.2	33.7	66.7
<i>Sheep</i>	3.9	1.1	6.0
Livestock sold last at times of climate related hazards?			
<i>Oxen</i>	10.5	33.6	61.2
<i>Cows</i>	42.9	37.2	3.4
<i>Calves</i>	13.3	1.8	-
<i>Goats</i>	6.7	4.4	30.2
<i>Sheep</i>	-	-	1.7

Source: Field survey 2008

Resource sharing

Resource sharing is a tradition deep rooted within pastoral communities of the study area. The tradition has been used as a safety-net mechanism to support vulnerable members to cope with diverse types of problems which they encounter. Established mechanisms of support range from simple sharing and provision of milk and other food items to contributing heads of livestock in order to restock the herds of affected families. Households who received the support in turn contribute to the community by helping others through labour work and livestock herding demonstrating mutuality in the support system. Some institutions, for example in Guji and Borena Zones, extend to include orphans and widows in their support system. The support system in Borena Zone (locally known as *Busa Gonofa*) has been one of the most important food sharing and wealth redistribution mechanisms (see Box-7). Similarly, in Hamer and Dasenech, communities support relatives and other clan members by temporarily providing milking livestock (a goat or cow) and other productive assets to address household food shortages.

Box – 7

Busa Gonofa; Indigenous social safety-net

The Borena pastoralists developed a social safety-net system where wealth, land, water and pasture are all communal and shared among clan members using a unique system of indigenous management, known as the Gada system. This indigenous and complex socio/political structure is believed to have evolved in the 1600s and it is based on a system that divides the Borena community into a number of general classes. It is responsible for all issues affecting the pastoral life of the communities, including governance of range resources and provision of a framework for socio-political stability. As part of this socio-political organization, Busa Gonofa ('Busa' means contribution and 'Gonofa' is sharing resources or support) is a social security system mostly among clan members. It is a traditional institution built for helping people in need and serves to enhance survival, maintain solidarity and redistribution of wealth. It is a coping strategy developed by the society to ensure survival despite losses that could be caused by the vagaries of nature, climate change induced drought, livestock and human diseases, floods or conflicts.

Busa Gonofa has different forms that work like social welfare with all Borena people in the same clan. The practice involves provision of livestock and sharing of other resources in the form of gift or herding partnerships. In addition to fulfilling the social responsibility of replenishing their member in times of adversity, it is a means of accumulating 'social capital' and anticipating reciprocity. Although support in terms of milk and food is simple and can usually be arranged on personal basis, the process of social support for restocking of herds requires collective decisions and certain scrutiny to check how the poor lost his/her livestock and whether there are people who can support.

Diversification of income sources

Given that the Borena, Guji and South Omo pastoralists have occupied their dry areas for centuries, their pastoral production system contains a mechanism

to solve problems. Despite their ability to cope with one or two failed seasons (with hardships but successfully in terms of supporting people and livestock through the next good season) repeated and prolonged climate hazards have stretched traditional coping strategies to their limits making some insufficient or even outmoded.

Hence, more and more pastoralists are desperately looking for additional sources of income including non-pastoral subsidiary activities which generate additional revenue during normal years and spread risks at times of insecurity. Such activities may range from opportunistic farming, daily labor in urban areas, and commercial farms to selling of charcoal, firewood and wild fruits. Guji pastoralists in Wadera and Liben Woredas, for instance, seasonally migrate to Kibre Mengist and Adola areas for seasonal labor in the towns and at the gold mining centers. Women and some men conduct petty trade, while few young men involve in traditional salt mining activities. In recent times, some households, who keep a good size of herds, sell some of their livestock during good market prices when they anticipate any possible occurrence of climate change induced hazards. Households put their money in the Bank for later use, buy and store grains, or invest in building and renting houses in nearby towns.

Consumption adjustments

During acute disasters, households are forced to change their normal food intake and adjust their composition to the available household resources. Consumption smoothing usually involves adjusting diets to cheap food items, supplementing with edible wild plants and fruits, and reducing the amount of meals and frequency of serving. Such adjustments involve food intake from three times to once a day, giving priority to children and the elderly, and

shifting from milk and milk products to more of cereals⁷ and tea (e.g. in Guji) and livestock blood (e.g. in Hamer). At times of serious food shortage, households in Hamer mix cattle blood with milk and water as main source of food. In Guji and Borena too, households mix milk with water and maize flour. Also, tea is replacing milk during serious drought in Guji and Borena. Moreover, households resort to eating wild fruits and roots like *Gersi*, *Kombata*, *Ter kaytie*, *Lokoto* and *Enkoy Kuz*, *Wee*, *Genba* (type of gum) and catching small fish in South Omo and *Gunbo*, *Buri*, *Ostria*, and *Dokma* in Borena and Guji. Nevertheless, these options for smoothing consumption are getting fewer as most of the wild fruit and plant resources shrink.

Resource management practices

Pastoralists traditionally use various types of resource management strategies to cope with and adapt to changing climatic conditions. These management practices are, however, dynamic in response to changing circumstances in the climate. Common practices include the management of rangelands and livestock. Pastoralists in the study area divide rangelands into different uses considering the season and nature of the climate: dry and wet season grazing. According to informants, such practices are undertaken to avoid overgrazing, allow regeneration of pasture, and in response to climatic variations within and between months in a year. The grazing pattern is regulated by availability of water and pasture and the size and structure of herds. Special areas, which are close to settlements and homesteads and considered rich in both pasture and water resources, are reserved for calves, milking cows, and weak livestock. Communities have also adopted water management systems to efficiently use the limited water resources available during dry seasons. For

⁷ Cereals are low quality food for pastoralists of Guji and Borena. Shift to the consumption of cereals in the household is indicative of calamitous situation.

instance, livestock are watered every second to third day, as opposed to daily watering, during the dry season in order to ensure proper forage-to-water intake. On the other hand, during the rainy season, ponds and deep wells are closed (mainly in Borena and Guji) and both livestock and humans use surface water. When the rain stops, they first shift to smaller ponds around their villages. As the volume of water decreases, they leave these ponds for calves and household consumptions and water the other livestock in larger ponds away from the villages. As the volume of water keeps on decreasing from these larger ponds, the livestock are watered at distant permanent ponds. Traditional institutions (the Gada system in Borena and Guji and the guardians for grazing/cropland land in South Omo) are responsible for proper management and fair utilization of rangeland and water resources. These institutions/groups have different local names and they particularly make decisions regarding which resources (rangeland or water) to use when and by whom. For example, a water manager called Abba Ella or Abba Herrega, who also coordinates the drinking order and maintenance of water points, heads the water use regulating council.

Controlled burning is the oldest range management strategy in the study area. The purpose of this practice is to allow regeneration of new pasture by eliminating unwanted weeds and control ticks, pests, rats and other disease causing organisms. According to pastoral elders in Hamer and Borena, the new green pastures are believed to enhance milk production and livestock reproduction through increasing the efficiency of mating of bulls. Bush burning is usually practiced in September or October to take advantage of the short rains, which normally come in October. Further, burning at this time assures effective control of ticks since grasses are dry enough to burn and effectively kill ticks. Although bush burning has been a long-standing

management strategy, it was banned since the 1970s as it was considered a harmful devegetation process by the government.



Plate 6. Controlled burning of noxious weeds

Herd diversification and splitting are herd management practices spreading in the study area in response to climate variability and droughts. Indeed, diversification offers sustained supply of various livestock products, allows the manipulation of different ecological potentials of livestock, and helps to spread risks associated with changing climatic conditions. In general, there appears a shift from the production of grazers (cattle and sheep) to browsers (camels and goats). Camels and goats are relatively more adaptive to changing climatic conditions and vegetation cover. The degradation of pasture resources from the variable and changing climate and the intrusion of bush species to formerly pasture lands forced the pastoralists to diversify their herds and increasingly shift towards livestock types that have comparative advantage in terms of the resources available locally⁸. In some of the communities, camels and goats are recent introductions especially promoted

⁸ Interaction with neighboring ethnic groups who are traditionally camel herders (such as the interaction of the Borena and Guji pastoralists with the Geri and Degodi Somali clans) is also attributed as a cause for the adoption of camels in some parts of Borena and Guji.

by some NGOs (FARM-Africa in Hamer and Arbore communities and SOS-Sahel and AFD in Liben, Yabello and Arero districts). According to discussions with informants, sheep and goats are particularly preferred for household nutrition, being sources of milk, meat and cash income. Camels and goats give milk even during dry periods, when lactating cows can hardly be milked. Further, the timing of milk availability is vital for households as goats and sheep could ensure continuous supply. Camels and donkeys in some places (not in Hamer) provide transport services and essential draught power. Pastoralists split their herds according to age, sex, type, productivity and different functional sub-herds (e.g. milking and fattening livestock). They send the matured ones and bulls to distant places while keeping lactating and heifers around their homesteads. Some communities spread risk by distributing their cattle to relatives and friends elsewhere. For instance, Bena and Mali pastoralists once used to be fierce enemies, enjoy bonded relationship through intermarriage. Hamer pastoralists in South Omo also enjoy traditional systems of reciprocal access rights and exchange of cattle from bond friendship with the Karo pastoralist communities. Splitting is also used to avoid localized raids and diseases that usually accompany droughts and other climatic hazards.

The choice of livestock breeds is influenced by climatic conditions. Most pastoral households in the study area prefer local livestock breeds that are resistant to droughts and diseases, able to trek long distances, and provide great cultural and economic value. For instance, the Borena cattle breeds are especially preferred for their docility, attractive body size and earlier maturity than most other breeds and are resistant to high temperature, ticks, and eye diseases. Hamer pastoralists prefer livestock considering the ability to resist periodic water and feed shortage, digest low quality feed, and walk long

distances. Despite the climatic and ecological pressures, increasing efforts to keep bees are also noteworthy.

Increased frequency of mobility

Pastoral households and communities in the study area have long developed herd and household mobility as a flexible mechanism to cope with impacts of climate change. According to the informants, mobility is a strategy to optimize the utilization of natural resources and a response to emergencies such as disease outbreak, flood, drought, conflict, etc. Although long distance mobility is a long-standing tradition of the pastoralists, its duration and frequency has changed in response to increased climatic stress. Long-distance and extended mobility has gradually been replaced with short-distance and frequent movements.

In order to assess the condition of mobility through time, households were asked to indicate whether the possibilities and freedom of movement from place to place in the pastoral areas has improved or worsened over time. About 44% of the respondent households said that pastoral mobility was good during the Haileseilasie (before 1974) period, 55% said it was fairly good during the *Derg* (1974-91) period, and 40% said it was fairly good since 1991 (Table 18). The most common mode of pastoral mobility in Guji and South Omo involves part of the family where only selected members of the household (usually those healthy and energetic young males with mature livestock and some milking livestock) move leaving behind most family members, including young children, the elderly and women. Young calves, sick, old and milking livestock will be left with the household staying behind. In Borena, 53% of respondents indicated that mobility usually involves relocation of the whole pastoral household members. Such complete

relocations usually need more organizations and identification of mobility routes and destinations which have relatively good grazing land, better access to watering points and safe in terms of security and health risks.

Table 18. Type and frequency of household mobility (% of households)

	Borena	Guji	S. Omo
Most common type of mobility			
<i>Part of the family (household)</i>	47	66	72
<i>Whole family (household)</i>	53	34	29
Frequency of mobility within a year			
<i>Once</i>	10	43	2
<i>Twice</i>	30	15	44
<i>Three times</i>	31	19	17
<i>More than three times</i>	29	24	16

Source: Field survey 2008

The frequency of mobility within a specific year shows slight variations within the study Zones. As can be seen from Table 18, mobility is more frequent in Borena than in Guji or South Omo. About 60% of the households in Borena reported that they normally shift locations and move with their livestock in search of pasture and water at least three times per year. Only 33% in South Omo and 38.5% in Guji said so. For most pastoral households in Guji (43%) mobility is normally once a year while in South Omo it is twice a year, i.e. during the two dry seasons that follow the main and short rainy seasons.

4.6.2. NGO Responses

Non-governmental organizations (NGOs) are important development partners in the country. Particularly, the NGOs operating in the study area play a significant role in the local development and emergency activities. Although the local people have been devising several strategies over the years against

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the impacts of climate change, it appears that the strategies have reached their limits to effectively deal with the problems. Realizing the potentially dire situation in the area, several NGOs have been operating by focusing on many thematic areas in order to support vulnerable communities, enhance their adaptive capacity and invest in preventive activities. The most known NGOs in the study area include FARM-Africa, SOS Sahel Ethiopia, CARE Ethiopia, Action for Development (AFD), EPaRDA, Catholic Church, ACORD, AMREF, MekaneYesus SW Synod, ORDA, Save the Children USA, and Save the Children UK. Some more detail on the focal activities of these NGOs is presented in Table 19. Some of these NGOs work in partnership with Cordaid in disaster risk reduction.

Table 19. Major NGOs operating in the study area and their core activities

NGO	Focal activity	Areas of operation
ACORD	Promotion of social justice	Borena
Action for Development (AFD)*	Livelihood diversification, disaster risk reduction and capacity building	Borena; Guji
AMREF	Pastoralist health care	S. Omo
CARE Borena	Emergency work, education, health	Borena
Catholic Church*	Disaster risk management, water supply and sanitation	Borena; S. Omo
EPaRDA*	Conflict mitigation and peace building	Borena; S. Omo
FARM-Africa*	Disaster risk reduction, asset protection and enhancement, resource management	S. Omo
GOAL Ethiopia	Livelihood development	Borena
ORDA	Community based tourism	S. Omo
Save the Children USA	Education and health issues	Borena; Guji
Save the Children UK.	Education and health issues	Guji
SOS Sahel Ethiopia*	Environmental management and food security	Guji; Borena

* Cordaid partner NGOs

Over the past years, the NGOs operating in the study area have been implementing several projects aimed at disaster impact mitigation and poverty reduction in pastoral/agro-pastoral communities. The projects have had considerable impacts, but also numerous problems in achieving the objectives of bringing improved adaptive capabilities and securing livelihoods. The responses of the NGOs are discussed under four main themes; disaster risk reduction, provision of social services, awareness creation, and conflict management and resolution.

Disaster risk reduction

Disaster risk reduction through asset protection and enhancing livelihood sources is a basic intervention that could reduce vulnerability and enhance the capacity to effectively manage and utilize available resources. In this regard, Cordaid has been promoting a drought cycle management (DCM) approach to reduce the vulnerability of communities to the impacts of drought (Box 8⁹).

⁹ The information contained in box 8 and box 9 and the analysis that followed are the contributions of Ato Moges Bekele, program coordinator of CORDAID Ethiopia Office.

Box – 8

Cordaid's DCM framework

Cordaid pioneered and promoted the Drought Cycle Management (DCM) model or approach that attempts to reduce communities' vulnerability to drought in order to strengthen their livelihoods rather than merely responding to disasters after they occur. DCM realizes that drought is normal and inevitable in the dry lands, but the question is when. It uses the periods between droughts to prepare for the next one so as to minimize its impacts since drought tends to follow a cycle. As indicated in the DCM framework, the cycle begins with a 'Normal' situation with good rain. Conditions gradually deteriorate through an 'Alert' stage. When water, pasture and other resources are becoming harder to find, to an 'emergency' stage, and when the rain eventually does again fall, water supplies and vegetation recover, and people can rebuild their livelihoods then to the 'Recovery' stage.



In South Omo, FARM Africa, Catholic Church and EPARDA, AFD all have projects and programs aimed at managing drought and other risks through the

protection of household assets, community owned natural resources and enhancement of livelihood sources (Table 19). FARM Africa has been implementing a drought cycle management (DCM) project in Hamer and Arbore localities. The main aim of the project was to establish community based early warning system and enhance the disaster preparedness and response capacity of local institutions (formal and informal). Informants in Assile and Arbore acknowledge the contribution of FARM Africa in terms of drought cycle management interventions and the protection of assets and range resources. Interventions in the form of water harvesting, identifying and fencing dry season grazing areas, early warning information, support in the form of loan arrangements (goats and camels), and emergency aid (food and nonfood aid) were mentioned by FGD participants in Assile and Arbore. EPaRDA's support during the flood hazard in 2006 in Arbore and Dasenech in the form of emergency aid (food and nonfood items), and conflict management were important. AMREF has recently launched projects targeting at improving the health system in South Omo Zone. AFD claims to have projects on basic services, education, early warning, and water development, although less visible by the community.

Disaster risk reduction builds on the shift of thought that disaster is “an act of God” to the view that disaster is “an act of man”. The shift is basically from a reactive approach against hazard events to a proactive approach of hazard prevention and mitigation and vulnerability reduction by building the capacity of individuals and communities. Furthermore, there has been a stronger belief that disaster risk reduction should involve communities at the different stages of planning and implementation. This has led to the emergence of the Community Managed Disaster Risk Reduction (CMDRR) approach as a feasible framework to disaster risk reduction. CMDRR is a condition whereby

a community systematically manages its disaster risk reduction measures towards becoming a safer and resilient community. Communities are actively engaged in the identification, analysis, monitoring and evaluation of risks. Using this concept, Cordaid partners have been working with communities to analyze the hazards they are exposed to, identify the reasons for their vulnerability to these hazards, and their capacities to deal with the problems. This was used as a basis to plan for measures to reduce vulnerabilities, enhance capacities, and plan for contingencies under the on-going drought risk reduction program that is operational in Borena and Guji zones.

Box – 9

The disaster risk reduction formula which is currently emerging as new development framework and tool shows that when disaster risk is high, the probability of a disaster erupting is also high; when disaster risk is low, the probability of disaster is also low.

$$\text{Disaster risk} = \frac{\text{Hazard} \times \text{Vulnerability}}{\text{Capacity}}$$

Disaster risk reduction paradigm advocates building resilient communities, guided by the following principles:

- *Communities have accumulated local knowledge in addressing hazard events and navigating from their adverse situation.*
- *Communities are survivors, not victims.*
- *Basic rights are the foundation of safety*
- *Community organizations are mechanism for successful disaster risk reduction initiatives and that the government is a major player.*
- *Communities have to take responsibility for their most at risk*

members (who could be the poor or those with less capacity to cope, or the most affected).

- *The community decides if it is in a state of disaster: if it could not cope with and need outside help or it can cope with and have the capacity to face the challenge.*
- *Resiliency is not merely accumulated physical assets or secured livelihood. It is also the will to survive and claim rights to be members of just and equitable society.*



Plate 7. Water pond constructed by AFD in Yabello Woreda.

In Guji Zone, SOS-Sahel is a major player in terms of range management and the development of water resources throughout its project area. The organization has implemented various projects on afforestation, bush and weed clearing, water storage cisterns, fodder and grain banking. In Liben Woreda, Save the Children-US has implemented projects on water pumps and livestock health services. Relatively more NGOs work in Borena than in the other two Zones. Care Borena works on emergency relief, nutrition, health, water management and drought related warning. SOS Sahel in Borena has projects on drought cycle management, livestock marketing, water supply, and food security. Save the Children has a pastoralist livelihood initiative

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project in Liben, Arero and Moyale. ACORD has a drought preparedness project in Borena Zone. Goal Ethiopia works on pastoral and agro-pastoral livelihood development project. AFD has relatively diverse but less focused programs from reproductive health, drought management, water harvesting to emergency response.

Table 20. Households' assessment of responses of NGOs (% of households)

Responses to:		Very effective	Moderately effective	Not effective	No idea
Drought	Borena	7	26	19	48
	Guji	14	28	8	50
	S. Omo	41	51	-	8
Epidemics and diseases	Borena	7	38	13	42
	Guji	10	51	5	34
	S. Omo	64	28	-	8
Conflict	Borena	11	30	18	41
	Guji	10	29	5	57
	S. Omo	75	19	-	6
Forest and range management	Borena	20	24	20	37
	Guji	15	27	7	52
	S. Omo	32	44	1	23
Water resource management	Borena	13	58	14	15
	Guji	20	58	3	19
	S. Omo	54	30	1	16

Source: Field survey 2008

Provision of social services

Overall, basic social services in the study area are for the most part lacking and poorly developed. Education, health, and infrastructure are particularly

the most important basic services required for pastoralists. Some NGOs work in the provision of education and health services. For instance, CARE Borena and AFD in Borena, Catholic Church and AMREF in South Omo, and Save the Children USA in Guji Zone are the main NGOs providing education and health services. Access to education may be an important component of poverty reduction and climate adaptation in the pastoral areas. But despite fragmented and disorganized short term training programs, community representatives and informants said that no visible and sustainable work has been done so far to help pastoralists send their children to school.

As reported by Kebele officials and FGD participants, despite the innumerable socio-economic problems and increasing impacts of variable climate and weather extremes (floods, pests and diseases) no NGO is working in Sokora Jide area of the Wadera district in Guji. In other areas some NGOs have responded to the exclusion of the poor in a variety of ways – sometimes concentrating at some locations to the exclusion of others, or constructing a water well where none exists, sometimes taking over the running of a neglected clinic or health post, sometimes training members of the community in basic health principles and encouraging them to train other community members. For example, in Mucho Kebele of Guji Zone the informants reported that a livestock health worker was trained and hired to serve the community at a government health post by Save the Children USA. This NGO has also constructed one hand pump in the Kebele. Other two solar water pumps are constructed by COOPI and SOS Sahel has supplied a water tanker for Mucho primary school via its school water program. In fact SOS Sahel, AFD and Care Borena have water-rationing programs at times of serious drought and chronic water shortages (in Hadhessa and Wachile for instance). FARM Africa, AFD and SOS Sahel also work on some water harvesting

programs including support for maintenance of traditional water wells and the construction of new ones.

Awareness creation

Lack of awareness in the areas of population planning, girl's education, women empowerment, reproductive health, and the impacts of harmful traditional practices complicate the impacts of climate change driven disasters. In addition to the disasters, there is concern that demographic expansion could have a negative impact on fragile local resources, particularly on water and grazing land, accelerate the spread of diseases and compound existing conflicts and social tensions among various ethnic groups. In the discussions, communities have recognized that demographic pressure is already creating stress on natural resources and social relations. In addition, unfavorable social practices and belief systems undermined participation of girls in education and of women in household and community decision-making processes. The problem is deep rooted within the society because of socio-cultural influences and lack of awareness. However, there is a limited NGO intervention in this area. AFD, Care Borena, Catholic Church are the only NGOs working on girl's education and reproductive health projects in the study area. Nonetheless, the projects are not only subsidiary but also lack consistency and rigor to bring about desired impacts.

Conflict management and resolution

Conflict resolution is vital for sustaining development activities particularly in pastoral areas. Traditionally, pastoral communities have their own age-old mechanisms of managing and resolving conflicts. However, growing climatic stresses and livelihood insecurities have largely contributed to the expansion of conflicts and the weakening of traditional resolving mechanisms. Since

recent time, the problem has received NGO attention and recognized as an important area of intervention. EPaRDA is the only NGO in the study area focusing on conflict management and resolution. Liben Pastoralist Development Association, Mekane Yesus, FARM Africa, AFD and PACT Ethiopia also support peace building initiatives although they do not have a full-fledged conflict management and resolution project. The contribute to peace building by mobilizing traditional leaders and elders, providing training, organizing peace conferences and delivering information, finance and materials for conflict resolution efforts in conflict prone areas. In the FGD, community representatives in Hamer and Dasenech acknowledged that EPaRDA and FARM Africa played considerable roles in managing the repeated conflicts between Dasenech and Hammer, Dasenech and Nyangatom, and Dasenech and the Turkana pastoralists. However, despite the wider scale and frequency of potential conflicts in the area, available interventions are quite limited and less effective to build sustainable peace. Moreover, other development projects carried out by NGOs are not conflict-sensitive.

Emergency aid and livelihood diversification

NGOs operating in the study area have major components for emergency assistance and diversification of the livelihood of pastoralists apart from development projects. Such activities include provision of relief food and non-food items, health care services, temporary shelter, evacuation facilities (at times of flooding), livestock feed, water, etc. In Dasenech and Hamer, for instance, communities reported that Farm-Africa along with EPaRDA provided transport, communication services, medicines, and emergency food to flood victims of 2006. In Borena Zone, Care Borena has been carrying out emergency feeding programs since the deadly 1984-5 drought. In terms of

livelihoods, a number of NGOs including FARM Africa, Care Borena, SOS Sahel, and AFD have program aimed at protecting pastoral assets and enhancing livelihoods. For example, in South Omo (Hamer and Arbore), FARM Africa has a dairy goat development program targeted at selected poor and destitute pastoral women and a pilot camel husbandry project to introduce camel, relatively drought resistant livestock, to the area.

General assessment of the strengths and weaknesses of the NGO sector

In the study area, because of their location, proximity and resources, most NGOs are ideally placed to design development schemes in the form of asset protection, livelihood diversification, social service provision and natural resource and climate related hazard management that the Federal government or Regional States may be unable to implement on a large scale.

Table 21. Assessment of the effectiveness of NGOs (% of households)

	Borena	Guji	S. Omo
Effectiveness of NGOs in reaching the poor			
<i>Yes</i>	52	36	91
<i>No</i>	48	64	9
Bureaucratic hurdle to get NGO support			
<i>Very challenging</i>	29	37	47
<i>Challenging</i>	39	43	44
<i>Smooth</i>	32	20	9
Interaction/communication with NGOs			
<i>Very strong</i>	9	19	45
<i>Fairly good</i>	21	19	51
<i>Poor</i>	44	28	2
<i>No relation</i>	26	34	2

Source: Field survey 2008

The NGO sector can assist vulnerable groups by mobilizing communities, resources, technologies and expertise. They can also share their field-level experience and help to build the capacity of state actors. Despite their limitations in scope, sustainability of projects and related uncertainties, the contribution in land management and water harvesting practices, agro-forestry systems, micro-finance and credit schemes, and the provision of social and economic services in the remotest and disadvantaged areas is invaluable. However, the multifaceted, structural and deep-rooted nature of the socio-economic and climatic problems in the pastoral areas cannot be solved with fragmented, piecemeal and narrowly designed sectoral approaches and projects. In this case, NGOs' small size and limited financial and technical resource means that their projects rarely address the structural problems which pastoralist communities face. Individualistic mentality and differences in philosophy and orientation are major blockages to mutual learning and cooperation at the different levels. Donor pressure to address short-term impacts together with short duration of projects has led in some cases to the promotion of inappropriate and unsustainable technologies. For example, the concentration of water points at few locations not only causes unfair distribution benefits among communities but also leads to overstocking and degradation of rangelands. With some NGOs, disoriented development approach has created misunderstanding within communities and affected the flow of resources to direct project implementation. In addition, this has created unfavorable precedent for current as well as future development interventions by other NGOs.

4.6.3. Government responses

The government of Ethiopia has adopted policies, strategies and action programs aimed at poverty reduction, environmental protection and

sustainable development. However, the country has no an explicit policy on climate change yet. Most of the policies and strategy documents hardly captured the threat of climate change as a development agenda. With this serious policy gap, other policies give attention in various ways to pastoral and rural areas development. Government responses related to climate change induced hazards in the study area are discussed in relation to emergency aid, asset protection/livelihood enhancement, disaster risk reduction, and conflict management and resolution.

Emergency aid

The government of Ethiopia has since long been engaged in supplying emergency aid to victims of various types of disasters. In the study area, the government has been supplying food and non-food items since the 1980s and particularly during recent drought and flooding. For example, during the 1984/85 and 1998/89 drought in Borena and Guji Zones and the 2006 flood hazards in South Omo, the Federal and Regional Governments in collaboration with other partners distributed food, medicine and relief supplies. Rescue operations were carried out and tents, blankets, foodstuffs, mosquito nets and nonfood items were distributed and some health, sanitation and security services were given. Rescue operations are followed by continued relief assistance and rehabilitation activities for some time in order to restore life and livelihood of the affected people.



Plate 8. Government supplied feed rationing in Borena zone during the 2008 droughts.

The disaster prevention and preparedness office at the district and sub-district levels work together with other sector offices and local NGOs at the initial stage of a hazard to study and report the situation to relevant authorities for immediate attention and support. During the FGDs, informants from all the study areas reported that the government supports those critically food insecure and destitute pastoral and agro-pastoral households through its productive safety net program. For instance, households in Wadera Woreda were given seeds and fertilizers (on loan), while in Hamer, Arbore and Mucho localities households received support through food-for-work and productive safety net arrangements. In February 2008, feed and water rationing has been carried out by the Oromia Pastoralist Commission and Borena Zone pastoralist development office and the zonal emergency coordinating committee. However, emergency responses in most cases do not match the amount required to address emergency needs of the people, nor delivered in time (see Table 22).

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Table 22. Emergency interventions and real gaps in Borena Zone (February-June 2008)

Sector	Total aid requested	Actual response	Gap
Feed for livestock	182,000 cattle	24,277	157,723
Water rationing	1,120,000 litres	750,000 litres	370,000 litres
Food rationing	314,907 people	88,000	226,907
Crop seeds	10,888 quintals for 27,000 households	-	10,888 quintals
Medicines for livestock	180,000 cattle	92,000 cattle	172,000 cattle

Source: Borena Zone Agriculture Office 2008.

Asset protection and livelihood enhancement

Protection of household and community assets reduces vulnerability to the impacts of climate variability and change. Households that have lost all or most of their livestock resources due to droughts, flood hazards, disease outbreaks and conflicts may face serious challenges that could eventually expose them to destitution. Since 2004, the national government introduced a Productive Safety Net Program basically aimed the prevention and creation of household and community assets in food insecure and vulnerable Woredas of the country. It was indicated in the FGDs that the program is supporting extremely vulnerable and destitute households, particularly women and the elderly, through direct transfer of cash and food. The program also mobilizes the community through food-for-work arrangements to engage in soil and water conservation, bush clearing and maintenance rural roads. Households were asked to evaluate the role of the government in management of community assets, forests, range resources and water. Overall, the responses of households indicate that (see Table 23), government activities in the management of forest, rangeland and water resources have not been very effective. This implies that increased local level action is required by the

government to reduce vulnerability of households through improved management of basic natural assets.

On the other hand, the government has been supporting households by providing different packages that facilitate the transition from an exclusively pastoral way of life to agro-pastoralism through the provision of seeds, fertilizers, tools and training. Nevertheless, such efforts should consider appropriateness of the local agro-ecology, socio-cultural fabric and other sustainability issues to practice sedentary farming. In some communities, support is being given through micro-credit schemes (for example in Wadera Woreda) to women's organizations in order to enable them establish small businesses.

Table 23. Households' assessment of government responses (% of households)

Responses to:		Very effective	Moderately effective	Not effective	No idea
Drought	Borena	6	44	20	30
	Guji	3	59	18	20
	S. Omo	48	46	3	3
Epidemics and diseases	Borena	11	51	9	29
	Guji	8	72	11	9
	S. Omo	65	31	-	4
Conflict	Borena	22	48	13	18
	Guji	5	50	12	33
	S. Omo	61	34	2	3
Forest and range management	Borena	6	43	21	30
	Guji	9	65	13	13
	S. Omo	45	42	-	13
Water resource management	Borena	6	32	23	39
	Guji	8	72	11	9
	S. Omo	46	28	1	25

Source: Field survey 2008

Disaster prevention and management

In disaster-prone areas like the southern lowlands, the role of the government in disaster prevention and risk management is very crucial. In the study area, there are disaster prevention and preparedness units and committees in each Woreda that are commissioned to provide early warning information, assess needs and monitor risks. However, most of these units suffer from poor organization, limited capacity and resources (material and human), and lack of networking with relevant sector offices. Most households of the study area did not consider government responses against the impacts of climate change induced hazards very effective (see Table 24). FGD participants, mainly in Borena and Guji Zones, indicated that they are not satisfied with responses of the government particularly against droughts, diseases and pests, and conflicts that have been inflicting heavy losses. In fact, other sector offices undertake some development activities that enhance access to water (through wells and boreholes) and carry out environmental protection and rehabilitation programs to improve range resources. Nevertheless, most of these activities are handicapped by material and capacity limitation and often lack continuity in order to enable households to cope with disasters.

Table 24. Assessment of the effectiveness of government institutions (% of households)

	Borena	Guji	S. Omo
Effectiveness of government institutions in reaching the poor			
Yes	50	39	96
No	50	61	4
Bureaucratic hurdle to get government support			
Very challenging	31 48	28 58	58 34

Challenging			
Smooth	21	14	8
Interaction/communication with government institutions			
Very strong	14	10	59
Fairly good	38	39	30
Poor	41	39	11
No relation	7	12	-

Source: Field Survey 2008.

Conflict management and resolution

The frequency and complex nature of conflicts in the study area is a serious obstacle to local social and economic development. Considering the seriousness of the problem, the government has setup various committees at different administrative levels from the Zonal to Kebele level. At the Kebele level, there are local militias and peace committee mandated to provide conflict related early warning information and other security services. At the Woreda and Zone level, Police and Security offices have setup peace and conflict resolution committees from the community, organize peace conferences, and oversee the activities of local militia and other security units. In this regard, there are encouraging efforts particularly along with community policing to identify and detect symptoms of conflict and tension, control crime and criminals, and bring problems to the attention of concerned offices. This is an encouraging direction, but should proactively engage and empower community institutions, and should promote peaceful co-existence through public education, capacity building and social development. In general, government response to conflicts in the area is more reactive.

5. Conclusion and Recommendations

5.1. Conclusion

Climate change is one of the major development challenges of the 21st Century. It is widely recognized that failure to respond to this challenge would impede efforts aimed at reducing poverty, global inequality and insecurity. The poorest countries are among the most vulnerable and least adaptive to the effects of climate change. Ethiopia is one of these countries most affected by the impacts of climate change and weather extremes. Although symptoms of the problem are widespread in many places of the country, the lowlands suffer most from the impacts of climate change-induced hazards. The southern lowlands which are occupied by pastoral and agro-pastoral communities are among the affected lowlands of the country. This study was aimed at assessing the local level impacts of climate change-induced hazards and the responses in the southern lowlands of Ethiopia. The study attempted to generate relevant information that fill in the knowledge gap on the localized impacts of climate change and contribute to development activities and policy formulation.

Analysis of historical climate data in the study area reveals that there has been increased rainfall variability during the last three to five decades. The amount and distribution of rainfall has become unpredictable and unreliable over space and time. Similarly, the temperature pattern clearly shows an increasing trend of warming. Such changes in the patterns of rainfall and temperature created pressure on the available water, forest, and range resources thus exacerbating food and feed shortages and making the environment more vulnerable and less resilient to future changes in the climate system. As the

result of changes in the climatic pattern, a number of hazards occurred in the study area that exposed the people to the risks of several types of disasters such as drought, flooding, epidemics, wildfire and pestilence. There is increased frequency and spatial coverage of the hazards; existing hazards are intensifying and new types are emerging with deleterious effects on lives and resources. The people in the area are exposed to chronic food shortages, unstable livelihoods, and conflict over increasingly scarce and fragile resources. In addition, the rise in temperature caused increased frequency of droughts, forest fire, outbreak of diseases and pests, and increased emergence of noxious weeds.

Although drought is a common phenomenon in the study area, it has become more frequent and intense in magnitude in recent years. The drought cycle has become shorter and droughts prevail almost every year or two. The impacts of flooding have also been considerable in the study area. Repeated flash and seasonal floods from the Omo, Segan and Woito Rivers have caused widespread destruction of life and property and induced massive displacements. Particularly, Dasenech Woreda suffers most from seasonal floods and the associated outbreak of fatal diseases such as diarrhea (acute watery diarrhea), cholera and malaria. Study results indicate that the incidence and spread of diseases and pests is intensifying in the area in recent years. New human, livestock and crop disease types that have never been known in the sub-region have emerged. In particular, new livestock diseases have caused considerable loss. Camels and goats, which are normally considered more resistant to droughts and diseases, are affected by newly emerged and unidentified diseases. Crop damage has become widespread due to pest infestations and occurrence of new types of pests and worms.

The disasters have caused increased vulnerability to poverty, food insecurity and loss of productive assets. For instance, the number of livestock held by pastoralist households has shrunk over the past two decades. Shortage of adequate fodder and underfeeding of livestock reduced not only the number of livestock but also productivity and resistance to diseases. The problem is exacerbated by shortage of livestock health facilities, services and poor infrastructure. On the other hand, crop production is constrained by frequent and intense crop diseases and pests and erratic rainfall. Hence, crop yield has been declining over the past two decades. Due to drought and the resultant food insecurity, people were forced to eat previously non-edible wild fruits, leaves, and roots. The impacts of the hazards transcend beyond mere decline in crop and livestock production, rather become the cause of tense social relations triggering ethnic and tribal conflicts. Most of the conflicts in the area are caused by competition over scarce natural resources. They are usually triggered during dry seasons when the competition over water and pasture has become stiffer. The conflicts have intensified over time as available resources shrunk due to climate change. The conflicts lead to the loss of human lives and property, and livestock raiding. For instance, in the period 2004 – 2008, cattle raiding related to conflicts affected 45% of the households in South Omo and about a quarter in Borena and Guji Zones.

Women and children are most affected by the impacts of climate change-induced hazards in the area. The hazards create additional burden and make them most vulnerable to the impacts. During drought seasons, women have to spend on average four to six a day to fetch water and fodder for small ruminants and calves. The burden is even greater as the responsibility to look for and prepare food for the household rests on them. Children, especially girls, are forced to drop out of school at times of droughts, flooding and

conflicts. They are supposed to assist their family in household and agro-pastoral activities.

The impacts of climate change does not just depend on the actual variations in temperature, precipitation etc. themselves, but also on the social and economic systems of affected communities to cope with the impacts of the changes. In addition to the direct impacts of climate change induced-hazards, various other factors complicate the problem and reduce the adaptive capacity of communities to the changes. The main complicating factors identified in the study area include weak livestock market, lack of preparedness, demographic pressure, unfavorable socio-cultural practices, lack of education, health and other social services, poor infrastructure, and weak early warning information.

Households and communities employ a range of indigenous strategies to cope with the changes and/or adapt to it. However, with increased intensity of the problem and its impacts, the traditional coping mechanisms are becoming obsolete or incapable to reduce damages and build their resilience. Some of the strategies such as cultivation of unsuitable areas, overgrazing, charcoal making and fuel-wood selling are not only unsustainable but would also cause resource degradation and desertification. Hence, institutional support is vital to reduce impacts of the hazards and curb unsustainable trails of household and community responses against the impacts. The various NGOs operating in the study area have invaluable contributions in terms of land management, water harvesting practices, rangeland rehabilitation, micro-finance and credit schemes, conflict resolution, etc. They have been particularly designing and implementing development projects related to asset protection, livelihood

diversification, social service provision, natural resource management, and disaster risk reduction. Though the contributions are encouraging, most of these efforts suffer from lack of cooperation and fragmented approaches. Furthermore, climate change is not well integrated and factored in the development activities of the NGOs. This coupled with short project duration to address proximate impacts has in some cases led to the promotion of inappropriate and unsustainable technologies.

The government has also a significant role to play. Indeed, the government of Ethiopia has adopted policies, strategies and action programs aimed at poverty reduction, environmental protection and sustainable development. However, the country has no explicit policy on climate change yet. The threat of climate change as a development agenda is hardly captured in most of the policy and strategy documents. Instead, government response has been sectoral, short lived and biased towards emergency aid, which in most cases is insufficient and not delivered on time. The early warning system of the country is narrow in its approach and is biased towards capturing the threats of drought and food insecurity in an emergency situation. In addition, lack of synergy among the various sector offices has hindered integrated and collaborative efforts to effectively mobilize communities and manage their resources. The multifaceted, structural and deep rooted nature of the socio-economic and climatic problems in the pastoral areas of southern lowlands cannot be addressed with fragmented, piecemeal and narrowly designed sectoral approaches and projects. Without strong coordination and cooperation between all actors and stakeholders, and creation of operational synergies, neither the indigenous coping strategies nor the interventions of external actors will sufficiently address the complex impacts of climate change. In this regard, all governmental, nongovernmental and donor institutions have a

fundamental role to play in developing appropriate programs and action plans that respond to climate change impacts. In this regard, the following recommendations are forwarded.

5.2. Recommendations

- ***Adopt integrated disaster risk reduction and early warning system:*** Disaster risk reduction activities should be designed in line with climate change adaptation strategies. The early warning system should be comprehensive to include existing and new types of disasters with improved coordination and dissemination. Integrated and holistic disaster risk reduction requires a well designed early warning system and practical action to prevent disasters from happening or reduce effectively the impact during and after they occur.
- ***Build on existing local knowledge and practices, and strengthen local institutions:*** Interventions need to build on existing knowledge and coping strategies in order to ensure sustainability of their activities. Furthermore, the role and capacity of local institutions need to be strengthened. Government institutions and NGOs should engage pro-actively local institutions and respect their roles in decision-making over resource use and other areas affecting their lives and livelihoods.
- ***Mainstream adaptation and resilience to climate change in the development process:*** Climate change adaptation and mitigation should be integrated into the country's development agenda, across all sectors and all levels of government.

- ***Provide access to information, education and social/economic services:*** Increasing access to marketing outlets and information, education and raising awareness, and developing alternative and complementary livelihood activities. In order to ease the impacts of population pressure and unsustainable resource uses, education and awareness creation campaigns concerning family planning, home economics, and reproductive health services need to be essential components of such intervention.
- ***Prevent livestock diseases and improve veterinary services:*** In view of the expansion of livestock diseases and the emergence of newly emerging varieties, it is crucial to develop systematic monitoring and periodic assessment of livestock diseases, prevention and control programs. There needs to be early livestock feed intervention instead of emergency rationing and improve the provision of veterinary services.
- ***Protect assets and diversify livelihood options:*** Protect vital livestock, range and environmental resources in order to enhance local adaptive capacity and resilience. It is also necessary to diversify livelihood options that help to reduce exposure to climatic shocks. Also, improved market infrastructure and credit facilities are vital.
- ***Improve the coverage and quality of climate data:*** Availability of climate data that has a fairly good temporal resolution and spatial coverage would considerably contribute to enhance the understanding, analysis and prediction of climate change and its impacts for improved preparedness and adaptation. It is therefore

necessary to improve the coverage and quality of climate data in the study area in particular and in the country in general. Moreover, promote programs that build local capacity to collect, analyze and predict climate information.

- ***Promote climate friendly development initiatives:*** Development actors in the area should factor climate change as a major component of their activities. It is necessary to consider local realities and sustainability issues in the design and execution of development projects and programs. Furthermore, collaboration among the various development actors operating in the area is imperative in order to streamline activities, effectively manage human and financial resources, and successfully meet intended objectives.
- Encourage environment friendly and “climate proof” investments in water management for livestock and agriculture, develop new production systems such as conservation farming based on organic crops, promote drought and heat tolerant crops, and improve social safety-nets and crop insurance to smallholder farmers, especially in the drier areas of the country.
- ***Empower women and other vulnerable groups:*** Develop interventions that help to empower women to actively play a vital role in household and societal decision-making processes. Specific programs aimed at reducing the vulnerability of women and build their adaptive capacity are urgently needed.

- ***Mobilize adequate and stable financial resources:*** Strengthen the capacity of relevant government institutions in order to secure available funds from international donors and be able to effectively and efficiently utilize to build the resilience of vulnerable communities and ecosystems to the impacts of change.
- Conduct further research on the local level impacts of climate change in order to bring out specific problems for a more target response.

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