Climate-related vulnerability and adaptive-capacity in Ethiopia's Borana and Somali communities

Final assessment report

Save the Children UK

care

Béatrice Riché (IISD)

Excellent Hachileka (IUCN)

Cynthia B. Awuor (CARE International)

Anne Hammill (IISD)

August, 2009

iisd International Institute for Sustainable Development / Institut international du développement durable

IUCN

Executive Summary

Pastoral communities in the Borana and Shinile zones of Ethiopia have been changing and adapting their livelihoods to changing environmental conditions for centuries. Recurrent droughts have been a major issue throughout history in the Ethiopian lowlands, and strategies to cope with, and adapt to these droughts are embedded in communities' traditional social structures and resource management systems.

Local and scientific observations show that the region's climate is changing. Recent evidence includes increasing temperatures and drought frequency, as well as unpredictable rains that fall in shorter but more intense episodes. The magnitude and rate of current climate change, combined with additional environmental, social and political issues, are making many traditional coping strategies ineffective and/or unsustainable, amplifying environmental degradation and food insecurity, and forcing communities to rapidly find new livelihood strategies.

The communities participating in this study have many ideas on how to prepare for future climate change, demonstrating a strong motivation to move out of poverty and take their future into their own hands. Suggested strategies include: modifying livestock diversity, composition and numbers; diversifying livelihood activities; producing, collecting and preserving hay; modifying rangeland management practices; modifying farming practices; maintaining, rehabilitating and constructing water infrastructure; education; savings and credit; establishing community groups to promote local engagement in a range of social and economic activities; making local natural resource management more effective, efficient and participatory; reducing conflicts over available resources; planting trees; and raising community awareness on climate change issues, including future projections and potential adaptation strategies.

Despite this sense of determination, pastoralists' ability to adapt is constrained by many factors including increasing land degradation; conflicts over scarce resources, which limit movement and destroy assets that are key for adaptation (especially in Borana); limited access to information (including that on weather, climate change, markets, as well as pest and disease outbreaks); limited education, skills and access to financial services and markets required to diversity their livelihoods; inadequate government policies, capacities and coordination; demographic pressures; and social and gender inequalities and marginalization, which reduce the voice and adaptive capacity of the most vulnerable. Enhancing the adaptive capacity of pastoralists will require community-based and community-led interventions, but will also require tailored support from NGOs, donors, and governments.

Table of Contents

1. Introduction

The purpose of this research is to undertake a comparative analysis of the climate-related vulnerability and adaptive capacity of Borana and Somali pastoralist communities in Ethiopia, how they have changed over time, and how they relate to climate change. The results of this analysis are intended to provide the Government of Ethiopia, civil society organizations, and international donors a basis for:

- **Improved development programming**, whereby results are used to devise strategies that support pastoral communities in managing risk and vulnerability; and
- **Advocacy**, whereby local information, observations and experiences are documented and communicated to broader audiences to raise awareness on pastoral issues.

For the purposes of this analysis, community-level vulnerability is understood as a function of exposure to (climate and non-climate) hazards, sensitivity to hazards, and adaptive capacity (IPCC 2001). Information on vulnerability is disaggregated, where possible, according to location, gender, age, and wealth in order to better understand exactly who is vulnerable to what, and how livelihood stresses are being observed and experienced by different social groups. A special focus is given to the underlying drivers of vulnerability. The implications of future climate change on the three pillars of pastoral livelihoods (livestock, people and natural resources) are also assessed. The report concludes with a series of recommendations for the Government of Ethiopia, civil society organizations, and international donors to improve the impact of their interventions on local-level resilience to climate change.

The process of undertaking this research involved a combination of training activities, field visits, and stakeholder consultations, which were conducted in Ethiopia during May and June of 2009. The International Institute for Sustainable Development (IISD) was contracted by CARE International and Save the Children UK (SCUK) to lead this study. Technical support was provided by the International Union for Conservation of Nature (IUCN), CARE International, and SCUK. Financial support was provided by the United States Agency for International Development (USAID) and the European Commission Humanitarian Aid Organization (ECHO).

2. Methodology

This study uses a bottom-up, vulnerability-driven approach to assess the implications of climate change on pastoral and agro-pastoral livelihoods in the Borana and Shinile zones of Ethiopia. It seeks to compile some of the perceptions and experiences of local communities and individuals who are on the frontlines of climate change.

Drawing from the definitions used by the Intergovernmental Panel on Climate Change's (IPCC), climate-related ***vulnerability*** is understood in terms of climate change exposure, sensitivity, and adaptive capacity (2001). ***Exposure*** is defined by the magnitude, character and rate of climate change in a given geographical area. ***Sensitivity*** to climate change is the degree to which a community is adversely or beneficially affected by climate-related stimuli. For the purposes of this analysis, sensitivity largely depends on the main livelihood activities practiced in a community (including its dependence on livestock and rain-fed agriculture), including the specific natural, physical, financial, human and social resources needed to carry out these activities, as well as the impacts of climate hazards on these key livelihood resources. The ***adaptive capacity*** of a community is its ability to adjust to climate change, to moderate or cope with the impacts, and to take advantage of the opportunities that may arise with climate change. It is understood in terms of some basic socio-economic factors or determinants (income, access to resources and services, literacy, etc.), a community's past and current strategies for coping with climate stress, whether these strategies are feasible in the face of future climate change, possible strategies to prepare for and cope with future changes, as well as the different enabling conditions and barriers to adaptation.

Guiding questions that were used in this research to assess climate-related vulnerability are presented in the Vulnerability Framework in Table 1.

Table 1: Climate Change Vulnerability Framework

Exposure	Sensitivity	Adaptive Capacity
1. **Which climate-related hazards affect livelihoods?** 2. **What have been the observed changes in the timing, frequency, and intensity of these hazards?** 3. **How do these climate-related hazards interact with non-climate hazards?** 4. **What are the projected impacts of future climate change in the research areas?** - How do community observations compare?	1. **How sensitive are livelihood activities to climate change?** Indicators of sensitivity include: - Dependence on livestock - Livestock type (are they resilient species?) - Dependence on rain-fed agriculture - Crop mix/types (are they resilient species?) - Environmental conditions (type, level, rate of degradation) 2. **Which livelihood resources are most affected by climate hazards?**	1. **What are some of the socio - economic factors determining adaptive capacity?** 2. **What are the communities' past and current experiences with risk management and coping** - Activities currently undertaken to cope with climate hazards? - Effectiveness and sustainability of strategies with future change 2. **What are some options for risk management and coping with future changes?** - Activities to prepare for climate change impacts - Resources that are key to these activities 3. **What are the enabling conditions and barriers to adapting?**

The methods used to answer these different questions related to vulnerability included a combination of:

- Consultations with pastoral and agro-pastoral community groups, as well as with governmental and non-governmental organizations working with pastoralists and agro-pastoralist communities in Borana and Shinile;
- Gathering of primary 'indicator' data (related to population, livelihoods, geography and well-being);
- Review of climate data from the National Meteorological Agency (NMA) and the Famine Early Warning System Network (FEWS NET); and
- Secondary, desk-based review of key documents including: UNDP's Climate Change Country Profile for Ethiopia, IPCC reports, Ethiopia's National Adaptation Programme of Action (NAPA), SCUK Livelihood reports, and other relevant research reports.

The research involved three main stages: (1) a 4-day training workshop in Adama, (2) 10 days of field work in Borana and Shinile zones, and (3) data analysis and reporting. These stages are summarized in Table 2 below.

Table 2: Research Stages

Stage 1: Training workshop in Adama/Nazret	Stage 2: Field work in Borana and Shinile zones	Stage 3: Analysis and Reporting
19-22 May 2009	23 May to 3 June 2009	8 June to 15 August 2009
• Offered by IISD and CARE International • To introduce CARE and SCUK staff in Ethiopia to CC vulnerability and adaptation and how to integrate it into development interventions through the application of 2 tools: CVCA and CRiSTAL (see Table 3)	• Undertaken by IISD, IUCN, CARE International and SCUK (Table 4) • To gather information for a comparative analysis of vulnerability and adaptive capacity in Borana and Somali communities • Research sites: 3 pastoralist associations in 3 districts in Borana zone and 3 villages in 3 districts in the Shinile zone (Table 5) • Tools used during field work included: rain calendars, vulnerability matrices, CRiSTAL, and CVCA Framework (Table 3) • The field guides and reporting template used by the field research teams are included in Annexes 10.1 and 10.2	• Led by IISD, with CARE International and IUCN • To analyse the gathered field data, climate information and background documents • Analysis written up into a summary report • Analysis presented at a feedback workshop in Addis Ababa on 17 July 2009 • Full assessment report and policy brief prepared for distribution

Descriptions of the tools used during the field work are provided in Table 3 below. The rain calendar and vulnerability matrix are community-based participatory tools, which were used with four community groups (old men, young men, old women and young women) in each village or pastoralist association (PA) visited. The Climate Vulnerability and Capacity Assessment (CVCA) framework was used by the research team to develop the field methodology and consultation questions, as well as to analyze some of the gathered data. CRiSTAL, a computer-based decision-support tool, was used by the research teams to analyze some of the data collected from community consultations.

Table 3: Summary Descriptions of Tools used in the Field Work

Tool	Objectives	For more information
Rain Calendar	- To understand what is "normal" rainfall from the perspective of community members - To examine trends in rainfall - To brainstorm on future rainfall scenarios and potential responses - To evaluate use of climate information for planning	See Annex 10.1, Field Guide 2
Vulnerability Matrix	- To determine the hazards that have the most serious impact on important livelihoods resources - To determine which livelihoods resources are most vulnerable - To discuss who has control over and access to livelihoods resources - To identify coping strategies currently used to address the identified impacts, and explore new potential strategies	See Annex 10.1, Field Guide 3 This tool is also part of the CVCA (see below)
CRiSTAL (Community Based Risk Screening Tool – Adaptation and Livelihoods)	- To better understand linkages between livelihoods, climate and project activities - To identify which livelihood resources are most vulnerable to climate hazards, and which resources are important for adaptation - To assist project planners and managers in making project adjustments to improve its impact on community resilience to climate change	www.cristaltool.org
CARE's CVCA (Climate Vulnerability and Capacity Analysis)	- To analyze vulnerability to climate change and adaptive capacity at the community level, based on a framework of 'enabling factors' for community-based adaptation - To combine community knowledge and scientific data to yield greater understanding about local impacts of climate change	http://www.careclimatechange.org/cvca

Figure 1: Community consultations with men's and women's groups in Medhecho PA

The research involved 2 field teams, as shown in Table 4 below. Staff from SCUK and CARE Ethiopia acted as facilitators during the field work. Most of them previously participated in the training workshop in Adama. Staff from IISD, IUCN and CARE Kenya provided technical advice on the application of the above tools and supervised the field work. A writer from CARE International joined the field teams to interview individual community members and compile climate-related stories/case studies. A consultant photographer also accompanied the field teams for a few days in each zone.

Table 4: Field Work Teams

Borana Zone	Shinile Zone
Kedir Musema (CARE Ethiopia) Boneya Guyo (CARE Ethiopia) Lemessa Demie (CARE Ethiopia) Hussien Tadele (CARE Ethiopia) Tesfaye Temesgen (CARE Ethiopia) Kassahun Aberra (CARE Ethiopia) Safo Halake (CARE Ethiopia) Malicha Sora (CARE Ethiopia) Béatrice Riché (IISD) Cynthia Awuor (CARE Kenya) Linda Ogwell (CARE International) Sylwia Pecio (Photographer)	Demeke Eshete (SCUK Ethiopia) Hassen Rebe (SCUK Ethiopia) Ahmed Mohammed (SCUK Ethiopia) Yassin Mohammed (SCUK Ethiopia) Mahlet Bezu (SCUK Ethiopia) Mohammed Aden (SCUK Ethiopia) Excellent Hachileka (IUCN) Cynthia Awuor (CARE Kenya) Linda Ogwell (CARE International) Sylwia Pecio (Photographer)

3. Background on Borana and Shinile zones

3.1 Geographic and livelihood information

This study was undertaken in the Borana and Shinile administrative zones of Ethiopia, two lowland areas where pastoralism is the predominant livelihood activity. Research areas included three Pastoralist Associations (PAs) in three different districts in the Borana zone, and three villages in three different districts in the Shinile zone, as shown in Table 5 below.

Table 5: Research Areas and Livelihood Zones (LZs)

	Regional State	Administrative Zone	District	PA or Village	Livelihood Zone
CARE Site	Oromia	Borana	Dire	Medhecho PA	Borana-Guji Cattle Pastoral (BGP)
			Moyale	Mado PA	Moyale Cattle, Camel & Shoat Pastoral (MCP)
			Teltele	Billa PA	Southern Agro-Pastoral (SAP)
SCUK Site	Somali	Shinile	Shinile	Kalabaydh Village	Shinile Pastoral (LZ2)
			Ayisha	Biyodidley Village	Shinile Pastoral (LZ2)
			Erer	Adajoma Village	Shinile Agro-Pastoral (LZ3)

Borana zone

The Borana administrative zone is situated in Ethiopia's Oromia regional state. This zone is divided into 10 *woredas* (districts) and its capital is Yabello. It is bordered on the south by Kenya, on the west by the Southern Nations, Nationalities, and Peoples Regional State (SNNPRS), on the north by the Bale zone and on the east by the Somali region. The Borana zone covers a total area of 48,743 km^2 (CORDAID and FSS, 2009; CSA, 2008). It lies at an altitude of less than 1500 m above sea level. It is an arid and semi arid area, with pockets of sub-humid zones. The rangelands are dominated by tropical savannah vegetation with varying proportions of open grasslands and perennial woody vegetation (Pratt and Gwynne, 1977: in Homann*et al.*, 2007). Perennial rivers in the area include the Dawa and Segen rivers.

The population of Borana zone is 966,467, consisting of 489,001 males and 489,001 females, with about 9% of the population classified as urban (CSA, 2008). The four largest ethnic groups are the Oromo (77%), the Gedeo (13%), the Amhara (3%), and the Somali (3%). The other ethnic groups make up about 4% of the population. The major religions are: Protestantism (32%), traditional beliefs (27%), Islam (14%), Ethiopian Orthodox Christianity (11%) and Catholism (1%) (CSA, 1994). According to a World Bank memorandum (2004), about 4% of the population in Borana has access to electricity; the zone has a road density of 27.5 km per 1000 km^2 (compared to a national average of 30 km); and the average rural household has 0.5 ha of land (compared to a national average of 1.01 ha and an average of 2.25 for pastoral regions). About 14% of the population is involved in non-farm related income-generating activities, compared to a national average of 25%. About 53% of eligible children are enrolled in primary school and 9% attend secondary school. In addition, according to this memorandum, 35% of the Borana zone is exposed to malaria (World Bank, 2004; World Bank, 2003; Deninger *et al.*, 2003).

According to CORDAID and the Forum for Social Studies (FSS) (2009), grazing/browsing land in Borana covers about 1,871,190 ha, bush and woodland about 155,050 ha, and cultivated land about 342,040 ha. The majority of community members in the zone are pastoralists or agro-pastoralists, and livestock holdings mostly determine the level of household wealth. The main livestock kept in the area include cattle, sheep, goats and camels. The main agricultural crops are maize, teff, sorghum and haricot beans. It is estimated that 55.4% of the income in the zone is derived from the sale of livestock (Demeke, 2006). Livestock exports from Borana contribute significantly to national foreign exchange earnings. High quality animals are also provided from the zone to highland areas for traction power and as a genetic base for breeding (CORDAID and FSS, 2009). Cattle contribute much of the total milk production in Borana. The majority of the milk produced is consumed by households, but a considerable portion is also sold on the market in Borana. About 60-70% of household food requirements are met through the purchase of staple foods. Subsistence agriculture and food relief contribute to a lesser extent to food needs. Other livelihood activities in the area include casual labor in the construction industry, sale of livestock products (such as milk), beekeeping, production and sale of vegetables, charcoal, firewood, water, minerals (such as gold, marble and granite), incense and natural gum (CORDAID and FSS, 2009).

Shinile zone

The Shinile administrative zone is located in the north-west of the Somali regional state. The Shinile zone borders the Afar zones 1, 3 and 5 (Afar region) to the north-west, the Harerge zones (Oromia region) to the south, the Jigjiga zone (Somali region) to the south-east, and Djibouti to the north-east. The Shinile zone is made up of six districts: Shinile, Dambal, Aysha'a, Erer, Afdem and Meisso. The altitude in the Shinile zone ranges from 950 to 1350 m above sea level. Its terrain consists of undulating hills, stony outcrops interspersed with plains of loose soil covered by bush and woody grasses. Three seasonal rivers, namely Erer, Hurso and Chow, and several dry river beds are found in the area (SCUK and DPPA, 2008).

According to the Central Statistical Agency (CSA) (2008), Shinile has an estimated population of 456,434, of which 245,928 are males and 210,506 females. About 14% of the population is classified as urban. The main ethnic group in Shinile is Somali, representing 95% of the population. According to a World Bank memorandum (2004), 0% of the population in Shinile has access to electricity; the road density is 17.3 km per 1000 km2 (compared to a national average of 30 km); the average rural household has 1.2 hectares of land (compared to a 1.01 national average and a 2.25 average for pastoral regions) (World Bank, 2004; Deninger *et al.*, 2003).

It is estimated that 80% of the 96,988 rural inhabitants in Shinile district, all the 50,043 rural inhabitants in Aysha'a, and 80% of the 83,471 rural inhabitants in Erer are pastoralists. The other 20% in Shinile and Erer are engaged in agro-pastoralism. Less than five percent of the population is involved in commercial activities in urban or trading centers (Population estimates for 2007 based on 1994 census: in SCUK and DPPA, 2008). Pastoralists are engaged in the production of livestock and livestock products such as milk and ghee. Camels and goats are predominant in the mountainous areas, whereas sheep and cattle are found in other areas. Milk is mainly consumed by households or given as gifts when it is abundant. During the rainy seasons, all livestock remain around the homesteads. In the dry season, herds are normally sub-divided. The sheep, as well as expectant and lactating animals stay near the villages, whereas hardier animals are taken further afield in search of water and pasture. Among pastoralists, wealth is mostly determined by the number of livestock owned by a household. Cattle are considered most important because they produce milk and ghee which can be sold. Sheep and goats are also important because they are easy to sell. Among agro-pastoralists, livestock holdings (especially cattle) as well as land holdings determine wealth. The main sources of income for pastoralists include sale of livestock and camel rent. Agro-pastoralists derive income from the sale of livestock, milk (mainly near urban centers), ghee, bush products such as firewood, pack camel rent, and grains. Remittances from relatives working in urban areas e.g. Diredawa, Djibouti, or Borana, and religious alms (Zakaat) to the poor are additional income sources. Households in the area incur expenditure on cereals, sugar, and oil (SCUK and DPPA, 2008).

3.2 General Climate Information

In Borana, the average annual rainfall ranges between 350 and 900 mm, with considerable spatial and temporal variability in quantities and distribution. Rainfall in the area is bimodal, with 60% occurring in the long rainy season (Gaana), which occurs from March to May, and the short rainy season (Hagaya) from September to November (Coppock, 1994: in Homann*et al.,* 2007). The long dry season (Boonahagaya) occurs from December to February, and the short dry season (Adolessa) occurs from June to August. The average annual temperature ranges between 19 and 26°C (CORDAID and FSS, 2009). Variable rainfall results in great variability in forage and range production. To cope with variable range production, communities in Borana area often combine

mobility and sedentary livestock management.

The Shinile zone receives an average of 500 to 700 mm of rain annually (SCUK and DPPA, 2008). The annual mean temperature ranges between 22.5 and 32.5°C, depending on the location within the zone (National Meteorological Agency, 2001: in Ethiopian NAPA, 2007). There are two rainy seasons, namely the Diraa' or Gu (short rains) from mid-March to mid-May and the Karan (long rains) from mid-July to mid-October. The dry seasons are Hagaa, from mid-May to mid-July, and Jilaal, from mid-October to mid-March. When there is a good amount of rainfall, water and pasture are generally available, milk production is high, the purchase of cereals is low, and the livestock stays around the homesteads. Conversely, during dry seasons, there is low availability of water and pasture, milk production decreases, the purchase of cereals increases, livestock migrate further afield, and livestock sales are high. Bush product collection also increases during the dry season.

The seasons in Borana and Shinile are illustrated in Table 6 below. However, it is important to note that the onset and duration of the rainfall seasons, as well as rainfall intensity and annual quantity, vary considerably inter-annually, due to the movements of the Inter-Tropical Convergence Zone (ITCZ), causing frequent drought in various parts of Ethiopia (McSweeney *et al.*, 2008). Climate variability, as well as long-term trends, will be discussed further in the next section.

Table 6: Seasons in Borana and Shinile Zones

Months	J	F	M	A	M	J	J	A	S	O	N	D
Borana	Boona hagaya (long dry season)		Gaana (long rainy season)			Adolessa (short dry season)			Hagaya (short rainy season)			
Shinile	Jilaal (long dry season)			Diraa' or Gu (short rainy season)		Hagaa (short dry season)		Karan (long rainy season)			Jilaal (long dry season)	

4. Analysis of climate change vulnerability

For the purposes of this analysis, vulnerability is understood in terms of climate change exposure, sensitivity, and adaptive capacity (see Table 1: Climate Change Vulnerability Framework). Each of these components of vulnerability consist of a series of indicative conditions (e.g. livelihood characteristics, socio-economic status), trends (e.g. observed changes in climate, environment, society), and experiences (e.g. impacts of hazards on livelihoods, coping strategies). Understanding these components of vulnerability relies on a combination of quantitative and qualitative information, which allows for a more nuanced and dynamic understanding of vulnerability.

4.1 Exposure to climate variability and change

Climate change exposure is defined by the magnitude, character and rate of climate change in a certain geographic area. Due to the lack of long-term and/or continuous meteorological records in many parts of the developing world, as well as the lack of scientific projections at more localized scales, scientific information (summarized and presented later in this section) in is often insufficient for analyzing local exposure to climate change. As a result, scientific information must build upon and be complemented by an analysis of local-level climate observations through consultations with communities and other local actors who are on the frontlines of climate change.

4.1.1 Current climate-related hazards and impacts in Borana and Shinile zones

The main climate-related hazard affecting pastoral and agro-pastoral communities in Borana and Shinile is drought. In Borana, when asked to rank the main (climatic and non-climatic) hazards affecting their livelihoods, 8 community groups out of 11 ranked drought has the main hazard (all community groups in Medhecho and Mado PAs), and 3 groups ranked drought as the second most important hazard (all groups in Billa PA), as shown in Table 7 below. The other hazards mentioned included conflict (mentioned as one of the main three hazards by 10 out of 11 groups), locust infestation (mentioned as the primary hazard by 2 groups in Billa), bush encroachment, livestock diseases, and human diseases (mostly malaria).

Table 7: Main Hazards Affecting Livelihoods in Borana

Pastoralist Association	Community Group	Hazard 1	Hazard 2	Hazard 3
Medhecho	Old men	Drought	Conflict	Bush encroachment
	Young men	Drought	Conflict	Animal diseases
	Old women	Drought	Conflict	Animal diseases
	Young women	Drought	Livestock diseases	Conflict
Mado	Old men	Drought	Conflict	Bush encroachment
	Young men	Drought	Conflict	Animal diseases
	Old women	Drought	Conflict	Human diseases
	Young women	Drought	Conflict	Diseases
Billa	Old men	Conflict	Drought	Human diseases
	Young men	Locust infestation	Drought	Human diseases
	Women	Locust infestation	Drought	Conflict

In Shinile, all 12 community groups interviewed ranked drought has the main hazard, as shown in Table 8 below. Livestock and human diseases were ranked as the second and/or third most important hazard by the 12 groups. Extreme heat was ranked as the second most important hazard by 2 groups and as the third hazard by 6 groups. Land degradation was ranked as the third most important hazard by one group in Erer District.

Table 8: Main Hazards Affecting Livelihoods in Shinile

District	Community Group	Hazard 1	Hazard 2	Hazard 3
Shinile	Old men	Drought	Livestock & Human disease	Extreme Heat
	Young men	Drought	Livestock & Human disease	Extreme Heat
	Old women	Drought	Livestock diseases	Human diseases
	Young women	Drought	Livestock diseases	Extreme Heat
Ayisha	Old men	Drought	Livestock diseases	Land degradation
	Young men	Drought	Livestock diseases	Human Diseases
	Old women	Drought	Extreme heat	Human & livestock Diseases
	Young women	Drought	Human & livestock disease	Extreme heat
Erer	Old men	Drought	Livestock & Human disease	Extreme Heat
	Young men	Drought	Disease	Land degradation
	Old Women	Drought	Livestock diseases	Extreme Heat
	Young women	Drought	Extreme Heat	Diseases

Droughts have hit Ethiopia regularly throughout history. However, according to communities and government officials at the Pastoralist, Food Security and Disaster Preparedness Offices in Borana, drought frequency in the region used to be every 6-8 years, but has now increased to every 1-2 years. Since 2005, at least two major droughts (in 2006 and 2008) have hit the Borana zone, as shown in the community-made rain calendars. The 2006 drought was especially severe. According to young

men in Medhecho PA, the 2006 drought led to the death of 25-60 percent of all livestock in the area, while the 2008 drought caused the death of weak animals and some calves, and also impeded pasture and crop growth. In the Somali region, Ayisha and Erer districts have had 15 and 4 days of rain respectively from 2007 to 2009, according to the recollection of the communities interviewed. The worst years in Somali region in terms of drought were 2007 and 2008, with communities reporting loss of about 80% of their cattle, 70% of their sheep, 40% of their camels and 30% of their goats. This shows that different livestock types have different resilience to climate hazards and livestock loss may be in part related to rainfall amount and distribution.

Drought impacts include decreased pasture availability, leading to pasture shortage, overgrazing, and land degradation; decreased water availability, leading to water shortages and travel over long distances by women in search of water; decreased livestock disease resistance; decreased livestock productivity, in terms of milk and meat; emaciation and death of livestock; decreased livestock prices and household incomes; crop failure in agro-pastoral areas; food insecurity and malnutrition, mostly affecting children, pregnant women and old people; abnormal community mobility; increased school drop-out due to community migration in search of pasture and water; interruption of development activities; increased human diseases and death; and (especially in Borana) increased conflicts over scarce resources.

Extreme heat was mentioned as a major hazard only in Shinile. Average temperatures are in general higher in Shinile than in Borana, so temperature increases have greater negative impacts in Shinile, sometimes exceeding the temperature threshold of livestock, crops and humans. The impacts of extreme temperatures are very similar to the impacts of droughts, including decreased pasture availability; increased water evaporation, leading to water shortages; emaciation and death of livestock; decreased livestock disease resistance and productivity; decreased livestock prices and household incomes; crop failure in agro-pastoral areas; food insecurity and malnutrition; increased human diseases; decreased human labor productivity; and increased conflicts over scarce resources. Communities in Shinile also mentioned that high temperatures foster the replacement of grass species by bushes, thereby contributing to enhanced bush encroachment.

The impacts of the different hazards affecting pastoral and agro-pastoral livelihoods in Borana and Shinile are summarized in Table 9 below. A review of these impacts helps to explain why certain hazards – i.e. drought, extreme heat – were ranked as more important than others.

Table 9: Impacts of Hazards in Borana and Shinile

Hazard	Impacts
Drought	- Decreased pasture availability (leading to shortage of pasture, overgrazing, and land degradation) - Decreased water availability (water shortages) - Emaciation of livestock (livestock weight loss) - Death of livestock - Decreased livestock productivity (milk and meat) - Decreased livestock disease resistance - Decreased livestock prices - Reduced incomes - Crop failure (mentioned in agro-pastoral communities in Mado, Billa and Erer) - Food insecurity and malnutrition (mostly affecting children, pregnant women and old people) - Increased school drop-out rates (due to migration) - Interruption of development activities - Drop out of members from saving and credit cooperatives - Women walking longer distances in search of water - Increased human diseases and death - Increased conflicts over scarce resources (in Borana)
Extreme heat (Shinile)	- Decreased pasture availability (leading to pasture shortages, overgrazing, and land degradation) - Decreased water availability (water shortages) - Poor condition of livestock and weight loss - Death of livestock - Decreased livestock productivity (milk and meat) - Decreased livestock disease resistance - Decreased livestock prices - Reduced incomes - Crop failure (for agro-pastoralists in Erer) - Food insecurity and malnutrition (mostly affecting children, pregnant women and old people) - Increased human diseases - Decreased human labor productivity - Increased conflicts over scarce resources - Bush encroachment
Livestock diseases	- Livestock weight loss - Reduced livestock productivity - Reduced livestock breeding - Livestock deaths - Loss of market access - Loss of incomes - Increased household food insecurity (especially due to scarcity of stable food like milk) - Human deaths (due to contamination)

Human diseases	- Decreased work power / human labor and productivity - Decreased income - Human deaths
Conflicts (Borana)	- Human deaths - Loss of husbands - Livestock raiding - Loss of property - Displacement - Increased poverty - Increased village instability - Interruption of development activities and education - Loss of access to markets, water sources and grazing lands - Difficulty in taking livestock to grazing lands in remote/border areas (leading to overgrazing and land degradation) - Damage to crops / farmland (mentioned in Billa)
Locust/pest infestation (Borana)	- Crop damage - Food shortages - Damage of pasture lands
Bush encroachment (Borana)	- Decreased pasture availability - Increased presence of predators - Food insecurity
Land Degradation (Shinile)	- Increased local temperatures - Decreased water availability due to increased water runoff - Poor pasture growth - Decreased availability of forest products - Increased soil erosion and decreased soil fertility and productivity

4.1.2 Interactions between climate and non-climate hazards

While the communities identified some non-climate hazards as affecting their lives and livelihoods, even these have some linkages with climate variability and climate change. It follows then that future climate change can be expected to exacerbate existing stresses on pastoral livelihoods.

Conflict

Conflicts are most often linked to competition over scarce resources, especially during drought years. Another factor leading to increased conflicts in Borana include new boundaries limiting movement. Boundaries are often changing and are not clearly defined in Borana. Internal borders are presently creating more issues than international borders. Livestock raiding used to be considered part of life, but now people are being killed intentionally during conflicts, which did not occur before. In Borana, there is a lot more animosity between ethnic groups than there used to be. Conflicts are less of an issue in the Somali villages visited, due to fewer internal borders, and less ethnic and religious diversity.

Patterns of disease and pest outbreaks

Climate change is expected to affect disease and pest distribution, range, prevalence, incidence and seasonality but the degree of change remains highly uncertain (IPCC, 2007). The potential impact of climate change on human diseases is relatively better understood than those on animal health. Nonetheless, climate change is expected to affect both pathogen and vector habitat suitability through changes in temperature, precipitation, humidity and wind patterns (Agrawala *et al.* 2003). Heat stress and drought are likely to have further negative impacts on animal and human health and disease resistance (IPCC, 2007). . Although the use of vaccinations and medications have decreased the incidence of livestock diseases in some of the research areas, disease and pest outbreaks were mentioned as important hazards in all of the PAs and villages. In Teltele District (Borana), the Vice-Chair of the Pastoralist Development Office noted that livestock are less able to deal with diseases due to decreasing pasture availability and quality (partly caused by changing weather patterns and recurrent droughts). In Shinile, the occurrence of strange or uncommon livestock diseases was reported in all three villages and attributed to a combination of weather patterns and decreased disease resistance, the latter stemming from decreased pasture availability and quality, as well as increased water stress. Human diseases such as malaria and diarrhea have also been reported as increasing in Shinile, especially amongst children, during warmer months and drought years as a result of milk scarcity, malnutrition, and lower disease resistance.

Cycle of land degradation

When the field work was undertaken in May-June 2009, most of the landscape in Shinile was dry and devoid of greenery due to very poor or absent 2009 Gu rains and land degradation (itself a result of deforestation, overgrazing, recurrent droughts, etc.). Land degradation can be both an impact and an amplifier of changing weather patterns. Indeed, communities in Borana and Shinile mentioned the impact of drought and extreme heat on pasture growth/availability, leading to pasture shortage, overgrazing, and land degradation. Communities in Shinile and government officials in Borana also mentioned that land degradation is contributing to increased local temperatures and decreased water availability (due to increased water runoff), thereby contributing to local climate change and enhancing its negative impacts.

Bush encroachment

Compared to Shinile, all three PAs in Borana were very green, but this was mostly due to the presence of shrubs. There were very few useful trees or grasses. Bush encroachment is considered a major issue/hazard in all three of the PAs visited in Borana and most of the pastures have been invaded. Some invasive species are indigenous while others have been introduced. Many of these shrubs serve no purpose for communities and their livestock, and some shrub species can even cause injuries and livestock paralysis. Bushes also serve as hiding places for predatory animals (e.g.

hyenas, wolves) and poisonous snakes that attack livestock and humans. According to communities in Medhecho, a major cause of bush encroachment is heavy precipitation events, causing soil erosion, which washes away grass seeds and seedlings, allowing for the subsequent replacement of grasses by bushes. Although there are many other potential drivers of bush encroachment, including bans on bushfires, overgrazing, and consequent land degradation, the contribution of changing weather patterns (such as increasing rainfall intensity, more frequent droughts, increasing temperatures, and shortening rainy seasons that prevent grass growth and propagation) could be significant and should be explored further.

4.1.3 Climate change observations in Ethiopia

Given the range of negative impacts of current climate (and non-climate) hazards on pastoralist and agro-pastoralist livelihoods, the implications of climate change must be taken into account to ensure longer-term survival and sustainability of these communities. This requires an appreciation of how the climate has already changed in recent decades and what is projected to change in the decades to come. According to the UNDP Climate Change Profile for Ethiopia, the mean annual temperature in Ethiopia has increased by 1.3°C between 1960 and 2006, at an average rate of 0.28°C per decade. The temperature increase has been most rapid from July to September (0.32°C per decade). It is reported that the average number of hot days[1] per year has increased by 73 (an additional 20% of days) and the number of hot nights has increased by 137 (an additional 37.5% of nights) between 1960 and 2006. The rate of increase is seen most strongly in June, July and August. Over the same period, the average number of cold days and nights[2] decreased by 21 (5.8% of days) and 41 (11.2% of nights), respectively. These reductions have mainly occurred in the months of September to November (McSweeney *et al.*, 2008).

It very difficult to detect long-term rainfall trends in Ethiopia, due to the high inter-annual and inter-decadal rainfall variability. Between 1960 and 2006, no statistically significant trend in mean rainfall was observed in any season. The decrease in rainfall observed in July to September in the 1980's recovered in the 1990s and 2000s. In addition, there are insufficient daily rainfall records to identify trends in daily rainfall variability and changes in rainfall intensity (McSweeney *et al.*, 2008).

According to the National Meteorological Agency, Ethiopia experienced 10 wet years and 11 dry years over the last 55 years, demonstrating the strong inter-annual variability. The wet years included 1958, 1961, 1964, 1967, 1968, 1977, 1993, 1996, 1998 and 2006. Dry years were 1952, 1959, 1965, 1972, 1973, 1978, 1984, 1991, 1994, 1999, and 2000 (Ethiopian NAPA, 2007).

[1] Hot day/night is defined by the temperature exceeded on 10% of days/nights in the current climate of that region and season.
[2] Cold day/night is defined as the temperature below which 10% of days/nights are recorded in the current climate of that region and season.

Recent analyses of rainfall and food security indicators by FEWS NET (2009) suggest that southern and eastern Ethiopia (including both Borana and Shinile zones) have been experiencing recent reductions in rainfall, mainly since 1996 and during the March to May rainy season. The reports also mention that the observed food aid and projected food shortfalls show chronic and increasing requirements that may soon extend beyond the intermittent aid strategy underlying early warning systems. The reports state that lowland and midland areas in the south and east may be the most affected by rainfall reductions and population growth, leading to the failure of pastoral livelihoods and farming in marginal land. The recent and recurrent poor March to May rainy season in many regions negatively impacts the growth of slow maturing long-cycle crops, pasture conditions, and seasonal harvests. As of June 2009, a total of 7.5 million chronically food insecure people received assistance through employment in public works under the Productive Safety-Net Program (PSNP) and an additional 4.9 million people required emergency food assistance. According to these reports, the decrease in the March-May rainy season across the Greater Horn of Africa might be linked to the recent warming in the western Indian Ocean. Figure 2 below shows the food security conditions in Ethiopia as of June 2009.

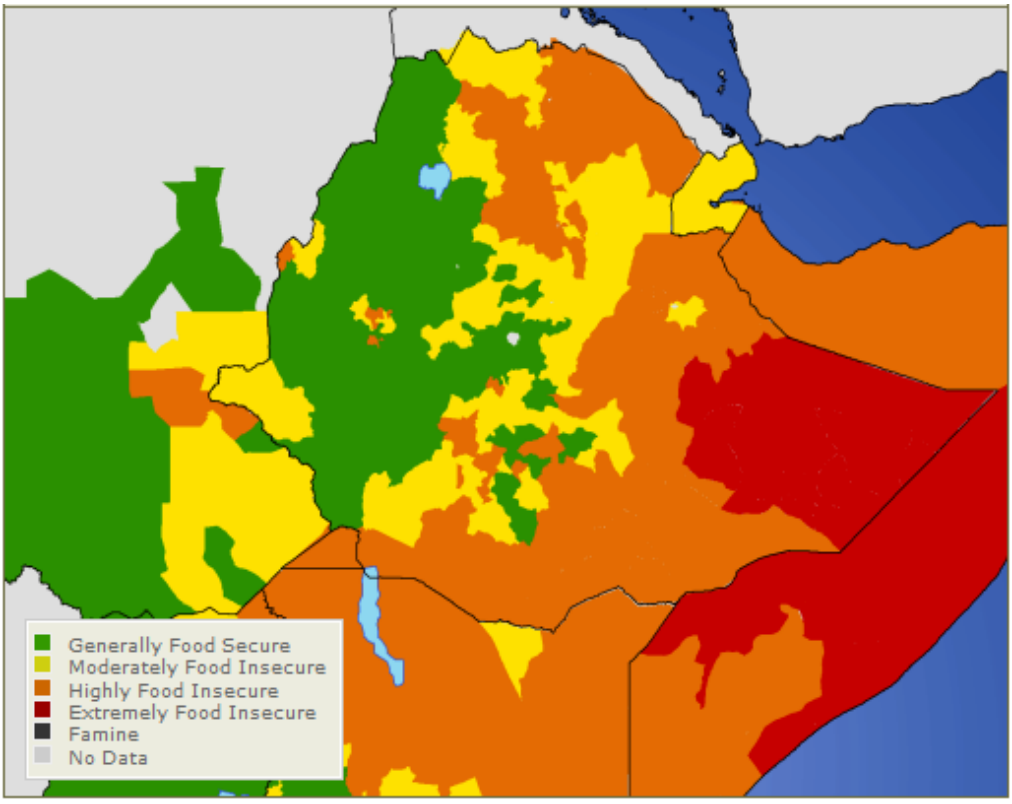

Figure 2: Estimated food security conditions, April-June 2009 (Source: FEWS NET 2009)

4.1.4 Climate change observations in Borana Zone

Seasonal rainfall records for Yabello, located in the Borana zone, from 1957 to 2006 are presented in Figure 3 below. These records demonstrate the high inter-annual rainfall variability in the region, as well as the important data gaps, which makes the detection of long term trends difficult.

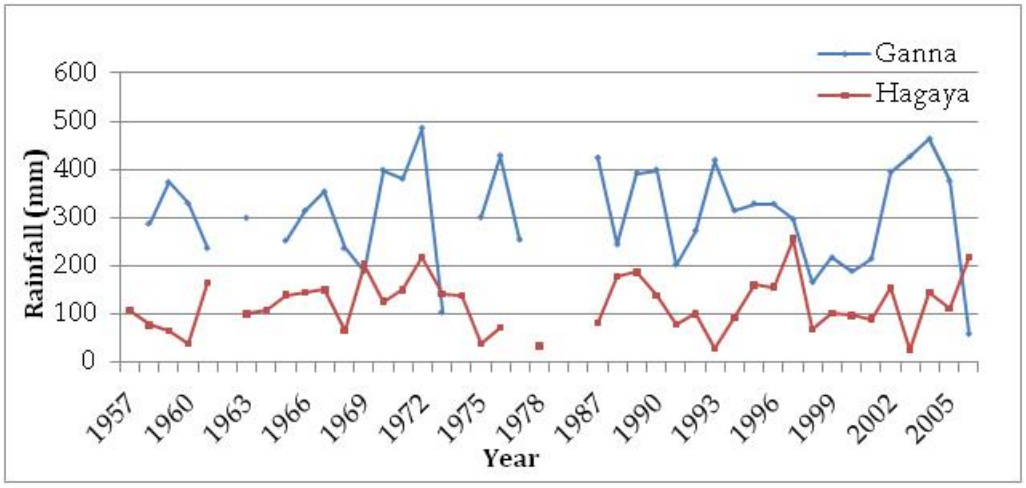

Figure 3: Total rainfall (Ganna and Hagaya rainy seasons), Yabello meteorological station, Borana Zone, 1957-2996. (Source: CORDAID and FSS, 2009)

Assessments of the Ganna rainy season in the Borana zone between May 2006 and June 2009 revealed that rainfall received during the main rainy season has been very low and scanty. The rainfall has been below normal, started late and ended too early to allow the normal growth of pastures and crops. Its distribution has been erratic and uneven, with some pocket areas receiving no rain at all (Borana zone Disaster Prevention and Preparedness Committee, 2008: in CORDAID and FSS, 2009; FEWS NET, 2009).

A statistical analysis of the temperature and rainfall data (from the Ethiopia National Meteorological Agency - NMA) for meteorological stations located in the three research districts in Borana was conducted as part of this research. The data available for Borana starts from the 1960s or 1970s, until 2006 or 2007. However, there are many data gaps (missing months and years). The statistically significant trends arising from this analysis are summarized below.

Mega (Dire District)

- Evidence of decreasing annual precipitation (83% confidence), as well as in May, June, and July (end of long rainy season and beginning of short dry season)
- Strong evidence of decreasing precipitation in August and September (end of short dry season and beginning of short rainy season)
- Night-time temperatures appear to be decreasing

Moyale (Moyale District)

- Overall there is evidence that diurnal temperature variations at Moyale have decreased since the 1980s (cooler daytime and warmer night-time temperatures)
- Very strong evidence that night-time temperatures are increasing
- Decrease in rainfall in May over time (end of long rainy season)

Teltele (Teltele District)

- Strong evidence that daytime temperature is increasing throughout the year 99.3% confidence
- Night-time temperatures increasing in February (long dry season)
- Precipitation has decreased over time in August (end of short dry season), increased in March (end of long rainy season). Some evidence of decreases in May and June (end of long rainy season) and increases in April and December (dry seasons).

The complete statistical analysis results are available upon request from Anne Hammill (ahammill@iisd.org).

4.1.5 Climate change observations in Shinile Zone

The SCUK historical timelines for the Shinile pastoral and agro-pastoral zones (SCUK and DPPA, 2008) demonstrate the high inter-annual rainfall variability and its impacts on local livelihoods. The area experienced below normal rainfall and poor livestock and crop production between 1992 and 1994. The years 1995-1998 were recorded as normal or good years. From 1999 to 2004, most years were recorded as below average, bad or very bad years. 2005 to 2007 were recorded as normal years.

Recent FEWS NET reports state that the 2009 Gu rains in Shinile have been below average, and the area is considered highly food insecure as of June 2009.

Less meteorological data is available for the Shinile zone than for the Borana zone. Rainfall records are only available since 1995. As for the Borana zone, a statistical analysis of the rainfall data (from FEWS NET) for the three research districts in the Shinile zone was conducted as part of this research. The available data spans from 1995 to 2007. Due to this very short time frame, it is difficult to detect statistically significant, long-term trends. Any evidence of temperature and/or precipitation increases or decreases over this 12 year period may be attributable to inter-annual or inter-decadal variations. Trends arising from this analysis are summarized below.

Ayisha (Ayisha District)

- No major trend in rainfall from 1995 to 2007

Shinile (Shinile District)

- No major trends evident from 1995 to 2007
- Slight evidence of a decrease in January (middle of long dry season), May (end of short rainy season), July (beginning of long rainy season) and October (end of long rainy season)

Erer (Erer District)

- No major trends evident from 1995 to 2007
- Some evidence of precipitation decreases in January (middle of long rainy season), March (start of short rainy season) and May (end of short rainy season).

The complete statistical analysis results are available upon request from Anne Hammill (ahammill@iisd.org).

4.1.6 Climate change projections

According to the UNDP Climate Change Country Profile for Ethiopia, the mean annual temperature is projected to increase by 1.1 to 3.1°C by the 2060s and by 1.5 to 5.1 °C by the 2090s. It is also projected that there will be a substantial increase in the frequency of days and nights that are considered 'hot' in the current climate, and a decrease in the frequency of days and nights that are currently considered 'cold'. It is projected that 'hot' days will occur on 19-40% of days by the 2060s and 26-69% of days by the 2090s. The number of 'hot' days and nights will increase most rapidly in the months of July to September. Cold nights will decrease in frequency more rapidly than cold days, and are projected by most models to not occur at all by the 2090s (McSweeney *et al.*, 2008).

Mean annual rainfall in Ethiopia is projected to increase, mainly as a result of increasing rainfall in the short rainy season (October to December) in southern Ethiopia, including in the Borana zone. Projected changes in the April to June and July to September rainy seasons, which affect larger portions of Ethiopia, are more mixed but tend towards small increases in the south (especially in the south-west) and decreases in the north-east, including in the Shinile zone. It is also projected that the proportion of rainfall that falls in heavy precipitation events will increase throughout the country, especially during the July to September and October to December rainfall (McSweeney *et al.*, 2008).

4.1.7 Community observations of climate change

In the Borana and Shinile zones, communities, government officials, and non-governmental agencies have been observing a shortening of the rainy seasons during the last decade (Ganna and Hagaya rainy seasons in Borana, and Gu/Diraa and Karan rainy seasons in Shinile). Rains tend to start later and end earlier than before. In addition, rain frequency, distribution and predictability seem to have decreased in both areas. This is leading to scanty or no pasture growth, increased water scarcity and depletion of resources. In Borana, this is also leading to increased competition and conflicts over pasture and water resources.

In Borana only, rain intensity seems to have increased, causing soil erosion and damages to pastures, crops, houses, roads, and water points. As summarized by government officials in Moyale,

> *The rainy seasons are shorter than they used to. In the past, the main rainy season was three months long; now there is on average 20 days of rain over these three months. It does not fill all the ponds and reservoirs, and it is not enough for the growth and reproduction of pasture grass. In addition, the rain has increased in intensity, causing soil erosion and pasture degradation.*

According to local observations in Borana and Shinile, temperatures have increased significantly. According to communities in Medhecho (Borana), daily temperature highs used to occur mainly in the afternoon, but now begins from 9 am, and night temperatures from December to March (Bona Hagaya season) are also warmer than before. According to communities in Mado and Billa (Borana), both day and night temperatures have increased in recent years. Similarly, according to local observations in Shinile, temperatures have increased significantly since 2006, with May 2009 being cited as the hottest year ever, both during day and night, while the winter period (Jillal) has also become warmer.

Community observations of increasing temperatures are consistent with scientific observations and projections for Ethiopia as a whole. Observations of increasing frequency of heavy rainfall events in Borana are consistent with climate change projections for Ethiopia, although not confirmed by scientific observations due to insufficient historical daily rainfall records. Local observations of increasing dryness and reduced rainfall in the Shinile zone is consistent with slight decreases in rainfall for some months in Shinile and Erer districts since 1995 (analysis of FEWS NET data 1995-2007), recent FEWS NET reports (FEWS NET, 2009) and projected decrease in April-June and July-September rainy seasons for north-east Ethiopia (McSweeney *et al.*, 2008). The perceived shortening of the rainy seasons in Borana and Shinile are also consistent with monthly rainfall changes in Borana (reduced rainfall in May, June, August and September) and in some parts of Shinile (reduced rainfall in March, May, July and October) detected through the analysis of NMA and FEWS NET rainfall data.

4.2 Sensitivity to climate change

Community sensitivity to climate change is the degree to which a community is adversely or beneficially affected by climate-related stimuli. It largely depends on the main livelihood activities of the community (including its dependence on livestock and rain-fed agriculture), its key livelihood resources, and the impacts of climate hazards on these key resources.

4.2.1 Sensitivity of main livelihood activities

Communities visited in the Borana and Shinile zones are either pure pastoral or agro-pastoral. In Medhecho, communities are mainly pure pastoral and part of the Borana-Guji Cattle Pastoral Livelihood Zone. In Mado, communities are mainly agro-pastoral, although pastoralism remains their main livelihood activity, and are part of the Moyale Cattle, Camel & Shoat Pastoral Livelihood Zone. In Billa, communities are mainly agro-pastoral and are part of the Southern Agro-Pastoral Livelihood Zone. Agro-pastoral communities in Billa have a greater dependence on agriculture than those in Mado. In the Shinile zone, the major livelihood system in Shinile and Ayisha is pastoralism, and the visited communities are part of the Shinile Pastoral Livelihood Zone. In Erer, the visited community is agro-pastoral and part of the Shinile Agro-Pastoral Livelihood Zone. The livestock kept by both pastoralists and agro-pastoralists in Shinile, Ayisha and Erer are mainly cattle, shoats and a few camels.

Both pastoralism and agriculture are considered to be highly climate-sensitive sectors. Pastoral and agricultural systems are impacted by changes in rainfall patterns, extreme events, ecology of pests and diseases, temperature, and carbon dioxide concentrations. Vulnerability to these changes varies with time, geographic location, and economic, social, and environmental conditions. Climate change impacts on pastoralism and agriculture are therefore highly region- , livestock- and crop-specific, determining whether they result in net benefits or losses. For example, while elevated atmospheric CO_2 levels may augment crop productivity, higher temperatures may offset such benefits by increasing pest and disease outbreaks (Fischer *et al.*, 2002). In countries like Ethiopia, however, where dryland pastoralism and rain-fed agriculture predominate, the productivity of many livestock, pasture and crop species, which are already near their maximum temperature and drought tolerance, is expected to decrease, even with minimal increases in temperature (IPCC, 2001).

4.2.2 Impacts of climate hazards on key livelihood resources

The main livelihood resources identified by community groups in each PA and village visited are listed in Table 10 below. The resources in red are those that are already significantly affected by drought and/or extreme heat events. As we can see, most of the natural, financial, human and social resources on which Borana and Shinile communities depend are already significantly affected by climate-related hazards.

Table 10: Key Livelihood Resources

	Borana Zone			Shinile Zone		
	Medhecho, Dire District	Mado, Moyale District	Billa, Teltele District	Kalabaydh, Shinile District	Biyadilayi, Ayisha District	Odajoma, Erer District
Natural	Pasture Water sources Farmland Trees	Pasture Water sources Farmland	Farmland Pasture Water sources	Pasture Water sources Trees	Pasture Water Trees	Farmland Trees Water
Physical	Health posts School building Roads Markets	Ponds Traditional wells School building Roads Health posts	Traditional wells Ponds School building Markets Roads Hand pumps	Clinic Schools Roads Hand pump Markets Traditional wells	Hand pump Schools Roads Clinic	School Road Clinic Hand pumps

	Borana Zone			Shinile Zone		
	Medhecho, Dire District	Mado, Moyale District	Billa, Teltele District	Kalabaydh, Shinile District	Biyadilayi, Ayisha District	Odajoma, Erer District
Financial	Livestock Livestock products Savings and credit Cash	Livestock Livestock products Crops/grains Casual labor Savings and credit Cash	Livestock Crops/grains Firewood Savings and credit	Livestock Livestock products Charcoal and firewood Savings and credit Remittances	Livestock Livestock products Casual labor Savings and credit Remittances	Livestock Crops/grains Firewood
Human	Labor Education Health Bush clearing capabilities Masonry skills Handicraft skills Business skills CAHWs[3] Broker skills (young men)	Labor Education Health Bush clearing capabilities Blacksmithing capabilities Masonry capabilities TTBA/CHA[4] capabilities Business capabilities	Labor Education Health CAHWs Farming skills Broker skills (young men)	Labor Education Health Herding skills Masonry skills Charcoal making skills Business skills CAHWs	Good health and fitness Livestock disease management skills House construction and decoration skills Traditional shoe making skills Bush clearing skills Blacksmithing skills Masonry skills	Herding skills Farming skills
Social	Savings and credit groups Women income generating groups Traditional resource management systems Youth associations Inter-youth support groups Marketing processes Cooperatives	Savings and credit groups Youth associations Women income generating groups Geda system Busa gonofa Debo (traditional mass support system) Health services	Youth associations Inter-youth support groups Women associations Geda system Busa gonofa Debo	Savings and credit groups Women income generating groups Traditional resource management systems Youth associations Customary and religious institutions Family and friends	Saving and credit groups Customary institutions Religious institutions Family and friends	Customary institutions Religious Institutions Agricultural marketing co-operatives

[3] CAHWs = Community-based Animal Health services
[4] TTBA = Trained Traditional Birth Attendants; CHA = Community Health Agents.

	Borana Zone			Shinile Zone		
	Medhecho, Dire District	Mado, Moyale District	Billa, Teltele District	Kalabaydh, Shinile District	Biyadilayi, Ayisha District	Odajoma, Erer District
	Geda system (the traditional eight-year governance system) Busa gonofa (asset redistribution / re-stocking to hazard victims) Busa konki (collection and distribution of milk to poor households) Singe institution (married women)	Singe Daimtu (traditional information exchange system)				

Impacts on natural resources

Communities are observing significant negative impacts of drought and extreme heat events on natural resources such as pasture, water sources, farmland and trees. Pasture is the most important natural resource in Medhecho, Mado, Kalabaydh and Biyadilayi, while farmland is the most important natural resource in Billa and Odajoma.

Communities, NGOs and government officials in Borana and Shinile mentioned the declining availability, productivity and quality of pastures and farmland. One government official at the Food Security and Disaster Prevention and Preparedness Commission Office in Moyale District noted, "The grazing potential of the land is going down, due to shorter rainy seasons, droughts, intense rainfall events, and overgrazing. The cattle eat grass before seeds are ready, and non-palatable plants are replacing palatable grasses." In addition, as mentioned by government officials at the Pastoralist Development Office in Teltele, declining productivity of land is contributing to conflicts, as agro-pastoralists look to expand their farmland. This was confirmed by community members in Billa when describing the 2008 conflicts over farmland, which led to massive human displacement, death and crop destruction.

Figure 4: left: Rangeland near Yabello; right: Woman carrying firewood in Medhecho PA

Deforestation is also an important issue in all districts visited, and is all at once a contributor, an amplifier, and a consequence of changing weather patterns. Indeed, local deforestation can alter local climatic conditions and amplify the impacts of global climate change. In addition, drought decreases tree growth as well as pod and leaf production. Also, coping strategies undertaken by communities in times of drought (such as firewood and charcoal selling) lead to increased deforestation rates. Tree planting (or reforestation) does not seem to be a common activity in the research areas, and very few community groups and governmental officials mentioned it as a potential adaptation strategy in the face of future climate change.

Impacts on physical resources

Few physical resources are impacted by drought. However, it was mentioned in some communities in Borana and Shinile that the utility of traditional wells and ponds decreases due to reduced water levels, but that people take good care of them during drought times (digging

deeper, etc.). It was also mentioned that drought leads to cracking of ponds, which lowers their future carrying capacity.

Impacts on financial resources

The main financial resources upon which Borana and Shinile communities depend include livestock and livestock products, crops/grains, savings, credit and cash. Because most of these are directly dependent on climate-sensitive natural resources, such as pasture land, farmland and forests, one could conclude that these communities' financial resources are strongly impacted by drought.

As mentioned above, drought leads to decreased pasture and water availability, which in turn leads to livestock emaciation and death, reduced livestock productivity (in terms of milk and meat), reduced livestock disease resistance, more livestock being sold on the market, and lower livestock prices, thereby leading to weaker terms of trade and decreased household incomes. As stated by many community groups, income generated through livestock sales is no longer sufficient, compounding poverty, food insecurity, and pastoralist drop-outs.

Amongst livestock species in Borana, cattle and sheep are especially vulnerable. Goats and camels are more drought-tolerant and less affected by pasture degradation and bush encroachment (since they are browsers rather than grazers). There used to be no camel in Borana 30 years ago and few in Shinile, but now camels are increasing in numbers, although most are owned by richer households.

Figure 5: Goats in Medhecho PA

Crops grown by agro-pastoral communities are also affected by drought. The main crops grown in these communities are teff, maize, sorghum and beans. Agro-pastoralists mentioned the failing of crops during drought/dry years and some are even questioning the suitability of agriculture in view of changing climatic conditions, i.e. decreasing rainfall predictability, shorter rainy seasons, increasing drought frequency and increased rainfall intensity. As stated by one farmer in Billa: "Since 2005, rains have been erratic, and when they come they are too much and they destroy our crops."

On the other hand, pastoralists are slowly introducing and expanding farming activities to support themselves in times of drought. As stated by government officials in Moyale District: "People are expanding agricultural activities to cope with drought, but the land and rainfall in this area are not suitable for agriculture, so it is a risky strategy."

There seems to be some disagreement concerning whether pastoralism or agro-pastoralism is better adapted to the changing climatic conditions, and the answer to this question seems to be greatly dependent on seasonal circumstances, location, and the types of livestock and crops grown. Local actors suggested that although agriculture can be successful for 2-3 years, it often accelerates land degradation, making the land unsuitable for both crop and grass growth after a few years of cultivation.

All communities visited seemed to agree that diversification of financial resources and income generating activities is key to adapting to changing conditions, whether this means engaging in petty trade, sale of firewood and charcoal , construction and renting of houses, honey and alcohol sale, business creation and management, or learning to save money using financial institutions.

Impacts on human resources

Drought is also affecting human resources that are important to people's livelihoods, including education, health, human labor and various abilities/capabilities. Increased migration resulting from droughts and conflicts leads to increased school dropouts. In addition, the decrease in food (mainly meat and milk) in times of drought affects human health (especially among children under 5 years, pregnant women and old people), reduces human disease resistance, human labor productivity, and human capability to undertake different activities such as learning in schools, bush clearing, blacksmithing, masonry, and business management. Drought is however positively impacting broker/mediator activities (undertaken by young men to gain income) and capabilities, since larger numbers of livestock are sold during drought.

Figure 6: Child in Medhecho PA

Impacts on social resources

Traditional asset redistribution systems are important social resources in Borana and Shinile communities. These social systems are meant to support poor households or those who have lost many assets due to hazards such as droughts, conflicts or diseases. In Borana, asset redistribution systems include: **Busa gonofa** - restocking of hazard-affected households by clan members; **Dabare** - providing milking cows to hazard-affected households on a temporary basis; **Busa konki** - collection and distribution of milk to poor households; and **Debo** - mutual aid system where community members get together to help a neighbour carry out a major task(such as cultivation or construction) in exchange for food. In Shinile, traditional social protection mechanisms include: **Zakat** - religious alms from wealthier relatives/clan/sub-clan

members usually provided to disadvantaged groups; **Irmaansi** - households providing milking animals to households with no lactating stocks across seasons; **Maal** - sharing of livestock during milking period; **Rai**- children from poor pastoralists herd for richer relatives and receive food and other benefits as payment; **Keyd** - adopting livestock offspring from richer households, sometimes on credit; and **Dhowrto** - surplus milk and butter is stored for distribution amongst poor households with no milking animals, especially during dry season (Jilaal).

These traditional systems demonstrate that dealing with hazards is not a new challenge in these communities. However, with droughts becoming more and more severe and frequent, these redistribution systems are becoming impracticable, as the number of people needing social support is increasing every year.

Figure 7: Group of young women in Mado PA

The effectiveness and sustainability of traditional resource management systems are also threatened by increased drought frequency, due to abnormal mobility and exacerbated resource scarcity.

Social associations, such as youth associations, inter-youth support groups, and women's income generating groups are also negatively affected by drought impacts. Increased migration and longer durations spent searching for water, livestock feed and food leaves little time for social activities and meetings.

Drought also impacts savings and credit groups/cooperatives negatively, since incomes from livestock, livestock products, crops, and activities such as petty trading, are highly reduced. Government officials in Moyale District mentioned increased drop-out of members from saving and credit cooperatives due to recurrent droughts.

Although affected by drought, all of these social resources are important to people's adaptive capacity, as will be explained in the next section.

4.3 Adaptive capacity

The adaptive capacity of a community is its ability to adjust to climate change, to moderate or cope with the impacts, and to take advantage of the opportunities. Adaptive capacity is often a determined by a range of factors, processes and structures such as income, literacy, institutional capacity, social networks, as well as access to information, markets, technology, and services, (IPCC 2007). Because the availability of these resources and services is limited in many developing countries, their adaptive capacity in the face of climate change is correspondingly low compared to developed countries.

4.3.1 Current coping strategies

Communities in both Borana and Shinile are already undertaking activities to cope with drought and other climate-related hazards (i.e. conflicts, disease and pest outbreaks, bush encroachment, and land degradation). An assessment of current local coping strategies, as well as their effectiveness and sustainability, can give us an insight on local adaptive capacity. Current coping strategies are presented in Table 11 below.

Table 11: Current Strategies to Cope with the Main Hazards

Hazard	Current Coping Strategies
Drought	- Increased migration/mobility to search for water and better pastures. This is abnormal mobility because people travel farther and migrate for longer periods of time. - Livestock diversification and use of more drought tolerant livestock species - Conserving water for dry periods - Digging deeper wells and boreholes - Preserving/storing grains and crop residues - Purchasing water for animals and humans - Transporting water and hay from remote areas by donkeys, camels, humans and vehicles - Collecting wild foods (e.g. boiling and eating *chat*, which also decreases appetite) - Purchasing food and feed - Receiving food aid - Borrowing livestock and money from relatives or from cooperatives/group savings - Feeding animals with tree branches, crop residues and relief food - Enclosing pasture land (kallo) for lactating and weak animals - Hay making - Removing hides from dead animals for sale and home use - Engaging in alternative income generating activities, such as casual labour, petty trade, sale of charcoal and firewood, and sale of wood for construction - Bleeding livestock and drinking blood as a source of food - Using water supplied by NGOs and government - Advising husbands to sell productive animals in order to save their children - Saving money (putting it in bank accounts or away at home) - Using traditional asset redistribution mechanisms (such as Busa gonofa, Dabare, Busa konki and Debo in Borana; and Zakat, Irmaansi, Maal, Rai, Keyd and Dhowrto in Shinile)
Extreme Heat (Shinile)	- Same strategies as for drought
Conflict (Borana)	- Engaging in peace building and conflict mitigation processes (traditional peace negotiations)

	- Resource sharing - Assigning guards to look after the villages - Taking immediate action against those who break the law - Fighting against enemies to save property - Migrating to secure areas - Clan and ethnic support for restocking purposes - Selling livestock - Engaging in other income generating activities, such as charcoal and firewood selling - Using traditional asset redistribution mechanisms (such as Busa gonofa, Dabare, Busa konki and Debo in Borana; and Zakat, Irmaansi, Maal, Rai, Keyd and Dhowrto in Shinile) - Arara (peacemaking ceremony) - Government-led peace building interventions, allowing different ethnic groups to graze their livestock in border areas
Disease and Pest Outbreaks	- Purchasing and using traditional and modern medicines and pesticides - Isolating sick animals from the herd - Re-planting crops when they fail because of pests - Bringing sick people or animals to heath posts for treatment - Promoting hygiene, sanitation and health education - Engaging in alternative income generating activities, such as charcoal and firewood selling - Vaccination by Community Animal Health Workers (CAHWs) - Reporting livestock diseases to the government - Refraining from eating meat from livestock that died from diseases - Depending on grain food and giving tea to children instead of milk - Using traditional asset redistribution mechanisms (such as Busa gonofa, Dabare, Busa konki and Debo in Borana; and Zakat, Irmaansi, Maal, Rai, Keyd and Dhowrto in Shinile) - To deal with market bans due to animal diseases: borrowing money and transporting livestock to better markets, or selling livestock at cheaper prices, or finding other markets in bordering towns in Kenya - Huluko (trying to prevent diseases by fencing the village with tree bark and praying)
Bush Encroachment (Borana)	- Bush thinning/clearing - Burning grasslands (but this is illegal and there is no grass underneath to which one can set fire) - Livestock diversification - Hay making
Land Degradation (Shinile)	- Digging deeper wells to deal with increased water runoff - Increasing migration/mobility to deal with poor pastures and loss of trees - Using animal manure to reduce soil erosion

It is important to note that not all current local strategies to cope with hazards are efficient or appropriate for long term adaptation. Some strategies, based on short-term considerations, survival needs, lack of information or imperfect foresight, can worsen environmental degradation and thereby diminish future adaptive capacity and livelihood options (Eriksen, 2001). The sustainability of different coping strategies also depends on the intensity, duration and frequency of hazards. For example, traditional coping strategies such as charcoal and firewood selling, food rationing, and traditional asset redistribution mechanisms, might be efficient coping strategies when there is a major drought every 6-8 years, as there used to be. However, if there is a major drought almost every year, charcoal and firewood selling leads to massive deforestation, making this strategy obsolete in the long run, and leading to intensification of climate change impacts; continuous food rationing leads to malnutrition, decreased disease resistance and human capabilities, and sometimes even death; and traditional

asset redistribution mechanisms become obsolete strategies if there are too many losses and too many people in need every year. The unsustainability of many traditional coping strategies in the face of current climate change is already visible, and has been mentioned by community members, NGOs and government officials in Borana and Shinile.

4.3.2 Suggested strategies for responding to climate change

If future climate change scenarios for Borana (i.e. increasing rainfall but concentrated in shorter periods of time, heavier rainfall events, increasing temperatures) and Shinile (i.e. decreasing rainfall and increasing temperatures) were to occur next year, community groups suggested the following and increasing temperatures) were to occur next year, community groups suggested the following **short-term coping strategies**:

1. **Migration:** This includes migration of livestock to better pasture lands in times of drought (mentioned in all PAs and villages visited); moving livestock to higher grounds during heavy precipitation events (mentioned only in Medhecho, where flooding is more of an issue); shifting human settlements to higher grounds (suggested only in Medhecho); migration of young men to nearby towns and across borders (e.g. to Kenya or Djibouti) to find employment; and temporary migration of young men to mines during difficult times.

2. **Early selling of weak and old animals** while livestock prices are still good

3. **Water infrastructure work:** Rehabilitating/repairing ponds after heavy precipitation events via community mobilization was suggested by old men in Medhecho and Mado. In addition, old men in Mado suggested diverting runoff water from traditional wells

4. **Mass/clan support** (restocking and food sharing) to those who have lost livestock or crops

5. **Using donkeys** for the transportation of grass, hay and water from remote areas

6. **Reducing the amount of food consumed** during drought times

7. **Informing and looking for assistance** from the government and external agencies. Many community members mentioned that existing coping strategies are not adequate to withstand projected climate changes and that additional external support will be needed.

Communities also suggested **longer-term adaptation strategies** to prepare for the possible future scenarios. This included:

1. **Modifying livestock diversity, composition and numbers:** Communities suggested increasing livestock diversity and adjusting herd composition towards fewer grazers (cattle and sheep) and more browsers and drought-tolerant species (such as camels and goats). For example, old men in Medhecho mentioned that households who have started rearing camels have been getting more milk during dry seasons and droughts than those households who

have not started rearing camels. Young and old men in Medhecho and Mado suggested reducing the number of livestock to simplify management during times of drought, and converting some of the livestock into fixed assets (e.g. selling animals to build/buy houses in town to rent or investing in other income generating activities like petty trade and small enterprises.) Old men in Medhecho suggested introducing a new policy promoting more equal/balanced livestock holdings among households, as some have 200-300 heads of livestock, while others only have 2-3. Some community members also suggested reducing the number of overall livestock because it currently exceeds the amount of available pasture.

2. **Diversifying livelihood activities**: Pure pastoral communities in Medhecho, Shinile and Ayisha suggested engaging in farming activities and planting early maturing crops to diversify income and food sources. They also suggested starting some irrigation agriculture if the government is able to piped water from highland areas or dig boreholes. In Mado, young men suggested growing and selling horticultural plants to generate income. Communities in all PAs and villages suggested engaging in different kinds of income generating activities such as petty trade, wage labour, starting businesses, building houses, producing and trading honey and alcohol (mentioned by women in Billa), selling camel milk (mentioned by women in Medhecho and Mado), brokerage activities (mentioned by young men), and selling firewood and charcoal. Young men in Medhecho stated that "Only depending on livestock is not allowing us to survive because of the repeated occurrence of drought, so it is important to use all of the alternatives we have."

3. **Hay making, collection and preservation** to prepare for adverse conditions or drought periods when there no pasture is available. For example, young men in all three PAs in Borana suggested assisting their family in haymaking and pasture enclosure activities. In Shinile, communities mentioned this activity would require irrigation.

4. **Modification of rangeland management practices**: Many community groups suggested scaling up pasture enclosures to feed weak animals, lactating cows and calves during dry seasons. Old women in Medhecho also suggested strengthening traditional wet and dry season grazing lands. Bush clearing/thinning with support from government agencies and NGOs was suggested as an adaptation strategy by old men in Medhecho. Young women in Medhecho and Mado and old men in Billa stated that they would like to adopt new methods to control bush encroachment.

5. **Modification of farming practices**: Agro-pastoral communities in Mado and Billa suggested shifting to crop species and varieties that grow within a shorter period of time and with less rainfall, like teff and beans. Young men in Mado and Billa also suggested more effective and efficient use of crop residues (e.g. storing residues for livestock feed during dry periods). Young men in Billa also stated,

> *In the dry season, we should prepare the farm land before the rain comes and start sowing seeds when the rain starts, because we do not know if the rain will come on time or not. […] Nowadays, climatic*

conditions sometimes force farmers to sow seeds three times in one season because of the erratic rain distribution. So it is better to keep enough seeds to prevent seed shortages when such events happen.

In Mado and Billa, old men and young women suggested irrigation due to the proximity to rivers.

6. **Maintenance, rehabilitation and construction of water infrastructure**: Old women in Medhecho suggested constructing a big cistern for the women's group. Young women in Medhecho recommended community participation in the construction of various water points like boreholes, ponds, cisterns, etc. Young men in Billa are thinking of preparing water catchments and using them for irrigation and livestock. Old men in Billa recommended the rehabilitation of traditional wells and other water sources. Old men in Mado suggested regular rehabilitation of ponds (2 days per week) and expanding the water holding capacity of ponds by digging and removing livestock dung and silt.

7. **Education**: In Borana, women suggested improving children's education so they can engage in different income generating activities and support their parents in the future. Young men in Borana stated a desire for formalized education in order to sustain their own future. In Shinile, both men and women emphasized the importance of education for both girls and boys and mentioned that trends are improving in terms of children school attendance.

8. **Savings and credit**: Community members in most PAs and villages suggested the promotion and further development of savings and credit activities. Young men in the three PAs in Borana also noted that they needed to learn how to save money in bank accounts in order to manage risks related to drought. Young men in Mado also suggested obtaining credit from relatives living in other areas and not as severely affected by climatic conditions.

9. **Establishing community groups**: Young men in Mado and Billa suggested the establishment of youth associations for undertaking diverse social and economic activities to overcome the negative impacts of drought. Members of a women's group in Mado also mentioned the benefits of their groups and associated activities (such as petty trading, farming and hay making), which support them during drought periods.

10. **More effective, efficient and participatory management of available natural resources**: Young men in Billa suggested harvesting and storing as much water as possible and using it effectively. In Mado, young men mentioned that, since the availability of pasture land is declining, they should diversify their livestock and shift to animals that consume shrubs (i.e. camels and goats.) Natural resources are presently exclusively controlled by elders, prompting young men to mention that giving younger people more control and decision-making rights over natural resources would give them a sense of ownership and responsibility. Women in Borana also mentioned that since men have control over all

resources (except animal products), it is difficult for women to have a say in land use decisions and implement various adaptation strategies.

11. **Reducing conflicts over available resources**: Young women in Medhecho suggested strengthening existing conflict resolution mechanisms to enhance resource access. Old men in Medhecho suggested eliminating new boundaries between regions to reduce conflicts over resource use. Old men in Mado suggested "better thinking on regional boundaries."

12. **Tree planting**: This strategy was only suggested by young men in Mado. They mentioned tree planting because one of the factors that contributes to the changing climate is deforestation.

13. **Raising community awareness on climate change issues**, including projections and potential adaptation strategies so that communities can prepare as much as possible (suggested by old men in Medhecho and by young men in Mado and Billa).

Resources identified by communities as being important for implementing coping and adaptation strategies are presented in Table 12.

Table 12: Resources important for implementing coping and adaptation strategies

Natural	Water sources Pastures Farmland Hay
Physical	Water infrastructure and implements (boreholes, ponds, cisterns, water catchments, irrigation tools and infrastructure) Markets Roads Pasture enclosures Medical clinics
Financial	Livestock species adapted to the new/projected climatic and environmental conditions Crop species / varieties adapted to the new/projected climatic and environmental conditions Fixed assets (such as houses that can be rented) Firewood and charcoal Savings Credit Cash
Human	Labor (human power) Education Health and fitness Awareness of climate change issues, projections, and potential adaptation strategies Bush clearing skills/capabilities Herding skills/capabilities adapted to the new conditions Farming skills/capabilities adapted to the new conditions Irrigation skills/capabilities Hay making and storage skills/capabilities Water infrastructure management and rehabilitation skills/capabilities House construction skills/capabilities

	Brokerage skills/capabilities Tree planting skills/capabilities Business skills/capabilities Charcoal making skills/capabilities Traditional skills Knowledge on money saving Knowledge on livestock diseases and treatments
Social	Arara (peacemaking institution in Borana) Traditional asset redistribution systems Friends and relatives Youth groups Women income generating groups Savings and credit groups Marketing processes Agricultural associations/cooperatives Customary institutions

Government officials from the Pastoralist, Food Security and Disaster Preparedness Offices at District level in Borana suggested the following adaptation strategies to prepare for the anticipated climate change scenario:

1. **Improvement of rangelands**, using techniques such as fencing/enclosure of degraded grazing lands (after 3-4 seasons without animals, the land may have recovered and animals can be reinserted), saving indigenous grass species tolerant to drought, and community mobilization for bush thinning/clearing

2. **Decreasing the population of livestock** (see above)

3. **Expansion of enclosures (kallo)** to feed weak and lactating animals during droughts

4. **Reforestation**

5. **Pond rehabilitation**

6. **Creation of ponds for horticultural activities**: Perennial plants (such as avocados, mangos, coffee, papayas, etc.) are good for food security and could be sustainable with longer droughts. However, there are arguments between pastoralists concerning water use for activities other than animal husbandry.

7. **Re-strengthening of traditional customary practices/systems for land management**

8. **Capacity building of community members** on reforestation, rangeland management and enclosure, and pond rehabilitation

9. **Introducing and promoting early maturing crops**, for e.g. early maturing varieties of maize, sorghum and teff. Some early maturing crops have already been introduced in some areas.

10. **Strengthening land use policies**: Separating cropland from pasture land and leaving unproductive cropland for pasture. There is no clear policy about land use, so there is no defined land use at the moment. A policy has been drafted but it has not been implemented.

4.3.3 Enabling conditions and constraints

Consultations with communities, NGOs and government officials in Borana and Shinile also allowed the identification of enabling conditions and barriers to adaptation at local, district and zonal levels. The following enabling conditions and constraints to the adoption of coping and adaptation strategies at the local level were identified:

Table 13: Enabling conditions and constraints at the local level in Borana and Shinile

Strategy	Enabling conditions	Constraints

Migration	- Young men in pastoral communities have the physical ability and willingness to move to other places within and outside internal and international boundaries to find work or better pastures	- Conflicts between tribes over pasture, water resources and new boundaries limit movement in Borana
		- Agricultural expansion limits livestock movement in some areas
		- Negative effects which may limit continued adoption of the strategy:
		  - Separation of families when men migrate
		  - Increased rural-urban migration of unskilled labor might exacerbate urban food insecurity and urban poverty

Modifying livestock diversity, composition and numbers	- Many community members (both men and women) are already realizing the importance of increasing livestock diversity, moving towards more browsers and drought tolerant species, and decreasing overall livestock numbers to invest in more diversified and less climate sensitive assets - Community members are already seeing the benefits of modifying herd composition on milk availability and food security	- Limited awareness on the types of animals that are better adapted to the new and projected climatic conditions - Poorer households have a low capacity to switch to better adapted livestock species such as camels (which are more expensive then sheep, goats and cattle) - Prevailing attitudes, as traditionally, holding a large number of livestock was a source of prestige and was a way to spread risks (instead of diversifying into other activities) - Reducing livestock numbers would require (a) increasing the productivity of animals, which is constrained by land degradation, droughts, lack of financial resources to buy feed, or (b) promoting other income generating

Strategy	Enabling conditions	Constraints
		activities to avoid a decrease in income levels (constraints described below)
Diversification of livelihood activities	- Community members have the willingness to undertake other livelihood activities - Drought times are favorable for brokerage activities (undertaken by young men) as there are many livestock to sell during those times	- Limited market access and limited up-to-date market information - Limited financial support and credit access to engage in different kinds of business activities - Limited skills to engage in new income generating activities - Limited water resources available for farming and irrigation in many areas - Firewood and charcoal selling is leading to depletion of forest resources (negative effect), and because many people are undertaking this strategy, prices are very low (disincentive) - Low or no demand for casual labor in many areas
Modifying rangeland management practices	- Many community groups are highly motivated to expand enclosures to save calves as well as weak and lactating animals during droughts - Land is communal in this area, so expanding enclosures would probably not lead to any conflicts or problems. It is part of the traditional system. - Young men are willing to support their families in enclosure activities - Elders (who control natural resources) also suggested demarcation of enclosures as an adaptation strategy - Many community groups expressed their willingness to mobilize themselves for bush clearing/thinning, and they have already started doing this in some PAs	- Saving indigenous grass species is limited by low grass seed availability and quality, and communities cannot harvest grass seeds easily. - The fire ban policy (which was put in place by the previous government) has greatly undermined the traditional rangeland management system - Controlling bush encroachment will require new and unfamiliar methods as well as more community mobilization
Modification of farming practices	- In Mado and Billa, there are rivers available for irrigation	- Shortage of oxen and seeds during the planting time - Lack of seeds of drought resistant crops - Lack of knowledge on the management of drought resistant crop species - Limited knowledge/skills to adapt practices to the new conditions - In Mado, it was mentioned by young

Strategy	Enabling conditions	Constraints
		women that crop farming is not working due to the absence of rain - Occupation of farmland by town dwellers and government workers, leading to overcrowding of farmland in Borana - Limited access to pesticides and limited commitment from the government to provide pesticides on time to deal with pest infestations
Maintenance, rehabilitation and construction of water infrastructure	- Many community members (both men and women) expressed their willingness to maintain and rehabilitate existing water infrastructure and participate in the construction of new infrastructure	- Current water infrastructures not well maintained by community members – lack of skills - Government concerns over ecological problems arising from the construction of water infrastructure (e.g. overgrazing, erosion, etc.) - Creation of new infrastructure would require an assessment of needs and environmental suitability. For example, it would be important to consider pasture availability as well as water availability.
Establishing community groups	- Women and youth clearly expressed the importance of community groups for increasing their adaptive capacity - Women groups have already been formed in some areas, with significant benefits in terms of women empowerment and increased adaptive capacity	- Awareness raising will be needed - Group meetings and activities are often interrupted during drought times and conflicts - No uniformly organized structure facilitates the formation of youth groups - Little attention has so far been given to youth groups in development initiatives - In many communities, women are not used to participating in meetings/consultations. They are often not allowed to participate in consultations or meet amongst themselves without the presence of men. This has however started to change with CARE projects (income generating activities undertaken with women groups) in the PAs visited.
Asset redistribution (restocking)	- Familiar, well-accepted coping strategy that is integrated into local cultures in Borana and Shinile	- The feasibility of this strategy is declining because of recurring droughts which increase the number of people in need from year to year. In addition, wealthy community members' assets are declining.
Bleeding animals and drinking blood as a	- Effective short term strategy to deal with food insecurity	- Not done much nowadays because communities are aware of diseases

Strategy	Enabling conditions	Constraints
source food		which can be caused by drinking blood
Raising community awareness on climate change	- Basic awareness among community members that the climate is changing - Willingness amongst community members (including the youth) to learn more about climate change in order to better prepare themselves	- Most local organizations and communities have no access to seasonal forecasts and other climate information - Awareness raising sessions and trainings organized by governments and NGOs are often only offered to elders, which would limit the involvement and contribution of youth and women in the implementation of adaptation activities
More effective, efficient and participatory management of available natural resources	- Willingness amongst community members (especially the youth) to use natural resources more effectively and efficiently	- There might be resistance amongst elders to give a voice to young people and women in natural resource management and decision making
Reducing conflicts over available resources	- Awareness that conflicts makes them more vulnerable to droughts and other extreme weather events - Expressed willingness to put conflict prevention and peace building strategies in place	- Regional boundaries are often changing and are not clearly defined in Borana - There are often delays in peace making and government interventions, which often come after human deaths and destruction of resources
Education	- Women in Borana and Shinile highlighted the importance of children's education - Young men mentioned their willingness to engage themselves in formal learning processes	- Increased migration due to recurrent conflicts and droughts leads to increased school dropouts - Girls are sometimes denied education due to cultural factors
Savings and credits	- Community members of all ages and gender are interested in expanding saving and credit activities to reduce risks associated with climate change - Young men in the three PAs in Borana are especially interested in learning to save money in bank accounts	- Lack of financial institutions that provide credit to the youth to engage in business opportunities in the research areas
Hay making, collection and preservation	- Many young men are willing to support their family in hay making activities - Members of a women group in Mado stated that they successfully made hay and used it in times of drought	- In Mado, young women mentioned that hay making is currently not working due to the absence of rain - In the Shinile zone, it was mentioned that this activity could only work with irrigation

4.4 Underlying drivers of vulnerability

In addition to the enabling conditions and constraints listed above, communities mentioned other, oftentimes mutually-reinforcing, environmental, social and political issues that have implications for their vulnerability and adaptive capacity. These underlying drivers of vulnerability include:

1. **Environmental degradation**: Increasing deforestation rates, pasture and farmland degradation, as well as desertification are important drivers of vulnerability in Borana and Shinile. These arid and semi arid lands have been degraded over several decades. Recurrent drought, increased felling of trees for firewood, charcoal production and livestock feed (especially during drought), overgrazing, agricultural expansion and inappropriate agricultural practices have led to increased soil erosion, lower quality of pasture and farmland, bush encroachment, and reduced carrying capacity for livestock and humans per unit area. In some parts of the Borana zone, large areas have been encroached by *Comiphora Africana, Acacia melliphera, A. drepanolobium, A. brevispicia and Lannearivae*species that hinder undergrowth (Dalle *et al*., 2006). These are not economically beneficial, since they neither provide browse for livestock nor firewood or medicinal herbs for humans.

   Climate change impacts and copping strategies contribute to further environmental degradation. For example, the increased frequency of droughts do not give rangelands enough time to recover, leaving large areas bare, thus susceptible to soil erosion by wind and water. Some of the coping strategies employed by communities, such as cutting more trees to produce charcoal and firewood for sale further contribute to environmental degradation, and reduces their resilience to climate change as resources become scarcer.

   Furthermore, areas with relatively better rainfall quantities tend to have high concentrations of human and livestock populations. Overgrazing and soil trampling can cause severe land degradation, especially if populations remain in the same areas over prolonged durations, as is the case when conflicts and agricultural expansion limit livestock movement.

2. **Population pressures**: According to both community members and government officials that were consulted during the research, increasing human populations and their corresponding livelihood demands are currently exceeding the availability of natural resources in Borana and Shinile. Population growth in the Borana and Shinile zones can be attributed to various factors, including in-migration and settlement of agricultural practitioners in rangelands, pastoralists fleeing conflicts in other areas, as well as natural population growth. FEWS NET (2009) also recognizes rapid population growth as one of the factors exacerbating food insecurity in Ethiopia. Pastoral and agro-pastoral communities in Borana and Shinile are particularly vulnerable to population pressures, as the average rural household in Borana and Shinile have only 0.5 ha and 1.2 ha of land, respectively, compared to a national average of 1.01 ha and an average of 2.25 ha for pastoral regions.

3. **Conflicts**: Unsettled internal boundary conflicts are a serious impediment to pastoral livelihoods. Conflicts restrict mobility, lead to destruction of assets, and reduces the capacity of pastoral communities to deal with climate variability and change. As of June 2009, about 200,000 people were displaced due to clan conflicts in southern Ethiopia (including Borana) and required humanitarian assistance (FEWS NET, 2009). See section 5.1.3 for more information on climate and conflict linkages.

4. **Social and gender inequalities**: Most resources are exclusively controlled by older men / male elders. Women and youth rarely have a say in decision-making over resources, which limits their capacity to implement adaptation strategies. In addition, the only source of cash available to women in many communities is the cash arising from women groups' income generating activities. This creates poor intra-household income distribution, disfavouring women. Also, women's direct and indirect contribution towards livestock production and household incomes is seldom recognized.

   Women and children are often less mobile compared to men. Consequently, when the worst effects of drought hit the area, women and children suffer much more due to scarcity of food, water, medicine etc., since they are left to fend for themselves while men migrate further afield in search of pasture and water.

   Also, girls-boys school enrolment ratio significantly favours males, creating imbalanced education levels and access to income opportunities. Ethiopian women have on average 57% fewer years of schooling and illiteracy rates hover at just over 70% for Ethiopian women nationally (FEWS NET, 2009).

5. **Inadequate off-farm employment opportunities and skills**: Pastoral and agro-pastoral communities in Borana and Shinile have limited education, skills, and opportunities to engage in alternative and sustainable off-farm income generating activities. Only about 14% of the population in Borana is involved in non-farm related income-generating activities, compared to a national average of 25%. In Shinile, less than 5% of the population is involved in commercial activities.

6. **Poor access to infrastructure, resources and services**: Many pastoral and agro-pastoral communities in Borana and Shinile have very limited access to markets, financial resources (such as credit and savings), information (on weather projections, climate change and markets), technology, education and health services. Pastoral communities in Ethiopia are often being marginalized and generally have a lower access to infrastructure, resources and services than highland communities. For example, in Borana, only about 53% of eligible children are enrolled in primary school and only 9% attend secondary school (World Bank 2004). In addition, in both Borana and Shinile, apart from the main roads linking major towns and borders, such as the one to Djibouti and the one to Kenya, many of the other roads are in poor condition. This hinders access to social services and infrastructure, such as health facilities, veterinary centers, schools and markets. With few resources at their disposal and limited access to quality social services, pastoral communities tend to be very vulnerable when hazards occur. For example, during the onset of drought, pastoralists are

often unable to quickly transport livestock to major distant markets for sale. They are also unable to access pasture and water due to limited mobility. When livestock and human diseases break out, the appropriate medical attention and medication are not readily accessible. This results in reduced quality of livestock and increased mortality (some which could have been prevented).

However, there are significant differences in infrastructure, resource and service access between different pastoral communities. For example, in the Borana zone, Teltele is one of the harshest and most marginalized pastoral areas. Even amongst other pastoralists in Borana, they are often regarded as "lower class" (personal communication). For example, in Billa, Teltele District, the *Gaana* rainy season had been very poor, leading to severe food insecurity in the area. According to community members, two people had already died of hunger and a third death was expected soon (note: the accuracy of this information could not be verified). The absence of nearby markets and roads in this area makes it difficult for people to access food when crops fail. Moreover, the absence of health services in this area has likely led to the high prevalence and impact of human diseases, mainly malaria. As a result, community members in Billa have comparatively low adaptive capacity in the face of current and future climate change.

7. **Inadequate government policies, capacities and coordination:** Government policies, especially related to land tenure, internal borders, investment, trade and markets, limit the options of pastoralist communities. As mentioned earlier, unclear internal borders limit movement and increase inter- clan conflicts. In addition, modern day national policies and development plans on livestock have mainly focused on improving livestock production and not the lives of pastoralists (as a significant group of livestock producers). Ranching and sedentarisation have been promoted over nomadic pastoralism and transhumance. In addition, pastoralists have not been well integrated into the national economy. Development efforts, projects and infrastructure are often targeted at other regions, thereby marginalizing pastoralists. Policies that restrict cross border trade have further disadvantaged pastoralists. For example, the ban on livestock exports to the Gulf States imposed on Ethiopia in 1998 and 2000 following the Rift Valley Fever outbreak, denied Somali pastoralists access to international markets and caused heavy income losses. This coupled with unfavourable market conditions, including low prices for livestock domestically, contributed to increased poverty and deterioration of pastoralists' welfare.

   In addition, there seems to be a lack of capacity, coordination and information sharing between different governmental agencies on weather and climate change issues. Government officials at the Zonal Pastoralist, Food Security and Disaster Preparedness Offices in Yabello were unaware of the current weather situation (i.e. almost total absence of rain) in Mado and Billa, and of the current food insecurity issues in Billa. This demonstrates serious information and communication gaps across the region. Government officials at the Zonal level also mentioned their lack of access to meteorological and climate change information, their lack of basic climate change knowledge, the absence of climate change considerations in policy making and implementation, their lack of awareness of and

involvement in the formulation and implementation of the Ethiopian National Adaptation Programme of Action (NAPA), and the lack of human and financial resources to implement adaptation strategies in Borana.

8. **Deteriorating role of traditional social institutions:** Modern governance systems do not recognize and appreciate the role of traditional social institutions. Furthermore, traditional institutions – such as *busa gonofa and dabare (among the Borana), Kaalmo, Jiisin, and Zkaat (among the Somali)* – are being stretched and undermined by more poverty, drought, and conflicts, which are increasing the number of community members requiring assistance. The deterioration of these support systems fosters vulnerability to climate change impacts, since affected community members may not recover from losses incurred due to adverse impacts of changing climatic conditions.

5. Implications of projected climate change for the three pillars of pastoral livelihoods

When presented with future climate change scenarios for their respective geographic area (i.e. decreasing rainfall and increasing temperatures in the Shinile zone; and increasing rainfall but falling in heavier events over shorter periods of time, as well as increasing temperatures in the Borana zone), communities mentioned that this matched recent observed trends. They predicted the following impacts on their livelihoods, categorized in Table 14 according to the 3 pillars of pastoral livelihoods.

Table 14: Projected Impacts of Climate Change Scenarios on Local Livelihoods

Livestock	People	Natural resources
- decreased livestock disease resistance, weight, productivity and numbers due to longer dry seasons - increased livestock death due to droughts, extreme heat events (Shinile), and heavy precipitation events (Borana) - increased livestock diseases due to extreme heat events (Shinile) - lower livestock prices - reduced livestock products, particularly milk (mostly mentioned by women) - disturbance of animal breeding cycles	- increased human health problems - decreased human labour productivity - increased food insecurity, malnutrition and human death - decreased efficiency of traditional coping mechanisms - increased student drop-outs - breakdown of traditional resource management systems (because of the increasing scarcity of resources) - increased conflicts between and within ethnic groups over limited resources - decreased dependence on (giving up) agricultural activities (mentioned by agro-pastoralists in Mado and Billa) - sharp increase in crop prices as a result of reduced availability in the market - decreased household incomes and increased poverty - increased dependence on emergency aid unless long-term aid instruments in place - separation of families for longer periods due to increased migration (to find labour work or better pastures) - youth frustration (mentioned by young men in Medhecho) - heavy rainfall events damaging ponds, wells and soil-roofed houses (Borana)	- greater soil erosion and decreased soil fertility - heavy rainfall taking away grass seeds and damaging pastures and crops (Borana) - decreased pasture and water resource availability - increased competition over grazing lands and overgrazing - drying up of water ponds - decreased rangeland productivity - wilting of crops and decreased crop yields due to higher temperatures and water scarcity - rainy seasons becoming too short for the growth of pasture grasses and crops like teff, maize and sorghum - increased deforestation (due to increased fuel wood and charcoal selling as a coping strategy)

5.1 Natural resources

The survival and success of pastoralist livelihoods (i.e. livestock rearing and agriculture) depend directly on the availability, quality, access and control over natural resources such as water, pastures, arable land, and forests/trees. The projected impacts of climate change on key natural resources are presented in this section.

5.1.1 Water Availability and Quality

The increase in temperatures projected in Borana and Shinile will likely lead to enhanced water evaporation rates, especially in Shinile where temperatures are already very high, thereby leading to decreased water availability.

Figure 8: Women carrying water in Medhecho PA

Annual rainfall is projected to increase in Borana and stay about the same in Shinile. Most of the increase in annual rainfall in Borana is expected to occur during the short rainy season (September to November). In Shinile, the amount of rain falling during the two rainy seasons (April to June, and July to September) is expected to decrease slightly. The proportion of rain falling in heavy precipitation events is expected to increase in both zones. There are high uncertainties regarding the impacts of these changes on water availability and quality. A greater proportion of rain falling in heavy precipitation events might lead to more water accumulation and an increase in water-borne diseases. It can also lead to more water lost as runoff, leading to less usable/available water, more soil erosion, and decreased soil water retention. In Borana, the increase in rainfall during the short rainy season might have positive impacts on water resources, if communities are able to capture and store the excess water during this period, and if strategies to minimize risks related to water-borne diseases are put in place.

5.1.2 Pasture and Arable Land

Increasing temperatures and more frequent hot days and nights, projected in both Borana and Shinile, will likely affect pasture growth, availability and quality, as well as crop yields negatively. Communities in Shinile are already mentioning high temperatures as a key hazard, leading to decreased pasture availability (subsequently leading to pasture shortages, increased pressure on available pasture, and land degradation), the wilting of crops and reduced crop yields.

There are high uncertainties regarding the impacts of precipitation changes on pasture and arable land. Pastures and arable lands in Borana will likely receive more rainfall annually. The impacts of this increase in rainfall can be positive or negative, depending on the intensity of the rains, its distribution during the year, and the coping strategies put in place to deal with these rainfall changes. So far, communities have observed increasingly dry conditions and more frequent droughts; although no significant trends in total annual rainfall has been observed since 1960s. This is probably because a larger proportion of the rain is now falling in heavy precipitation events, leading to more water runoff (so less usable water), increased soil erosion, loss of grass seeds, and destruction of pastures, crops and other assets. In addition, if more rain falls in a shorter period of time (i.e. reduced rainy seasons), pasture grasses and crops might not have enough time to mature. Therefore, the ability of communities to benefit from increased total annual rainfall will highly depend on the development and implementation of new strategies for water harvesting during heavy precipitation events, water conservation, soil protection/ conservation, erosion control, and pasture improvement.

Figure 9: Farm land in Mado PA

Increased variability in temporal and geographic rainfall distribution might also lead to increased mobility/migration, as is already being observed in Borana and Shinile, and increasing competition and conflicts over land resources.

5.1.3 Forests and Trees

Although high temperatures and changing rainfall patterns are likely to affect tree growth, the major threats affecting forests and trees are the coping strategies put in place by community members during times of drought: firewood and charcoal selling. These livelihood activities provide households with an alternative income source when livestock and crop production fail. Although these strategies are effective in the short-term, they become unsustainable as droughts become more frequent, leading to massive deforestation and forest degradation, as seen in many parts of the Shinile zone. This degradation in turn leads to the loss of other ecosystem services, including local climate regulation. With future climate change and increasing drought risk, pressures on forest resources are likely to intensify, unless more sustainable alternative sources of fuel are provided and other alternative income-generating activities are put in place. Resulting deforestation and forest degradation will go on to diminish the future adaptive capacity and livelihood options of local communities, reinforcing a cycle of vulnerability.

5.2 Livestock

Livestock is at center of pastoral livelihoods and is a key source of food and income in pastoral communities. This section describes the implications of projected climate change on livestock numbers and dependence, herd composition, and livestock quality/productivity.

5.2.1 Livestock Numbers and Dependence

The impact of future climate change, summarized in Section 4.1, combined with other stresses such as environmental degradation, demographic pressures, and increasing poverty, may lead to a decrease in livestock populations in Shinile over the longer-term, although periodic population booms and busts will likely persist. Some breeds of livestock may not cope well with extreme heat events and could suffer high mortality due to increased incidences of weather-related diseases. More frequent, longer and intense droughts could also lead to increased mortality. Inadequate access to veterinary services would undoubtedly exacerbate the impacts.

Figure 10: Goat in Medhecho PA

This, coupled with the deteriorating role of traditional social institutions that used to support livestock recovery, would reinforce the cycle of poverty and livelihood vulnerability to climate change. The reduction in household incomes resulting from reduced livestock numbers could be prevented or minimized by a change in livestock composition and by introducing new income generating activities.

In the Borana zone, the frequency of livestock population fluctuations may increase. Like in the Shinile zone, higher livestock mortality may occur due to an increase in average temperatures, as well as further bush encroachment. In addition, an increase in heavy rainfall events could result in an increase in periodic flash flooding, leading to more livestock deaths from drowning and water-borne diseases. It is possible that livestock numbers will regenerate due to the availability of water and abundant pasture after flood waters recede. However, the impact of increased rainfall (especially during the short rainy season from September to November) on livestock is highly uncertain and will depend on the intensity of the rainfall and on the capacity of communities to use and benefit from this increased rainfall, as mentioned in Section 6.1.2.

Borana and Shinile zones may see an increase in the number of pastoralist drop-outs in the future, as communities explore and increasingly engage in other income-generating activities that are less sensitive to climate hazards, such as wage labour and the establishment of viable cottage industries and businesses. Consequently, the number of livestock per household could

continue to reduce in these areas. The effectiveness and sustainability of these alternative income generating activities will greatly depend on changes in literacy levels, education and technical training, and on the support from NGOs and government agencies. NGOs in the Borana and Shinile are already promoting alternative income-generating activities, but many of these activities are still often climate-sensitive.

5.2.2 Herd Composition

In both zones, it is likely that there will be shifts in herd composition. Pastoralists in Shinile zone are already shifting to goats and camels, which are hardier under drought conditions than cattle and sheep. This trend is likely to continue. Hardy cattle species such as Zebu cattle may also be favored over other cattle species. The same is likely to happen in the Borana zone where, although cattle are still considered more valuable, some pastoralists have also begun to rear camels in addition to sheep, goats and cattle. However, only the better-off and richer households in Borana can currently afford to pay for this shift in herd composition since camels are more expensive than sheep, goats and cattle. To ensure a wider adoption of this strategy, especially by the poorest and most vulnerable households, formal and informal assistance (for example by richer clan members, NGOs and governments) will be needed.

Figure 11: Camels in the Borana zone

5.2.3 Livestock Quality/Productivity

The Shinile zone is likely to witness a decline in the quality of livestock over time. More frequent and severe droughts, coupled with a degraded environment, scarcer water resources and decreased disease resistance will contribute to a decrease in body mass, reproductive capacity (in terms of the survival of young animals) and milk production.

In Borana, there is potential for livestock quality to improve over time. This is because the projected increase of rainfall could see an increase in the quality of parts of the rangelands that have not been invaded by woody plant species. If properly managed, communities may be well placed to harvest and store dry season fodder during the rainy seasons. If livestock are well fed on a variety of species, their weight is likely to increase and the quantity of milk production sustained at relatively high levels most of the year.

5.3 People

People and social structures in pastoral communities are also likely to be strongly affected by future climate change, mainly via impacts on key natural resources and livestock. Significant

impacts can be expected on human health and nutrition, social structures and interactions, as well as markets and prices.

5.3.1 Human Health

Increased human health problems are already being experienced due to high temperatures, increased dust from stronger winds over barren lands, and drinking water scarcity.

Figure 12: Child in Billa PA

Given the predictions that it will get hotter and dryer during some seasons in Shinile, sanitation-related and vector-transmitted diseases could change in distribution, range, prevalence, incidence and seasonality. Similarly, higher temperatures and increased rainfall intensity may lead to flash floods that result in more water-borne diseases in Borana. However, there remain high uncertainties regarding the impacts of future climate change on diseases, as explained in Section 4.2.2.

Increased food insecurity and malnutrition is likely to decrease human disease resistance and human labour productivity and increase human deaths, unless health services, which are currently very poor in these areas, are improved in the coming years.

5.3.2 Human Nutrition

As droughts are becoming more frequent in Shinile and Borana, pasture and water scarcity is leading to low conception rates and poor health of lactating animals. This has an adverse implication on the availability of milk and milk products for home consumption. Higher temperatures and increased rainfall unpredictability, combined with increasing land degradation and bush encroachment, will result in increased food insecurity and nutritional deficits, unless pastoralists switch to better adapted livestock species. However, poor households, who are the most prone to food insecurity and malnutrition, usually do not have the financial capacity to modify their herd composition.

Figure 13: Jug of milk in Medhecho PA

Similarly, rain-fed crop production might become more and more challenging with the predicted increase in temperatures, more intense heavy precipitation events in Borana, and reduced Gu and Karan rains in Shinile. According to the IPCC projections for Africa, agricultural production and access to food is projected to be severely compromised by climate variability and change; there is an expected decrease in the area suitable for agriculture, length of growing seasons and yield potential, particularly along margins of semi-arid and arid areas; and in some countries, yields from rain-fed agriculture could decrease by up to 50% by 2020 (IPCC, 2007).

The anticipated changes in agro-ecological conditions and increases in extreme events (such as extreme heat, droughts and floods) might increase food assistance needs in both Shinile and Borana. However, both formal and informal assistance systems may not be able to sustain an increasing number of people in need.

Climate change impacts on key financial resources might also reduce households' capacity to purchase staple foods such as sorghum, milk, sugar and tea, leading to increased malnutrition especially among children and infants.

Figure 14: Children in Billa PA

5.3.3 Social Structures and Interactions

The practice of herd and family splitting is becoming more and more common among pastoralists. During dry seasons, the herd is divided into smaller groups. Sheep, as well as milking and weak animals stay with the core family (mothers, children and older men) near villages, while hardier animals (i.e. camels, cattle, goats) are driven further afield by young men in search of water and pasture. In recent years, prolonged droughts and their impacts on pasture and water availability has led to splitting of families for longer periods due to longer and farther migration in search of pasture and water.

With droughts becoming more and more frequent, pastoralist drop-out is increasing, leading to the migration of men to nearby towns in search of wage labour. Based on future climate change projections, rural-urban migration is likely to increase, with potentially serious impacts on urban development, food security and poverty.

Informal assistance or asset redistribution mechanisms in Borana and Shinile pastoral communities are already reported to be on the decline due to increasing number of households in need of assistance. With the projected increase in the frequency of extreme weather events, asset losses and the number of people in need are likely to continue to increase, making these social protection mechanisms ineffective. Similarly, increasing resource scarcity and mobility are

leading to the breakdown of traditional resource management systems in Borana and Shinile. This loss of governance capacity is contributing to the degradation of natural resources.

Figure 15: Men discussing in Mado PA

Finally, in recent years (especially in Borana) increasing frequency and intensity of droughts has put further stress on resource availability, leading to more frequent and violent conflicts between and within ethnic groups (although limited resources are not the only driver of conflicts in the area, as described in section 5.1.3). Conflicts disrupt development activities, education, and migration, limit access to markets, and destroy assets that are crucial to deal with droughts and other extreme events. The impact of future climate change on conflicts will greatly depend on changes in water and pasture availability, described in Sections 6.1.1 and 6.1.2, and on the establishment and/or support of conflict-resolution mechanisms, especially in relation to internal border issues.

5.3.4 Markets and Terms of Trade

Increased rainfall variability and heavy precipitation events, prolonged droughts, extreme heat and increased land degradation will likely reduce crop yields, decreasing the availability of crops on the market and increasing crop prices. Conversely, decreased pasture availability and livestock quality in times of drought will result in more livestock being brought to the market and sold at reduced prices. These market conditions in times of drought (i.e. increased grain prices and decreased livestock prices) will further weaken the terms of trade for pastoralists, leading to reduced household incomes and increased poverty.

Less directly, more conflicts over scarce resources may also reduce market access for pastoralists, limiting their capacity to sell-off their livestock quickly at the beginning of a drought or buy food when their livestock or crop production fails.

5.4 Summary of comparative analysis of vulnerability and adaptive capacity in Borana and Shinile

Research on community-level vulnerability and adaptive capacity in Borana and Shinile has revealed some important similarities and differences between the two areas.

The most obvious similarity is that communities in both zones are highly impacted by climate hazards, especially drought, due to their reliance on climate-sensitive sectors (pastoralism and agriculture). Stakeholders consulted in both areas are observing climate trends that are consistent with scientific climate change observations and projections, including increasing drought frequency, decreasing rainfall predictability, decreasing length of rainy seasons, and increasing temperatures. These climate trends are likely to continue in the future. In both zones, traditional coping strategies to deal with climate variability are becoming less effective, forcing people to look for alternative strategies. Communities in both zones suggested diverse adaptation strategies that could be implemented to help them face current and projected climate change. Communities believe that their own actions/strategies and future plans can have a big impact on their ability to cope with future climate changes. However, the adaptive capacity of communities in both areas is limited by their low access to education and training, health services, financial resources and services, information (on weather, climate change, markets, pests, etc.), roads and markets. In addition, vulnerability to climate change is enhanced in both zones by land degradation, population pressures, conflicts, social and gender inequalities, inadequate government policies, capacities and coordination, and the deteriorating role of traditional social institutions.

Despite these similarities, some important differences exist within the two zones, particularly regarding the current climate hazards faced by communities. Increasing temperatures and extreme heat events currently have a greater impact on the visited communities in Shinile than in Borana. On the other hand, communities in Borana are more exposed to heavy rainfall events than communities in Shinile.

In addition to these differences between the Borana and Shinile zones, this study reflected important differences between communities within a same zone, as well as within communities. For example, different communities within the same zone, as well as women, men and youth within the same community, often expressed different adaptation priorities and suggested different adaptation strategies, as shown in section 4.3.2. These differences will need to be taken into account in the development and promotion of adaptation strategies, to ensure that adaptation strategies are community-led and based on local adaptation needs and priorities. In addition, depending on their main livelihood activities, communities within a same zone suggested different, and sometimes contradictory, adaptation strategies. For example, pure pastoralists suggested that agro-pastoralism would be a better livelihood strategy to deal with climate change, while agro-pastoralists would like to drop out of their farming activities due to increasing crop failure. This shows the need for greater knowledge- and experience-sharing between communities.

6. Recommendations

Given the above analysis, the research team has devised the following set of recommendations for three target groups: the Government of Ethiopia, civil society, and international donors.

6.1 To the Government of Ethiopia

To counteract the adverse climate and poverty trends in pastoral areas, Ethiopia requires urgent changes in its rural and pastoral development priorities. The Government, operating at the national and sub-national levels, should aim to address the underlying drivers of vulnerability mentioned in section 5.3.4. This means implementing poverty reduction and development policies that: protect of pastoral livelihoods and entitlements; enhance access to vital infrastructure, resources and services in pastoral areas; enhance the security of pastoralist land holdings; restore and protect the environment in rangelands; create more efficient markets; and help control population growth, particularly through women's education and empowerment. More specifically, the Government of Ethiopia should:

1. **Re-evaluate the place of pastoralism in Ethiopia's sustainable development,** protecting pastoral land from encroachment and conversion to unsustainable land uses. To be successful, customary and formal authority must find a basis for collaboration. Governments should work to resolve internal boundary issues and engage with traditional social institutions in conflict prevention and resolution. In addition, policies should clarify land tenure systems that allow vital pastoral mobility, especially in the face of increasing drought frequency.

2. **Protect and enhance pastoral livelihoods through the development and implementation of appropriately-targeted economic development, social protection and relief strategies**. Livestock marketing support and diversification activities, including adding value to livestock products such as milk, ghee, hides and horns, could contribute to increased pastoral incomes. The government should also support the improvement of social safety nets, while at the same time ensuring the availability and efficient distribution of emergency food aid and cash support.

3. **Improve coordination, communication, and information-sharing between different government agencies from national to the local levels**, especially regarding weather, climate and food security information. Information pathways should be enhanced, so that local communities can access seasonal weather forecasts and early warnings for climate hazards as early as possible and in their own languages, and so that governments can be promptly informed of poor rain conditions and food insecurity issues. In addition, government awareness of climate change impacts, projections, and of the National Adaptation Programme of Action (NAPA) should be enhanced at all levels (from the national to the local level), to allow government officials to better deal with current climate risks and prepare for projected climate change.

6.2To civil society

To contribute to the enhancement of climate change resilience among pastoral and agro-pastoral communities in the Borana and Shinile zones, practitioners such as CARE and SCUK should take into account current climate variability, projected climate change impacts, and climate change vulnerability and adaptation when developing programmes and projects. This should involve:

1. **Creating partnerships with weather and climate institutions**: this could include the National Meteorological Agency (NMA) of Ethiopia, the FEWS NET office in Ethiopia, as well as other regional climate analysis bodies such as the Intergovernmental Authority on Development (IGAD) Climate Predictions and Analysis Centre. These bodies could regularly provide useful local level data and information on expected seasonal weather conditions as well as medium to long term climate projections, as these continue to be generated and refined.

   Such data and information could be used to plan for, and adjust programme interventions to ensure that the livelihoods and welfare of communities are safeguarded and improved in the face of current climate variability and change. For example, in view of the projected increase in heavy rainfall events, especially in Borana, practitioners could incorporate emergency and contingency planning and resources into the livelihood programmes in the area. This could take the form of construction of large cattle and human emergency shelters, as well as grain and seed banks that are raised above ground to reduce the negative impacts of flash floods. In addition, strategies could be put in place to prevent soil erosion by heavy rainfall events and reduce risks related to water-borne diseases. In view of the observed and projected decrease in the length of rainy seasons and increasing drought frequency, interventions could aim to improve food and fodder preservation; demarcation and management of dry season grazing areas; access to early maturing and drought tolerant crop varieties; as well as water harvesting, conservation and efficient utilization. As explained in greater detail below, strategies should be based on local vulnerability and knowledge, and should be community-led.

2. **Using traditional knowledge and starting from what people are already doing on the ground**: Local communities are already observing and experiencing the effects climate change, as well as implementing coping and adaptation strategies. Efforts to support climate change adaptation should be based on an understanding of what people are already doing on the ground, assessing the effectiveness of current coping strategies and how they might fare over the longer-term with climate change. Ineffective and unsustainable coping strategies are not always a choice; communities are often pushed into these strategies due to a lack of better options. Discussions with different community groups (women, men, youth and children) can give insight into which community groups are vulnerable to what, and which coping strategies are implemented by different groups. Participatory community

consultations should aim to develop sustainable alternatives to replace ineffective or unsustainable practices.

3. **Understanding climate-livelihood linkages in an intervention area**: To ensure that development programmes and project activities promote climate change resilience and increase adaptive capacity, it is important to understand which livelihood resources are sensitive to climate hazards and which resources are important for adaptation.

   Livelihood resources identified in this research as being sensitive to (or highly impacted by) climate hazards are presented in red in Table 10. Development programmes and projects should aim to decrease the sensitivity of these resources (for example by promoting a shift to more drought tolerant livestock species and crops, or by promoting strategies to reduce conflicts, diseases and land degradation which make resources more sensitive to climate hazards) or should aim to decrease the dependence of communities on these climate-sensitive resources (for example by promoting alternative income generating activities that are not climate-sensitive).

   Livelihood resources identified in this research as being key to implementing adaptation strategies are presented in Table 12. To increase local resilience to climate change, development programmes and projects should aim to increase the availability of, access to, and control over these resources by all community members. For example, practitioners could: promote access to micro-finance and credit facilities, markets, and drought-tolerant livestock and crop species; promote more sustainable and participatory management of pasture and water resources; promote education and capacity building on sustainable livestock management, conservation farming, bush clearing, water infrastructure management, hay-making, tree planting, and business management; and promote the creation and participation of social groups and associations.

   Tools have been developed to facilitate the analysis of climate-livelihood linkages and to improve the impact of interventions on community resilience, such as the Climate Vulnerability and Capacity Analysis (CVCA) Framework and the Community-based Risk Screening Tool – Adaptation and Livelihoods (CRiSTAL) (see Table 3 for more information on these tools).

4. **Building on community suggestions and recommendations**: To ensure buy-in and make sure that adaptation strategies are community-led and based on local traditions and norms, adaptation strategies promoted by practitioners should build on suggestions and recommendations from communities. Strategies suggested by communities in the PAs and villages visited as part of this research are presented in Section 5.3.2, and include suggestions related to livestock diversity, composition and numbers, rangeland management practices, farming practices, alternative income generating activities, water infrastructure, savings and credit, education, tree planting, social groups, local awareness raising, and involvement of youth and women in decision making.

5. **Improving information and knowledge-sharing**: Disagreements regarding suitable adaptation strategies have been observed within and between communities in Borana and Shinile. For example, communities seem to disagree on whether pastoralism or agro-pastoralism is better adapted to the new climatic conditions (especially increasing drought frequency). Pure pastoral communities are gradually switching to agro-pastoralism as they believe it is more reliable than pure pastoralism, while agro-pastoral communities want to drop out of agriculture. Bringing these two groups together, as well as different NGOs and governments who work with these communities, to share experiences on climate risks and different adaptation strategies, could prevent the implementation of adaptation strategies that have already been shown to be unsustainable in the long-run and favour collaborative development of new adaptation strategies.

   In addition, practitioners should aim to facilitate information sharing between weather and climate institutions (such as the NMA and FEWS NET) and local communities. Seasonal weather forecasts and early warnings for climate hazards should be available to local communities on time, and translated into local languages. In addition, communities should be supported in using climate information for planning.

6. **Addressing constraints to adaptation and building on enabling conditions**: The main constraints and enabling conditions to the implementation of the different adaptation strategies suggested by communities in Borana and Shinile are presented in Table 13. The successful implementation of adaptation strategies will depend to a great extent on the ability of practitioners, communities and governments to address these constraints and build on existing enabling conditions. Not taking these key constraints into consideration risks undermining the success of the interventions. It could also inadvertently make communities even more vulnerable to climate risks. Addressing these constraints will require action from local to national levels.

7. **Address the underlying drivers of vulnerability**: Key underlying drivers of vulnerability in pastoral and agro-pastoral communities in Borana and Shinile were presented in section 5.3.4., and include environmental degradation, population pressures, conflicts, social and gender inequalities, inadequate off-farm employment opportunities and skills, poor access to infrastructure, resources and services, weakening of the role of traditional social and governance institutions and inadequate government policies, coordination and capacities. Practitioners should aim to address these underlying drivers of vulnerability.

   For example, interventions should aim to build resilient livelihoods by supporting investment in and development of key infrastructure and services. Construction of more schools (including mobile schools that are adapted to increased pastoral mobility), their appropriate staffing, and provision of incentives for school attendance such as food for education programmes could be beneficial. An increase in the number of human health care centers and services, including immunization and medical treatment, as well as training of community health workers, could help reduce impacts of diseases and mortality among vulnerable groups, thereby ensuring a strong, productive population that is less vulnerable

to climatic shocks. Construction of veterinary centers and expansion of Community Animal Health Workers' services, as well as regular supply of key veterinary medicines could help reduce livestock mortality from preventable and treatable diseases, and reduce livestock vulnerability during droughts and extreme heat events.

In addition, practitioners should advocate for the improvement of market conditions e.g. development of policies that support trade and increased revenue for the benefit of pastoralists, traders and public services. Direct support could be in the form of: construction of abattoirs at strategic points (e.g. market centers) in the region and training community members on hygienic slaughter, preservation and transportation of produce. They could be trained in, and provided with facilities for hygienic meat drying and packaging. Export markets for these products could be sought and cooperatives established and strengthened to maximize the benefits from such trade.

Social and gender equality should be promoted in all interventions. In Borana, the impact of CARE interventions (such as the creation of and support to women groups) on women empowerment is already noticeable, with clear benefits on women's adaptive capacity in the face of current climate hazards. However, important inequalities still remain, and women as well as youth empowerment activities should be up-scaled and replicated throughout pastoral areas.

6.3To international donors

Donors should allow enough funding flexibility to enable practitioners to adjust interventions in the face of climate change uncertainties. In addition, donor funding should include funds for emergencies and contingencies to provide projects and programmes with adequate resources to address climate-related emergencies without threatening the achievement of programme/project goals and objectives.

Donors should also promote the integration of climate change adaptation considerations into development programs, projects, and policies. Comprehensive guidance on this is available through the OECD (2009). In addition, donor funding for adaptation to climate change should support all the four pillars of community based adaptation, namely: building resilient livelihoods, disaster risk reduction, capacity building, and addressing the underlying causes of vulnerability (more information on these four pillars are provided in the CARE CVCA Handbook: http://www.careclimatechange.org/cvca). An integrated approach to reducing vulnerability would promote the achievement of positive programme/project outcomes, and reduce the risks of maladaptation.

7. Further research needed

This current research cannot respond to all research needs and priorities related to climate-related pastoral vulnerability and adaptation in Borana and Shinile. More research will be needed to complement and deepen the findings of this research. Key research priorities, mostly identified during the debriefing meeting in Addis Ababa in July 2009, include:

1. Broadening the scope of this current research to other pastoral areas within Ethiopia. The findings of this research cannot necessarily be extrapolated to other pastoral areas within Ethiopia, which might be exposed to different climate hazards and trends, or might have different adaptation strategies and priorities. For example, this research mostly focuses on rain-fed pastoral areas, while pastoral communities along river basins have not been studied.

2. Linkages and synergies between the policy measures suggested in this research and existing development policies, programmes and reforms should be explored and built on (for example linkages with the Productive Safety Net Project).

3. Continuous monitoring and research is needed to better understand climate change impacts and adaptation and how they are evolving over time. This would require the establishment of key indicators that could be monitored. This should not be ad-hoc research.

4. A deeper analysis of the influence of non-climatic factors (such as population growth, policies, land use changes, etc.) on local vulnerability to climate change.

5. An analysis of the contribution of global climate change drivers (CO_2 emissions from other countries) versus local climate change drivers (local deforestation and desertification affecting the local climate).

6. An analysis of the resources (financial, human, etc.) required to adapt to climate change, and how to efficiently manage them for the realization of optimal adaptation benefits. This might include large uncertainties related to different development pathways, climate change mitigation efforts, and the adaptation strategies chosen.

7. A quantitative analysis of climate change impacts to complement this qualitative research.

8. References

Central Statistical Agency (CSA). 2008. *Summary and statistical report of the 2007 population and housing census.* Addis Ababa, Ethiopia. Available at: http://www.csa.gov.et/pdf/Cen2007_firstdraft.pdf

Central Statistical Agency (CSA). 1994. *Population and housing census of Ethiopia: Results for Oromia Region.* Volume 1, part 1. Available at: http://www.csa.gov.et/surveys/Population%20and%20Housing%20Census%201994/survey0/data/docs%5Creport%5CStatistical_Report%5Ck04%5Ck04_partI.pdf

Cordaid and FSS. 2009. *Assessment of climate change-induced hazards, impacts and responses in the southern lowlands of Ethiopia.*

DalleG., Maas B., and Isselstein J. 2006. Encroachment of woody plants and its impacts on pastoral livestock production in the Borana lowlands, southern Oromia, Ethiopia. *Africa Journal of Ecology*. Issue no. 44: pp 237-246. The East African Wildlife Society. John Wiley and Sons, USA.

Demeke, F. 2006. *Pastoralists Livelihoods Initiatives (PLI) Enhancing Afar and Borana Livelihoods Efforts (ENABLE) – A Coping strategy index Report for Fentale and Borana Areas of Oromia Region.* CARE International, Addis Ababa, Ethiopia.

Deninger, K., Jin, S., Adenew, B., Gebre-Selassie, S., and Nega, B. 2003. *Tenure security and land-related investment - evidence from Ethiopia, Volume 1.* Available at: http://econ.worldbank.org/external/default/main?ImgPagePK=64202990&entityID=000094946_03032704080562&menuPK=64168175&pagePK=64210502&theSitePK=477938&piPK=64210520

Eriksen, S. 2001. *Linkages between climate change and desertification in East Africa.* Arid Lands Newsletter 49.

Ethiopian NAPA. 2007. *Climate Change National Adaptation Programme of Action.* Addis Ababa, Ethiopia. Available at: http://www.preventionweb.net/files/8522_eth01.pdf

FEWS NET. 2009. *Recent Rainfall and Food Aid Tendencies in Ethiopia.* Available at: http://www.fews.net/pages/country.aspx?gb=et&l=en

Fischer, G., Shah, M., and Velthuizen, H. 2002. *Climate change and agricultural vulnerability.* International Institute for Applied Systems Analysis. 152 pp.

S. Homann, B. Rischkowsky and J. Steinbach. 2007. The Effect of Development Interventions on the Use of Indigenous Range Management Strategies in the Borana Lowlands in Ethiopia. *Land Degradation and Development* Vol.19: pp 368-387. Wiley Interscience. Available at: www.wileyinterscience.wiley.com.

IPCC . 2007. Africa. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press,Cambridge UK, 433-467.

IPCC. 2001.*Climate change 2001: Impacts, adaptation, and vulnerability.* Summary for policymakers. A report of the Working Group II of the Intergovernmental Panel on Climate Change. 17 pp.

McSweeney, C., New, M., and Lizcano, G. 2008. *UNDP Climate Change Country Profiles – Ethiopia.* Available at: http://country-profiles.geog.ox.ac.uk

OECD. 2009. *Policy Guidance on Integrating Climate Change Adaptation into Development Co-operation.* Paris: OECD.

SCUK and DPPA. 2008. *Livelihoods and Vulnerabilities – An Understanding of Livelihoods in Somali Regional State, Ethiopia.*SCUK and Disaster Prevention and Preparedness Agency. Addis Ababa, Ethiopia.

World Bank. 2004. *Background Report, Four Ethiopias: A Regional Characterization*. Ethiopia: Country Economic Memorandum. Available at: http://siteresources.worldbank.org/INTETHIOPIA/Resources/PREM/FourEthiopiasrev6.7.5.May24.pdf

World Bank. 2003. *Ethiopia – Second road sector development program project*, *Project Appraisal Document.* Available at: http://www-wds.worldbank.org/external/default/main?pagePK=64193027&piPK=64187937&theSitePK=523679&menuPK=64187510&searchMenuPK=64187283&theSitePK=523679&entityID=000112742_20030530104124&searchMenuPK=64187283&theSitePK=523679

9. Annexes

9.1 Field Guides

9.1.1 Field Guide 1: Facilitation Tips

Before Going to the Community

Plan carefully.

- Acquire background information before going to the field. Be aware of community or group history, past or present conflicts and power dynamics which may be important in selecting focus groups or in facilitating dialogue.
- Prepare the agenda for the community visits. The agenda should ensure that participants are able to move at their own pace, but that the required ground will be covered in the available time.
- Find out about literacy levels in advance if possible to ensure that you plan exercises accordingly.
- Don't forget to allow time for clarification, questions and answers, discussion and 'learning moments'.
- Keep in mind that community members are very busy, so visits should be kept short and be spaced out over time as much as possible so as not to take too much time away from their regular activities.
- Plan to provide refreshments when appropriate.
- Decide on focus groups.
- Ensure that facilitators are functional in local dialects.

Get support of community leaders.

- Explain purpose of fieldwork and get their permission to work in the community.
- It may be helpful to have a preparatory meeting bringing together local stakeholders, including community leaders, local government representatives, CBOs, and other local organizations to explain the approach and its benefits and to plan the timing of the community visits.
- Review the agenda with stakeholders to clarify objectives, how much time will be needed, and where the discussions will take place (ensure that this is an appropriate venue which is accessible and comfortable for women or other less mobile community members).
- Agree on focus groups. If enough facilitators are available, it may be helpful to have concurrent sessions in the same community to allow participants in different groups to speak freely without being concerned about being heard by other groups.
- Decide how information on focus group discussions will be communicated to participants.
- Agree who will introduce the facilitators to the communities.

Be prepared.

- Ensure the objectives of the community visits are agreed among all members of the analytical team.
- All facilitators must have a good grasp on the tools and analytical methodology. It may be helpful to practice facilitating the tools before going to the communities.

- If you are working as a facilitator team, decide who will actively facilitate which parts of the agenda, and who will take notes.
- The facilitation team should include both men and women, and should be trained in gender-sensitive facilitation. In some contexts it is very important to have female facilitators work with women's groups to increase comfort.
- Agree with co-facilitators on how concepts such as hazard, livelihood resources, etc. will be described in local languages. Note that the concept of climate change may be difficult to explain. Community members may be more comfortable talking about seasons, weather, the environment, etc.

Be ready to handle conflict.

- The process can draw out issues of inequality that need to be addressed in order to reduce vulnerability. With these issues, facilitators must tread carefully, as there are generally established levels of power and influence within communities, or between communities and other groups.
- Having a grasp on conflict resolution techniques will help facilitators manage the process should any conflicts arise.
- Engaging a wide range of stakeholders in the gathering and analysis of information can assist in mitigating conflicts.

Ensure you have the materials you need.

- These may include:
    - Flipchart paper
    - Thick-tipped markers in a variety of colours
    - Coloured paper
    - Masking tape
    - Local materials such as stones, sticks, seeds, etc.
    - Recording device
    - Camera to document the process (ensure that this is culturally appropriate)
    - Notebook and clipboard
    - Snacks/lunch/water (depending on how much time the meeting will take, and where it will take place)

<u>During the Focus Group Discussions</u>

Manage expectations.

- It is important to manage expectations during the fieldwork. Communities have often been "assessed" many times for different projects, and may have expectations that the fieldwork will lead to a project or program.
- Facilitators should be aware of this, both because it may influence the issues that are raised in the discussions, and to ensure that expectations are not being raised for follow-up projects.

Create and maintain a trusting and 'safe' space.

- Allow a trusted community member or local representative to introduce the team.
- Be gracious and welcoming.
- Allow everyone to introduce themselves.
- Ask permission to take photographs or video, and refrain if participants are uncomfortable with it.

- Provide refreshments if appropriate.
- Value participants' knowledge and experience.
- Interrupt any "attacks".
- Admit to and correct your errors.
- Be impartial.
- Allow time for participants to ask questions.

Animate and balance participation.
- Ensure that the venue is conducive to participation.
- Develop ground rules with the participants.
- Explain the process and ensure that all understand instructions and questions.
- Support those that are timid, and gently silence those that take the floor too much or consider themselves as "experts".
- Find ways to allow people to drive the process (e.g. building the map themselves, marking symbols on the matrix).
- Allow participants to raise issues, but keep the process on track. Ensure that you are moving quickly enough to cover the necessary ground in the time allocated.
- Probe for more information if the discussion is lagging, but try not to lead participants.

Finish gracefully.
- Explain what the next steps are.
- Schedule a time to return to validate the analysis.
- Thank the group for their participation, and give an opportunity to ask questions.
- If the participants would like to keep the products of the focus group discussions (e.g. hazard maps), make a copy and leave the original behind.

9.1.2 Field Guide 2: Rain Calendar

Objectives

- To understand what is "normal" rainfall from the perspective of community members
- To examine trends in rainfall
- To brainstorm on future rainfall scenarios and potential responses
- To evaluate use of climate information for planning

How to Facilitate

This activity should take approximately 2 hours.

***NOTE**: Throughout the exercise and discussions, listen and take note of any mention of the following issues:*
- *Coping strategies (note whether they are currently being used, or whether they would like to use them, and if it is the latter, try to find out why they are not using them – what are the constraints?)*
- *Changes in environment, conditions, hazards, livelihoods*
- *Social or political issues that may have implications for vulnerability*

STEP 1 – Prepare the calendar.

Use the ground or large sheets of paper. Mark off the months of the year on the horizontal axis. Mark off a range of years (from the SCUK historical timeline) which includes a good year, a bad year, a drought year and an average year. Try to select the most recent years.

STEP 2 – Plot timing of rainfall in past years.

Explain to the participants that you would like to develop a calendar to understand the rainfall patterns that they are experiencing. For each of the years on the calendar, plot the start and end of the rainy season(s), and note the quality of the rain (light/heavy) and the distribution (did it fall all at once, was it distributed over the season, etc.,etc.).

STEP 3 – Present a future scenario.

Somali area: decreasing rainfall, increasing temperatures
Borana area: increasing rainfall, more concentrated in a short period of time, more heavy events, increasing temperatures

Present a future scenario using the calendar if you think it will make it clearer.

STEP 4 – Discuss impacts of future scenario on livelihoods.

Ask the group how they think the future scenario will affect their livelihoods.

STEP 5 – Discuss response to potential scenario.

Ask the group how they would respond if the future scenario were to occur next year.

STEP 6 – Discuss preparation for future climate change.

Ask the group what they might do to prepare for this possible future scenario in terms of changing livelihoods strategies.

9.1.3 Field Guide 3: Vulnerability Matrix

Objectives

- To determine the hazards that have the most serious impact on important livelihoods resources
- To determine which livelihoods resources are most vulnerable
- To discuss who has control over and access to livelihoods resources

How to Facilitate

This activity should take approximately 2 hours.

***NOTE**: Throughout the exercise and discussions, listen and take note of any mention of the following issues:*

- *Coping strategies (note whether they are currently being used, or whether they would like to use them, and if it is the latter, try to find out why they are not using them – what are the constraints?)*
- *Changes in environment, conditions, hazards, livelihoods*
- *Social or political issues that may have implications for vulnerability*

STEP 1 – Prepare the matrix.

Prepare a matrix in advance. This can be done on the ground or on flip chart paper.

STEP 2 – Identification of livelihoods resources.

Ask the group to identify THEIR most important livelihoods resources. These do not have to be resources that they currently have, but those that they consider to be most important in achieving well-being. They may create a long list of resources. As they brainstorm, organize the list based on the different categories of resources – human, social, physical, natural and financial. Use the reference list of resources to prompt people. They may particularly need help in identifying social and human resources.

***NOTE**: It is unlikely that community members will categorize their resources in terms of these categories – it is the job of the facilitation team to organize their ideas within the different categories. Also, the concept of resources may be difficult. It may be better to ask participants about how they gain their livelihoods, or what they do in a typical day, and then ask them what things they need to undertake these activities. This can lead to an identification of resources.*

***NOTE**: It is very important to make it clear to the participants that you want them to talk about their own experiences. In order to disaggregate data, it needs to be clear that participants are providing information based on their own experiences, priorities and strategies, not those of the household. This is particularly important with women's groups, who may be more inclined to speak about the activities and priorities of their husbands than their own.*

STEP 3 – Prioritize livelihoods resources.

For each of the categories, ask the group to identify the THREE resources that they consider to be MOST important in achieving well-being. If they only listed three or less during the brainstorm, just use these. List these priority resources down the left side of the matrix on the vertical. Use symbols if this will help participants to better understand.

STEP 4 – Discuss control of resources and access to facilities and services.

Using the resource list, discuss who has control over the different resources that were prioritized. If the resources are facilities or services, ask participants if they are using them, and if not, why.

STEP 5 – Identify hazards.

Then ask the group to identify the greatest hazards to THEIR livelihoods. Hazards may be natural or man-made. Do not limit the discussion to only climate-related hazards, but you may want to prompt the group if they are not identifying environmental hazards.

***NOTE**: It is important to be specific in the hazards, and to ensure that the issues identified are actually hazards. Participants may identify conditions such as "food insecurity" as hazards. It is up to the facilitator to ask the group to break down these conditions to determine if they are caused by hazards (e.g. food insecurity may be the result of a drought, which is a hazard). Similarly, some groups may identify scarcity of resources, such as "lack of money", as a hazard. In this case, it should be determined whether the lack of a resource is the result of a hazard, or in some cases, whether the resource should be added to the list of priority resources identified in the previous step.*

STEP 6 – Prioritize hazards.

Ask the group to prioritize the three hazards that have the greatest impact on their livelihoods. The THREE most important hazards should be listed horizontally across the top of the matrix, again using symbols if necessary.

STEP 7 – Discuss changing hazards.

Ask participants if the hazards are different now than they were 10/20/30 years ago (depending on age of participants). If they say the hazards have changed, ask them how (e.g. more frequent, more intense, different timing, etc.).

STEP 8 – Score the impact of the hazards on the different livelihoods resources.

Ask the participants to decide on the degree of impact that each of the hazards has on each of the resources. This will involve coming to consensus as a group. The note taker should note key points of discussion that lead to the scores assigned, and any disagreements on the scores.

Ask the community to decide on a scoring system for the hazards against the livelihoods resources, identifying significant, medium, low and no hazard. The scoring system should be as follows:

- 3 = significant impact on the resource
- 2 = medium impact on the resource
- 1 = low impact on the resource
- 0 = no impact on the resource

You can use stones, symbols or different colours of markers (e.g. red = significant risk to resource, orange = medium risk, green = low risk, blue = no risk). Ensure that all members of the group understand the scoring system.

***NOTE**: Ensure that you are asking the right question of the participants. The question is how much the HAZARDS affect the RESOURCES. Note that some hazards may have no impact on particular resources. It must be made clear to participants that they shouldn't struggle to find an impact – it is perfectly fine to say that it has no impact.*

***NOTE**: The note taker must note down the justifications for the different scores, as this will be important in understanding the data later.*

STEP 9 – Discuss current coping strategies.

For each of the impacts identified, ask the group members how THEY are CURRENTLY coping with the impacts of the specific hazards identified. Ask them if the coping strategies are working or not.

***NOTE**: It is very important to make it clear to the participants that you want them to talk about their own perspectives. In order to disaggregate data, it needs to be clear that participants are providing information based on their own experiences, priorities and strategies, not those of the household. This is particularly important with women's groups, who may be more inclined to speak about the activities and priorities of their husbands than their own.*

STEP 10 – Discuss potential adaptation strategies.

Ask the group members if there are any strategies they would like to adopt which would help them to deal with the hazards in the future. Discuss the constraints or opportunities that exist to adopt these strategies.

9.2Field work report template

REPORT FROM FIELD WORK

Facilitators

1	
2	
3	
4	
5	

Group Information

District	
Village	
Group (e.g. young men)	
# of participants	
# of households in the village	

RAIN CALENDAR

MONTHS													**Notes on Quality of Rainfall**
YEARS													

How will the future scenario affect livelihoods?

How will the group respond if the future scenario were to occur next year?

How will the group prepare for the possible future scenario?

VULNERABILITY MATRIX

Livelihood Resources Brainstorm

Natural
Physical
Financial
Human
Social

Hazard Brainstorm

Note any hazards identified.

Note any changes to hazards discussed.

	HAZARDS		
RESOURCES			
Natural			
Physical			
Financial			
Human			
Social			

HAZARDS, IMPACTS AND COPING STRATEGIES

Hazard	Impacts	Coping Strategies

DISCUSSION

Who has control of resources and access to facilities and services?

Which current coping strategies are working? Why?

Which current coping strategies are not working? Why not?

What different strategies would the participants like to adopt which would reduce the impact of hazards on livelihoods?

What resources are available to adopt these new strategies?

What are the constraints to adopting these new strategies?

OTHER ISSUES

Coping strategies (note whether they are currently being used, or whether they would like to use them, and if it is the latter, try to find out why they are not using them – what are the constraints?)

Changes in environment, conditions, hazards, livelihoods

Social or political issues that may have implications for vulnerability