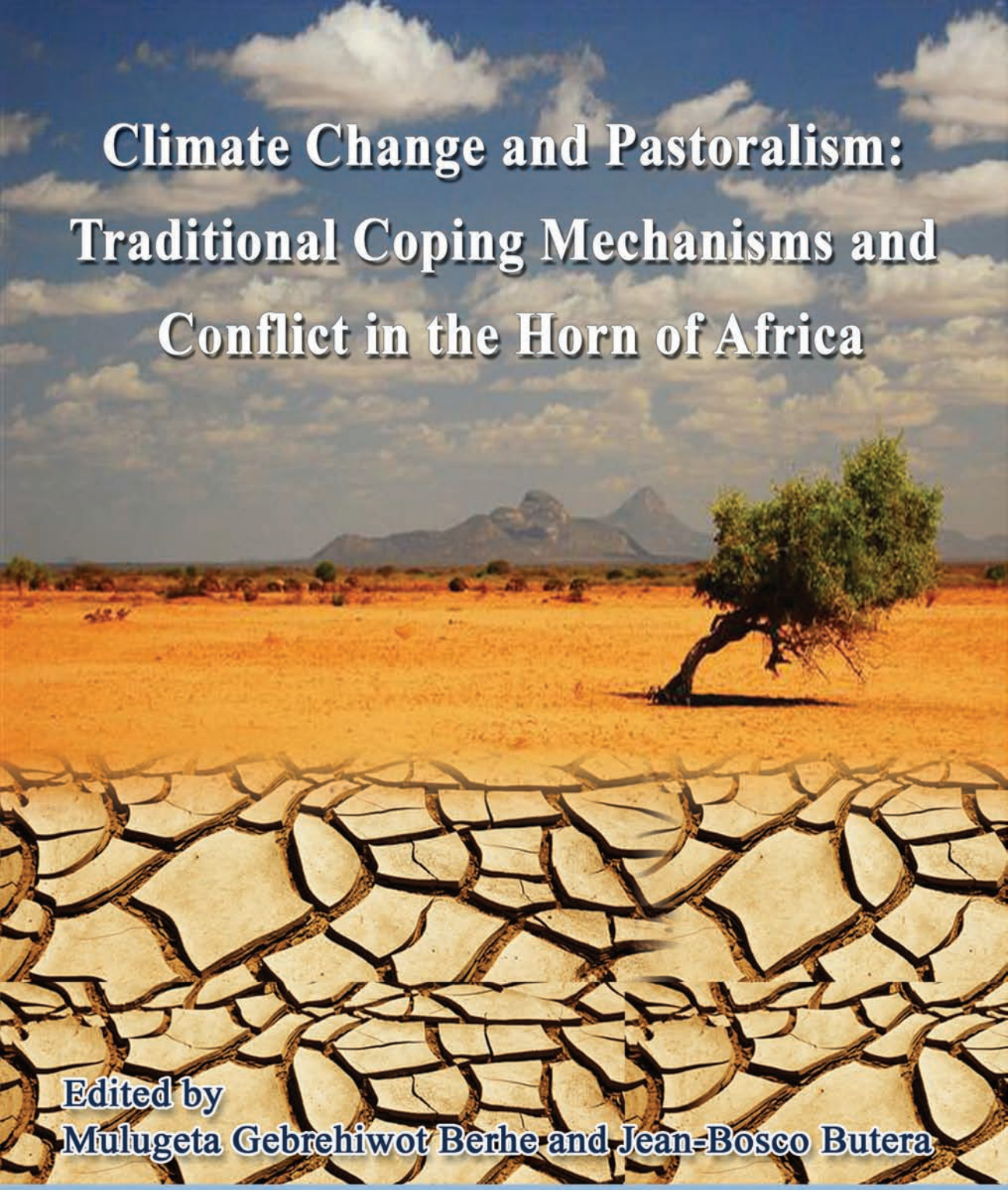
Climate Change and Pastoralism: Traditional Coping Mechanisms and Conflict in the Horn of Africa



Edited by
Mulugeta Gebrehiwot Berhe and Jean-Bosco Butera

Institute for Peace and Security Studies

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Dedicated to Dr. Mohammed Umer,

A paleoclimatologist and paleoenvironmentalist who worked tirelessly to understand the past climate and environment of the Horn of Africa

He passed away in the middle of the publication of this volume

Preface

The countries in the Horn of Africa, a region known for being a conflict hotspot, are actively engaged in finding lasting solutions to regional conflict and fostering sustainable development, as a fundamental part of human security. The causes of these conflicts range from governance constraints, colonial legacy, post-election violence, over ethnic- and clan conflict to competition for resources. These are just some of the challenges pertaining to the region. Conflict stands in the way of development and progress to take root in the region and it must be addressed in order for the region to prosper, and for the nurturing of human security and development and secure rights for its peoples.

The Institute for Peace and Security Studies (IPSS) was established in 2007 to augment better understanding of conflict in the Horn of Africa, in particular, and the continent, in general. The objectives of IPSS are to enhance excellence in research and the teaching and learning of peace and conflict issues, to educate society about peace, and to serve as a think tank for actors keen to promote peace and security in the region. The Royal Embassy of Denmark to Ethiopia has been a partner of IPSS from the beginning, both financially and, equally importantly, in spirit, and has commended the work of IPSS as an Institute and as a focal point for peace and security work in the region.

The Institute has already achieved significant outcomes in its short life. It has graduated four cohorts of graduate students and conducted a series of short courses for participants from various sectors of Ethiopian society. And recently IPSS launched a PhD programme, further strengthening and consolidating its research base. IPSS also cooperates with a range of institutions to strengthen networks and its ability to act as a centre of excellence on issues of peace and security in the region. The Embassy hopes that the work of IPSS will contribute towards the development of a research community, which will work to better understand the cause of conflict and ways to prevent it.

This book is a step in this direction. The adverse impacts of climate change are predicted to severely constrain the lives and livelihoods of Africans. Pastoralists are among the most vulnerable population groups. Considering the fact that the Horn of Africa has a large concentration of pastoral communities and that pastoralist conflicts are rife in the region, many fear that climate change-induced scarcity will increase the incidence and severity of pastoral conflicts during the coming decades.

Research into this phenomenon will assist all actors, for example, policymakers, academics, and civil society organisations, to make better, more informed decisions on how to approach the enhancement of peace and security in the Horn of Africa. We hope that this book will contribute to this goal.

Pernille Dahler Kardel

Ambassador, Royal Danish Embassy in Addis Ababa, Ethiopia

Acknowledgements

The idea of engaging in this research project was conceived during our visit at the Danish Institute for International Studies (DIIS) in November 2010. The visit aimed to establish a scientific partnership with the DIIS. Our thanks go to Professor Moller (currently a Professor at Aalborg University) for his valuable insights during the inception of the research project. The financial support of the Royal Danish Embassy in Addis Ababa was crucial to the undertaking of the research, the organization of the international conference and publication of this book.

We also want to specifically acknowledge the support of Ambassador Pernille for sharing with us her insights on the research topic, both during the inception of the project and later during the international conference. This is over and above the flexible and responsive financial administration her staff provided to the project. We also thank the Inter-Governmental Authority on Development (IGAD) for honouring us by its presence during the international conference.

The project was undertaken in two phases: the first commenced with desk research and culminated in a three-day international conference conducted at the Desalegn Hotel, Addis Ababa, 1-3 September 2011; the second phase consisted of efforts to select the best papers for publication in this volume from the 22 presented during the conference.

The role played by Dr. Asnake Kefale and Mr. Fana Gebresenbet in the first phase was crucial for the success of the project. They conducted the desk research, solicited papers from a wide network of researchers and established a panel that selected abstracts for presentation, not to mention their contribution to the flawless organization of the conference.

Asnake and Fana were assisted by a number of individuals during the organization and running of the conference. We would like to thank the following individuals for their support (in alphabetical order): Mr. Bealem Amdissa, Mrs. Rahel Getachew, Mrs. Samrawit Tesfaye, Ms. Seble Mulugeta, Mr. Tewodros Assefa, and Ms. Tsega Desta. The conference report was prepared by Mr. Fana Gebresenbet, Ms. Grace Atim and Ms. Tsega Desta.

Dr. Mesfin Gebremichael and Mr. Fana Gebresenbet coordinated tasks pertaining to the second phase. Each paper was reviewed by two academics with relevant research experience. We used inputs from these anonymous reviewers to select the 15 papers included in this edited volume.

We thank Miss Judy Wall for her excellent language editing and for making the papers easily readable. Fana undertook the scientific and desktop editing of all the contributions.

We would also like to take this opportunity to thank the authors of the papers for bearing patiently with us during the long editorial process and responding to our, sometimes hair-splitting, comments and corrections. We hope that their and our efforts have paid off and that you will find this book interesting, informative and useful in your future engagements.

Editors

Mulugeta Gebrehiwot Berhe and Jean-Bosco Butera

List of Acronyms

ABEK	Alternative Basic Education for Karamoja
ACD	Armed Conflict Database
AfDB	African Development Bank
ASAL	Arid and Semi-Arid Land
AU	African Union
AVHRR	Advanced Very High Resolution Radiometer
CARE	Cooperative for Assistance and Relief Everywhere
CDI	Center for Defense Information
CEWARN	Conflict Early Warning and Response Mechanism
CEWERU	Conflict Early Warning and Response Unit
CIESIN	Center for International Earth Science Information Network
CSA	Central Statistics Agency, Ethiopia
CSO	Civil Society Organisation
DHS	Demographic and Health SUrveys
DRC	Democratic Republic of Congo
DRDC	Darfur Relief and Documentation Centre
EAC	East African Community
ECA	Economic Commission for Africa
ENSO	El Nino Southern Oscillation
EPaRDA	Ethiopian Pastoralist Research and Development Association
EU	European Union
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FAO	Food and Agriculture Organisation of the UN
FEWSNET	Famine Early Warning Systems Network
FIC	Feinstein International Centre
FM	Field Monitor
GCM	Global Circulation Model
GDP	Gross Domestic Product
GIS	Geographic Information System
GPCC	Global Precipitation Climatology Centre
GTP	Growth and Transformation Plan
HDI	Human Development Index
HoA	Horn of Africa
HPG	Humanitarian Policy Group
ICRAF	International Centre for Research in Agroforestry
IGAD	Intergovernmental Authority on Development
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IRIN	Integrated Regional Information Network
ITCZ	Inter-Tropical Convergence Zone
KC	Karamoja Cluster
LDC	Least Developed Countries
MODIS	Moderate Resolution Imaging Spectroradiometer

NAPA	National Adaptation Programmes of Action
NASA	National Aeronautics and Space Administration, of the USA
NBC	Nile Basin Commission
NBI	Nile Basin Initiative
NBSF	Nile Basin Sustainability Framework
NDVI	Normalized Difference Vegetation Index
NGO	Non-Governmental Organisation
NMSA	National Meteorological Services Agency, Ethiopia
NOAA	National Oceanic and Atmospheric Administration
NRC	United States Nutritional Research Commission
NRI	National Research Institute
OAU	Organisation for African Unity
OFDA	Office of Foreign Disaster Assistance, USA
PADEP	Plan for Accelerated Development and Eradication of Poverty
PCI	Pastoralist Communication Initiative
PENHA	Pastoral and Environmental Network in the Horn of Africa
PPG	Pastoralist Parliamentary Group
RCM	Regional Climate Model
RF	Rainfall
RFE	Meteosat Rainfall Estimates
SCAD	Social Conflict in Africa Database
SNNPR	Southern Nations, Nationalities and People's Region, Ethiopia
SPCM	Swedish Philadelphia Church Mission
TECCONILE	Technical Cooperation Commission for the Promotion and Development of the Nile
TRMM	Tropical Rainfall Measuring Mission
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nation's Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
UNISDR	United Nations International Strategy for Disaster Reduction
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
USA	United States of America
USAID	United States Agency for International Development
WB	World Bank
WDI	World Development Indicators
WFP	World Food Programme of the UN
WHO	World Health Organisation
WMO	World Meteorological Organisation

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Theme 4: Climate Change and Pastoral Conflicts

Introduction

Mulugeta Gebrehiwot Berhe and Jean-Bosco Butera

Climate change: the most challenging threat to pastoralists in the Horn of Africa

Globally, climate change is the biggest challenge of the twenty-first century. Rising temperatures, changes in seasonality and amount of rainfall, rising sea levels and the associated physical impacts of climate change threaten to adversely affect the wellbeing of human beings across the globe. Poverty, poor infrastructure and governance institutions, and too much reliance on primary sectors of production render Africa the most vulnerable continent.

Africa took a long time to recognize the importance and impact of climate change on its population. Vulnerability varies across the continent and depends on various physical and socio-economic factors. In general, politically and economically marginalized areas are more vulnerable. Pastoralist regions in the Horn of Africa have been affected by natural disasters like droughts, with dramatic consequences on populations, since the 1970s. Climate change is feared to increase the likelihood of extreme weather events (drought or floods) in this part of the continent.

This scenario depicts a grim future for the 15-20 million pastoralists of Djibouti, Eritrea, Ethiopia, Kenya, Somalia, South Sudan, Sudan and Uganda. The region contains the largest remaining concentration of pastoralists in the world, with their livelihoods predominantly dependent on livestock, rangeland and water. The very nature of their livelihoods makes pastoralists particularly vulnerable to natural disasters, especially drought. For example, the drought of 2011 has affected close to 12 million pastoralists, the most affected being those in Southern Somalia as a result of decades-old violence and breakdown of institutions. Even under normal circumstances, they often face extreme challenges in meeting their basic needs, due to significant reductions in pasture and water as a result of desertification, bush encroachment, soil erosion, population growth, and political and economic marginalization.

Pastoralism is also under pressure created by social changes and modern development, for example the decrease in available land for pasture due to the acquisition of land for other activities such as (commercial) farming. Tensions resulting from under-development and scarcity of resources like water and land are common. As a result, pastoral communities have been increasingly involved in violent clashes against each other on the one hand, and against the state on the other.

In recognition of the environmental impacts on the livelihoods of communities, states in the region established the Intergovernmental Authority on Drought and

Development (IGADD) in 1986, a milestone in Africa, which later developed into the Inter-Governmental Authority for Development (IGAD) broadening its objectives to wider political and economic cooperation among the states. The regional body established several programs to meet its objectives among which the Conflict Early Warning and Response Network (CEWARN), which monitors conflicts in the Horn of Africa (HoA) is one. From its inception, CEWARN focused on monitoring conflicts in the pastoralist communities with the main purpose of giving governments in the region a tool to prevent violent conflicts and to develop responses that will foster durable solutions.

IGAD's CEWARN and others have done several studies around the issue of pastoralism but there is a limitation in properly investigating how the communities in the affected areas have traditionally responded to the challenges of harsh climatic conditions and how these communities have coped (or not) with climate change and its social impacts, such as pastoral conflicts. It is this gap that the Institute for Peace and Security Studies (IPSS) of Addis Ababa University and the Africa Programme of the University for Peace (UPEACE) undertook to examine through the research project "Traditional knowledge and adaptation to adverse impacts of climate change among pastoralist in the Horn of Africa". This volume presents fifteen papers selected and edited after presentation at a conference organized as part of the research project.

This book is not only attempting to understand and document the problem, and analyze the interventions but also to understand the traditional coping mechanisms of pastoral communities and evaluate whether external interventions streamline those mechanisms. Environmental disasters are not new phenomena to this region, thus pastoralist communities are assumed to have developed coping mechanisms to survive such disasters which have allowed them survive across the generations. However, there isn't sufficient research and literature that addresses whether the National Adaptation Programmes of Action (NAPAs) of the member states and the activities of IGAD and various Non-Governmental Organizations (NGOs) streamline these traditional mechanisms into their interventions. It is important to understand the traditional coping mechanisms and see if they are incorporated into external interventions and identify the benefits and difficulties of doing so in addressing the threat posed by climate change.

Furthermore, there is a need to fill this knowledge gap by providing empirical evidence for some of the correlations that seem to be taken for granted by writers and academics. For example, a positive correlation between resource scarcity (pasture and/or water) and conflict is assumed, and provision of modern education to pastoralists is considered as a step in the right direction towards resolution of their problems, with little or no empirical evidence. There is a need to test these notions using case studies and provide supporting empirical evidence, if they prove to hold true.

Outline of the book

The desktop research and the associated international conference carried out by IPSS and UPEACE had four key objectives: 1) identifying the different aspects and manifestations of climate change in the HoA, particularly in the Karamoja Cluster; 2) investigating the use of traditional coping mechanisms as a way of adapting to the challenges of climate change; 3) investigating the extent to which traditional knowledge and coping mechanisms have so far been used by governments and other actors in devising adaptation and development strategies in the region; and 4) understanding the linkage between climate change and pastoral conflicts in the region.

This book includes 15 papers categorized under four chapters, each covering a more or less clear theme matching the aforementioned objectives. The first chapter consists of four papers covering paleoclimatic and linguistic evidence of climate change, its consequences in pastoralist areas and its use in vulnerability assessments for the HoA region. The second chapter, with three papers, attempts to cover the traditional coping mechanisms for climate change in the region. The third chapter includes three papers focusing on issues related to the nature of interventions by governments and climate change adaptation projects. The last chapter includes five papers that discuss the nexus between climate change and violent conflicts in the region, and local and regional conflict resolution approaches. The key messages in each of the papers are summarized hereunder.

1. Evidence for and vulnerability to climate change in the Horn of Africa

The first paper by Mohammed Umer and Agazi Negash is a historical review of pastoralism. The paper explains pastoralism as a way of life that uses extensive grazing in rangelands for livestock production, a key food production system in the world's drylands. It refers to archaeological and genetic evidence that indicate the early Holocene domestication of cattle in North Africa and elaborates, using paleoclimatic data, that continued dryness completed the desiccation of the Sahara around 5000 years ago, rendering it a desert, which seems to have obliged pastoral communities to move towards the Horn of Africa region, among others. Since then, low amplitude climate fluctuations along with the internal dynamics of the savannah as well as human interference have affected the equilibrium between bush and pasture. Climate variability on annual and inter-annual scales is documented which has been producing droughts and famines in the region, and sometimes correlates with the El Nino/Southern Oscillation (ENSO) phenomenon. These have been endangering the lives of humans and livestock.

The second paper, by Sagal Joshua Mark and J.T. Grade, discusses linguistic evidence for climate change in Karamoja, Uganda. This can be seen as an alternative approach to examining historical climate change in an area where long-term climate data is unavailable. It outlines the names and meanings given to the months for 11 different Karamojoŋ people groups. Its findings show that three of

the ethnic groups simply number the months, an indication of loss of traditional knowledge. The remaining eight groups name the months according to environment or weather dependent activities, many names being held in common. It suggests that such work may be used as a tool not only to keep the language alive but also to examine historical climate change.

The paper written by Joshua W. Busby, Todd G. Smith, and Kaiba L. White follows the definition of vulnerability developed by the Intergovernmental Panel on Climate Change (IPCC) and the United Nations International Strategy for Disaster Reduction (UNISDR), and assumes it to include exposure to physical hazards as well as socio-economic and political factors that magnify the effects of these hazards. The study considered four baskets of equal weight in assessing vulnerability: physical exposure (droughts, rainfall variability, floods, cyclone winds, wild fires, coastal inundation etc); population; community/household vulnerability (measured by health status, education, access to food, water and healthcare); governance and political violence (as measured by voice and accountability, government effectiveness, global integration, political stability and presence of violent events). The composite vulnerability map depicts much of Somalia (especially Southern Somalia), the Somali region, the South Omo Zone and western Ethiopia, and much of South Sudan in the highest vulnerability quintile. Changing the weighing scheme didn't bring much change in the distribution of the most vulnerable quintiles. A further finding was that models do not seem to agree on their predictions of the future climate of the HoA. Comparison of the distribution of aid and adaptation funding with the vulnerability maps shows that aid money is not reaching the most vulnerable parts of the region.

The fourth paper by Russell F. Schimmer, Roland A. Geerken, and Yancey A. Orr, discuses how the unintended consequences of some pastoralist cultural responses to climate variations (such as re-stocking) could contribute to drought conditions through a case study of Northern Kenya. The paper analyzed climate records over ten-, twenty-, and sixty-year spans to understand the relationship between precipitation, environmental stress and cultural responses in the region. Remarkably, years of below-average rainfall do not correlate highly as catalysts to recorded drought events. Even more surprisingly, in some cases vegetation vigour was found to be negatively correlated to precipitation increases, an indication that resource management is a key factor to maintaining environmental integrity. It argues that traditional resource management practices, as cultural responses to multi-year climate cycles, can contribute to the frequency and severity of drought events. It concludes that the most important responses that set the conditions for drought occurrences likely take place during average rainfall periods and above-average rainfall years when pastoralists restock their herds.

2. Coping with the adverse impacts of climate change through traditional means

The first paper by Asnake Kefale and Fana Gebresenbet examines the traditional coping mechanisms used by the Dassanech and Nyangatom pastoral groups from

the Ethiopian sector of the Karamoja Cluster. The paper enumerates the traditional community coping mechanisms as herd diversification, herd splitting, income diversification, restocking, local alliances and others. The paper contends that interventions by governmental and non-governmental development agencies by and large overlook the capacity of traditional methods of adaptation to climate change. It cites the Ethiopian government's key strategy of 'settlement' as an example, and questions whether settlement could bring pastoral communities a "stable and secure" way of life, and also doubts whether the introduction of large-scale commercial farming would bring pastoral communities more challenges than opportunities.

The following paper by J.T. Grade, under the title 'Karamoja (Uganda) pastoralists wild plants use as hunger and famine foods' discusses the particular coping mechanisms of the Ugandan Karamojon towards climate change. It is based on a survey of un-domesticated wild edible plants that have been, and currently are, used in Karamoja as a coping mechanism towards hunger and famine. A total of 132 'hunger foods' are identified, the majority being plants (126) whilst six are animal/insect protein based. The most common plant form used in Karamoja for hunger or famine foods are trees (51) and herbs (47). The most common plant parts used are fruits (45) and tubers/roots (31). Most (84.5%) of the hunger foods listed require some preparation, and 60.7% require a significant amount of time. Four food categories were defined: famine, hunger, normal and special. Of the 132 foods identified, 63 are hunger foods, 35 are normal wild foods, 29 are famine foods and 5 count as special and preserved foods. The paper underscores the value of such information culturally and for development, and emphasizes the need to consider the domestication of under-utilized wild edible plants.

The next paper, by Fredrick Kisekka-Ntale, discusses how indigenous people living in the Kakamega forest, Western Kenya, have responded to mounting pressure from pastoral migrants. It analyses the local forest resource management institutions and the adaptive socio-cultural methods employed by the indigenous Luhya people in the face of pastoral migrations and changing climate. The paper discusses the following questions: how do the Luhya people perceive migrant pastoralists? How are the newcomers incorporated in relation to forest resource usage? Are they assimilated? Through an ethnographic study the paper attempts to illuminate the local adaptive mechanisms adopted by the Luhya to manage local forest resources amidst mounting migration by the Pokot and changing climate.

3. Government intervention and adaptation to climate change in the Horn of Africa

This chapter consists of three papers. The first paper, by Martha Wagar, outlines some of the unintended consequences of the rise in formal education in Karamoja. Some of these negative experiences are: reduction in communities' capacity to cope with environmental change due the loss of traditional knowledge; young people's isolation from elders; disruption of traditional models of status and

subsequent loss of respect for and connection with traditional wisdom. In its worst form, it results in widespread disruption of traditional governance systems. The paper argues that the increasing numbers of school-leavers that return home to find no job prospects resort to plundering the fragile environment (for example, by selling firewood and charcoal) and contribute to the further degradation of the environment. The paper attempts to see if any mechanisms exist to modify the formal education system and other education programmes like Alternative Basic Education for Karamoja (ABEK), in order to facilitate transmission of the traditional knowledge which is critical at this time for the Karamojong people to cope with climate change and address other socio-economic factors contributing to the escalation in environmental degradation.

The second paper, by Yohannes Aberra, highlights the importance of examining the National Adaptation Programs of Action (NAPA) of the states in the HoA and how they address pastoralist vulnerabilities in their policy framework. Furthermore, it tries to review policies related to pastoralism and explore the preparation processes of the NAPA for four HoA countries (Eritrea, Ethiopia, Sudan, and Uganda), and evaluates their friendliness to pastoralism in a comparative manner. In spite of some largely superficial differences in policy attitudes amongst the four states there seems to be consensus about the fate of pastoralism: its gradual disappearance. The NAPA documents also have differences in their methodologies and how they have addressed stakeholders and vulnerabilities, but their unmistakable vagueness in the phrasing of the priority projects vis-à-vis pastoralism reveals the prevailing dilemma about what should be done with this particular system of livestock production.

The paper by Tesfaye Tafesse examines the history and importance of cooperation by the riparian states of the Nile Basin. Regional organisations play an indispensable role for the sharing of climate data and experience related to water infrastructure development. He further argues that pastoralists in the Horn will benefit from such cooperation, as most member states of the Basin have a sizable pastoral population. He concludes that a similar regional cooperative arrangement should be initiated, in order to effectively enable pastoral communities to cope with the impact of climate change.

4. Climate change and pastoral conflicts

The first paper by Todd G. Smith starts by reviewing the environmental security literature from the last two decades which examines the relationship between rainfall variation and conflict, and concluding that there is, as yet, no consensus about the nature of the relationship or the causal pathways involved. It points out that case-based studies have presented several potential mechanisms but lack generalizability, while empirical studies have focused almost exclusively on international or civil war onset as the dependent variable, to the exclusion of other types of conflict. Using the Social Conflict in Africa Dataset (SCAD), the paper contends that both too much and too little rain leads to conflict through distinctly

different causal mechanisms. Contrary to widely-held belief, below-average rainfall is found to have no effect on the likelihood of social conflict on a continental scale, but significantly reduced conflict risk in the IGAD region.

The second paper, written by Wario R. Adano under the title 'Pastoralist resources, conflict and climate change in East Africa', attempts to examine long-term trends in pastoral conflict in the dry lands of northern Kenya. It uses rainfall and conflict data from the Marsabit and Turkana districts. The data shows no evidence of increasing violent conflict incidents in the long-term perspective. Moreover, long-term rainfall and violent conflict data consistently indicate more violent casualties in wet years than in dry years, and wide deviations in inter-seasonal and inter-annual variability in rainfall. Thus, the author claims that the scarcity-causes-conflict argument in the dry lands lacks empirical support. Instead, it maintains that it is the recent subdivision of communal grazing areas into ethnic territory through the creation of more administrative boundaries that severely limits pastoral mobility, hinders efficient use of resources, constrains the pastoral production system and alters traditional mechanisms for negotiating access to rangeland resources. Ethnicization of administrative boundaries has produced a new reality: eruption of conflicts over territory and further marginalization of pastoral groups and increased poverty. In its conclusion, the paper asserts that adverse impacts of climate change and increased climate variability in the dry lands call for better local knowledge of fluidity in property rights and access to pastoralist resources, adaptations tailored to climate change and cooperation over available resources.

The paper by Paul Omondi highlights the role of Darfur's rapidly deteriorating natural environment in the generation of conflict. It takes the view that an important impact of these environmental stresses was scarcity, which had significant implications on the security of the area, and interrogates the relationship between environmental scarcity and human security taking two types of evidence. The first relates to supply-induced scarcity, i.e. the declining trend and volatility of the rains from the mid-1970s through to the 1980s. The second relates to demand-induced scarcity, i.e. the marked increase in population density since the mid-1970s that has put pressure on both farming and pastoral livelihood systems. In view of that, the ensuing ecological deterioration, which affected the northern part of Darfur most, forced the nomadic inhabitants of the north to gradually move into the southern parts in search of water and pasture. It finally argues that environmental pressures, cemented by ethnic differences in livelihood strategies, provided fertile ground for the civil war to emerge.

Gebre Yntiso's paper explores the conflictual relationship between two Atekers: the Nyangatom of Ethiopia and the Turkana of Kenya. The paper conceptualizes inter-ethnic pastoral conflictas as a confrontation that prevails between groups of people who have, or perceive themselves as to have, competing interests in resources (in this case, pasture and water points), power, opportunities etc. The paper suggests that violence could be averted by addressing the root causes of

conflict and by preventing the triggering factors, both of which require the creation of conditions for the opponents to feel safe, united and benefiting from a mutual connection. It further recommends that interventions should attempt to identify commonalities between the conflicting parties in order to use them as connectors or peace capacitors and suggests considering joint border area projects targeted to promote cultural and socio-economic integration as ways of addressing the conflicts.

The last paper, by Yonas Ashine, starts by discussing the severity of environmental problems and their impacts in the HoA, particularly in the pastoralist areas. It claims that this problem is complicated by the division of pastoralists and their grasslands by the political boundaries of states and indicates that the trans-boundary nature of the problem calls for new regionalism. It further points out that this trend has attracted the attention of states and urged them to collaborate since the late 1980s, the time when the Intergovernmental Authority for Drought and Development (IGADD, which later became IGAD) was created. The paper has two separate but interrelated objectives, examining not only the presence but also the viability of new regionalism in the HoA, and exploring the evolution and the effectiveness of IGAD/CEWARN in addressing pastoralist conflict in the region. In its findings the paper claims that the application of regionalism as an approach to address conflicts is growing. However, weak state-civil society relations, donor fatigue and the reluctance of member states to contribute membership fees are identified as factors contributing to the ineffectiveness of the new regionalist approach in addressing conflicts in the region.

Findings from the various papers can be grouped into four broad categories:

1) Manifestations of climate changes go far back in the history of the continent
2) Pastoralist populations have established knowledge and mechanisms for adapting to climate change
3) Government interventions are often not in harmony with the needs and interests of pastoralist populations
4) A direct causal relationship between climate change and conflict is yet to be established firmly and conflicts in pastoral areas are complex.

Theme 1

Evidence for and Vulnerability to Climate Change in the Horn of Africa

Historical Review of Pastoralism and Climate Change in the Horn of Africa, With Special Emphasis on Ethiopia

Mohammed Umer and Agazi Negash

Abstract

Pastoralism, the use of extensive grazing in rangelands for livestock production, is one of the key food production systems in the world's drylands. Seventy percent of Africa's surface is covered by desert, open grassland, or shrub land, i.e. arid or semi-arid landscapes. Ever since the Eocene, the environmental history of Africa has been characterised by the expansion of open habitats and arid-adapted vegetation, and the evolution of fauna well adapted to coping with open and arid conditions. Archaeological and genetic evidence indicate the early Holocene domestication of cattle in North Africa. Starting at around 5,000 years ago, climate became drier and led to a complete desiccation of the Sahara, rendering it a desert. This situation seems to have pushed pastoral communities to move towards the Horn and East African regions. In this region closed woodlands started to transform into open savannah, fed by water from the surrounding highlands. Since then low amplitude climate fluctuations, with the internal dynamics of the savannah, as well as human interference have affected the bush-pasture equilibrium. Climate variability, on annual and inter-annual scales, has been documented as producing drought and famine in the region and sometimes these events correlated with the ENSO phenomenon. These have endangered the lives of humans and livestock.

1. Introduction

Over the last several decades much research has been conducted on reconstructing millennial scale climate changes in Africa. The results from tropical Africa, mainly based on lake sediment records, have shown synchronous evidence over wide spatial coverage. Because the Horn of Africa fits within the same context, it is possible to link the climate history of the region with the area supposed to be the origin of pastoralism, i.e. the Sahara. In this paper, the evidence from climate archives is compared with archaeological evidence, in order to make linkages between pastoral activities and climate change in the north eastern African region. It tries to bring together information regarding the timing for the establishment of aridity in Africa, the climatic context in which pastoralism developed in Africa, and the context in which pastoralism was established in the Horn of Africa region.

It is to be noted, however, that there are limitations to this research. The limitations originate from the fact that climate data sets and the archaeological information utilised may not have the same spatial and/or temporal coverage; age controls may

not be congruent; and for smaller time scales (century/decadal scales) archaeological data may not be available.

1.1 Roots of the spread of aridity

Pastoralism, the use of extensive grazing in rangelands for livestock production, is one of the key production systems in the world's dry lands (Blench, 2001). Bobe (2006) states that 70% of Africa's surface is covered by desert, open grassland, or shrubland, i.e. arid or semi-arid landscapes. Bobe (2006) also suggests that the roots to aridity can be traced back to the Eocene time (for the actual ages of geological time-terms refer to Table 1). Although Africa supports an astonishing diversity of environments, ranging from tropical rainforests to deserts, the continent as a whole has a relatively arid landmass. In eastern Africa the proportion of arid and semi-arid environments is close to 83% (Foley et al., 2005).

There is much evidence to indicate that in the past Africa was a wetter continent than it is today, and that it was covered by extensive woodlands and forests (van Zinderen Bakker & Mercer, 1986). This, on broad temporal and spatial scales, resulted from the extinction of large herbivores at the end of the Mesozoic period (65 million years ago, Ma here after) and the warming of the earth in the early Cenozoic, which provided suitable conditions for the expansion of woody vegetation and closed environments (Wing & Sues, 1992). The warm temperatures of the Paleocene and Eocene were associated with high precipitation, while the disappearance of large Mesozoic herbivores temporarily eliminated a suite of animals that could open up forests by knocking down trees and consuming fresh growth (Wing & Sues, 1992).

Table 1: Actual ages of geological time-terms

Era	Epoch	Period	Age (in million years)
Cenozoic	Quaternary	Holocene	0.1
		Pleistocene	1.6
	Teritiary	Pliocene	5.3
		Miocene	23.7
		Oligocene	36.6
		Eocene	55
		Paleocene	65

Declining global temperatures and lower precipitation in many parts of the planet prompted the expansion of more open habitats. Ever since the Eocene, the environmental history of Africa has involved the expansion of open habitats and arid-adapted vegetation, and the evolution of fauna well adapted to coping with open and arid conditions. These environmental changes were characterised by multiple fluctuations, and a complex interplay of climatic, tectonic, and biotic factors (Potts & Behrensmeyer, 1992).

1.2 History of climate change over the past 20,000 years

This part will present climate changes in Ethiopia during the last 20,000 years, which encompasses the transition from hunter-gatherer to domestication and agricultural activities.

It is now well known that quaternary climate oscillations (or fluctuations of the climate during the last 2 million years) had a dramatic impact on regional environments at a global scale. Tropical Africa has experienced hyper arid and wet phases, and the very high summits also went through glacial and de-glacial conditions. Large fluctuations in precipitation, and thus water resources, have driven biological and human activities (Chalie & Gasse, 2002). This could also have impacted on the rise and fall of civilizations.

The most hyper arid and cold conditions in Africa occurred between 20,000-10,000 Before Present (BP); in its intermediate years (10,000-5,000 BP) there was a very wet climate, and during the latter portion (after 5,000 BP) it was relatively dry, although abrupt climate shifts and low amplitude fluctuations were superimposed on these broad patterns. Human adaptation, during the hyper arid phases, might have forced migration to suitable habitats (refugium). The community may have dispersed again during the humid phase of the early Holocene, when records of very high lake levels were seen (e.g., Umer et al., 2004).

1.2.1 Conditions during the hyper arid and cold phase (20,000-10,000 BP)

A sedimentary core segment, recovered from the central part of Lake Tana, source of the Blue Nile, at 24m below the modern lake surface, has indicated a complete drying of the lake 17,000 years ago. Clay overlain by a papyrus swamp peat, as well as diatom flora extracted from these sediments, evidence this event. Over 500 years, the lake waters gradually rose to over flow the papyrus, before abruptly spilling into the Blue Nile gorge, some 14,700 years ago. The timing of these events is similar to the drying and refill and overflow of the White Nile's headwater lakes, 1,500km to the south. It seems that the entire Nile system was reduced to an ephemeral stream, before the monsoon rains returned and the overflowing lakes filled the Nile once again (Lamb et al, 2007a).

A palaeosol, with *in situ* grass remains and dated to between about 17,000-16,000 years ago, indicated the drying of lake Abhé —as well as several lakes in the Afar Rift portion of the Ethiopian Rift System. Similarly, very low levels were recorded for the Ziway-Shalla basin lakes, before the lakes started rising dramatically about 12,000 years ago (Gasse, 1977; Umer et al., 2004).

The above evidence shows that the whole north, eastern, western and central regions of Ethiopia were hyper arid between about 20,000 to 15,000 years ago. One can therefore hypothesise that the most suitable habitat at this time, where plant, animal and human population existed, was the south western Ethiopian highland regions, a region which still receives the highest rainfall in Ethiopia.

1.2.2 The rising of lakes and the Early Holocene Climate Optimum (15,000-5,000 BP)

Stepped fluctuations led to the slow rise of lake levels until dramatic high stands were observed about 11,000 to 10,000 years ago. After this time the lakes of the Ziway-Shalla basin merged to form a single lake that reached an outlet level and overflowed northward into the Awash River (see Figures 1a and b). During these intervals, Lake Abhé in the Afar depression, received water from both the modern drainage area of the Awash River and the Ziway-Shalla overflow. Also during this period Abhé was a large, closed, freshwater lake, and 160m deep (Gasse, 1977).

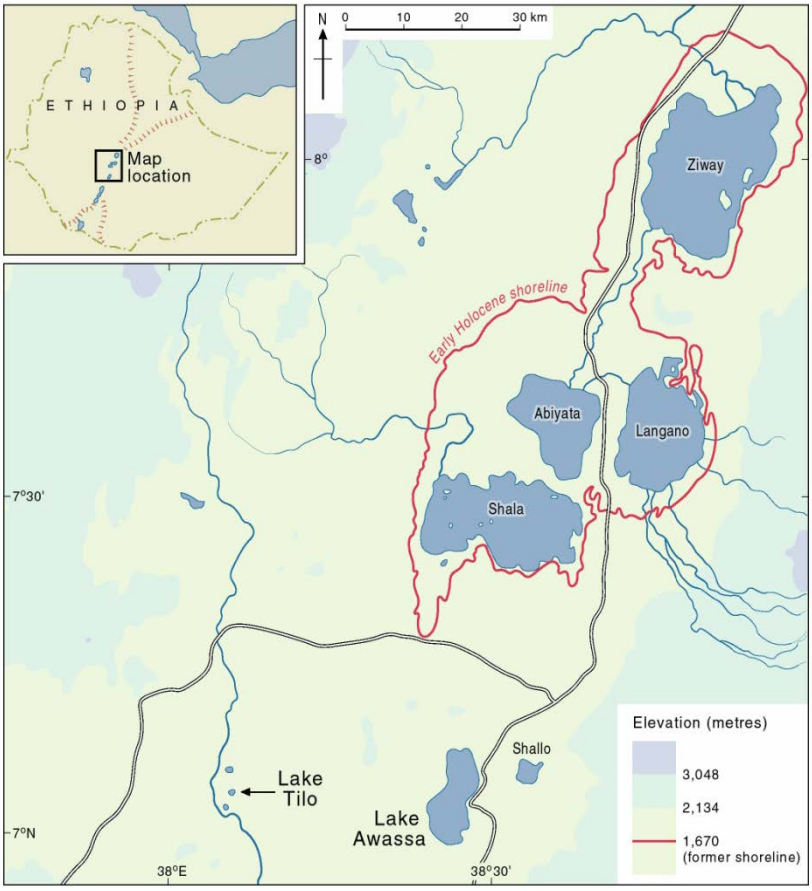

Fig. 1a: Early Holocene +120m high lake levels at which the Ziway-Shalla lakes were united as one Mega Lake (Gillespie et al., 1983).

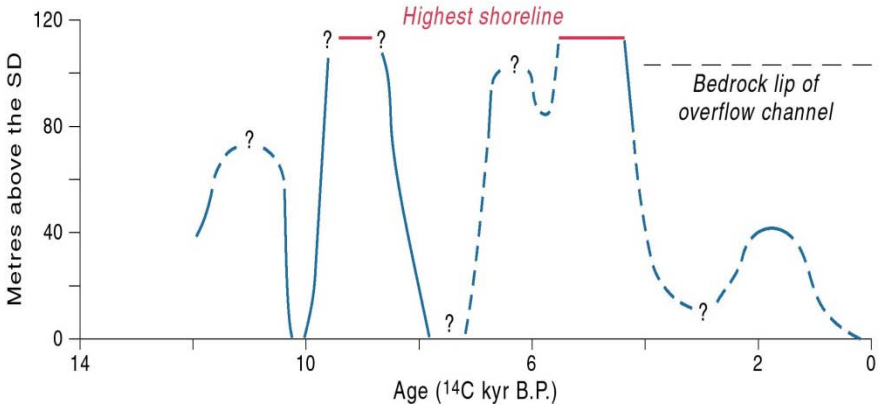

Fig.1b: Early Holocene high shore lines (+120m), which receded once after 5,000 years ago (Gillespie et al., 1983). SD=specified datum; kyr=thousand years

Moreover, lakes and extensive ground water reserves were established in the present day deserts of the Sahel and Sahara. About 9,500 years ago nearly all lakes between latitudes 0 to 22^{o} N were high as were the lakes of the Sahara desert and the Sahel (Gasse, 2000). The groundwater that we see today in these deserts is, therefore, fossil in nature and as old as this interval of Africa's humid phase.

The humid conditions led to the re-establishment of vegetation belts, which were depressed during the previous dry and cold climate. The vegetation belt or line rose to high altitudes along with the melting of ice on the high summits of the Bale, Arsi and Semien mountains, as a response to warming. The vegetation history of the Bale Mountains, as recorded by pollen data for the past 17,000 years, clearly evidences this situation (Umer et al., 2007).

This event has allowed humans, plants and animals to disperse to then extensive suitable habitats—including the Sahel-Sahara region, coinciding with the domestication of animals in the region.

1.2.3 Establishment of arid and semi-arid climates, seasonal rainfall and agriculture on the Ethiopian Highlands (5,000 BP)

Regional aridity 5,000 years ago made lake levels gradually drop to their present levels, with phases of moderate rises and falls. This prolonged aridity was felt across the regions of Tropical Africa (Gasse, 2000). The Sahara was transformed into a desert and the Sahel into a semi-arid region. Vegetation responded to moisture deficit in lowland areas across eastern Africa. Dry upland forest with *Podocarpus* and *Juniperus* expanded in the same region, on the highlands, in response to low moisture and, perhaps, accentuated seasonality (Umer et al., 2007). During this period the Savannah grassland became more extensive, with species which could tolerate arid conditions (Lamb et al. cited in Sagri, 1998).

1.2.4 The last 2,000 years - climate change and human impact

Marshall et al. (2009) provide independent evidence, based on diatom and stable isotope records of Lake Ashenge, of increased wetness in northern Ethiopia between 2.2 and 1.5 cal kyr BP, when the Aksumite Empire rose to power in the northern Ethiopian highlands. Machado et al. (1998) also found evidence for a wetter period during this time, from in-filled valley deposits in the northern Ethiopian highlands. These data, therefore, support Butzer's (1981) hypothesis that an extension of the growing season (probably with a change to a strongly bi-modal rainfall) allowed enhanced agricultural output, necessary to support the significant increase in population. However, it appears that the change to a wetter climatic regime occurred at least 200 years prior to Aksum's rise to prominence, during the so-called 'pre-Aksumite' phase, when some of the first evidence for complex societies on the plateau of northern Ethiopia is found. Although any climatic shift did not trigger an immediate rise of the Aksumite empire, it provided the suitable conditions, which the local population increasingly utilised (Marshall et al., 2009).

There is evidence, from the Lake Ashenge diatom and stable isotope records, that soon after 1.5 cal kyr BP (500 AD) there was a rapid increase in aridity. This supports Butzer's (1981) another conjecture that there was a shift back to a drier climate (to uni-modal rainfall) in the northern Ethiopian highlands, which reduced the growing season and was, perhaps, a significant factor in the decline of the Aksum. However, the Ashenge data indicate that the arid shift occurred some 250 years prior to that suggested by Butzer (1981), when Aksum was at the height of its power. This, therefore, indicates that there was no abrupt population collapse, but more likely a gradual move away from a region that could no longer provide the resource base required to support such a large population. Higher resolution reconstructions constrained by more robust age-depth models are required to confirm these proposed short-lived climate shifts (Marshall et al, 2009).

Lake Ashenge also yielded pollen data useful for reconstructing vegetation history. Abrupt *Podocarpus* decline and enhanced soil erosion occurred ~1,500 BP **(**500 AD), coincident with intensive land use following the shift towards dry conditions.

In Wollo the records from the sediments of Lakes Hayke and Hardibo indicate that deforestation started at 500 BC and secondary vegetation persisted for 1,800 years (Darbyshire et al., 2003). This was superimposed by drought, from 1,200-1,400 AD. *Juniperus* forest with *Olea* and *Celtis* then expanded from 1,400-1,700 AD, perhaps due to drought induced depopulation, that was followed by increased rainfall (Darbyshire et al., 2003; Lamb et al, 2007b).

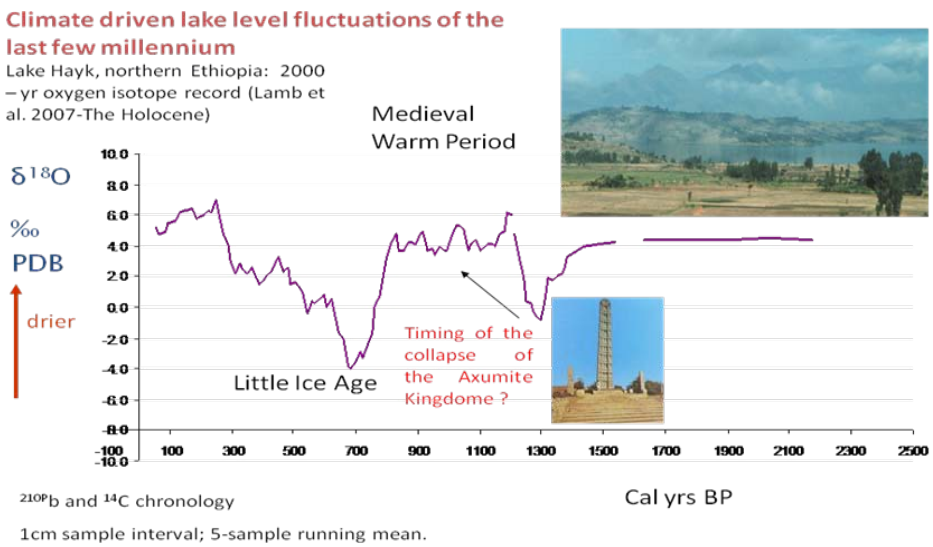

Fig. 2: Climate driven level fluctuations for Lake Hayk, Northern Ethiopia (Lamb et al, 2007b).

2. History of climate and pastoralism in the Horn of Africa

New archaeological and genetic data support the early Holocene domestication of cattle in the marginal areas of North Africa, and the patchy spread across the Sahara to the south as climatic conditions deteriorated, mainly around 5-4 thousand years BP (Marshall & Hildebrand, 2002). Plant domestication came rather late in Africa (after 4,000 BP), perhaps because of the high mobility of the herders and risk associated with cultivation in arid environments (Marshall & Hildebrand, 2002). This trend is assumed to be unlike other parts of the world, where domestication was the result of settled hunter gatherers in well watered places with abundant resources, rather than in marginal areas.

Based on genetic and archaeological evidence, there seems to be general agreement among investigators that pastoralism in North Africa was fully developed by 7,000 BP. Many sites in eastern and central Sahara (e.g., Wadi Bahkt, Enneri and Gabong) were, by this time, occupied by cattle and caprine pastoralists, who also utilised wild plants (Close & Wendorf, 1992). At some sites (e.g., Nabta Playa) there was intensified utilisation of wild plant resources for a long time. By 8,000 BP the sorghum recovered from Nabta Playa had already started to show some characteristics of cultivated (but not of domesticated) varieties (Wendorf et al., 1992). By 6,000 BP pastoral sites had become common in the Sahara; on many of them pottery and grinding stones have been found (Close & Wendorf, 1992).

Heavy reliance on small stock, at the expense of cattle, and more importantly the move south of the Sahara to wetter areas, appears to have been the response to deteriorating climatic conditions. At Adrar Bous, Arlit and other sites (in the Sahara), cattle were present by the 6th to the 4th millennium BP, while in the east, in

the Sudan, evidence of cattle from as early as 6,500 BP has been found. The Sahara had become dry by the 4th millennium BP, and was almost deserted by the 3rd millennium BP (Close & Wendorf, 1992; Wendorf et al., 1992).

Clark (1954, 1988) and others suggest that the mid-Holocene aridity of the Sahara forced pastoralists to migrate into the Horn of Africa in search of pasture. Unfortunately, there are only a few sites that have yielded evidence of pastoral (animal) remains in Ethiopia and the Horn.

Excavations at Lalibela and the Natchebiet caves near Lake Tana (Dombrowski, 1970; Dombrowski, 1971) have yielded the charred remains of barley, legumes and chickpeas, associated with ovicaprids and possibly domesticated cattle, pottery, grinding stones, and a microlithic industry dating to no earlier than 2,500 BP. However, the crops are of the "Near Eastern Complex" and therefore only provide minimal age estimates for the use of these domesticates in Ethiopia.

Other evidence for early food production in northern Ethiopia in the form of livestock, include cattle and possibly donkey bones—identified from deposits excavated in the 1940's at the Quiha rock shelter near Mekele (Barnett 1999 a, b; Clark 1954, p. 324; Clark, 1988). These bones were found associated with ceramic bearing Late Stone Age/Neolithic assemblages, and were composed of obsidian microliths, small scrapers, blades and blade cores. While Clark (1988) suggests that this lithic assemblage, particularly the "blades with marginal retouch [are] not unlike those of the East African [Kenya, Tanzania] Elementeita[1]-Industry", Fattovich (1977) refers to them as "traces of Elementeita-like industry". On the other hand, Bower (1988, 1991) sees connections between the pottery from Quiha and those of Narosura Ware (one of the several pastoral Neolithic ceramic types of East Africa) and suggests southward, pastoral movement from this part of northern Ethiopia to East Africa. However, more data is needed before confirming these propositions. Clark (1988) further states that there is very little doubt about the similarity between the Quiha pottery, those of Agordat (Arkell, 1954), and those of the Atbai tradition of Eastern Sudan (Fattovich et al., 1984). However, although Clark (1988) postulates a 4,000-3,000 BP date for the ceramic bearing obsidian artifacts, obsidian hydration dates put them considerably later.

At the site of Danei Kawlos, also in northern Ethiopia some 70 km (as the crow flies) northwest of Quiha, a direct date of Bos lower third premolar from layer 5 of the site, yielded an age of 3,358 +/- 47 BP. At this level there was also charcoal dated to 3,380 +/- 160 BP and provides one of the first securely dated contexts for the presence of domestic livestock in the Horn of Africa. The fauna were associated with decorated ceramics and a microlithic dominated industry. However, on this site, and at the lower levels of the nearby site of Ba'ati Ataro, the inhabitants also relied heavily on small wild animals, particularly dik-diks,

[1] An archaeological culture named after the type site of Elementaita in Kenya.

indicating dependence on water resistant animals and, thereby, demonstrating the arid conditions of the time (Negash, 2001). This is consistent with the paleoclimatic reconstructions of the period.

Similar evidence is to be found in Gobedra, near Aksum in northern Ethiopia, which has yielded probable domestic cattle remains. These were associated with pottery and stone artifacts dating to 856 BC, while the lower stratum of the site that yielded a camel tooth has been brachiated to between 7,000-3,000 BP (Phillipson, 1977). At Lake Beseka, near Metehara in central Ethiopia, cattle occurred around 3,500 BP in the Late Holocene Phase of the Beseka Industry period (Brandt, 1982). The domestic cattle were associated with a lithic assemblage largely composed of end and convex scrapers, made of obsidian, together with pottery, grinding stones, and a possible stone bowl fragment. At Laga Oda, a rock shelter close to Dire Dawa, remains of camel and cattle associated with microliths have been recovered in the more recent levels of the site. Clark and Prince (1978) suggest a mid-second millennium BC for the levels that yielded these fauna.

Other evidence for livestock presence in Ethiopia and the Horn at the beginning of the mid-Holocene period comes in the form of rock art. In the Horn, rock art is found in the form of paintings and engravings. Although some rock art sites display some wild animals the overwhelming majority show domestic animals. The focus on domestic animals has compelled scholars to describe the rock art of Ethiopia and the Horn as pastoral (Negash, 1997a). Of the domestic animals displayed cattle are the most represented. Sometimes the art shows humans plowing or milking cattle. Although the exact number is still unknown, such rock arts are found in the Harar-Dire Dawa area in eastern Ethiopia, in the Temben-Agame area in northern Ethiopia, and in the Welaita Sodo area in southern Ethiopia (Anfray, 1967; Graziosi, 1964: Joussaume, 1981; Negash, 1997b). Therefore, these rock art finds suggest the presence of a food producing economy (pastoralism and/or agro-pastoralism) in the Horn in prehistoric times.

The rock art of the Horn is divided into two main stages (Cervicek, 1979). The first stage, the Surre-Hanakiya stage, contains a naturalistic painting of humpless cattle, and is tentatively dated to between 5,000-3,000 years ago. The second stage, the Dahthami stage, is divided into early and later art forms. It is suggested that the earliest form of the second stage coincides with the return of the ameliorating humid conditions that occurred during the late Holocene (around 2,000 years ago), while the later form, dated to around the 4th century AD, contains depictions of humped cattle, and reflects the arid conditions of the time (Brandt & Carder, 1987).

Current opinion favours that domestic animals were imported into East Africa (Kenya and Tanzania) from areas to the north (Ambrose, 1984; Bower 1988, 1991; Marshal, 1994). This is largely because excavations at the few but geographically well distributed sites, that date to the late Pleistocene and early Holocene (e.g., Lake Turkana basin, Lake Nakuru basin), have not yielded wild progenitors of

domestic stock; neither did the pre-Neolithic faunal assemblages from the Sudan. Therefore, the most likely place from which domestic stock could have been introduced into East Africa is the eastern Sahara, migrating through either southern Sudan or southern Ethiopia. This does not create any chronological disagreement as the earliest agreed date for the origins of pastoralism in East Africa is ca 4,000 BP. Unfortunately, only a few sites from this time have been excavated in East Africa and, as a result, the extent to which pastoralism was adopted in East Africa between 5,000-4,000 BP is poorly understood.

Bower (1991) states that domestic fauna in East Africa was extremely rare before 3,000 BP, and he has looked for other supporting evidence. He cites a single rock shelter in Kenya that contains depictions of humpless domestic cattle and notes their resemblance to pictures of animals found in eastern Ethiopia—that are tentatively dated to 5,000-3,000 BP. However, there is an abundance of domestic cattle in the assemblages dated to and after 3,000 BP. On a morphological and metrical basis (Marshal, 1994) an argument has been made for the presence of zebu cattle in East Africa by 2,000 BP; while a single horn core belonging to the short horn breed (Gifford, 1998) was found at Narosura, a site that has been dated to 2,360 ± 110 to 2,760 ± 115 BP. Although not in large quantities, there are some livestock remains at the site of the Enkapune Ya Muto rock shelter, in the Central Rift of Kenya, predominantly associated with hunting-gathering occupation levels and dated to around 4,000 BP (Marean, 1992).

Other early but securely dated (4,000 BP) faunal remains come from Dongodien in northern Kenya, along the eastern shores of Lake Turakna. The site contains microliths and pottery. Based on recovered domestic cattle and caprines, as well as fish and other small wild animals at this site, Marshall (1994) suggests that the site represents populations who kept herds but who also practiced hunting and fishing. No plant remains were recovered from this site.

In conclusion, the preceding discussion clearly indicates that pastoralism was introduced from the Sahara, as there is no indication of wild ancestors of animal domesticates in the Horn of Africa or East Africa. The pastoral movement from the Sahara occurred as a result of its complete desiccation after 5,000 BP. At this time a semi-arid climate was established in the East African lowlands, supplying pasture and well watered areas that were also fed by streams from the surrounding highlands, where pastoralists might have taken refuge.

3. Savanna ecosystem over the last 5,000 Years: Case study from the main Ethiopian Rift Valley

Pollen and charred epidermal fragments from a small crater lake, Tilo, in the Main Ethiopian Rift Valley indicate a transition from woody savanna to drier grassland occurred at 5,000 BP (Lamb, 2001). This transition marked the change from *Hyparrhenia* species dominance to more diverse grassland, with *Themeda* and

Heteropogon species. This transition could also mark the expansion of grazing and pastoral systems. By 2,000 BP *Chloris* and *Aristida* species had become more abundant, perhaps indicating increased anthropogenic grazing intensity. Indicators of cultivation, such as maize and ruderal plants, which appeared very late (about 100 years ago), perhaps show a transition from pastoralism to agriculture.

4. History of bush encroachment over the last 2,000 years: case study from Dawcha Ridge

One major impact of climate, and also humans, on savannah over century scale variability is related to the issue of bush encroachment. Bush encroachment is a significant phenomenon in savanna environments, as it affects wildlife and local livelihoods by preventing new pasture generation. In Ethiopia this has been studied from pollen records in hyrax middens from the Dara range in the Mago National Park, south western Ethiopia (Gil-Romera et al., 2010). Their investigation centred on whether bush encroachment is a new phenomenon in this region, prompted by recent overgrazing and uncontrolled burning, or whether it conforms to a normal succession phase in a non-equilibrium context, in accordance with a state-and-transition savanna model, as suggested by Meyer et al. (2007). The findings for the last 2,000 years show that the vegetation of the region remained open savannah while bush encroachment, based on abundance of encroaching taxa, such as *Grewia* and *Capparaceae* species, took place at c.a. BC 150, and AD 180, 450, 1050, 1280 and 1750.

Gil-Romera et al. (2010) also examined whether the savannah dynamics observed in the Dewachaga record are linked to well-described regional palaeoclimatic events or human induced processes, or both. They tried to compare the bush encroachment index Detrended Correspondence Analysis ((DCA), axis 1 on Figure 3) at Dewachaga with other records, such as the East African lake levels—within limitations such as the shortage of regional palaeo-environmental records, the fact that the sites are relatively far from the study area, and that there could be chronological uncertainties (although comparison is only done with calibrated calendar years (BC/AD)). Interestingly, however, they found that long-term, non-encroaching phases, namely those in which DCA axis scores remained constantly low, appear during relatively wetter periods. The coincidence was interpreted as wet phases may facilitate grass expansion up to a certain threshold, following which trees can then outcompete grasses, expanding their cover until self-thinning, intra-competitive processes, or persistent drought allows the grass layer to spread again.

This succession would explain the rise and fall of encroaching species between ca AD 100 and 300 and the relatively stable herb layer between ca AD 1,250 and 1,750 at Dewachaga (Fig. 3), when lake levels rose in response to increasing rainfall (Verschuren et al., 2000). Lake Turkana remained relatively low for much of the first millennium AD, which would be consistent with a rather open

landscape at Dewachaga. During this period grass expansion might not have been linked to increasing precipitation but could have been the final consequence of a persistent tree-grass fluctuating dynamic since ca BC 300. The continuing aridity would have played a determinant role, favouring grasses over trees. Trees would later recover as a consequence of the wet pulse, reflected in Lake Turkana levels around AD 1,000. The Medieval Warm Period (MWP), between AD 1,000 and 1,270 in some East African regions, has been characterised as an extremely dry phase in which lake levels generally decreased (Verschuren et al., 2000; Umer, 2005). In Dewachaga, an abrupt decline in the encroachment trend ca AD 1,200 marks the start of a relatively open landscape that continued until the end of the sequence. This last phase of open landscape corresponds to the Little Ice Age (LIA), ca AD 1,270–1,850, (Verschuren et al., 2000), which in East Africa is widely recognised as a relatively wet phase. It can be seen how the vegetation at Dewachaga presented a threshold response to this environmental change, where increasing precipitation may favour a particular plant functional type until the threshold is crossed, triggering a dramatic change in the ecosystem.

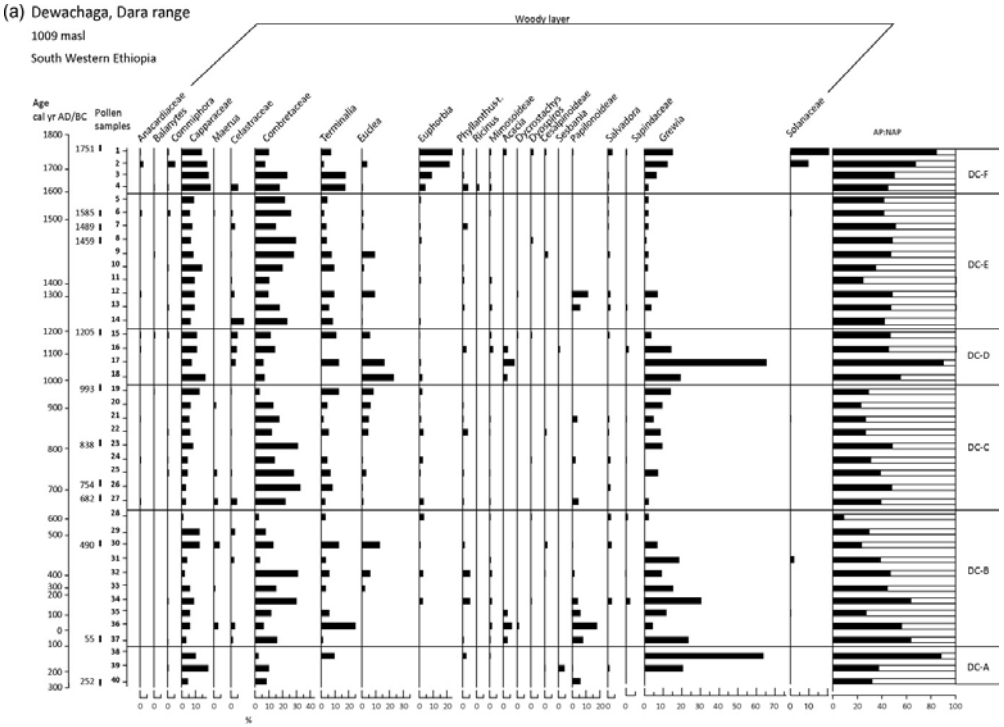

Fig. 3: Pollen diagram from Dewachaga, in the Dara range, showing phases of bush encroachment and climate (Gil-Romera et al., 2010).

Verschuren et al. (2000) acknowledge that landscape transformation could also have been driven by human activities, although the best guess is that the Mursi occupied the area only in the early to mid-nineteenth century. However, there is evidence of former occupation by hunters, agriculturalists and pastoralists, who

may have had similar cultural systems and been involved in similar subsistence activities to the Mursi. In the acquired data the only obvious signs of these activities are found at AD 1,700, through the presence of cereal pollen (sorghum and maize). This does not imply an absence of human activity in earlier times, but could suggest that agriculture was then less important than pastoralism. Thus, faecal and fungi spores, which might be related to pastoralism, are consistently present from ca. AD 1,000. Pastoralism would probably imply increasing fire activities, although no clear correlation was found between the spores and charcoal abundance. Verschuren et al. (2000) conclude that while human activity may have been an important driver of the system, it was probably not a transformative one.

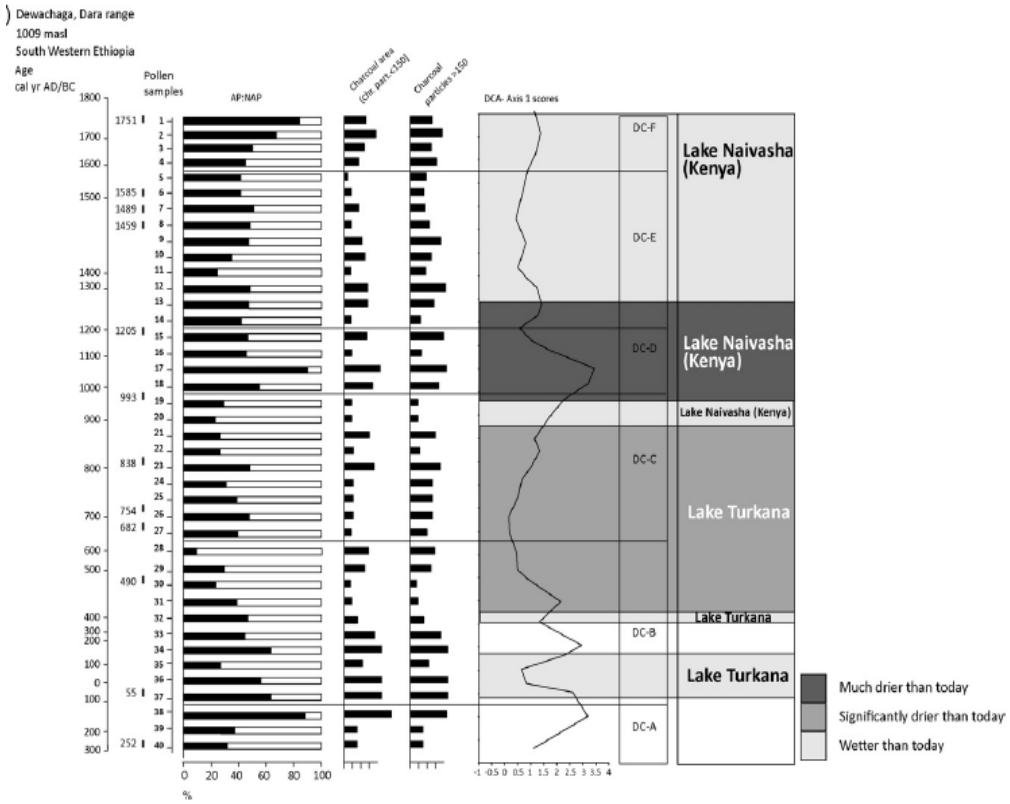

Fig. 4: Arboreal (tree) pollen (AP) and non-arboreal pollen (NAP) proportions and the DCA index showing encroachment and climate phases (Gil-Romera et al., 2010).

5. History of drought and famine

Marshall (2010) has provided a good summary of the history of drought and famine in his PhD dissertation, partly based on the following literature. Degefu (1987) wrote on the long-term history of the occurrence of drought and famine in Ethiopia, utilising references cited in the works of Shove (1977) and Nicholson (1979), and information obtained from the Ethiopian Relief and Rehabilitation

Commission (RCC) and the Economic Commission for Africa Report (1984). A total of 27 events are noted, with evidence derived from old Nile flood level records, Ethiopian documentary archives (AD 1,400 onwards), and meteorological records (since the 1950s). Although no obvious local climatic trend is evident from the long-term record (Degefu, 1987), a correlation is suggested between these drought/famine events in Ethiopia and the occurrence of the El Niño Southern Oscillation (ENSO) (Haile, 1988) (see Table 2).

Table 2: Chronology of El Niño and drought/famine in Ethiopia

El Niño Years	**Drought/Famine Years**	**Region(s)**
1539-41	1543-62	Harar (eastern)
1618-19	1618	Northern Ethiopia
1828	1828-29	Shewa (central)
1864	1864-66	Tigray and Gondar (northern, north western)
1874	1876-78	Tigray and Afar (northern, north eastern)
1880	1880	Tigray and Gonder (northern)
1887-89	1888-92	Ethiopia
1899-1900	1899-1900	Ethiopia
1911-12	1913-14	Northern Ethiopia
1918-19	1920-22	Ethiopia
1930-32	1932-34	Ethiopia
1953	1953	Tigray and Wolo (northern, north eastern)
1957-58	1957-58	Tigray and Wolo
1965	1964-66	Tigray and Wolo
1972-73	1973-74	Ethiopia, Tigray and Wolo
1982-83	1983-84	Ethiopia
1986-87	1987-88	Ethiopia
1991-93	1990-94	Ethiopia
1997-98	1999-2000	Ethiopia (flooding in 1998)

Source: Adapted from Wolde-Georgis, 1997; Caviedes, 2001

Table 2 shows the high degree of correlation between El Niño events (warm ENSO) and drought/famine years in Ethiopia. Drought can be seen to either coincide with, or follow, El Niño events, with more northerly regions of the country often being the worst affected. The coincidence of warm ENSO episodes and drought became evident after the El Niño of 1957-58, as the phenomena seem to have become more frequent and intense more recently, possibly as a result of contemporary global warming (Comenetz & Caviedes, 2002).

Regarding rural vulnerability to famine, Wolde-Mariam (1986) presents evidence that the occurrence of recent El Niño-forced droughts has had disastrous consequences for agricultural and pastoral communities in Ethiopia. Whenever the summer monsoon is weakened or late to arrive, as a result of El Niño, crops planted in the early summer are either stunted or fail altogether (Comenetz &

Caviedes, 2002). With most cultivation powered by oxen, the failure or delay of rains causes critical shortages of fodder that leads to cattle mortality (Wolde-Georgis et al., 2001). Wolde-Mariam (1986), analysing drought occurrences between 1958 and 1977, indicated that a spatial pattern of drought progression across the country appeared to have taken place.

5.1 The Great Ethiopian Famine of 1888-1892

During the late nineteenth century, Ethiopia suffered one of the worst famines in the country's history. Pankhurst (1966a, b) gives a detailed contemporary description of the episode, referred to in Ethiopian history as *Kifu Ken* (meaning harsh or evil days). Numerous contributing factors, such as cattle plague epidemic (rinderpest), harvest failure, an outbreak of insect swarms, and a meteorological drought, combined to cause serious deleterious effects, which cumulated in acute starvation throughout Ethiopia.

In 1888 both the *kiremt* (summer) and the *belg* (mid-year) rains failed to come, triggering catastrophic drought. In November 1888 there were reports that the lack of rain had caused a large proportion of the crops to perish. By January 1889, in certain areas of the country, the sun had burned all the remaining crops. To make matters worse, in the same month, masses of caterpillars appeared and destroyed any crops that had survived. Swarms of locusts followed and annihilated the little that was left. By February, the harvest failure and insect infestation had reduced much of the country to misery, with grain production in some areas falling by as much as 97% (Pankhurst, 1966a). Though the failure of the harvest was initially caused by the meteorological drought, the impact was exacerbated by the rinderpest epidemic that killed almost all the oxen, and, therefore, brought an end to ploughing. Peasant farmers began to give up hope, and many left their land to become fallow (Ibid).

The harvest failure led to a doubling in the price of provisions by as early as November 1888. Pankhurst (1966a) draws on a wide range of documentary archives to illustrate how these increases were felt across the whole of the market. Between 1889 and 1890 the cost of grain increased by one to two hundred times; plough oxen by twenty to thirty times; and cattle by thirty to forty times. The value of salt, historically used as a trading currency, rocketed in response to the increased transportation costs resulting from the shortage of livestock. Food became difficult to obtain at any price, with employees refusing to be paid in anything but grain. The food supply shortage throughout Ethiopia led to a "famine of the most acute proportions" (Pankhurst, 1966a, p. 112). Pankhurst (1966a, p. 113) quotes a missionary from 1890 as reporting "Everywhere I meet walking skeletons and even horrible corpses, half eaten by hyenas, of starvelings who had collapsed from exhaustion." A degree of civil unrest ensued, as the peasants refused to work and taxes were no longer paid.

The existence of large numbers of unburied animal and human corpses led to a substantial deterioration of sanitary conditions (Nicholls, 1993). The famine was accompanied by the outbreak of epidemics and a dramatic increase in the death rate through illness, as enfeebled famine victims lacked the stamina to fight infection (Pankhurst, 1966a). Outbreaks of smallpox, typhus, cholera, influenza, bronchitis, and dysentery were reported from many parts of the country, which killed large numbers of people. The famine and subsequent epidemics are believed to have resulted in the death of one-third of the entire population of Ethiopia (Pankhurst, 1966a). Considerable depopulation and migration occurred, causing massive demographic changes. After the great famine, the population was concentrated around the central regions, where the new imperial seat of Ethiopia, Addis Ababa, was located. Some areas of the north were abandoned, while others were intensively over-farmed. The population shifts and environmental degradation that occurred seriously affected the ecological make-up of Ethiopia, making it highly susceptible to future drought (Fesseha, 2002).

5.2 Drought and famine in the 1970s and 1980s

The most devastating drought since meteorological records began started in 1972 (Degefu, 1987). Although the drought affected many parts of Africa, the most pronounced impact was felt in Ethiopia. The event is also important as it was the first time that the negative consequences of the occurrence of warm ENSO anomalies in regions of the tropics was fully appreciated (Caviedes, 1982). Globally, the 1972-73 El Niño was not extremely severe, when compared to past episodes, but regionally, the consequences in Africa were the most calamitous of recent decades (Comenetz & Caviedes, 2002). This event substantially upset the hydro-meteorological regimes of eastern and sub-Saharan Africa, initiating the infamous drought and subsequent famines of the Sahel (Kates, 1981).

In Ethiopia, a complete failure of the *belg* rains and a partial failure of the *kiremt* rains dramatically reduced the harvest season of 1972, particularly in the north eastern region of Wolo. By 1973 the ENSO episode had become more apparent, as the *kiremt* rains again failed to materialise, which extended the drought further into the northern highlands (Comenetz & Caviedes, 2002). By mid-1974 the spectre of famine covered most of the country (Wolde-Mariam, 1986).

Degefu (1987) cites figures from an RCC publication of 1982 to illustrate the severity of the 1970s drought and famine episodes on the Ethiopian people. Famine-related deaths for Tigray, Wolo and northern Shewa are given at around 200,000, although Degefu (1987) also provides other estimates given at 400,000 to one million for Tigray and more than 100,000 for Wolo. In these northern areas, it is reported that 80% of cattle, 50% of sheep, and 30% of goats perished. Poor harvests, as a partial result of drought, were still occurring in these regions towards the end of the decade. In 1977-78 at least 75% of the main harvest was destroyed due to “unfavourable climatic conditions” (Degefu, 1987, 31).

The premature development of an El Niño event in May 1982 caused a two-month delay in the *kiremt* rains, which again resulted in crop failure in northern Ethiopia, particularly in parts of the Gonder and Wolo regions. Below average rainfall persisted during the rest of the year and continued into 1983. The *belg* rains arrived at the start of October, but during the second week of this month they ceased and aridity prevailed throughout the country. The continued dryness caused widespread migration and the dislocation of rural populations who moved in search of grass and water (Degefu, 1987). Thousands of both domestic and wild animals perished as a result of severe dehydration, and the outbreak of forest fires caused incalculable damage to the environment and to the forest-based economy of the country (Degefu, 1987).

It was following the 1982-83 El Niño that led to the 1984 drought and famine, that the National Meteorological Services Agency (NMSA) first initiated the application and incorporation of El Niño information into its early warning strategy for the 1987 drought. Although improvements are apparent, a current failing of this technique is the "predictability gap" (Nicholls, 1993) which describes the period of time between the recognition that an El Nino event is apparent and the rains failing. Currently this gap is not sufficient to fully prepare for or mitigate the effects of El Nino.

6. Conclusion

The environments of tropical Africa in general, and the Horn of Africa in particular, have been affected by global scale natural climate oscillations that have forced humans to adapt, through migration and innovation at various time scales. Under natural conditions ecosystems have the power to recover, provided that stress is relieved and extreme climate is ameliorated. Although it is possible that a number of factors led to the transition from hunting and gathering to domestication and food production, climate must have played a role in determining the spatial and temporal availability of water and pasture. In the long term this led to regional migration, while in the short-term locally diverse habitats, such as oasis in deserts or altitudinal migration, provided temporary resources. It is necessary to conserve such sites while a more feasible adaptation strategy is determined.

Potential suitable habitats, which can withstand climate stress, must be identified and protected from degradation and already degraded areas should be rehabilitated. The trajectory of future anthropogenic climate change, mainly temperature rise, is now established. Changes in rainfall regimes and related hydrological and ecological shifts still need to be understood at regional and local levels. In any case environmental protection and innovation, rather than migration, are the most likely future instruments of adaptation—combining indigenous and scientific knowledge.

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Potential Tool to Support Climate Change Research in Karamoja, Uganda: Historical Month Names and Meanings

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Abstract

Karamoja, 28,000 km^2 in northeastern Uganda, is inhabited by 1.2 million people. The Karamojoŋ consist of eight Nilotic groups in the plains and three Kuliak groups in the mountains. Despite the challenge of modernization, Karamojoŋ pastoralists continue to utilize a unique calendar system based on historical seasonal events. Data on rainfall has not been well kept nor regularly analysed. Therefore, this paper examines another approach to historical climate change. It outlines the names and meanings of the months in 11 different Karamojoŋ agro-pastoral groups. The study of linguistic change over time–philology or historical linguistics–within a language can help give more evidence or reconstruct events from long ago. Methodologies used include literature review, personal observation, group discussion and systematic survey. Three of the ethnic groups' number the months (the Labwor, Tepes and Meniŋ); the remaining eight groups (Bokora, Dodos, Ik, Jie, Matheniko, Nyaŋiya, Pian and Upe) name the months according to environment- or weather-dependent activities. Many names are held in common. The results show that month names have not changed, but the climatic events associated with their naming have shifted in Karamoja for 10 of the 12 months. Only two months have retained their original meanings; these are the two hottest and driest months in the area, LOKWAKO *and* LODUNGE *(January and February, respectively), thus correlating with climate change. To the best of our knowledge, this is the first time that the majority of the ethnic groups living in Karamoja, Uganda, have had their month names and their meanings documented. This work may be used as a tool to keep the language alive, and may be relevant to the larger body of climate change research, especially historical changes where meteorological data is non-existent.*

1. Introduction

Karamoja is an arid/semi-arid region, 28,000 km^2 in area, located in the north-eastern part of Uganda at 1°30´ - 4°00´N and 33°30´ - 35°00´E. Karamoja is inhabited by approximately 1.2 million people (Uganda Bureau of Statistics (UBOS), 2008) distributed among eleven different ethnic groups[1]: Bokora, Matheniko and Pian (the 'Karmojoŋ'), Dodos, Ik (Teuso), Labwor (Leptur), Meniŋ, Nyaŋiya and Tepes (Sor) (see Figure 1). Each group has a different

[1] Historically, the literature would not use the term people or ethnic group, but rather tribe. Local people will likewise use the term 'tribe'. However, terms like tribe or clan can be controversial terms implicating cultural superiority; we prefer to use people or ethnic group.

language.[2] Six are Nilotic ethnic groups living in the plains (Karimojoŋ, Dodos, Jie, Labwor, Meniŋ and Upe) and three are Kuliak groups living along the mountains (Tepes, Ik and Nyaŋiya) (Gradé, 2008). We shall use the term Karamojoŋ as a geographic group to include all these ethnic groups. Most Karamojoŋ are agro-pastoralists who put great value on cattle and livestock; however, the Labwor and Kuliak groups are less cattle-centric. Culturally, the Karamojoŋ people are inherently meteorologists and environmentalists, and have strong social networks. The people of Karamoja rely on their cattle and, thus, are dependent upon the land and other natural resources. They use indigenous knowledge and cultural systems to interpret and forecast events, both social and ecological.

The Karamojoŋ show meteorological acumen by interpreting and predicting the behaviour of the environment using, for example, ants and anthills, bird migrations (e.g. white pelicans, known as ŋABOŋIA) and flowering trees (e.g. *Acacia senegal*). The Karamojoŋ also use natural objects like the sky, stars, meteors, the moon and the sun to foretell seasonal climatic events. They also use the smell of particular winds to predict what weather is going to occur in the near future.

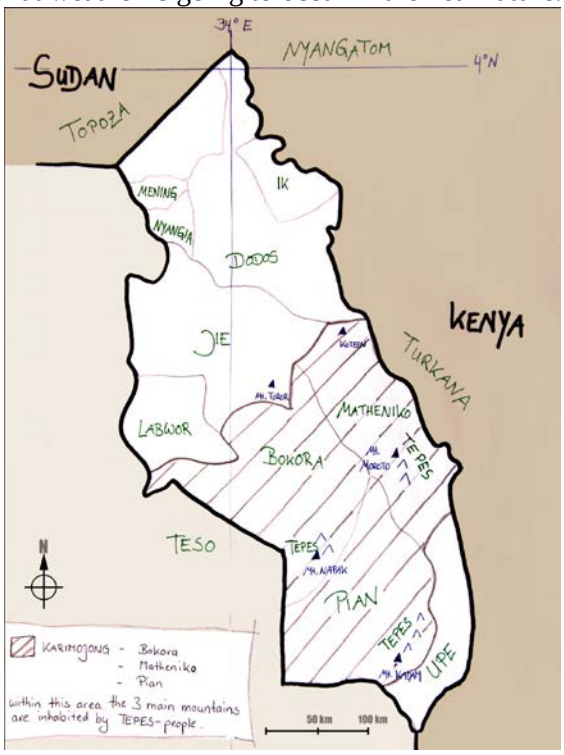

Figure 1: Map of Karamoja, Uganda - showing the 11 ethnic groups interviewed (Credit: M. Lejeune)

[2] Some (Ik, Labwor, Meŋiŋ, Nyaŋiya and Tepes) have completely different languages and are unintelligible to any of the other 11 groups; while others (Pian, Bokora, Matheniko, Dodos and Jie) can understand one another.

The Karamojoŋ show environmental insight when they incorporate their environment into their daily culture. For example, most clans are named after their favourite animals, birds, trees or other natural objects. They enjoy and respect the environment and all of its natural resources because they know that everything in nature is useful to them.

One other issue is their community social system, based on love for one another. Like many African cultures (Legesse, 1973; Mbiti, 1989), the Karamojoŋ people believe and follow the "I am because you are, and since you are, therefore I am" philosophy. There is a great spirit of belonging to the community, no-one in their culture lives like an island but, rather, everyone is intricately connected and shares responsibility in the community. Within the community, any elder has the authority to discipline a misbehaving child or person according to their cultural norms; for example, there can be a public whipping as the order of the day at community gatherings for a serious offence (i.e. killing or offending a community member). The social punishment structure is broken into gender roles, the women will discipline women, and the men will discipline men. This is done so that everyone knows the effect they have on the entire community, not just themselves. Parents are also affected by their child's offence–they are obliged to sacrifice a bull by spearing it or brew beer to appease the offended person and the entire community. This is meant to bring a general, peaceful cleansing. Another aspect of their communal living is how they share food. Milk and meat are given to a family that has no livestock. But climate change has caused change in the social structure of the Karamojoŋ. These days, food scarcity has brought about greed and a diminished spirit of sharing together or having a unified social discipline. People now live for themselves and there is no spirit of sympathy as there was some decades ago. Climate change has affected other aspects of behaviour as well, for example, there is now an increased tendency to move to towns away from the traditional villages. Most of the young generation has forgotten to count and name months in the traditional way and they have greatly diminished traditional environmental knowledge. Modernization and the system of government have corrupted the pastoralists' culture.[3]

Despite the challenge of modernization, Karamojoŋ pastoralists continue to utilize their unique calendar. This observation based calendar provides a schedule for weather and climatic changes, environmental happenings (like trees shedding their leaves and mushrooms coming out) and even when certain animals will give birth. The names of months in most European languages are derived from Roman times and some celebrate Roman deities and emperors, which have little to no meaning for most people today. Native American months were named after the full moon with an environmental awareness, e.g. the moon of the wolf, the moon of the snow,

[3] This paragraph are direct observations by the primary author, a 41 year old Pian Karamojoŋ man, in good community standing and awareness, well-travelled and known throughout the entire Karamoja region.

flower, hunter, cold, etc.[4] Some African cultures likewise, name their months according to seasons. Few references are available documenting traditional month names worldwide. Those found include, Aztec, Maya (which have more months and less days), Gregorian, Julian, Chinese, Jewish, Islamic, Burmese, Japanese, Belarusians, Celtic, Berber, Ethiopian, Maori and Oromi.[5] Some advanced societies, like Japan, have shunned the traditional names and now just number them. However, sometimes one or two traditional months' names are used in poetry.

The name of each Karamojoŋ month forms a single-word idiom and explains what event will happen with the weather or the environment. The naming system plays a very important role in the traditional indigenous Karamojoŋ life, advising and directing local communities as to when it is better to prepare land, sow seeds, perform marriage ceremonies or when their livestock can migrate out in search of pasture, water and shade areas.

Physically, in recent years (from the mid-1980s) the region has experienced changes in seasonal patterns and alterations in the climate. This includes natural events such as: stormy rains, floods,[6] landslides,[7] high temperatures, irregular winds, poor vegetation growth, diminishing species of grasses, herbs and trees, and soil changes. Other weather phenomena have also appeared: including extreme heat and/or little or too much rains are causing rocks to fall, creating landslides and other hazards for the local people.

Disease outbreaks in Karamoja; such as malaria, cholera, yellow fever, hepatitis and elephantiasis; may be due to climatic changes (Patz, Campbell-Lendrum, Holloway & Foley, 2005), causing alarm among the Karamojoŋ.[8] They say "Why are there such strange diseases happening now? Long ago these diseases were not here and such destructive events never used to take place." This suggests the need for rapid action to help pastoralists adapt to climate change, as it has serious repercussions for public health, food security and general effects on the environment. The impacts of climate change create challenges for the poorest communities as their livelihoods are likely to be more sensitive to change (Tompkins & Adger, 2004).

[4] http://americanindian.net/moons.html

[5] For details see Legesse, 1973; http://www.mexconnect.com/articles/1554-aztec-calendar, http://www.everyculture.com, http://www.oromia.org, http://www.belarusguide.com/, http://www.calendarzone.com, http://calendopedia.com;http://calendarhome.com)

[6] Karamoja, a semi-arid land prone to droughts experienced a flood in 2007 that swept away villages, gardens and roads. Dozens people died and boats were used for transportation as all major roads were cut off. Annual flash floods are not uncommon, carrying a few people who attempt to cultivate in the river beds in 2011 at least 8 people were killed (New Vision newsaper, September 2007).

[7] A mudslide in Kaabong (N. Karamoja) killed 7 people in 2011 and over 23 villages were destroyed. *Karamoja cut off by floods* (New Vision newspaper, August 2011)

[8] The first author claims that in 1970 there were no mosquitoes in most subcounties of Karamoja, but today they are everywhere.

In the absence of reliable and affordable climate forecast or information and high-quality tools, the rural Karamojoŋ use their own predictions and precautions to cope with climate variability and change. Although they realize a serious issue is approaching, they are still using natural and handmade objects as their metrological stations.

In recent years, researchers and development agencies have been looking for evidence of climate change and are considering how to design appropriate measures to adapt to impacts of climate change. This evidence includes rainfall data, temperature, wind, etc. Unfortunately, for Karamoja, these data points are rare and unreliable. The best data available is that from the 50's and 60's when the British government representative and researcher Mr. Wilson was based in Moroto (Wilson, 1962). In mid-2010, a weather station was put up in Moroto; the 'capital city' of Karamoja, but it broke down after functioning for just a few months.[9] Famine Early Warning Systems Network (FEWSNET) has recent data points, but they are based in Entebbe and have limited data that doesn't differentiate areas within each district. Moreover, the available data on rainfall is not well kept, consistent or regularly analysed. Even the new stations are providing some questionable data (KALIP technical report, 2009). Therefore, this paper will look at other ways to find historical evidence of climate change. One of these ways is to look at the names and meaning of the months for the 11 unique people groups living in Karamoja. Since these names reflect what the weather patterns have been in the past, they could provide insight into historical patterns and recent changes.

To address these problems, this paper suggests the need for reflection on the traditional calendar system. This paper outlines, for 11 different agro-pastoral ethnic groups in Karamoja, the names of the months, their direct translations and the fuller meanings of the names. This could give great insight into historical climate change. It could also provide an additional tool for scientific research. The study of linguistic change over time, known as *philology* or historical linguistics, can give evidence for or reconstruction of events long ago.

2. Methodology

A variety of methods were used, including literature review, personal observation, group discussion and systematic survey. The results in the form of names, translations and community activities during those months, were tabulated in an Excel spreadsheet and analyzed using pivot tables. Data from six key Ik (Teuso) informants was provided by resident linguist, T. Schrock,[10] whereas the all of the other data was personally collected by the two authors.

[9] Personal communication with district weather officials, August 2011.

[10] Terrill Schrock is a PhD candidate in African linguistics at Leiden University that has been living among the Ik people for two years. He has his MA in Applied Linguistics and is the project leader for SIL language development efforts with the Ik. He conducted in depth one-on-one interviews on month names in the local language with trusted key informants and painstakingly deciphered the

Over the course of four months, eleven ethnic groups residing in Karamoja, Uganda were interviewed to ascertain the common naming of their months, translations, general meanings and activities during the said months. The groups interviewed were the Bokora, Matheniko and Pian (the "Karimojoŋ[11]"); Dodos; Ik; Jie; Labwor; Meniŋ; Nyaŋiya; Tepes; Upe. A total of 88 people were interviewed (69 men, 19 women, see Table 1 for details). All participants were adults and the average estimated age was 50 years–which is considered very old by the Karamojoŋ.

Table 1: Informants listed according to ethnic group and gender

Ethnic group	Location	Male	Female	Total
Bokora	Iriiri, Kangole, Lotome	4	1	5
Matheniko	Moroto	2	1	3
Pian	Nabilatuk, Lolachat	18	8	26
Dodos	Kaabong	12	1	13
Ik	Timu	5	3	8
Jie	Kotido	13	4	17
Labwor	Abim	6	0	6
Meniŋ	Karenga	3	0	3
Nyaŋia	Karenga	4	1	5
Tepes	Mt Moroto	1	0	1
Upe	Amudat	1	0	1
Total		**69**	**19**	**88**

3. Results

Current changes in climate patterns are challenging the Karamojoŋ calendar month names. The Karamojoŋ have begun to ask themselves: "What is happening in recent years? Even mushrooms are growing at the wrong month, crops begin flowering in June or July!" As such, they are feeling a change and realizing that certain negative consequences are occurring, like floods and mosquito infestation in areas that were not formerly infested. This, to the Karamojoŋ, suggests that something different is happening, especially during the months of March to August. Elders confirm the changes have become more difficult to understand and cope with. According to the memory of the informants, it appears that the stars "no longer rhyme with the changes of the seasons."

unwritten language into phonetic letters and translated the month meanings. Two other Ik, students in Bokora, filled out the months' survey and they also understand ŋakarimojoŋ, the language the authors used to interview all other participants.

[11] Karimoŋ had been a unified ethnic group, now these three sub-groups (Bokora, Matheniko and Pian) are unique that is, they engage in tribal warfare against one another and have linguistic differences.

Table 2**:** Local month names† listed according to ethnic group in alphabetical order, noted if the language is in the Kuliak grouping and if not noted, it is Nilotic

	Bokora	Dodos	Ik* Kuliak	Ik*/students**	Jie	Labwor‡	Mathen iko	Meniŋ‡	Nyaŋiya Kuliak	Pian*	Tepes‡ Kuliak	Upe
1	Lokwaŋ	Lokwaŋ	Kupon	Lokwaŋ	Lokwaŋ	Dwe me acel	Lokwaŋ	Opalobito	Salokwaŋ	Lokwaŋ	Awan edech	Mu
2	Loduŋe	Loduŋe	Bets	Loduŋe	Loduŋe	Dwe me ario	Loduŋe	Opalare	Saloduŋe	Loduŋe	Awan nebec	Tïrtïr
3	Lomaruk	Lobal	Daŋ	Lomaruk	Lomaruk	Dwe me adek	Lomar-uk	Opalouni	Salobal	Lomaruk	Awan iyun	Poyko-kwö
4	Titima	Lomaruk	Lomoe	Titima	Locoto	Dwe me angwen (Othegere)	Titima	Opalongon	Salomar-uk	Titima	Awan nuwaa	Rïkïsa
5	Yeliyel	Locoto	Kinam	Weliwel	Titima	Dwe me abic	Yeliyel	Opalomiet	Salocoto	Yeliyel	Awan intund	Pöröwö
6	Lomodo-kogec	Lawasicino	Namakar	Lomodo-kogec	Lolingac-ino	Dwe me abicel	Lomodo-kogec	Opaloile	Satitima	Lomodok’ gec	Awa intund ka nedes	Melwon
7	Losuban	Lomodok’ gec	Iliŋa ets	Ilingas / Losuban	Loreŋerot	Dwe me abiro	Losuban	Opalomiet-are	Saŋam	Lopoo	Awa intund ka nabec	Sïkukï
8	Lotiak	Loreŋarot	Idat ŋer	ngures/ Lotiak	Lopoo	Dwe me aboro	Lotiak	Opalomiet-auni	Salotiyak	Losaban	Awa intund ka niyon	Mïkeyon
9	Lolobae	Lotiyak	Nakarib	Lolaba/ Lolabae	Lakabi-nen	Dwe me abungwen	Lolobae	Opalomietao ngon	Salolobae	Lotiyak	Awa intund ka inuwa	Tapach
10	Lopoo (loopoi)	Losuban	Teres	Loipo	Lolabae	Dwe me apar	Lopoo (loopoi)	Opalotomon	Samawe	Lolobae	Awa mimiri eneek	Kïpsöt
11	Lorara	Lolobai/ Lopoo)	Kawes	Lorara	Loraara	Dwe me aparacel	Lorara	Opalotomon kolo-bito	Salorara	Lorara	Awa mimiri eneek ka nedes	Kokeïyan

12	Lomuk	Lomuk	Raraan	Lomuk	Lomuk	Dwe me aparario	Lomuk	Opalototo-monkare	Salomuk	Lomuk	Awa mimiri eneek ka nebec	Pköghe

† For translated meanings of the month names from each ethnic group, see Table 7, 8 and 9

‡ These three ethnic groups, Labwor, Meniŋ and Tepes, name their month by numbering them, i.e. the first month, the second month, etc

* Some discrepancies seen in Pian and Ik surveys and interviews; see Table 4 and 5, respectively

** Ik students, currently studying among the main language group people (Karimojoŋ)

Many people, when interviewed, would initially only use numbers (1-12) to number the months. After encouragement, most would eventually reveal the local names for most or all of the months. Three of the ethnic groups simply number the months (Labwor, Tepes and Meniŋ), whereas the remaining eight name the months according to the environment (weather, vegetation changes) or activities. However, we were able to find one Labworian man who actually remembered the fourth month's name, OTHEGERE, although he did not know the meaning nor know any of the other names.

Table 2 presents the local language names according to each of the 11 people groups (for detailed translation and meanings, refer to Tables 7, 8 and 9 below).

Some informants exhibited hesitation in remembering the proper order in one-on-one interviews and in group interviews, discussions and arguments over order and the correct name could ensue. Some months have more than one name. The Karimojoŋ (Bokora, Matheniko and Pian), who share the same eastern Nilotic language with slight tonal differences, have a catchy song (see Table 6) that they use to help remember the order, which is the same as listed in Table 2 for the Bokora people. Informants believed that this song was developed by a local school teacher to help students remember the order of months.

All groups, except the Upe, have months named 'white mushrooms' and 'white'. The white mushroom month (LOMARUK – B, D, J, M, P, SOLOMARUK – N and KINAM – I) is named after a large, edible, white mushroom and coincides with when these mushrooms emerge from termite mounds, in the 3rd or 4th month. The Ik refer to February as 'white', whereas the six other ethnic groups call January 'white'.

Three translated names are common across six groups: 'green and lush', TITIMA, referring to when crops and other vegetation are flourishing, typically sorghum is knee-high or mid-thigh; 'trees shed leaves', LORARA, in November when leaves finish dropping off trees; 'covering', LOMUK, referring to the trees sprouting buds, typically in December.

Three translated names are common in five ethnic groups: 'dirty mingling stick', 'dividing the season' and 'hartebeests deliver'. LOMODOKOGEC translates to 'dirty or stained mingling stick'; informants said that this refers to the time when food is available from the garden and the joy and excitement that the three pronged mingling stick (EGEC) always has some food on it, i.e. is never fully cleaned. The Ik talk of dirty cooking utensils (IDAT ŋER) in August, not necessarily the mingling sticks, but for the purpose of this discussion it is including in the category 'stained mingling stick'. Dividing the season, LOTIAK, is the bridge or separation between the wet season rain and the dry season. Even though hartebeests are not commonly seen after the 1980's, five groups name September or October LOLABAI/LOLABAE, which refers to when the hartebeests give birth.

The Jie pointed out that most of the sorghum is ready in LOLABAE and that ripe sorghum is the same colour as hartebeest. The Nyaŋiya call the following month SAMAWE, or the month of the lions – referring to the month when the lions eat the hartebeest calves. They were the only ethnic group that had the 'lion' month.

Of those eight groups that name the months, rather than count or number them, there are many common names. Table 3 shows translated month names according to frequency of occurrence within these eight ethnic groups.

Table 3: Translated month names in order of occurrence in different ethnic groups

Translation of month name	**Frequency of occurrence (in the 8 ethnic groups)**	**ethnic group***
white mushrooms	7	B,D,J,I,M,N,P
white	7	B,D,J,I,M,N,P
covering	6	B,D,J,M,N,P
LODUƉE†	6	B,D,J,M,N,P
mingling stick	5	B,D,I,M,P
trees shed leaves	6	B,J,I,M,N,P
crops green, lush & knee-high	5	B,J,M,N,P
dividing the season	5	B,D,I,M,P
hartebeests give birth	5	B,J,M,N,P
ceremonies	4	B,D,M,P
cooking many foods	4	B,J,M,P
faeces divided	4	D,I,J,N
flowering	4	B,M,P,U
red mushrooms	4	D,I,N,U
white ants	3	D,I,J
chaff	2	I,J
muddy	2	D,N
red road	2	D,J
stars	2	P,U

*B-Bokora, D –Dodos, I – Ik, J-Jie, M-Matheniko, N –Nyaŋiya, P – Pian, U-Upe (Pokot)
†LODUƉE has multiple different translations, depending on the ethnic group. For the main Karamojoŋ language groups (B, J. M, P) it means to push on quickly, for Dodos it is the name of a food made of white ants (edible termites) that are typically available in that month, for Nyaŋiya it is the name of the luggage that carries harvested sorghum.

The Ik had three unique month names, and the Upe had at least[12] 8 unique names. The Upe data only had two names, 'flowering' (9th month) and 'stars' (11th month)

[12] We can only say 'at least' because two of the months, although they were named, no informants knew their meaning. Therefore, the Upe may have up to 10 unique month names. See Table 8.

that were similar to the other seven groups; two of their months (6th and 10th) have yet to be correctly translated (see Table 9).

One common month name, LODUƉE, is used for February by six ethnic groups, but the informants gave three translations for LODUƉE, 'the push' (Bokora, Jie, Matheniko and Pian), 'white ants' (Dodos) and 'head luggage' meaning harvested grain (Nyaŋiya).

Most of the months refer to environmental observations such as weather, agriculture, tree growth, wild-life or livestock mating or birthing (hartebeest, rabbits, goats etc). Even the months that are named after cooking utensils or ceremonies are related to environment and agriculture as these events follow the start and end of harvest, respectively.

Many of the eight ethnic groups use names with basically the same translations, as do the neighbours of the greater Karamojoŋ cluster. The Teso of Uganda and the Turkana of Kenya, whose languages are very close to *ŋakarimojoŋ*, have their month names listed in the dictionaries referred to in Table 6. However, the actual time of the months may not be the same; for example, 'white mushrooms' is a month name for all but one of the eight groups who name their months, but can refer to March or April. This could be explained by different rainfall patterns across Karamoja, i.e. those that call March, the month of the white mushrooms, would have historically received the first rains in earlier (in March). In the study year (2011), the white mushrooms were not harvested until August. Some years, certain events in the month names never happen. This phenomenon can even last for a few years when a particular named month just never comes. For example, the 'muddy month' was missing for four years during a drought in Jie.

According to our informants, the names of the months have not changed, but the events which define the month names have shifted in many cases. The two exceptions are January and February. January is called LOKWAƉ, which means whitish-dry, indicating the dry season in Karamoja. February is called LODUƉE, which usually means 'to push off quickly' due to the hot and intense dry season, when the livestock, people and grasses are ready to die or to 'make it' to the expected rainy season, even when the mushrooms are expected to grow (see Tables 7, 8 and 9). A Pian elder, Sagal Mawa, explained, "You need to plan properly to know how to cross into the next season; you will be pushed off to live to the next season or to die." In summary, both January and February still retain the original seasonal events for which they were named generations ago.

Events in the other 10 months have changed; to illustrate this point, three examples will be given. The first, LOMARUK—the 3rd month in South Karamoja and the 4th month in North Karamoja—means the season when the white, edible mushrooms grow out of termite mounds. The informants confirmed that, since 1985, the white mushrooms no longer come in March or April, but first appear in July and August.

In 2011, they also appeared in July and August which continues to surprise the Karamojong. The second example, TITIMA—means lush, green crops to knee-high levels which correlate to the 4th month for the Karimojoŋ—the 5th for the Jie and 6th for Nyaŋiya (moving from south to north). Pian informants said that, since 1985, the lush green crops do not reach knee-high level until the 6th month; the Jie of Kotido claim that TITIMA has been in July since 1979.[13] In Namalu, a South Karamoja green belt inhabited by the Pian, crops reach knee height in May to June while, in other districts, pastoralists are either beginning to plant (in the north) or are in the middle of planting in the rest of Karamoja. Therefore, TITIMA does not show its real meaning because the events have shifted. The third example, YELIYEL means the season when the crops, grasses and other plants bloom and open up (5th month for the Karimojoŋ and 9th month for the Upe). However, in Pian since 1980,[14] the crops will not flower until late June or July.

Table 4: Discrepancies in Pian month naming

Month	TH elders* 6 informant	youth also† female elders 15 informants	Ikjatubo, Aliŋtabiso‡2women	Koriaŋ Paul Tiyan‡ 1 elder	mixed group** 5 people
1	Lokwaŋ	Lokwaŋ	Lokwaŋ	Lokwaŋ	Lokwaŋ
2	Loduŋe	Loduŋe	Loduŋe	Loduŋe	Loduŋe
3	Lomaruk	Lomaruk	Lomaruk	Lomaruk	Lomaruk
4	Titima	Titima	Titima	Titima	Titima
5	Eliyel	Yeliyel	Yeliyel	Yeliyel	Yeliyel
6	Lomodokgec	Lomodokogec	Lomodokogec	Lomodokogec	Lomodok'gec
7	Losuban	Lopoo	Lopo	Losuban	Lopoo
8	Lopo	Losuban	Losuban	Lotiak	Lolobai
9	Lolobai	Lotyak	Lotiak	Lolobae	Lorara
10	Loloŋu	Lolabae	Lolobai/Lopoo	Lopoo	Losuban
11	Lorara	Lorara	Lorara	Lorara	Lotyiak
12	Lomuk	Lomuk	Lomuk	Lomuk	Lomuk

* key male elders whom the authors have long (12years) standing relationships with, they are all traditional healers (TH) whom typically have deep insight to the culture. Their responses mirror those of the available dictionary, see Table 6

†Although not all interviewed together, male youth and female elders gave the same answers to the month names

‡names of informants; **mixed gender and age group from interviews held in April and May

[13] Although many informants are not well versed with years of events, including their birthdays, they will refer to years by their major events. This (1979) is the year General Idi Amin's army ran away, killing wild animals and leaving the meat to rot, meanwhile the Matheniko raided the barracks to become the first heavily armed ethnic group in Karamoja.

[14] The year of "the big famine that killed many people, the only satisfied one were the vultures"

The Pian people were the most heavily interviewed (29 of the total 63 informants), and there are discrepancies in the reported order of the names, especially from the 7th to the 10th months, even though all the names were consistent. Table 4 shows discrepancies within five different interview groups: elders, youth, women and mixed.

Curious is the unique name, LOLOŋU, so-named by a group of five male traditional livestock healers for October. No other informants ever mentioned this term. Even the elders themselves could not clearly articulate what LOLOŋU[15] means. One idea that others confirmed in follow-up one-on-one interviews was *'Akiloŋiloŋakin'* – shifting and changing positions of the stars or milky way, whereas another was that it could be LOLOŋU, the time for two wild foods to be ready, hence *'aluŋarkin ayoŋ'*—to mean 'I'm leaving your hospitality because I can find food elsewhere, at my home from the harvest or even in the bush.

Similarly, there are discrepancies in the information collected from the Ik (Table 5). One group interview (with 6 key informants) was done systematically by an expatriate linguist (T. Schrock); two surveys were completed by Ik students. We called upon the resident linguist as he not only knows this difficult and relatively unwritten language; he has built relationships with key older informants who are well versed with the Ik culture and language that is being rapidly absorbed by the neighbouring ethnic groups (T. Schrock, personal communication).

The two students filled in the survey themselves and have listed the names in the dominant regional language (Ŋakarimojoŋ) which is the medium of instruction in their schools. The use of dominant local languages could be among the chief reasons contributing to the numbering of months, rather than naming, by some of the smaller language groups, like those of the Meniŋ and Tepes ethnic groups.

The following Table shows a literature review of five basic lexicons;[16] three from Karamoja, and two from linguistically similar neighbours, Teso of Uganda and Turkana of Kenya (see Figure 1: Map of Karamoja, Uganda - showing the 11 ethnic groups interviewed (Credit: M. Lejeune)). Table 6 also includes a song commonly sung in schools to memorise the order of the months. This table shows similarities in naming, although some names occur in different periods.

[15] Strangely, this was also the name that was used in all three available dictionary primers (Table 6) for October, although no definition was given.

[16] These basic pocket dictionaries were printed locally as aids to incoming missionaries and primary school children.

Table 5: Discrepancies of months' names within Ik (Teuso) informants

Months	Interview	Survey 1	Survey 2
1	Kupon	Lokwaŋ	Lokwaŋ
2	Ɓets'	Loduŋe	Loduŋe
3	Dáŋ	Lomaruk	Lomaruk
4	Lomoe	Titima	Titima
5	Kinám	Weliwel	Yeliyel
6	Namaƙar	Lomodokogec	Lomodokogec
7	Iliŋa ets'	Iliŋas	Losuban
8	Iɗata ŋer	ŋures	Lotiak
9	Nakariɓ	Lolaba	Lolobae
10	Terés	Loipo	Lopoo
11	Káwés	Lorara	Lorara
12	Ráráán	Lomuk	Lomuk

- Mr. Schrock is the expatriate linguist and the columns, Survey 1 and 2, present findings of the surveys filled in by students.
- For meanings of local names, see Table 9.

The only written information that is accessible is found in the above dictionaries, only two of which have an ISBN number. The others are dated, out of print and were published locally. Unfortunately, the dictionaries only went so far as to list the month names, with no attempt in translation. The most recent Karimojoŋ dictionary (Logiro & Ilukori, 2007) seems to have just directly copied the earlier dictionary work of Loor (1976), where there are some unique month names which are no longer being used, and which probably used no direct field work or interviews. For example, LOLOƉU is given for October–yet only a few elderly Pian men used this word.

Table 7, 8 and 9 show full translated meanings for each month according to the ethnic group as well as how the translated meanings relate to seasonal weather patterns, events and environmental happenings. The purpose of these tables is to show the importance of the indigenous Karamojong calendar and how it both supports and disagrees with current and past weather patterns. Table 7 lists the three Karimojoŋ ethnic groups (Bokora, Matheniko and Pian), Table 8 lists the three ethnic groups (Dodos, Nyaŋia and Ik) that are located in Kaaboŋ district, the northern-most district in Karamoja, and Table 9 shows the Pokot and Jie.

Table 6: Summary of literature review of available dictionaries and a song with their listed month names for the Karamoja Cluster tribes

	Turkana	**Karamojoŋ song**	**Teso**	**Karamojoŋ 1**	**Karamojoŋ 2**	**Karamojoŋ 3**
1	Lokwang	Lokwaŋ	Orara (elap losodit)	Lokwaŋ	Lokwaŋ	Lokwaŋ
2	Loduŋe	Loduŋe	Omuk (elap loiyareit)	Loduŋe	Loduŋe	Loduŋe
3	Lomaruk	Lomaruk	Okwang (elap lokiuniet)	Lomaruk	Lomaruk	Lomaruk
4	Titima	Titima	Oduŋe (elap loiwongonet)	Titima	Titima	Titima
5	Eliel	Eliel	Abwoatidwe/Opedelei (elap loikanyet)	Eliel	Eliel	Eliel
6	Locoto	Lomodokogec	Omaruk/ Oserede Elap loikanyet'ape	Lomodokogec	Lomodok'gec	Lomodokogec
7	Losuban	Losuban	Omodokokingol (mingling stick from palm tree)	Losuban	Losuban	Losuban
8	Lotyak	Lotyak	Otikoik/Oloja (elap loikanyet'auni)	Lotyak	Lotyak	Lotyak
9	Lopo	Lolobae	Otibar/ Ocoto (elap loikanyet'aongon)	Loloŋu	Loloŋu	Loloŋu
10	Lorara	Lopoo	Olobai/Osokosokoma (elap loitomonet)	Lopo or Lolobae	Lolobae or Lopoo	Lopoo or Lolobae
11	Lomuk	Lorara	Osuban (elap loitomonet'adiop)	Lorara	Lorara	Lorara
12	not listed	Lomuk	Opolokalokai (elap loitomonet'aare)	Lomuk	Lomuk	Lomuk

The Karamojoŋ dictionaries are listed in chronological order. 1 was compiled by J.L. Loor (1976), 2 by Verona Fathers (1985) and 3 is P. Logiro & J. Ilukori (2007)

Table 7: Month translations comparison between the three Karimojoŋ ethnic groups - Bokora, Matheniko and Pian*

Month	Bokora		Matheniko		Pian	
	Local name	*Meaning*	*Local name*	*Meaning*	*Local name*	*Meaning*
1	**Lokwaŋ**	ekwaaŋ akwap koori nyilibit – white or not greenish	**Lokwaŋ**	white	**Lokwaŋ**	tokwaŋu /akwaŋun, akwap , ŋinyia, ŋikito ka ŋamanat- the vegetation (trees, grass and shrubs get whitish gray) ekwaŋ
2	**Loduŋe**	akiduŋar akamu ŋuteŋa aloreria nauyoi – when the dry season pushes people from home to kraals. 'Akiduŋar' push away from	**Loduŋe**	to push on	**Loduŋe**	(akiduŋar) atipei erae ŋolo eokioto ŋiŋya, Emam ŋinya, Emuana akaloŋ nooi, akoro daŋ eyai nooi. A push-off month (quickly), due to drought
3	**Lomaruk**	ŋimaruk – white mushrooms. Elomuniata ŋimaruk ilimi akiru	**Lomaruk**	white mushrooms	**Lomaruk**	month when mushrooms (ŋimaruk) appear/grow and white ants come out
4	**Titima**	itititmauniata ŋimumwa – the sorghum is lush and green, up to mid thigh	**Titima**	garden is lush and green	**Titima**	itititmaete ŋimomua (akititiim) when crops and other vegetation flourishing very well.
5	**Yeliyiel**	opening up of the flowers (of sorghum)	**Yeliyiel**	opening up of the flowers	**Eliyel**	akiyeliyelar ŋasuron, assuror (opening up the flowers)
6	**Lomodokogec**	epetunor akimuj – egec '3 pronged mingling stick' is full of food	**Lomodokogec**	mingling stick is not cleaned	**Lomodokgec**	imwuokete ŋituŋa (people get satisfied) and food remains on mingling sticks (egec)
7	**Losuban**	time of celebrations and ceremonies	**Losuban**	celebrations	**Losuban**	ŋolo (aŋasuban) ceremonies period
8	**Lotiak**	'divide' the dividing of rain and dry season	**Lotiak**	dividing of rain and dry season	**Lopo**	when village households come together for new-food tasting festival at gates to cook (akipore) new crop foods
9	**Lolobae**	euriyata ŋilobae – 'hartebeest' when ŋilobae deliver their young	**Lolobae**	hartebeest birth period	**Lolobai**	euriyete ŋilobai (when wild animals called 'ŋilobai' bear young calves
10	**Lopoo**	ŋapoe – rabbits' this is the month when the ŋapoe deliver their young	**Lopoo**	many things are cooked and enjoyed together	**Loloŋu/ Lotiyak**	Akiloŋiloŋakin shifting and changing position of stars(Milky Way). Lotiyak – 'separate', separation of dry season and wet season
11	**Lorara**	eraraariata ŋikito ŋakwi – 'shedding' when trees drop their leaves	**Lorara**	shedding' when trees drop their leaves	**Lorara**	erarate ŋikito ŋakwii daadaŋ kwap, rainfall – dry season (eraraete)

12	**Lomuk**	elibuniata ŋikito – trees start to bud (cover)	**Lomuk**	trees start to bud leaves (cover)	**Lomuk**	imukumukunete ŋikito ŋakwii when trees flourish with foliage green all over (akimukumukun)

* The next three tables, 7, 8 and 9 list the translated meanings of the months names for each tribe, for names only –see Table 2, Three ethnic groups, Labwor, Meniŋ and Tepes, are not in the following three tables because they name their months by numbering them, i.e. the first month, the second month, etc

Table 8: Month names and translations of ethnic groups living in northern Karamoja, Kaaboŋ district; Dodos, Nyaŋiya and Ik

	Dodos		Nyaŋiya		Ik	
Month	***Local name***	***Meaning***	***Local name***	***Meaning***	***Local name***	***Meaning***
1	**Lokwaŋ**	when it is dry and whitish (ekwaŋ), vegetation is dry and there is no sign of rain.	**Lokwaŋ**	Sunny (ekwaŋ)	**Kupon**	'cloudiness' – clouds taunt the people with rain but usually do not actually produce rain
2	**Loduŋe**	white ants collected from termite mounds and prepared into a special dish (Aduŋe)	**Loduŋe**	Ŋaduneta (luggage of harvested sorghum)	**ɓets'**	'whiteness' – the moon shines especially brightly
3	**Lobaal**	brown mushrooms (ŋibaalel) appear	**Lobaalel**	Inedible brown mushroom (ŋibaalel) germination	**dáŋ**	'white ants' – white ants are collected
4	**Lomaruk**	month when white mushrooms (ŋimaruk) appear	**Lomaruk**	White edible mushroom (ŋimaruk) germination	**lomoe**	'inedible mushroom species'
5	**Locoto**	when it is muddy (ecoto)	**Locoto**	Muddy (ecoto)	**kinám**	'edible mushroom'
6	**Lowasicino**	when the faeces of people are of different colors (ewasiaka)	**Titima**	When the crops/vegetation grow at knee height (itititmai)	**namaƙar**	'long period of sunshine'; this is a break between rainy seasons
7	**Lomodokgec**	Tasting, eating and leaving mingling sticks with food (emodokegec); everybody is satisfied	**Loliŋacino**	When the faeces are of different colour (eliŋa ka ŋacin)	**iliŋa ets'**	'faeces are divided' – human faeces are part wild greens and part 'new food' maize, beans etc
8	**Loreŋrot / Lokabinin**	When the sorghum stock (ŋikabinin) is dropped on the way	**Lotiak**	When the dry season and the wet season separate (atiaka)	**iɗata ŋer**	'cooking utensils are dirtied' – people really start cooking newly harvested food, hence the dirtied utensils
9	**Lotiak**	Separation of dry season and wet season (atiaka)	**Lolobai**	When the hartebeest give birth (ŋilobai)	**nakariɓ**	'chaff'
10	**Losuban**	Month of ceremonies (ŋasuban)	**Maawe**	When the lions kill (maawe) the young hartebeest calves	**terés**	'splitting' – marks the seasonal split between the rainy season and the oncoming dry season

11	**Lolobae / Lopo /Larara**	When the hartebeest (ŋilobae) gives birth	**Lorara**	When the trees shade off the leaves (Eraratar)	**káwés**	‘cutting trees’ – people begin cutting out new plots in the thick forest for next year’s gardens
12	**Lomuk**	When the trees become covered up (akimuk) with foliage leaves	**Lomuk**	When the foliage leaves cover up the trees (akimuk/okin)	**ráráán**	‘lose leaves’ – trees start dropping leaves due to the onset of dry season

Table 9: List of month names and their approximate meanings for Pokot (Upe) and Jie

	Pokot Upe		Jie	
Month	***Local name***	***Meaning***	***Local name***	***Meaning***
1	**Mu**	mu – hunger, name means time of hunger.	**Lokwaŋ**	Akica (sunshine), ka akoro (hunger) the bones become white on the road as cows die
2	**Tïrtür**	birds – cheptürtür – their call is türtür	**Loduŋe**	(Akiduŋar), push off to the western water areas the people and even water: push on quick
3	**Poykokw**ö	mimics a warning call from a bird at that time that means 'prepare the roofs for rain'	**Lamaruk**	(Nigimaruk) big white ones/mushrooms; the month the mushrooms grow
4	**Rïkïsa**	means seeds – this is planting season	**Locoto**	(Ecoto) muddy
5	**Pöröwö**	means the time for the men to return home with the cows	**Titima**	(Itimaete) growing dark green at knee heights
6	**Melwon**	unknown	**Loliŋacino**	(Eliŋana) acino (the faeces have different colours)
7	**Sïkukï**	'busy' – people are very busy harvesting sorghum	**Loreŋerot**	the path (erot) way gets red (ereŋ) due to sorghum stalks that people eat like sugar canes
8	**Mïkeyon**	unknown	**Lopo**	(Akipore) cooking food and beer
9	**Tapach**	'light of flowers' – time of flowering, ready to harvest honey	**Lokabinin**	'chaff" – the chaff (ŋikabinin) is swept out of the stores of sorghum
10	**Kïpsöt**	söt – 'gourd' when shepherds carry water containers with them, digging wells for water	**Lolobai**	when the hartebeest (ŋilobae) gives birth, sorghum is also still in the garden and it has the same colour as the hartebeest
11	**Kokeïyan**	Kokel 'stars'. Special elders read the start to determine the next season	**Lorara**	Toraraun – trees shed off their leaves
12	**Pköghe**	kwagha – 'he-goat'. Time for male goats to be mating	**Lomuk**	Kimukoskis ŋikoto –trees cover up and sprout buds of new leaves

4. Conclusion

This paper has laid out the names of the months and their meaning for 11 ethnic groups in Karamoja. Three of the groups just name the months according to a count from one to twelve; however, eight of these ethnic groups name months according to environmental and climatic events. This data could be relevant to the larger body of climate change observation, especially historical changes where meteorological data is non-existent.

These results show that the local names of the months have not changed, but the climatic events associated with their naming have shifted for 10 of the 12 months in most of Karamoja. Only two months still experience the events associated with their original meanings, these are the two hottest and driest months, January and February. This correlates with the expected drying due to climate change. The impacts of climate change create challenges for the poorest communities as their livelihoods are likely to be more sensitive to change.

To the best of our knowledge, this is the first time that the majority of the ethnic groups living in Karamoja have had their month names and meanings documented and tabulated in one manuscript. The only other written information that is accessible is found in dictionaries from Karamoja (three), Teso in Uganda and Turkana in Kenya. Only two of these have an ISBN number, the others are dated, out of print and were published locally.

Thousands of the world's languages are vanishing at an alarming rate, with 90% of them expected to become extinct with the current generation (Krauss, 1992). In Karenga, few elders are left and even fewer Meniŋ know their language. Meanwhile, the Ik students seem to have 'forgotten' their own month names and have adopted the dominant language in Karamoja, Ŋakarimojoŋ. It appears that having a living document, like a song, helps to reinforce the names of the months for the mainstream Karamojoŋ people. We recommend more initiatives like this to keep the culture alive and vibrant. It is important to go into more depth with those three ethnic groups that apparently only number the months (Tepes, Labwor and Meniŋ); we have shown that the Labwor at least have historically named their months because one elder knew the name of the fourth month. Losing language and cultural norms is due to introduced education system, prosperity and rural-urban migration; therefore, cultural centres should be established and traditional norms should be taught to the younger generation to sustain the culture and traditional knowledge.

This documented work may be used as a tool, not only to keep the languages alive, but to use the month names and their meanings to substantiate (or not) climate change over the course of history as rainfall data is very erratic or non-existent in Karamoja and in other remote pastoralist areas of the Horn of Africa. This method could usefully be further investigated and developed in those areas.

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Climate Security and East Africa: A GIS-Based Analysis of Vulnerability*

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Abstract

The 2011 famine in Somalia and the broader drought in the region raised challenging questions about what made the region vulnerable to climate-related hazards and whether climate change was responsible for the underlying drought affecting the region. By drawing on an on-going research project to map chronic climate security vulnerability in Africa, this paper seeks to contribute to the first question, about understanding the sources of vulnerability. This paper develops the idea of climate security vulnerability; the potential for large numbers of people to be put at risk of death from exposure to climate-related hazards. This paper applies a continent-wide model of climate security vulnerability to East Africa and identifies the hot spots of concern, based on the confluence of physical exposure, population, household and community resilience, and governance and political violence. We found that large parts of South Sudan, notably in Warrap and Jonglei states, and southern Somalia, the area affected by famine in 2011, are the most vulnerable. Other smaller pockets of high vulnerability are also noticeable in western Ethiopia, Eritrea, Burundi, and the Karamoja triangle area of Uganda, Sudan, Kenya and Ethiopia. Our maps of water scarcity, based largely on data of past droughts and precipitation variability, are compared to preliminary findings of a mid-21st century climate projection. Most notably, we find parts of southern Somalia are projected to be vulnerable in the future and have historically faced severe droughts and water scarcity. Finally, we discuss the policy implications of our findings and include an overlay of World Bank and African Development Bank active projects in the region on our vulnerability maps. These suggest that foreign assistance dollars from these institutions have been directed to areas with better governance and lower overall vulnerability, rather than highly vulnerable areas like Somalia and South Sudan.

1. Introduction

In summer 2011, in the wake of a crippling drought, the world witnessed the worst humanitarian crisis to affect the Horn of Africa in two decades. Failed rains across two agricultural cycles in late 2010 and early 2011 led to crop failures, loss of grazing areas, and constricted drinking water supplies. Together with rising food prices, agro-pastoralist communities across the arid Horn ran down their food reserves and lacked the resources to purchase sufficient food to feed their families. Pastoralists faced significant loss of livestock.

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While countries throughout the region were affected by the drought, the consequences have been most severe in Somalia, where as many as 3.7 million people were estimated to be food insecure (of which 3.2 million were deemed to need life-saving assistance to prevent starvation). Analysts estimated that more than 29,000 Somali children under five died between May and the end of July 2011. In Somalia, with the absence of a functioning state and an ongoing civil war, aid organizations had difficulty providing the necessary services to prevent the situation from escalating into a full blown disaster. Malnutrition and mortality led the United Nations (UN) to declare parts of southern Somalia to be suffering from famine in July 2011. In August 2011, that famine zone was later extended to include more extensive portions of the southern part of the country.

With the Somali state virtually absent and unable to provide emergency relief services, and international aid organizations initially constrained from operating in the region because of violent intimidation from the al Shabaab militia, Somalis responded the only way they could; they left. The crisis led to a mass exodus of internally displaced persons as villagers fled rural areas to violence-plagued Mogadishu in the hopes of securing food aid. The crisis also spurred hundreds of thousands of Somali refugees to make the difficult journey across state borders to Kenya and Ethiopia, where refugee camps swelled to unprecedented numbers. Dadaab, a town in eastern Kenya, houses four refugee camps; the complex became the largest refugee camp in the world, with its intended capacity of 90,000 housing in excess of 440,000 people. The UN estimates that as many as 12 million people were affected by the crisis, seen as the worst drought to affect the region in 60 years (the Famine Early Warning System Network (FEWSNET), 2011).

Beyond the heartbreaking suffering, the famine in Somalia and the broader drought in the region raise challenging questions about what makes the region vulnerable to climate-related hazards and whether climate change is responsible for the underlying drought affecting the region. By drawing on an on-going research project to map chronic climate security vulnerability in Africa, this paper seeks to contribute to the first question, about understanding the sources of vulnerability.

Some observers of the famine have suggested that politics and the absence of governance in Somalia were overwhelmingly important in explaining the crisis, and why famine stops at the borders between Somalia and its neighbours (Barder, 2011; Carr, 2011). Others have suggested that drought is becoming more frequent in the region, a telltale sign, in their estimation, that anthropogenic climate change is already affecting East Africa (DeCapua, 2011; Good, 2011; Hersh, 2011; Sachs, 2011).

Our own view is more nuanced. While acknowledging the importance of politics,

our model of chronic climate security vulnerability gives equal weight to physical exposure and political factors, alongside population density and a *basket* of household and community resilience indicators. Our model of climate security vulnerability is designed to identify the places where large numbers of people could be exposed to mass death as a result of exposure to climate-related hazards. At the same time, we also acknowledge that scientific understanding about the likely effects of climate change in East Africa is contested, with many climate models suggesting that the region is likely to become wetter with climate change rather than drier. Given that the La Niña effect is thought to have an especially strong influence on the drought of 2011, we think it is premature to ascribe causality to anthropogenic climate change.

Even if climate change has an uncertain causal relationship with the 2011 drought, we think it is appropriate to identify the places of potential concern that, if past climate hazard exposure is any guide, are likely to be vulnerable in the future. At the same time, we report some initial findings, based on regional climate model projections for Africa, that we hope provide some purchase for the expected future consequences of climate change in East Africa.

This paper applies our continent-wide model of climate security vulnerability to East Africa and identifies the hot spots of concern. The paper is divided into four sections. In the first, we develop the idea of climate security vulnerability and explain our emphasis on exposure to extreme weather events. In the second section, we explain our methodology. In section III, we report our findings, which include our maps of chronic vulnerability and preliminary findings of a mid-century climate projection. In the fourth section, we discuss the policy implications of our findings and include an overlay of World Bank active projects in the region on our vulnerability maps.

We find that large parts of South Sudan, notably in Warrap and Jonglei states, and southern Somalia, the area affected by the 2011 famine, are the most vulnerable. Other smaller pockets of high vulnerability are also noticeable in western Ethiopia, Eritrea, Burundi, and the Karamoja triangle area of Uganda, Sudan, Kenya and Ethiopia. As Figure 1 shows, the most vulnerable areas in our composite map of chronic vulnerability, the dark red areas, largely correspond to Somalia's famine zone, identified by FEWSNET (see Figure 1, page 68).

2. Climate security vulnerability

Growing out of the environmental security literature of the 1990s (Homer-Dixon, 1999; C. Kahl, 1998; C. H. Kahl, 2006; Levy, 1995; Percival & Homer-Dixon, 1998), a host of studies since 2005, largely from think tanks, advocates, and the broader policy community, have identified climate security concerns as a distinct

issue, with weather-related effects of climate change—droughts, floods, storms, and cyclones—contributing to dislocation and migration, competition over scarce resources, and, in turn, functioning as a "threat multiplier," that could increase the risks of conflict and even state failure. This grey literature has run ahead of academia with recommendations, (Campbell et al., 2007; CNA Corporation, 2007; Fingar, 2008; Herman & Treverton, 2009; High Representative and the European Commission to the European Council, 2008; Podesta & Ogden, 2008; Solana, 2008; UN Security Council, 2007; WBGU, 2007) even as the scholarly community has questioned whether or not climate change is associated with the increased likelihood of civil conflict (Gleditsch, Nordås, & Salehyan, 2007; Nordås & Gleditsch, 2009; Raleigh, Jordan, & Salehyan, 2008; Salehyan, 2008).

Most of the scholarly work in this arena relies on quantitative data on historic rainfall, drought, or storm patterns and seeks to ascertain whether climate phenomena are correlated with the increased frequency or onset of violent conflict, controlling for other factors (Buhaug, 2010; Buhaug, et al., 2008a; Burke, et al., 2009; Hendrix & Glaser, 2007; Levy, et al., 2005). To date, the findings of this literature have been mixed and somewhat disappointing, in part because of the lack of adequate data (Buhaug, et al., 2008b; Busby, 2009a, 2009b). More importantly, by focusing on the links between climate change and conflict, the academic community has narrowed its conception of security to lose sight of more pressing and imminent threats posed by extreme weather events like the on-going drought in East Africa. Extreme weather events already pose a security challenge for which both national governments and the international community need to prepare. Extreme weather events—such as Hurricane Katrina, cyclone Nargis, Pakistan's floods of 2010, and Australia's of 2011—require the mobilisation of militaries for humanitarian relief.[1] If scientists are right that climate change will deliver more numerous and/or more severe events like these, (Intergovernmental Panel on Climate change (IPCC), 2007a) then governments will increasingly need to divert attention from urgent war-fighting efforts or from protecting the homeland to address these sorts of events (Busby, 2007, 2008).

Can scholars of security studies, who typically seek to explain *past* patterns of conflict and violence, offer any insight on how to identify areas of *potential* concern? By coupling innovative geospatial mapping techniques with insight about governance and political violence, we have developed an approach to map sub-

[1] Scientists continue to debate whether anthropogenic climate change had anything to do with these particular events. Large concentrations of people and infrastructure concentrated on coasts or along rivers in environmentally degraded locations indubitably transformed such weather episodes into human disasters. Even if the science of attribution of specific events remains unproven, and the likely regional consequences of climate change remain uncertain, the expectations in the aggregate are clear: climate change should yield a world of more extreme weather events (Ananthaswamy, 2010; Curry, 2011; Lehmann, 2011; Pielke Jr., 2011; Tebaldi, 2010).

national security vulnerability to climate change, defined as situations in which large numbers of people are put at risk of mass death as a result of climate related phenomena. Our approach is based on the recognition that security vulnerability is about more than physical exposure to climate hazards. It is a function of other contributing factors, including demographics, household and community resilience, and governance and political violence. This approach offers a way to identify "hot spots" of concern at a sub-national level, enabling scholars to focus on these areas for further case study investigation and for national governments and the international community to prioritise resources accordingly (Friedman, 2010).

We emphasise the potential security consequences of climate change, including but not limited to conflict, to encompass situations where weather-related phenomena put large numbers of people at risk of mass death. The security focus makes our work different than the United Nations International Strategy for Disaster Reduction (UNISDR), which focuses on mortality and economic losses from disasters (UNISDR, 2009). We are especially interested in the impact of climate related hazards where physical exposure, compounded by other sources of vulnerability, will likely put large numbers of people at risk of death and suffering, which local emergency rescue personnel cannot cope with. In those instances, emergency relief will often require the mobilisation of domestic and foreign militaries. In some cases, such crises will make internal conflict more likely and contribute to other potential security outcomes of interest, including internal and international migration.

Even before the famine of 2011, Africa had been buffeted by a number of climate related weather events over the previous decade that were, in damages and lost lives, severe enough to qualify as disasters. In the period 1999-2010, climate related weather "disasters" in Africa, according to the Emergency Events database (EM-DAT), killed more than 12,500 people, made homeless 2.8 million, and affected in the order of 190 million people (Centre For Research on the Epidemiology of Disasters (CRED), 2011). Of these, a significant share of deaths (30%), people made homeless (36.5%), and affected populations (52.2%), occurred in East Africa, defined for the purposes of this study as the eleven countries comprising the regional groups, the Intergovernmental Authority on Development (IGAD) and the East African Community (EAC). These include Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, South Sudan, Sudan, Tanzania, and Uganda.

Though a number of high profile "disaster" events of all kinds in the 2000s were located outside Africa—such as the 2004 Asian tsunami, the 2010 Haitian earthquake, the 2010 Pakistani floods—Africa typically received a large percentage of resources from bilateral donors and the international community for disaster assistance. Between fiscal year 2000 and 2009, the U.S. government allocated

more than 58% of its total humanitarian funding for disasters to Africa ($14.6 billion of $25.3 billion in constant 2009 dollars), with a significant share of these funds dedicated to East Africa, particularly to Sudan, Ethiopia, and Somalia.[2] For example, in fiscal year (FY) 2009, of the more than $2.1bn the U.S. government spent on disaster relief in Africa, nearly 70% was directed to East Africa, with more than 40% of the total directed to Sudan and another 16% to Ethiopia. East Africa also commanded more than 70% of U.S. humanitarian funding in FYs 2005, 2006, 2007, and 2008 (USAID-OFDA, 2010).

Our approach ranks locations within Africa in terms of their relative security vulnerability to climate change. The vulnerability rankings are relative to other African countries rather than the entire globe. Thus, countries and localities exhibiting low relative vulnerability within Africa may still be highly vulnerable to climate change, compared to the world as a whole. The challenges posed by climate change are not uniformly distributed within East Africa. In order to identify areas of security vulnerability and prioritise limited resources, it is not sufficient to say "Ethiopia is vulnerable" without explaining which parts of Ethiopia are particularly vulnerable and for what reasons. In the next section, we explain our methodology more fully.

3. Methodology

The consequences of climate change are likely to emerge based on the confluence of various forms of vulnerabilities.[3] We consider four broad processes important in an area's overall total vulnerability to the security-related consequences of climate change. They are:

- *Climate Related Hazard Exposure:* First, at a minimum, areas must be physically exposed to climate related hazards to be considered vulnerable.
- *Population Density:* Second, policymakers are generally more concerned about places where people live. Therefore, all else being equal, more

[2] Within that total, 65% of USAID's Office of Foreign Disaster Assistance (OFDA) funding was spent in Africa (about $2.45 billion of $3.8 billion in constant 2009 dollars). This expenditure included spending on complex emergencies, particularly for Darfur (which may have some relation to historic drought conditions). Exclusively climate related disasters accounted for about 12% of OFDA's total (excluding complex emergencies but including floods, droughts, fires, winter emergencies, typhoons and food security). The Department of Defense (DoD) assists in about 10% of the overseas' disaster emergencies. Between FY 2005 and 2010, the Joint Staff in the DoD estimated the DoD assisted in 30 disasters, 21 of which were weather related, though only one was in Africa (the Algerian floods of FY 2006). This estimate does not, however, include additional efforts by the Combatant Commands (Office of Partnership Strategy and Stability Operations (PSO), 2010; USAID-OFDA, 2010).

[3] This section builds on our previous research in Busby, et al. (2010).

densely populated areas that are highly exposed to climate related hazards tend to command more attention from decision-makers.

- *Household and Community Resilience.* Third, the first line of defence for many people will be what resources they have at the household and community level to protect themselves from physical hazards and enable them to respond in the event of climate related emergencies like floods, droughts, or storms. Communities where many people are sick and have inadequate access to health care and basic amenities are likely to be less resilient than those that are healthier and have greater access to services. Where people are poorly educated, they may have fewer entrepreneurial skills to avoid those hazards or minimize their effects.
- *Governance and Political Violence:* Fourth, weather emergencies frequently exceed the ability of local communities and emergency services to respond adequately, requiring national level mobilisation to rescue people from rising waters or from being trapped under rubble and to provide food, water, and shelter for people left homeless or otherwise affected by extreme weather events. Countries with poor or unstable governance, however, may be less able or even unwilling to provide such services, especially in areas with a history of political violence. Venal and incompetent governments can transform even small physical effects, like the modest drought in Somalia in the early 1990s, into major humanitarian disasters. Failing a national response, the international community—i.e. foreign militaries, humanitarian relief agencies, and Diaspora communities—may marshal resources to respond. Some countries, however, can be difficult places for these actors to operate. Many international organizations withdrew from Somalia in the 1990s and insecurity in some regions continues to be a challenge for many relief agencies. Foreign journalists have been severely restricted in Eritrea and the international community may be unaware of emerging humanitarian crises in the country. Places with a history of violence may be more difficult to deliver services to and may have additional localised governance challenges.

Our operating assumption is that the most vulnerable places are likely to be those where high physical exposure to climate related hazards conjoins with high population density, low levels of household and community health and education, and poor governance and widespread political violence.

Each of these four baskets—physical exposure, population density, household and community resilience, and governance and political violence—is represented in our maps by observable and measurable indicators. In all but the population density basket, multiple indicators have been selected to represent the basket. We selected these particular indicators based on review of the existing literature, with some

statistical tests to eliminate indicators that were highly correlated. We also selected these indicators with the intention of identifying sub-national data sources for a continent where data availability is problematic.

Within each basket, indicators are assigned weights and aggregated. Following conventions among many studies that employ indexes, such as the Human Development Index (HDI), Vulnerability Resilience Indicators Model (VRIM), and the Commitment to Development Index (CDI), all four baskets have equal weight in the final vulnerability analysis.[4] We then classified the vulnerability categories into quintiles with the least vulnerable 20 percent represented by yellow and the most vulnerable 20 percent represented by the colour red. These quintile classifications are relative to the rest of Africa, not the rest of the world. So, while all of Africa might be vulnerable to climate change, some areas are more vulnerable than others (see Figure 2 for a representation, page 68). We also conducted some sensitivity analysis to see how our maps of hot spots changed with different weights attached to different baskets.

From the four baskets, we developed a composite map combining all four baskets of vulnerability. We started the process by mapping physical exposure to climate related hazards on its own and then created an additional map of population density, another of community/household resilience, and, finally, a fourth map of governance and political violence. At each stage, we also created a map adding each new dimension to the previous one (such as climate exposure + population density). We then mapped the difference between the simpler map and the more complex one, which allowed us to identify the places that showed up as more or less vulnerable with the addition of each basket.

As our composite model of vulnerability demonstrates, places that are physically exposed to climate hazards and are densely populated may be resilient to climate change because individuals and communities are better prepared to protect themselves and their governments are willing and able to help when needed. But in several countries in East Africa, this was not true. The incremental addition of our population density, household/community resilience, and governance/violence baskets showed the value of a more holistic approach to vulnerability.

4. Findings

We used historic exposure to climate-related hazards to represent physical exposure. Models of future climate vulnerability for Africa notoriously engender

[4] The Human Development Index adopted a more complex methodology in November 2010. For a discussion of the virtues of equal weights in composite indices, see Stapleton and Garrod (2007). For a discussion of problems with equal weight-based indices, see Chowdhury and Squire (2005).

widespread disagreement among scientists about what is likely to happen. For that reason, we began with past exposure to climate-related physical hazards (see Table 1 for a list of data sources). Later in the paper, we included some early findings from our collaborative work with climate modellers, that aimed to provide a better job of mirroring past weather patterns in Africa and which produced data on timescales and indicators that would be more useful for policy audiences than existing global climate models.

Our map of climate hazard exposure shows that in the 10 countries under investigation (11 counting South Sudan), those most exposed to extreme climatic events are much of Sudan, pockets of western Ethiopia and northern Kenya, the Karamoja region of Uganda, part of the Somali coast surrounding Mogadishu, and two pockets in Tanzania, which correspond to the Serengeti National Park and Selous Game Reserve (see Figure 3, page 69). For the most part, these are areas that are already arid or semi-arid and where food security and livelihood are already tenuous and failing rains can have a more adverse effect.

Table 1: Climate related hazard exposure data

Hazard Type (weight)	Data Source	Year(s) of Data Used
Cyclone Winds (.17)	UNEP/GRID-Europe	1975-2007
Floods (.17)	UNEP/GRID-Europe	1999-2007
Wildfires (.17)	UNEP/GRID-Europe	1997-2008
Aridity (Coefficient of Variation) (.17)	UNEP/GRID-Europe	1951-2004
Droughts (.17)	Global Precipitation Climatology Center (GPCC)	1980-2004
Inundation (Coastal elevation) (.17)	USGS DEM	1996

However, where these effects occur in sparsely populated areas, like the Tanzanian parks, they may not generate great concern. Whether or not physical exposure to climate hazards actually translates into large-scale potential loss of life, damage, or security consequences, like those explored in this paper, ultimately depends on other factors, the first of which is whether large numbers of people live in an area that is physically vulnerable. Because this work focuses on the direct impact to human populations, we excluded unpopulated areas from our analysis.

Our population map, which relies on data from Landscan, show that the most densely populated areas in East Africa are central Ethiopia, the Great Lakes or Uganda, Kenya, Tanzania, Rwanda, and Burundi, and the area around Nairobi (see Figure 4, page 69).

We next created a map of household and community resilience and added it to climate related hazard exposure and population density (see Table 2 for data

sources). This basket includes eight national level indicators—two in each category. In the education basket are national level indicators for adult literacy rates and primary school enrolment rates. Similarly, we relied on national level indicators for the access to healthcare. These were national health expenditure per capita and nursing and midwifery density. The health basket includes a national level indicator for life expectancy at birth and a more finely tuned sub-national indicator for infant mortality rates. The daily necessities basket is the highest resolution with two sub-national indicators; percentage of underweight children from Center for International Earth Science Information Network (CIESIN) and an indicator of access to improved water sources, at the first-level administrative division that we constructed from USAID, UNICEF, and WHO household survey data.

As shown by Figure 5 (page 70), large areas and, in some cases entire countries—for example Sudan and Uganda—in this basket appeared in the same quintile even though there may have been some sub-national variation (see Figure 5). At the regional level, however, there was high variation between the IGAD/EAC countries. Uganda and Kenya are among the most resilient countries in Africa while Somalia and large areas of Ethiopia are some of the least resilient.

Our final basket measures the potential effectiveness of any governmental response during and after exposure to climate hazards and whether or not an extreme weather event becomes a disaster. Five variables comprise this basket: (1) government accountability, (2) government effectiveness, (3) global integration, (4) political stability, and (5) presence of political violence. We used national-level indicators for the first four variables to develop a national composite score for each variable. We combined these scores with sub-national data on political violence to create a final quintile score for individual grid cells (see Table 3 for data sources.)

Table 3: Governance and political violence data

Variable	Indicator (weight)	Source	Year(s)
Government Responsiveness	Voice & Accountability (.2)	World Governance Indicators	2008
Government Response Capacity	Government Effectiveness (.2)	World Governance Indicators	2008
Openness to External Assistance	Globalization Index (.2)	KOF Index of Globalization	2009
Government Stability	Polity Variance (.1)	Polity IV Project	2000 - 2009
	# of Stable Years (.1)	Polity IV Project	1855 - 2009
Presence of Violence	Battles & Violence against Civilians (.2)	Armed Conflict Location and Events Dataset (ACLED)	1997-2009

Table 2: Household and community resilience data

Variable (weight)	Indicator (weight)	Source	Years of Data Availability
Education (.25)	Literacy rate, adult total (% of people ages 15 and above) (.125)	World Development Indicators	2008; 2007 for Burkina Faso; 2006 for Algeria, Egypt, Mali and Senegal; 2005 for Niger; no data for Djibouti, Rep of Congo or Somalia
	School enrolment, primary (% gross) (.125)	World Development Indicators	2006–2009; 2004 for Gabon
Health (.25)	Infant mortality rate adjusted to national 2000 UNICEF rate (.125)	CIESIN	1991–2003
	Life expectancy at birth (years) both sexes (.125)	World Development Indicators	2008
Daily Necessities (.25)	Percentage of children underweight (more than two standard deviations below the mean weight-for-age score of the NCHS/CDC/WHO international reference population) (.125)	CIESIN	1991–2003
	Population with sustainable access to improved drinking water sources (%) total (.125)	USAID Demographic & Health Surveys; UNICEF Multiple Indicator Cluster Surveys; World Development Indicators	DHS 2000–2008; MICS 2005–2006; WDI 2008 for Algeria, Botswana, Cape Verde, Comoros, Eritrea, Mauritius and Tunisia; WDI 2005 for Equatorial Guinea; WDI 2000 for Libya
Access to Healthcare (.25)	Health expenditure per capita (current US$) (.125)	World Development Indicators	2007; 2005 for Zimbabwe; no data for Somalia
	Nursing and midwifery personnel density (per 10,000 population) (.125)	World Development Indicators	2004–2008; 2003 for Lesotho; 2002 for Kenya

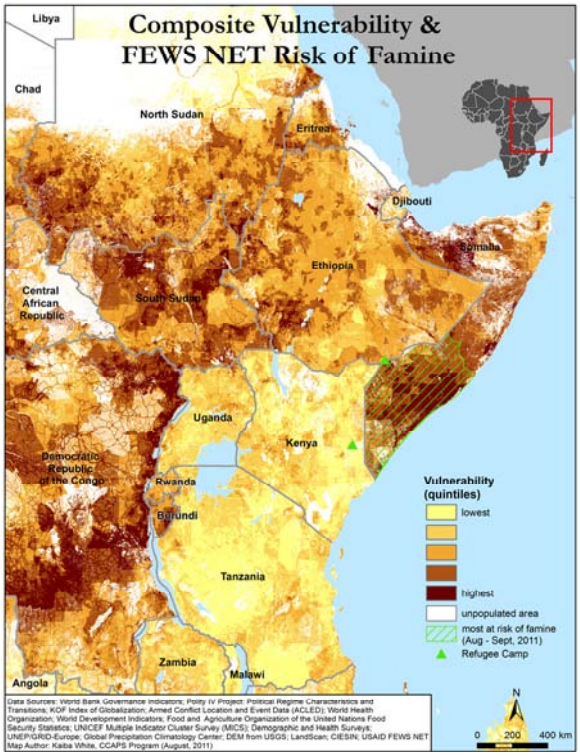


Figure 1: Composite vulnerability and FEWS NET risk of famine

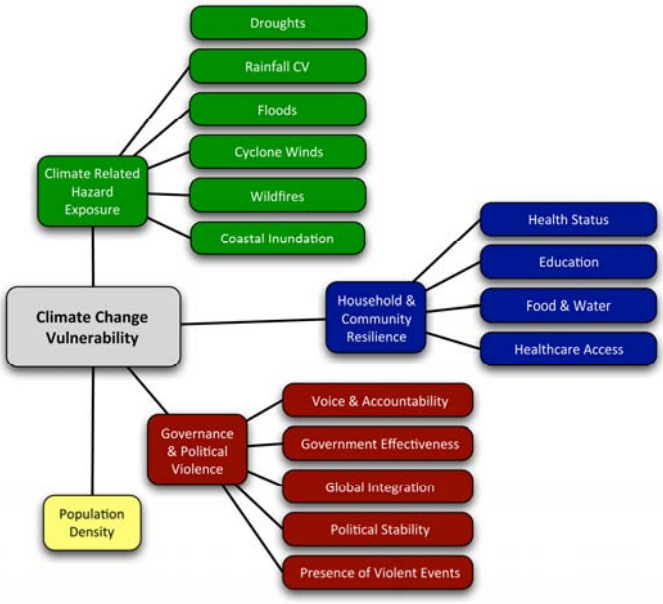


Figure 2: Composite vulnerability baskets and indicators

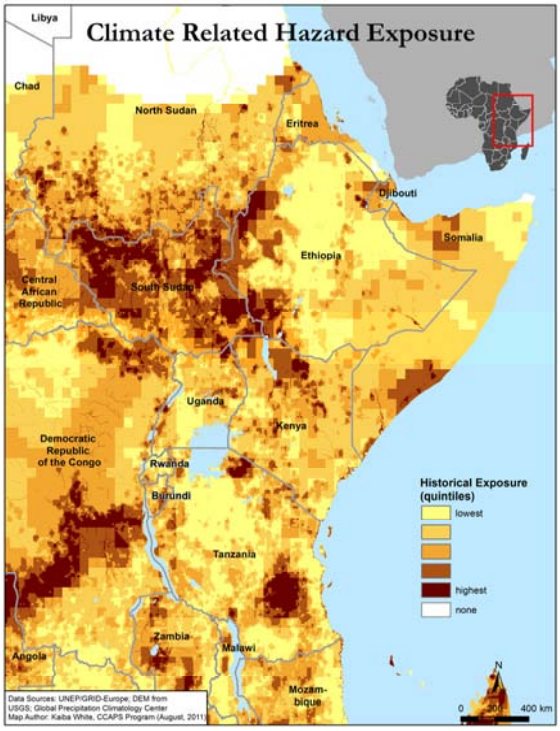


Figure 3: Climate related hazard exposure in East Africa

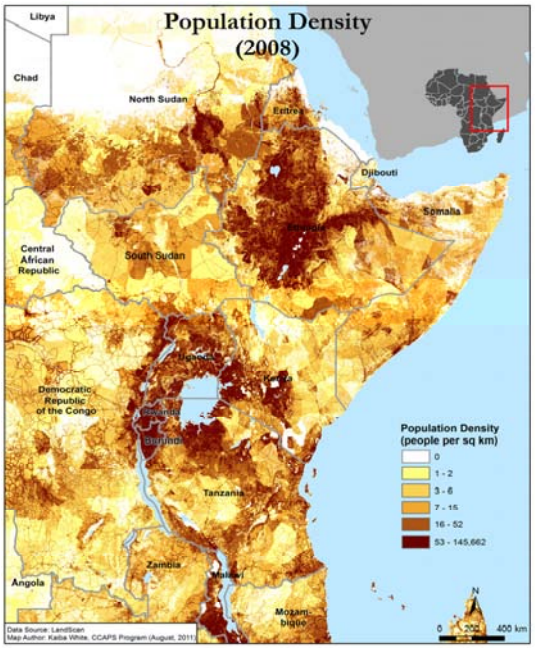


Figure 4: Population density

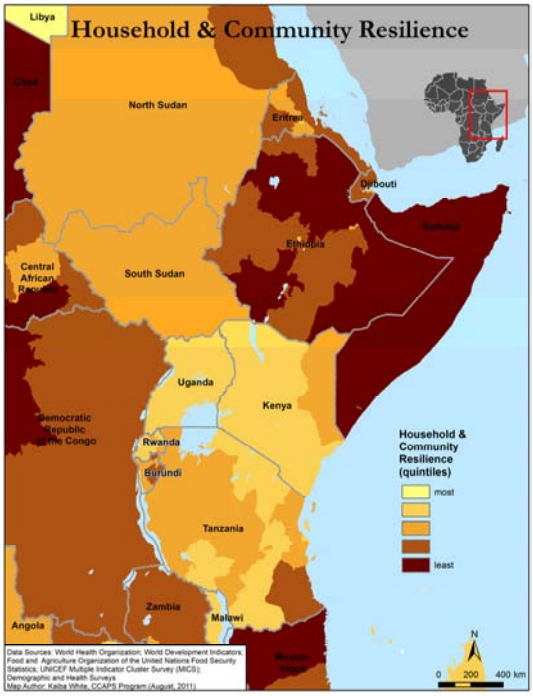


Figure 5: Household and community resilience in East Africa

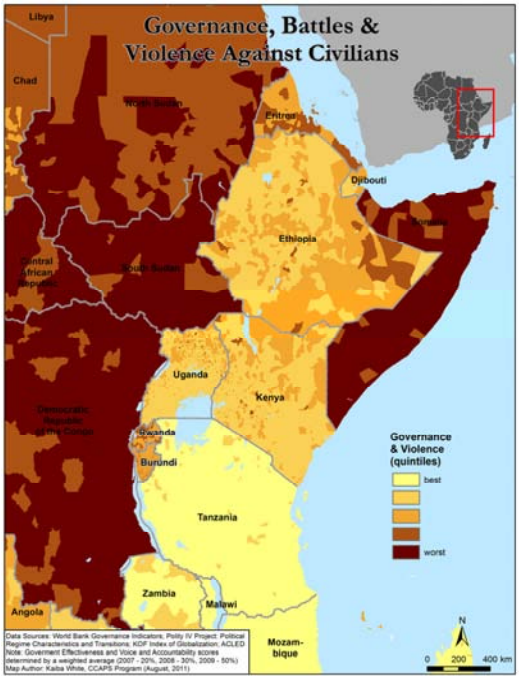


Figure 7: Governance, battle and violence against civilians

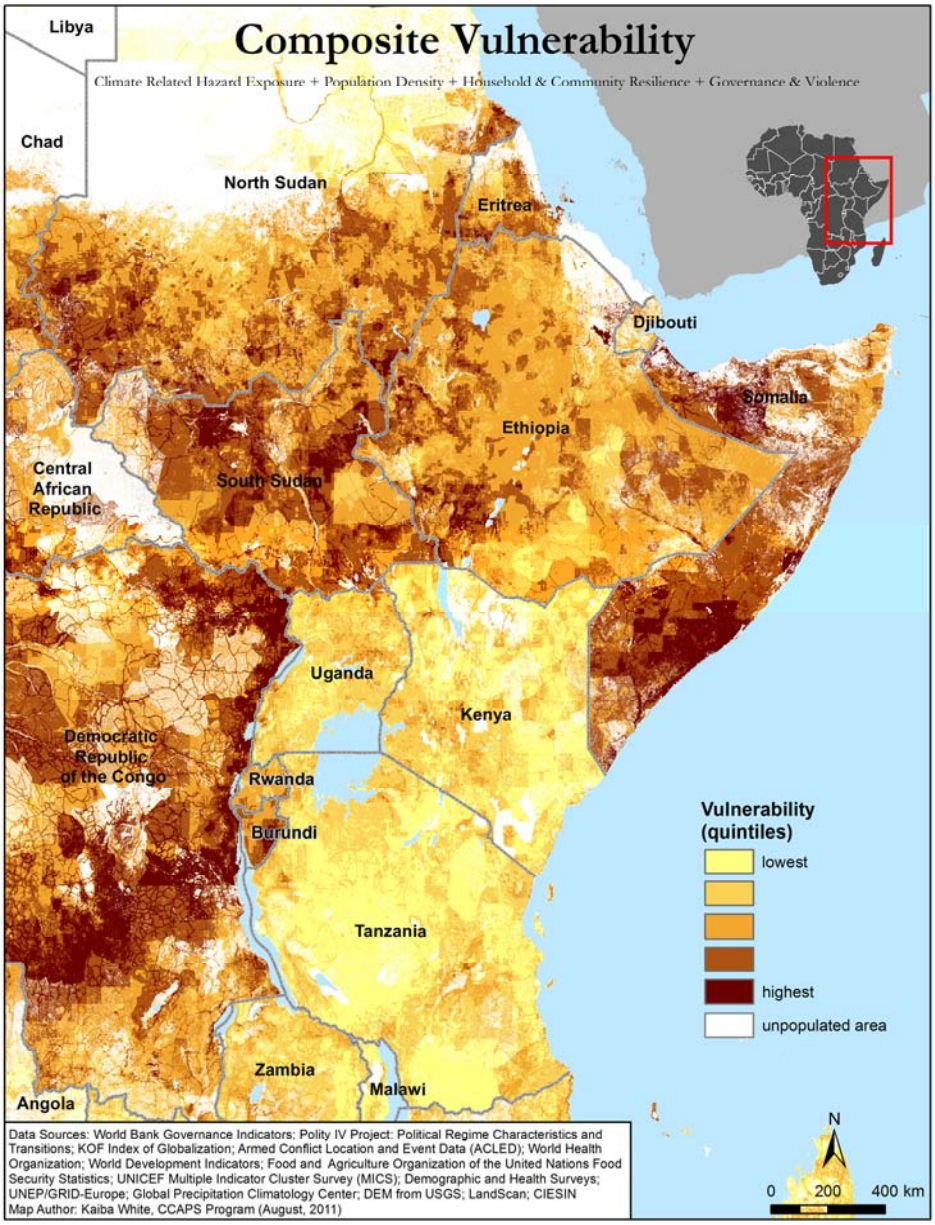
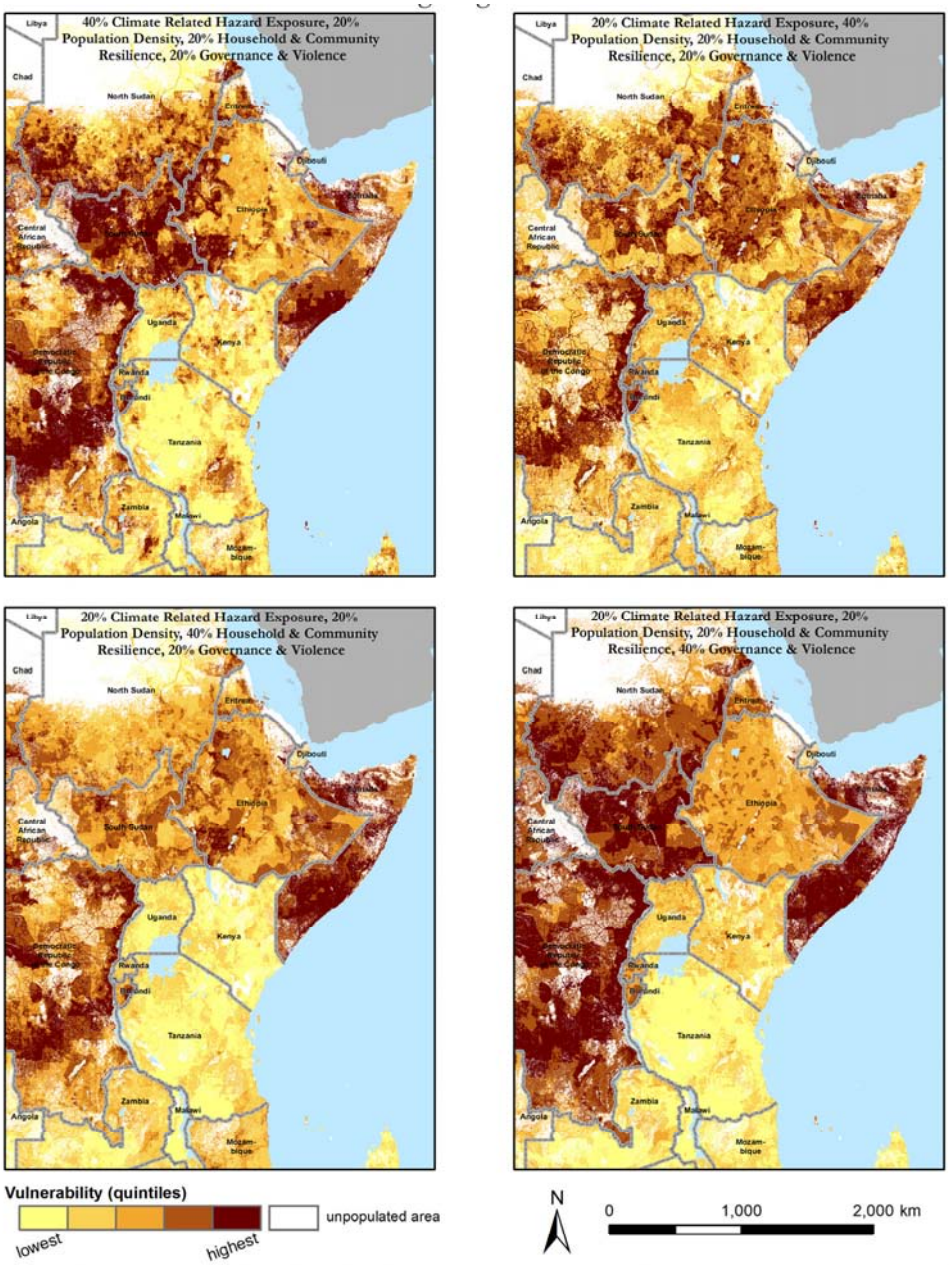


Figure 8: Composite vulnerability in East Africa



Data Sources: World Bank Governance Indicators; Polity IV Project: Political Regime Characteristics and Transitions; KOF Index of Globalization; Armed Conflict Location and Event Data (ACLED); World Health Organization; World Development Indicators; Food and Agriculture Organization of the United Nations Food Security Statistics; UNICEF Multiple Indicator Cluster Survey (MICS); Demographic and Health Surveys; UNEP/GRID-Europe; Global Precipitation Climatology Center; DEM from USGS; LandScan; CIESIN
Map Author: Kaiba White, CCAPS Program (October, 2011)

Figure 9: Composite vulnerability in East Africa using four weighing schemes

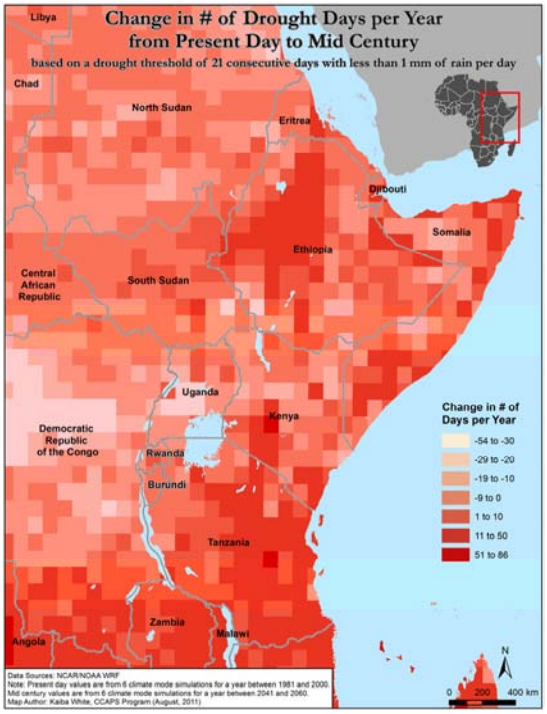


Figure 10: Change in number of drought days per year from present day to mid-century

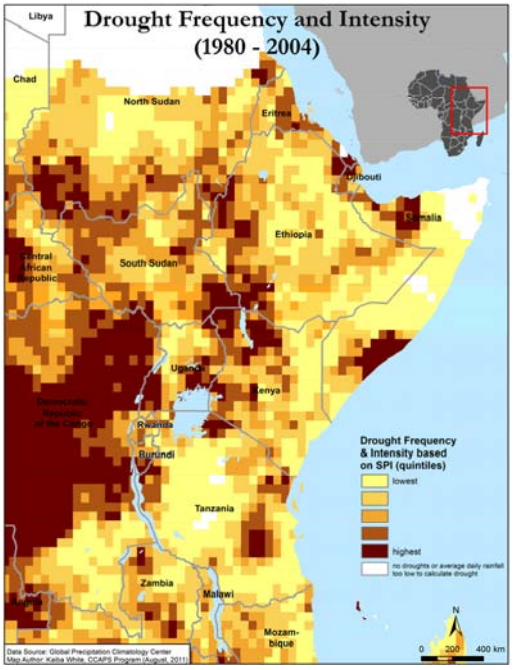


Figure 11: Drought frequency and intensity (1980-2004)

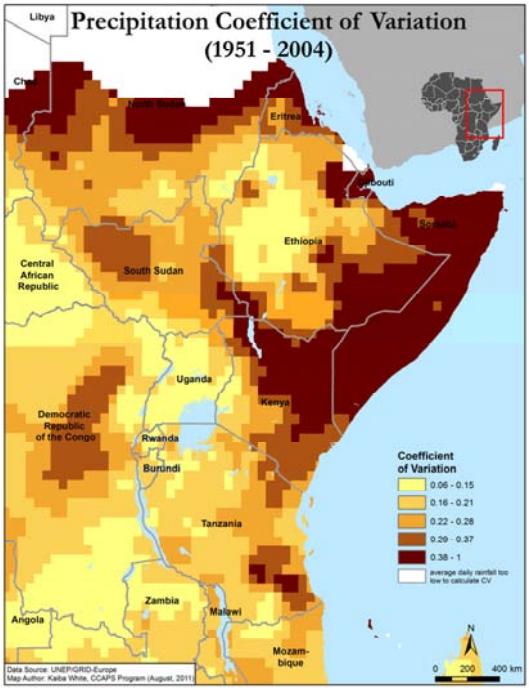


Figure 12: Precipitation coefficient of variation (1951-2004)

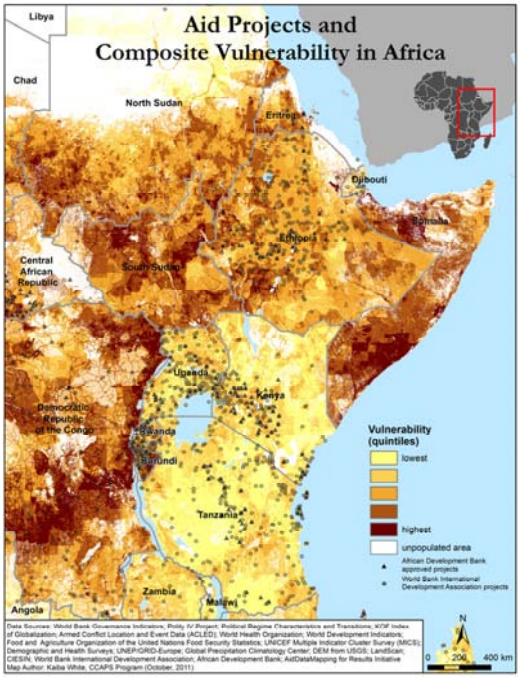


Figure 13: Aid projects and composite vulnerability in Africa

The chart of East African governance ratings in Figure 6 draws on national-level data of indicators of voice and accountability and government effectiveness, an index of global integration, and measures of political instability to rank IGAD and EAC countries against the rest of Africa. From this it is apparent that the region has suffered many governance challenges in recent history. Tanzania has the highest ranking governance in the region, but still ranks only 16th on the continent, largely due to limited integration into the global economy. Kenya has a better global integration score but suffers from recent political instability. Unsurprisingly, Somalia ranks 53rd, the worst on the continent and Sudan ranks 51st, very near the bottom. (In this chart, Sudan includes both Sudan and South Sudan).

When we incorporate sub-national data on battles and violence against civilians, Somalia and Sudan still remain in the worst quintile. Some sub-national variation becomes apparent. For example, the civil war against the Lord's Resistance Army in northern Uganda has left a legacy of instability that is still felt, and which is reflected in our maps (see Figure 7, page 70).

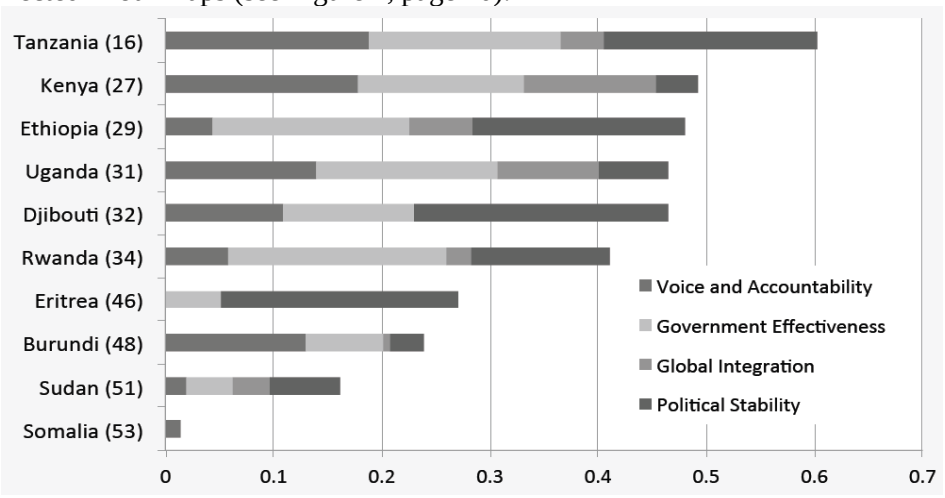


Figure 6: East Africa governance indicators

Putting these four baskets together, we arrive at a composite map of climate security vulnerability (see Figure 8, page 71). This map reveals that large parts of South Sudan, notably in Warrap and Jonglei states, and Southern Somalia, the area affected by the 2011 famine, are in the most vulnerable quintile. Other smaller pockets of high vulnerability are also noticeable in Western Ethiopia, Eritrea, Burundi, and the Karamoja triangle area of Uganda, Sudan, Kenya and Ethiopia.

This map of hot spots of chronic vulnerability is largely robust to what weights we attach to individual baskets. South Sudan and Southern Somalia appear particularly vulnerable across different model specifications (see Figure 9, page 72).

While these maps of chronic vulnerability provide a point of departure, places that have historically faced intense exposure to floods, droughts, and other climate related hazards might not be affected in the same way by climate change. Existing general circulation or global climate models have shown wide disagreement about the likely effects of climate change on the African continent.

Models agree that Southern and Northern Africa are likely to get drier, but elsewhere, including parts of East Africa, there is less consensus. Based on its review of multiple studies, the 2007 IPCC Fourth Assessment concluded: "There is likely to be an increase in annual mean rainfall in East Africa" (IPCC, 2007b). The A summary of model projections of rainfall by the IPCC report show nearly 20 models projecting higher rainfall over East Africa in most months.

Despite the apparent convergence of climate models, suggesting East Africa will become wetter with climate change, there are some reasons to be sceptical. First, there is less model convergence for all of East Africa. Moreover, the results reported by the IPCC are based primarily on global circulation model (GCM) projections, which may not be well suited to produce regional climate projections in all locations. Third, some studies suggest that East Africa may, in fact experience more episodes of drought in the future, and attribute the 2011 drought conditions to the emergent effects of climate change—rather than an especially strong La Niña episode. Geographer Chris Funk, along with colleagues from the U.S. Geologic Survey (which also advises FEWS NET), has made this argument most persuasively in a number of studies. In a 2011 paper, with A. Park Williams, he suggests drier conditions in East Africa will continue because of climate change (Williams & Funk, 2011). Funk attributed the lack of rain to warming over the eastern Indian Ocean and the extension of the Tropical Warm Pool, which originates in Indonesia:

> It's warmed about a degree over the last 30 or 40 years and maybe about half a degree over the last 20. But the reason that it's important is that it's already really, really warm. And so, as far as we can tell, that warming has triggered more rainfall over the central Indian Ocean. And that rainfall basically pulls in moisture from the surrounding area and prevents it from going onshore into Africa.
>
> The sea surface temperatures in the Indian Ocean are really well correlated with global temperatures. So, the past 150 years, as far as we can tell, the Indian Ocean has gone up and down very closely with global temperatures. I'm not sure that we fully understand why that is, but it seems to be an area that as we're experiencing global warming the Indian Ocean is warming up right in step with that.

His views are a bit more nuanced as he noted that other areas in East Africa might get wetter the closer they are to Lake Victoria (DeCapua, 2011).

Given the problems of global circulation models (GCMs) in validating local climate patterns at more fine-grained resolution, and the lack of model agreement for Africa broadly and East Africa in particular, we have worked to develop a regional climate model (RCM) for application over Africa. This model, which is derived from the National Centre for Atmospheric Research's Weather Research and Forecasting Model (WRF), aims to validate better than GCMs, meaning that the simulations of historic rainfall and temperature patterns are a closer fit with historic observed data (at least compared to GCMs). A reasonable validation of the historical rainfall and temperature patterns is viewed as a necessary but not a sufficient condition for a confident future prediction. While most GCMs focus on end of the 21st century projections of 2080-2099, our model focuses on mid-century projections; a time frame more relevant to policymakers.

While space forbids a more detailed discussion of the model, we have run a mid-21st century ensemble under the IPCC AR4 mid-line A1B emission scenario (see Cook and Vizy, 2012; Vizy and Cook, 2012 for a full description of the model design). We are currently in the process of developing multi-year simulations in an effort to capture dynamics in the seasonality of rains. Nonetheless, we can present some of the preliminary findings based on the initial ensemble. In terms of drought dynamics, which we define as 21 consecutive days with less than a 1mm of rain, we find a mixed picture in East Africa. Parts of the Somali coast are projected to experience an increase in drought days, as is much of western Ethiopia. However, large swaths of the region, including Central Uganda, Northern Kenya, and Eastern Ethiopia, are all projected to experience a significant decline in the number of drought days (see Figure 10, 73). We expect the next iteration of projections will provide more clarity about changes in the seasonality of rain, in terms of timing, intensity, and total amounts, as well as the mechanisms that affect these dynamics.

How well do these patterns of future drought match historic exposure? Here, two maps of historic rainfall patterns may be relevant: our maps of drought derived from the Standardized Precipitation Index (which captures rainfall anomalies) and our maps of the coefficient of variation, which does a better job at capturing areas of chronic water scarcity (see Figures 11 and 12, pages 73 and 74 respectively).

Both the patterns of historic droughts and chronic water scarcity are different from projections of future drought days. The areas of congruence are along the Somali coast. Of course, these measures of historic drought and water scarcity are based on slightly different indicators. It may be more valuable to have comparable before and after metrics for future analysis. Nonetheless, on the basis of our composite

maps, and the preliminary findings of our climate models, we are confident that Somalia's Southern coast will likely continue to experience continued exposure to climate hazards and, given its other problems, be particularly vulnerable in the future.

5. Policy implications

In light of these observations, what are the implications for policy? In the midst of an on-going humanitarian emergency in Somalia, there are a number of available short-run interventions that could prevent people from dying. However, a number of these short-run decisions have long-run implications for the recovery of the population and the future of the Somali state, and major implications for the rest of the region. Busby has written elsewhere about the short-run emergency needs of finance and access as well as the larger challenges of fostering a functioning Somali state (Busby, 2011).

Most observers have focused on the need for a longer-term development vision for the region, and indeed, if climate change will have deleterious effect on parts of East Africa, as our maps and models suggest, then long-run finance must be mobilised to help the region adapt. However, when one looks at the geographic location of active projects from the World Bank and the African Development Bank (AfDB) (across all sectors, not just adaptation-specific projects), overlaid on our climate security vulnerability maps, money is flowing to governments in the region—Kenya, Uganda, and Ethiopia—with the most capacity to absorb aid and spend the money well (see Figure 13, page 74).

By and large, multi-lateral donor assistance is not going to countries like Somalia and Sudan that may need it the most, in order to minimise the adverse consequences of climate change. With Somalia lacking a functioning government, and the Khartoum regime still largely an international pariah, these funding patterns are understandable, particularly since the Bank may be constrained to work with state actors rather than channel money directly to civil society, as many bilateral governments do.

Although the fledgling South Sudan is still struggling to build governmental capacity, it will be interesting to see how quickly aid patterns change. Of course, the World Bank and AfDB are just two donors and their actions may not reflect wider bilateral lending and giving patterns, but they are two very important donors and they often reflect broader donor tendencies. It must also be noted that this map may not be fully representative of spending patterns, since each dot represents a project rather than the amount involved. Some of the projects may account for a disproportionate amount of funding and per capita giving may be higher in some countries. Moreover, projects could be stacked in a single location, which is not

visible in this map. Nonetheless, the dearth of projects in Somalia and Sudan is important and raises the question of whether funding should be directed to countries that can spend the money well or to those that need it.

When we look at project commitments from the World Bank, in terms of dollar amounts, these trends are largely corroborated, with Somalia and Sudan receiving little or no assistance from the Bank and Ethiopia (somewhat vulnerable) and Tanzania (less vulnerable) receiving the largest volumes of assistance. Tanzania receives the largest Bank assistance per capita (see Table 4).[5]

How representative are World Bank projects of broader patterns of overseas development assistance? In terms of other donors, the portrait is mixed. When we look at AfDB projects by country, some similar patterns emerge, with projects concentrated in total dollar amounts and per capita terms in Ethiopia, Tanzania, and Kenya. According to AidData, a database of bilateral and multilateral donors and recipients of foreign assistance,[6] of the nearly $6 billion in African Development projects in 2009 and 2010, more than 40% was dedicated to two projects in Ethiopia, a project to improve electricity transmission and a smaller project to protect basic services. Another 28% was dedicated to Tanzania (AidData, 2010).

Table 4: World Bank active projects and total commitments as of February 3, 2011

Country	Active projects	Total amount ($US mil)	Per capita (2008 pop.)
Burundi	14	$414.8	$51.37
Djibouti	7	$50.9	$59.94
Eritrea	2	$75.3	$15.28
Ethiopia	32	$3669.9	$45.47
Kenya	33	$2166.96	$55.90
Rwanda	13	$460.88	$47.41
Somalia	0	$0	$0
Sudan	2	$13.7	$0.33
Tanzania	42	$3120.92	$73.46
Uganda	30	$1708.26	$53.96

Source: World Bank

[5] It should be noted that there are some multi-country World Bank projects not reflected in Table 6. There are an additional 11 projects totalling $877.5 million. All of these projects are located in the EAC region, except for two that include Somalia. Both of those are fisheries projects in the Indian Ocean, which list Somalia, Kenya and Tanzania as recipients.

[6] AidData is a database of bilateral and multilateral donors and recipients of foreign assistance. It includes traditional OECD donor countries as well as non-traditional bilateral donors, such as Brazil and China and 15 multilateral lending agencies.

However, as the earlier discussion of U.S. disaster spending noted, both Sudan and Somalia have been major recipients of humanitarian assistance. When we looked at AidData statistics of spending for all multilateral and bilateral donors, for which information was available, we found more significant spending in Somalia and Sudan across all sectors (see Table 6).

Table 5: African Development Bank active projects and total commitments, 2009-2010

Country	Active projects	Total amount ($US mil)	Per capita (2008 pop.)
Burundi	2	$75.265	$9.32
Djibouti	0	$0.00	$0.00
Eritrea	1	$15.66	$3.18
Ethiopia	2	$2,474.10	$30.65
Kenya	7	$1,490.09	$38.44
Rwanda	6	$121.61	$12.51
Somalia	0	$0	$0.00
Sudan	0	$0.00	$0.00
Tanzania	7	$1,648.88	$38.81
Uganda	3	$164.50	$5.20

Source: African Development Bank

In terms of spending on climate adaptation, a cursory approach defined adaptation in two ways, a broad definition and a narrow definition.[7] Broadly defined, adaptation projects nearly encompassed the majority of the projects, while narrowly defined very few of the projects in the region were adaptation-related.

[7] The aid community has yet to agree upon a definition for climate change adaptation aid. Rather, several actors have proposed schemes that classify aid based either on purpose or effect. AidData and other CCAPS researchers have worked to code aid projects according to these classification schemes. The broad definition of adaptation aid is based on the assumption that populations are better able to cope with the consequences of climate change when they are healthier and better educated and when they have more diverse livelihoods and access to better transportation, shelter and production infrastructure. Therefore, many traditional development projects qualify as adaptation aid under this broad definition. In contrast, only projects that directly seek to control or lessen the expected consequences of climate change qualify as adaptation aid under the narrow definition. Examples of such projects are promotion of drought resistant crops in areas that are expected to receive reduced rainfall in the future or construction of seawalls to protect against rising sea levels or saltwater intrusion in low-lying coastal areas. For more information on these definitions see Weaver and Peratsakis (2010).

Table 6: EAC & IGAD member countries 2008 population and development assistance (2008 US dollars)

Country	EAC	IGAD	Total POP	Development assistance – All sectors		Adaptation aid – Broadly defined		Adaptation aid – Narrowly defined	
				Total	Per capita	Total	Per capita	Total	Per capita
Burundi	✔		8,074,254	$633,643,333	$78	$426,211,623	$53	$287	$0.00
Djibouti		✔	849,245	$192,992,857	$227	$56,102,958	$66	$0	$0.00
Eritrea		*	4,926,877	$97,076,653	$20	$78,015,909	$16	$0	$0.00
Ethiopia		✔	80,713,434	$3,485,996,812	$43	$2,993,246,564	$37	$1,944,043	$0.02
Kenya	✔	✔	38,765,312	$1,509,301,522	$39	$1,353,865,469	$35	$6,690,913	$0.17
Rwanda	✔		9,720,694	$923,401,924	$95	$511,238,640	$53	$978,230	$0.10
Somalia		✔	8,926,326	$854,082,849	$96	$813,887,417	$91	$0	$0.00
Sudan		✔	41,415,151	$2,447,709,292	$59	$2,202,827,901	$53	$58,963	$0.00
Tanzania	✔		42,483,923	$2,773,472,742	$65	$1,211,419,222	$29	$113,738	$0.00
Uganda	✔	✔	31,656,865	$1,978,660,970	$63	$1,345,334,894	$42	$188,095	$0.01
EAC			130,701,048	$7,818,480,491	$60	$4,848,069,848	$37	$7,971,264	$0.06
IGAD**			207,253,210	$10,565,820,956	$51	$8,843,281,112	$43	$8,882,014	$0.04

* – IGAD membership suspended in 2007; re-admittance currently under consideration
** – including Eritrea
Sources: UN World Population Projections; AidData

6. Conclusion

Space prevents a more detailed examination of donor giving trends in foreign assistance, but it is fair to say that support for the most vulnerable countries in the region, such as Somalia and Sudan, has been directed towards emergency crisis response rather than long-term developmental needs. Because these countries, especially their conflict-ridden southern regions, are subject to recurrent problems, including exposure to climate related hazards, and the absence of investment in long-term development programs to enhance their resilience, emergency relief efforts every few years is required on a massive scale. The neighbouring countries in the region, including Ethiopia, Uganda and Kenya, have created relatively better social safety nets, food for work schemes, income support, investment in agriculture, and income diversification programs, which meant that the 2011 drought had a less severe impact on affected communities. Still, these countries continue to suffer detrimental spill-over effects from their less developed neighbours, such as a large influx of refugees. The maps of chronic vulnerability in this paper suggest that the agro-pastoralist zones of Southern Somalia and South Sudan, among other areas of East Africa, are particularly vulnerable to recurrent crisis, given the confluence of physical exposure of large numbers of people in communities that lack local resilience, and in states that lack capacity or the willingness to assist the population in times of need. In light of these findings, and the existing sources of foreign assistance and relief, these maps raise a number of questions about where and for what future foreign assistance ought to be directed. They are, nevertheless, merely a starting point for these discussions and should not be considered conclusive distribution plans.

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Pastoralist Cultural Responses to Climate Variations Potentially Contributing to Drought Conditions in Northern Kenya

Russell F. Schimmer, Roland A. Geerken, and Yancey A. Orr

Abstract

During the period 2007-2010, pastoralists in the semiarid region of Northern Kenya and south western Somalia reported progressively severe drought conditions. Locals complained of diminishing water resources and some groups reportedly came into conflict while competing to sustain economically vital livestock herds. To understand the relationship between precipitation, environmental stress, and cultural responses in the region, we analysed climate records over 10, 20 and 60-year spans. Remarkably, years of below-average rainfall (RF) do not highly correlate with years with recorded drought. Even more surprisingly, in some cases vegetation vigour recorded by the Normalised Difference Vegetation Index (NDVI) was negatively related to precipitation increases, which is an indication that resource management is a key factor for the maintenance of environmental integrity. The absence of a consistent relationship between RF and drought, in addition to the importance of livestock grazing and herd sizes on vegetation health and water resources in the region, implies that the number and management of livestock in Northern Kenya are determinants which influence environmental vulnerability. We argue that traditional resource management practices, as cultural responses to multi-year climate cycles, can contribute to the frequency and severity of drought events. The most important responses that set the conditions for drought occurrences likely take place during average RF periods and above-average RF years, when environmental conditions are suitable for increasing herd sizes.

1. Introduction

It is innately difficult to form hypotheses, let alone conclusions, about regions described as socio-politically and environmentally complex. Many regions in the Horn of Africa are such places. We looked to available documented materials and scientific data to find a starting point to understand how rainfall, climate change, herding, and social systems interacted to produce such an extreme form of suffering as drought and famine. From these data, we derived a 60-year narrative of climate and cultural responses in the pastoralists' region of semiarid Northern Kenya (Figure 1).

During the period 2007–2010, pastoralists in the region of Northern Kenya and south western Somalia reported progressively severe drought conditions. Neighbouring tribes, e.g. Pokot, Borana, and Turkana, complained of diminishing water resources and some groups were reported to have come into conflict while

competing to sustain economically vital livestock herds. Locals named unpredictable seasonal rains and decreased rainfall (RF) as reasons which contributed to these stressful environmental conditions.

For many pastoralists of this region, the number of livestock owned by an individual, household, or community is a sign of wealth. Livestock, specifically goats, also offer a far better return on investment, even after drought, than other forms of investment, such as interest from local banks (McPeak, 2005). Sustaining or increasing herd size is a priority for a family's unity and survival (Henriksen, 1974). Thus, traditional cultural responses (McCabe, 2004) and economic rationality (McPeak, 2005) promote propagating livestock herds whenever environmental conditions are suitable. However, these anthropogenic responses to short-term climatic oscillations can contribute to environmental stress and subsequent losses of livestock and exacerbate social tensions and regional instability.

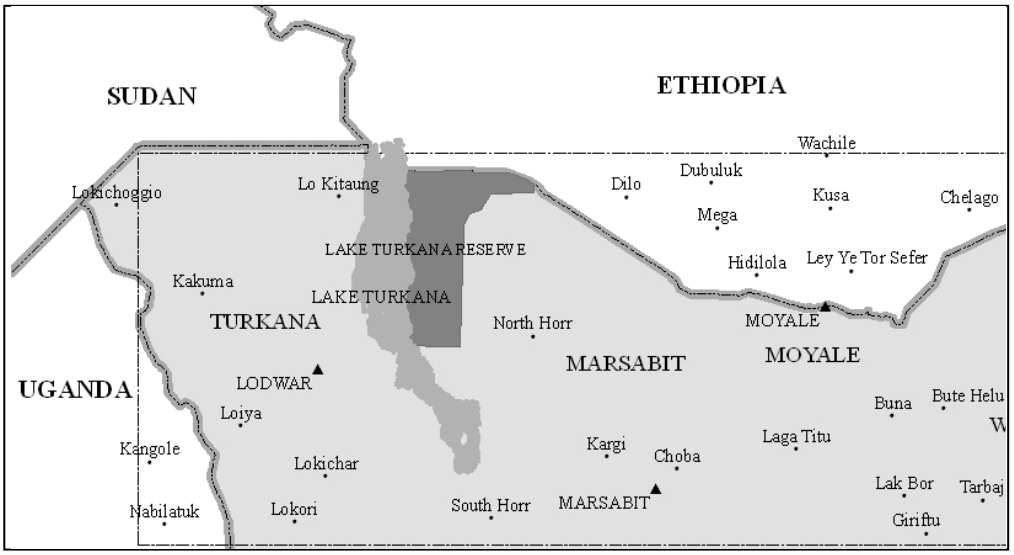


Fig. 1: Research Area

We examined RF estimates for the region during the period 2001–2010 using Meteosat Rainfall Estimates (RFE). In addition, we examined NDVI estimates for the region using Moderate Resolution Imaging Spectroradiometer (MODIS) products. An expected correlation response of NDVI to RF is conformity; i.e. in an equilibrium system NDVI is expected to increase with increased RF. By combining RF and NDVI analyses with cultural responses and historical records, it is possible to study human interactions with environmental change and potential contributing factors to events such as drought.

For the examination of longer climate trends, we used rain station-based estimates over a 60-year period, 1948–2007, a product prepared by the Global Precipitation

Climatology Centre (GPCC). Using Advanced Very High Resolution Radiometer (AVHRR) NDVI products we analysed vegetation responses to GPCC estimates for a 25-year period, 1982–2006. By categorising drought events based on these historical data, we determined that the most recent drought event (2007–2010) could not be attributed to climate alone. We suggest that normative cultural responses contributed to the duration and severity of this prolonged drought event.

2. Methods and Materials

2.1 Research area

We studied an area that covered the five major districts of Northern Kenya, viz. Turkana, Marsabit, Moyale, Wajir, and Mandera (Figure 1). This is a particularly fragile environment inhabited primarily by agricultural and pastoral groups. It is a region that experienced a prolonged drought from 2007 to 2010. The research area covers ~255,000 km^2. The climate is classified as semiarid and the predominant biome is semiarid desert. The dominant land cover types are Northern Acacia-Commiphora bushlands and thickets in the western districts; Masai-Xeric grasslands and shrublands in the central districts; Somali Acacia-Commiphora bushlands and thickets in the eastern districts; and East African Montane Forests sporadic throughout but mostly in the west. Lake Turkana and the Lake Turkana Reserve are dominant features in the northwest. We used two RF-measuring products and two vegetation-monitoring products to analyse intra- and inter-annual trends of RF correlations to recorded drought events and vegetation responses over a 60-year period in the study region.

2.2 Rainfall (RF) data

In the expansive and sparsely populated districts of Northern Kenya obtaining accurate RF data is problematic. Because of limited availability of point station data, satellite acquired data offers a reliable source of information for precipitation. For Africa, several products are available that differ in spatial resolution, temporal resolution, and temporal coverage. We examined two available products, Deutscher Wetterdienst (DWD) Global Precipitation Climatology Centre (GPCC) estimates and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)'s Meteosat rainfall estimation (RFE). A third product, the National Aeronautics and Space Administration (NASA)'s Tropical Rainfall Measuring Mission (TRMM), also provides RF data for the region, but we do not include those findings in this report, primarily because TRMM pixel sizes are over six times larger than RFE and temporally cover about the same period (TRMM 1998–2010 and RFE 2001–2010).

Satellite-based data sets have advantages and disadvantages if compared with in situ measured station data. For example, satellite data acquisition ensures spatial and temporal homogeneity and comparability, and available products often offer adequate spatial precipitation variations, unbiased by interpolation procedures that typically do not consider e.g. topographic influences on RF distribution. These data

are particularly useful for temporal and spatial trend analyses. Thus, these precipitation products provide more reliable temporal and spatial continuity in certain regions of the world where RF stations are widely dispersed or station records are unreliable. For example, we examined station data from five locations,[1] Lodwar, Marsabit, Wajir, Moyale, and Mandera, for the period 1976–2010 (Figure 1). We found unexplainable gaps in the station records and discontinuity with the other two precipitation data sets (Figure 2).

Although many satellite climate-monitoring products use station data for calibrating satellite acquired precipitation amounts, the main disadvantage to these precipitation products is that, unlike reliable station records, these products provide information about "precipitable water" in the atmosphere. These estimates may not be synonymous with the actual precipitation reaching the ground. Thus, the mean RF values reported here should not be considered as actual ground level accumulations but representative of these accumulations. We calculated an "annual RF mean" on daily or monthly records comprising a calendar year, and we calculated a multi-year record from the average of annual means for that period. We use the term "RF period" to describe a temporal unit either longer than a year or which traverses parts of two subsequent years, thus distinguishing a period from a calendar year.

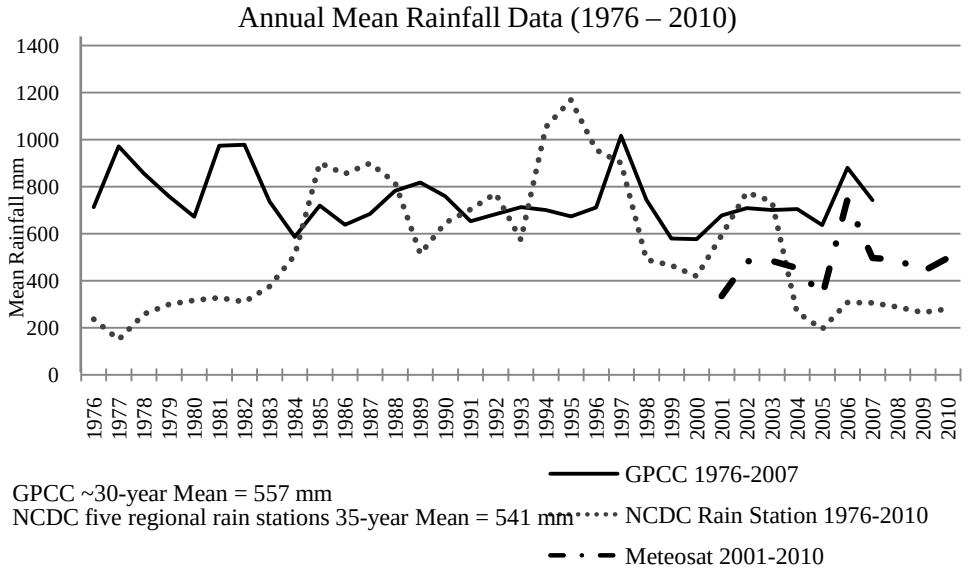


Figure 2: Annual mean rainfall data, GPCC, NCDC, Meteosat
[a] These data were provided by NOAA's National Climate Data Center (NCDC). http://gis.ncdc.noaa.gov/map/isd/

[1] NOAA's National Climate Data Center (NCDC) provided these data. http://gis.ncdc.noaa.gov/map/isd/

2.3 GPCC and RFE estimates

Temporal coverage of the GPCC data set starts in January 1901,[2] making it particularly suitable for monitoring long-term precipitation variations and trends. Due to its coarse temporal (monthly) and spatial resolution (0.5^o – 2.5^o), the data are less suited for local studies but rather for regional, including large watershed or basin analyses. For this study, we used GPCC's version 004 product produced at the 0.5^o resolution, or pixel area of ~ 3080 km^2, and covering the period from 1901 to 2007. The data set is a reanalyses product based on interpolation of measurements from station data. Temporal coverage for the RFE daily product we used in this study starts in January 2001.[3] RFE data are available in different temporal intervals, e.g. daily and decadal, and spatial resolutions. The daily product we used for this research has a spatial resolution of ~ 120 km^2 pixel area.

2.4 NDVI

In addition to RF, we examined two NDVI estimates for the region captured by multispectral satellite instruments, NASA's MODIS-Vegetation and the National Oceanic and Atmospheric Administration (NOAA)'s Advanced Very High Resolution Radiometer (AVHRR). Since 1982, NOAA's AVHRR has captured daily spectral data suitable for NDVI in the visible (0.58–0.68 μ) and near infrared (0.725–1.10 μ) ranges of the electromagnetic spectrum with global coverage in an 8 km spatial resolution (64 km^2 pixel size).[4] NASA's Terra missions include the MODIS instrument, which collects NDVI data globally on a one-to-two day basis at a 250 m spatial resolution (0.0625 km^2 pixel size).[5]

Intra- and inter-annual changes in NDVI prove a reliable monitor for plant growth (vigour), vegetation cover, and biomass production, from multispectral satellite data produced in nearly cloud-free weekly and bi-weekly composites. The principle behind NDVI is that chlorophyll causes considerable absorption of incoming sunlight visual light in the red-light region of the electromagnetic spectrum, whereas a plant's spongy mesophyll leaf structure creates considerable reflectance in the near-infrared region of the spectrum (Tucker, 1979; Jackson et al., 1983; Tucker et al., 1991). As a result, vigorously growing healthy vegetation has low red-light reflectance and high near-infrared reflectance, hence high NDVI values. The algorithm produces output values in the range of -1.0 to 1.0. Increasing positive NDVI values indicate increasing amounts of green vegetation. NDVI values near zero, and decreasing negative values, indicate non-vegetated features, such as barren surfaces (rock and soil), water, snow, ice, and clouds.

[2] http://kunden.dwd.de/GPCC/Visualizer
[3] http://earlywarning.usgs.gov/fews/africa/web/dwndailyrfe.php
[4] http://phenology.cr.usgs.gov/ndvi_avhrr.php
[5] http://modis.gsfc.nasa.gov/about/

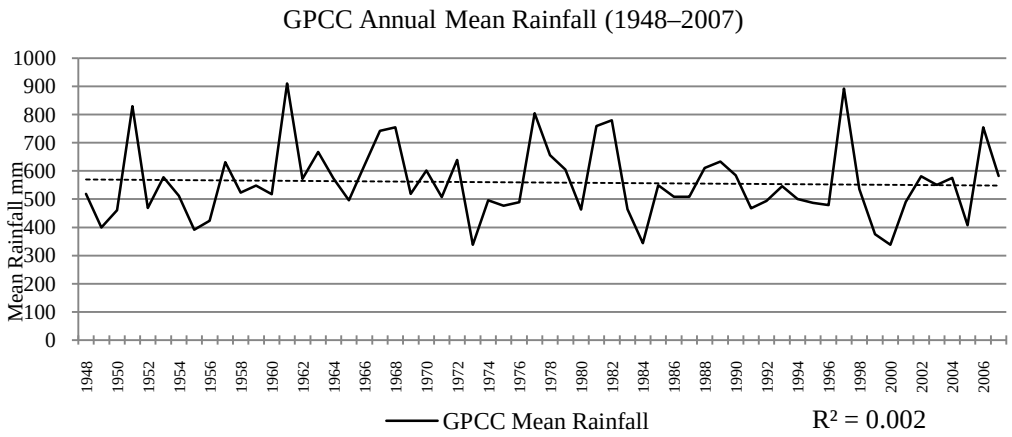
3. Findings

3.1 The GPCC Sixty-Year Rainfall Record (1948–2007)

Although the GPCC, 0.5 ^{o} RF data set covers the period 1901–2007, we chose to examine a 60-year period from 1948 to 2007 (Figure 3) for the purpose of this study, as a statistically suitable sample which both honours the Central Limit Theory and is within and individual's life-span (Table 1). The GPCC 107-year mean RF is 560 mm and the 60-year mean is 559 mm; essentially equal. Thus, mean RF during the 20th century and first decade of the 21st century is nearly unchanged. A time series trend analysis of the GPCC estimates for the period 1948–2007 results in a negative fitted trend equation, $Y_t = 569.492 - 0.357768*t$, with mean absolute percentage error (MAPE) of 18.3%. Although this is a mild negative trend, the most recent 20 years (1988–2007) have a mean RF decrease of 10% (544 mm) from the 60-year mean (559 mm). In addition, the data are not normally distributed (Figure 4), p-value < 0.005 at 95% C.I., and contain three mild outliers for the above-average RF years 1951, 1961, and 1997 (Figure 5).

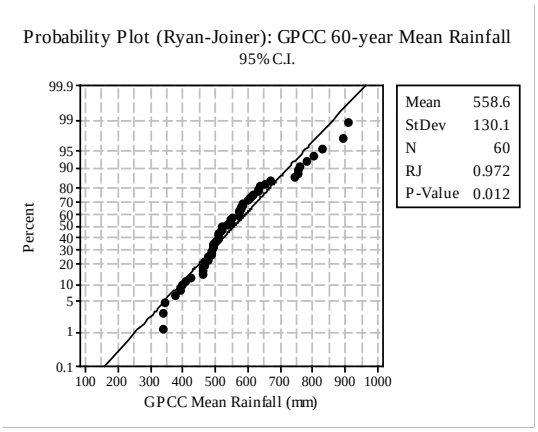
In the districts of Northern Kenya from 1948 to 2007, United Nations agencies and their sources have recorded 25 years as experiencing drought events (Table 1) (UNDP, 2004), and the period from 2007 to 2010 is essentially a period of continuous drought (see UNICEF Humanitarian Action Reports, Kenya). Thus, we further divided the RF data among three 20-year periods because time series patterns of droughts revealed clustering in three 20-year periods, 1948–1967, 1968–1987, and 1988–2007 (Table 2). Furthermore, each of these periods contains at least one year with RF $\geq$ 40% of the 60-year mean (1951, 1961, 1977, 1982, and 1997), of which three are mild outliers (1961, 1981, and 1997). Although not statistical outliers, mean RF for the years 1973 and 2000 were $\leq$ -40% of the 60-year mean. According to the Oceanic Niño Index (ONI),[6] 1951 and 1977 were weak El Niño years; 1997 was a strong El Niño year; 2000 a weak La Niña year; and 2007 a moderate La Niña year.

[6]http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/; http://ggweather.com/enso/oni.htm



GPCC Mean (1948 - 2007) = 559 mm
GPCC Mean (1948 - 1967) = 569 mm (+2%)
GPCC Mean (1968 - 1987) = 563 mm (+1%)
GPCC Mean (1988 - 2007) = 544 mm (-10%)

Figure 3: GPCC annual mean rainfall (1948–2007)



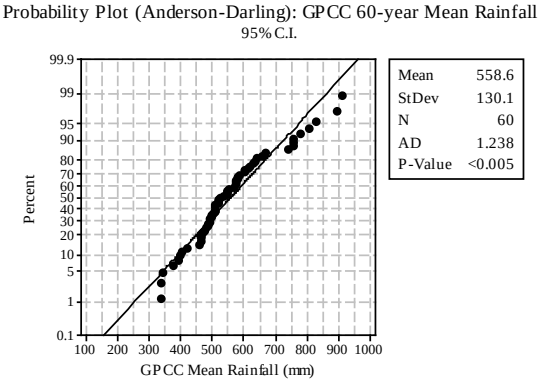


Figure 4: GPCC probability plot (Ryan-Joiner) and GPCC probability plot (Anderson-Darling)

Table 1: GPCC RF estimates, 1901–2007

Year	Comments[a]	Drought Category	Annual Mean Rainfall (mm)	% 60-year Mean	% 60-year Mean 5% Threshold	% 60-year Mean 10% Threshold	Mean LR Jan.-June	Mean SR July-Dec.
1901			508	-9	-9	0		
1902			617	10	10	10		
1903			766	37	37	37		
1904			477	-15	-15	-15		
1905			658	18	18	18		
1906			793	42	42	42		
1907			569	2	0	0		
1908			524	-6	-6	0		
1909			685	23	23	23		
1910			499	-11	-11	-11		
1911			536	-4	0	0		
1912			593	6	6	0		
1913			603	8	8	0		
1914			768	38	38	38		
1915			547	-2	0	0		
1916			708	27	27	27		
1917			690	23	23	23		
1918			423	-24	-24	-24		
1919			424	-24	-24	-24		
1920			573	3	0	0		
1921			382	-32	-32	-32		
1922			417	-25	-25	-25		
1923			776	39	39	39		
1924			497	-11	-11	-11		
1925	Northern Rift Valley[b]		610	9	9	0		
1926			665	19	19	19		
1927			403	-28	-28	-28		
1928			461	-17	-17	-17		
1929			492	-12	-12	-12		
1930			677	21	21	21		
1931			469	-16	-16	-16		
1932			477	-15	-15	-15		
1933			360	-35	-35	-35		
1934			529	-5	-5	0		
1935			572	2	0	0		
1936			643	15	15	15		
1937			630	13	13	13		

Year	Comments[a]	Drought Category	Annual Mean Rainfall (mm)	% 60-year Mean	% 60-year Mean 5% Threshold	% 60-year Mean 10% Threshold	Mean LR Jan.-June	Mean SR July-Dec.
1938	Widespread [b]		433	-22	-22	-22		
1939	Widespread [b]		485	-13	-13	-13		
1940			648	16	16	16		
1941			676	21	21	21		
1942			516	-8	-8	0		
1943			439	-21	-21	-21		
1944			620	11	11	11		
1945			507	-9	-9	0		
1946			454	-19	-19	-19		
1947			657	18	18	18		
1948			519	-7	-7	0	241	247
1949			399	-29	-29	-29	193	150
1950			460	-18	-18	-18	316	102
1951			830	49	49	49	395	390
1952	Droughts followed by floods, cattle mortality ~70-80 % in Maasai land [b]	1	468	-16	-16	-16	242	190
1953	Droughts followed by floods, cattle mortality ~70-80 % in Maasai land [b]	4	577	3	0	0	304	250
1954	Droughts followed by floods, cattle mortality ~70-80 % in Maasai land [b]	4	511	-8	-8	0	301	170
1955	Droughts followed by floods, cattle mortality ~70-80 % in Maasai land [b]	4	391	-30	-30	-30	182	170
1956			423	-24	-24	-24	257	161

Year	Comments[a]	Drought Category	Annual Mean Rainfall (mm)	% 60-year Mean	% 60-year Mean 5% Threshold	% 60-year Mean 10% Threshold	Mean LR Jan.-June	Mean SR July-Dec.
1957			631	13	13	13	385	227
1958			523	-6	-6	0	305	184
1959			548	-2	0	0	347	158
1960	Drought widespread [b]	3	517	-7	-7	0	339	178
1961	Drought widespread [b]	3	911	63	63	63	263	596
1962			572	2	0	0	328	221
1963			667	19	19	19	346	299
1964			573	3	0	0	321	234
1965			495	-11	-11	-11	195	265
1966			618	11	11	11	340	211
1967			742	33	33	33	350	340
1968			755	35	35	35	418	327
1969			519	-7	-7	0	298	202
1970			602	8	8	0	421	115
1971			507	-9	-9	0	263	229
1972	Drought widespread; human-livestock deaths northern districts; Massai cattle losses ~80% [b]	3	638	14	14	14	301	282
1973	Drought northern and eastern-central provinces [b]	4	337	-40	-40	-40	118	163
1974	Drought northern and eastern-central provinces [b]	4	496	-11	-11	-11	279	159
1975	Drought widespread [b]	4	476	-15	-15	-15	263	155

Year	Comments[a]	Drought Category	Annual Mean Rainfall (mm)	% 60-year Mean	% 60-year Mean 5% Threshold	% 60-year Mean 10% Threshold	Mean LR Jan.-June	Mean SR July-Dec.
1976			489	-12	-12	-12	229	183
1977	Drought widespread [b]	2	804	44	44	44	366	388
1978			655	17	17	17	342	291
1979			605	8	8	0	386	198
1980	Drought widespread [b]	1	463	-17	-17	-17	239	169
1981	Drought widespread[b]	4	760	36	36	36	547	182
1982			780	40	40	40	420	334
1983	Drought widespread [b]	1	464	-17	-17	-17	237	164
1984	Drought north-eastern, central, Rift Valley, and eastern provinces [b]	4	343	-39	-39	-39	145	160
1985			549	-2	0	0	396	147
1986			508	-9	-9	0	270	181
1987			508	-9	-9	0	343	111
1988			611	9	9	0	333	248
1989			633	13	13	13	344	250
1990			584	5	5	0	399	188
1991	Drought northern, central, eastern provinces [b]	1	467	-16	-16	-16	265	160
1992	Drought northern, central, eastern provinces [b]	4	494	-12	-12	-12	186	262
1993			545	-2	0	0	427	111

Year	Comments[a]	Drought Category	Annual Mean Rainfall (mm)	% 60-year Mean	% 60-year Mean 5% Threshold	% 60-year Mean 10% Threshold	Mean LR Jan.-June	Mean SR July-Dec.
1994	Drought northern, central, eastern provinces [b]	1	500	-10	-10	-10	190	262
1995	Drought widespread [b]	4	486	-13	-13	-13	287	189
1996	Drought widespread [b]	4	479	-14	-14	-14	270	135
1997	El Nino		892	60	60	60	260	683
1998			535	-4	0	0	394	119
1999	Drought widespread [b]	1	375	-33	-33	-33	172	184
2000	Drought widespread [b]	4	338	-40	-40	-40	103	173
2001			490	-12	-12	-12	238	196
2002			581	4	0	0	277	282
2003			550	-1	0	0	334	197
2004	Drought widespread [b]	3	575	3	0	0	282	268
2005	Drought widespread [c]	4	407	-27	-27	-27	250	104
2006			755	35	35	35	307	428
2007	Drought northern provinces [d]	3	582	4	0	0	243	279
Year	Comments[a]	Drought Category	Annual Mean Rainfall (mm)	% 60-year Mean	% 60-year Mean 5% Threshold	% 60-year Mean 10% Threshold	Mean LR Jan.-June	Mean SR July-Dec.
107-year Mean (1901–2007)			**560**	**0**	**0**	**0**	**N/A**	**N/A**
60 Year Mean 1948 - 2007			**559**	**0**	**0**	**0**	**297**	**227**
60 Year StDv. 1948 - 2007			**130**	**23**	**23**	**23**	**83**	**106**
60 YEAR Max. 1948 - 2007			**911**	**63**	**63**	**63**	**547**	**683**
60 YEAR Min. 1948 - 2007			**337**	**-40**	**-40**	**-40**	**103**	**102**
30 Year Mean 1948 - 1977			**567**	**1**	**0**	**0**	**297**	**232**
30 Year Mean 1978 - 2007			**550**	**-1**	**0**	**0**	**296**	**222**
20 Year Mean 1948 - 1967			**569**	**2**	**0**	**0**	**298**	**237**

Year	Comments[a]	Drought Category	Annual Mean Rainfall (mm)	% 60-year Mean	% 60-year Mean 5% Threshold	% 60-year Mean 10% Threshold	Mean LR Jan.-June	Mean SR July-Dec.
20 Year Mean 1968 - 1987			**563**	**1**	**0**	**0**	**314**	**207**
20 Year Mean 1988 - 2007			**544**	**-3**	**0**	**0**	**278**	**236**

[a] Recorded drought events listed are only those covering the study region. [b] UNDP, [c] UNICEF, [d] UNICEF

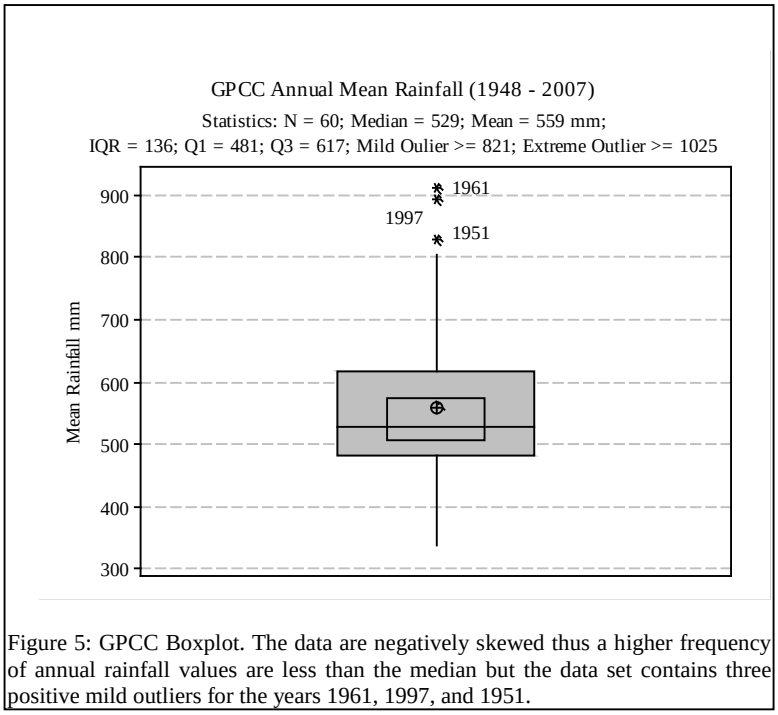


Figure 5: GPCC Boxplot. The data are negatively skewed thus a higher frequency of annual rainfall values are less than the median but the data set contains three positive mild outliers for the years 1961, 1997, and 1951.

Table 2: GPCC sixty-year and twenty-year annual mean rainfall estimates

Rainfall estimates in mm	**1948–2007**	**1948–1967**	**1968–1987**	**1988–2007**
Mean	559	569 (+2%)	563 (+1%)	544 (-10%)
Max.	911	911	804	892
Min.	337	391	337	338
StDv.	130	136	135	125
Frequency ≥ 5% (+)	19	6	8	5
Frequency ≥ 5% (–)	30	10	11	9
Reported Droughts	25	6	9	10
Frequency of Droughts	1 drought per 2.4 years	1 drought per 3.3 years	1 drought per 2.2 years	1 drought per 2 years

3.2 Deriving annual RF percentages from the sixty-year mean and the 5% and 10% thresholds

In order to better analyse the rainfall data, we calculated annual means as percentages of the 60 year mean (Table 1). In addition, we processed the data into two sets of thresholds, 5% and 10%, based on these mean RF percentages (Table 1, Figure 6 and Figure 7). For the 5% threshold, we considered that the range -4.99% to 4.99% typifies an average RF year and for the 10% threshold, the range -9.99% to 9.99% typifies an average RF year. Using these thresholds, we were better able to analyse correlating patterns between annual RF estimates and recorded drought events (Table 3).

We found that historical drought events correlated with 64% of the ≤ -10% threshold years but only with 8% of the ≤ -5% threshold years. Moreover, drought events correlated with 16% of the ≥ +10% threshold years. From these findings, we determined that an average rainfall year, i.e. with an annual mean rainfall that alone could not explain the onset of a drought, is in the range of -9.99% to 9.99%. In the following sections, we describe how we used this standard to categorise types of drought, as well as make other determinations about the climate record and its correlation with NDVI.

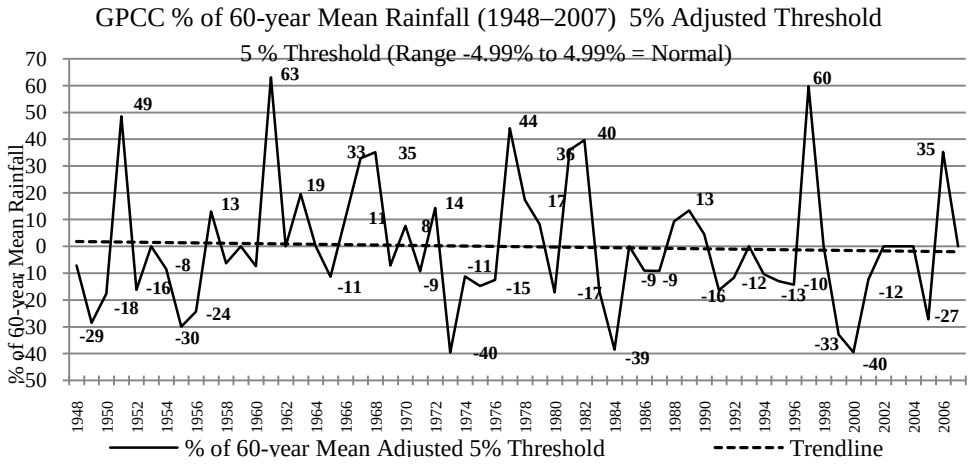


Figure 6: GPCC % of 60-year Mean RF (1948–2007) 5% adjusted threshold

Other notable observations include: (1) the frequency of below-average RF years is 32% higher than above-average RF years, but the magnitude of above-average RF years is 41% greater than below-average RF years; and (2) the frequency and upper range, or magnitude, of positive RF years in the ≥ ± 25% ≤ ranges are higher than for negative RF years.

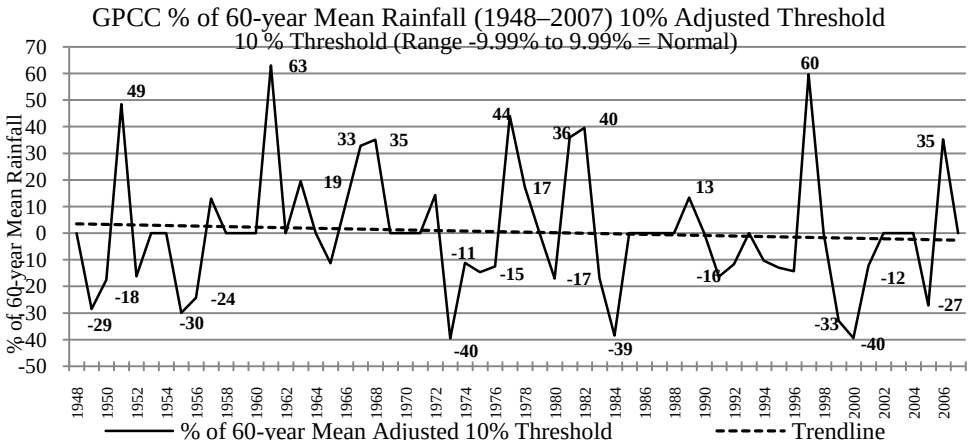


Figure 7: GPCC % of 60-year mean RF (1948–2007) 10% adjusted threshold

Table 3: Drought categories and GPCC estimates, 5%, 10%, and 25% thresholds of annual % of 60-year mean

Threshold	Frequency in years	Drought Category-1	Drought Category-2	Drought Category-3	Drought Category-4
≥-+25% ≤ +63%	9		1	1	1
≥-+10%	15			1	
≥ +5%	19				
-4.99% – +4.99%	11			2	1
≤ -5%	30			1	1
≤ -10%	22	5			5
≤ -25% ≥ -40%	7	1			5

3.3 Determining the drought categories

As we discussed in the previous section, we determined that the range -9.99% to 9.99% describes an average rainfall year in Northern Kenya. Using this baseline, and examining the groupings and frequency of recorded drought events, we created four categories by which to group droughts (Table 3). The twenty-five droughts recorded during the 60-year period resulted in an average of one drought per 2.4 years, but the frequency of droughts in the last 20 years of the record has increased to one drought per two years.

A Category-1 drought is a correlated same-year response of a recorded drought event to a below-average RF year, but not directly preceded either by a recorded drought event or by a below-average RF year. A Category-2 drought is a recorded drought event responding to a ≥ 2 -year period of consecutive below-average RF years but not directly preceded by a recorded drought event. A Category-3 drought

is a recorded drought event occurring during an average or above-average RF year but not directly preceded by either a Category-1, -2, or -4 recorded drought event, or a below-average RF year. A Category-4 drought is not otherwise categorized; hence we define it as a confluence of the other three categories within a multi-year period.

Note that the frequency of below-average RF years falling in the adjusted $\leq$ -5% category is ~37% greater than for the adjusted $\geq$ +5% category and contributes to 64% of the 25 recorded droughts during the 60 years. But of these 25 droughts, only two are attributed to the $\geq$ -5% < -10% range. In addition, all Category-1 (direct response) droughts we attribute to below-average RF years in the $\geq$ -10% range. Finally, Category-4 (the confluence category) corresponds to the greatest number of recorded droughts (13 events) distributed throughout the threshold ranges but with a high frequency in the $\leq$ -10% range. Thus, we attribute 24% of the recorded drought to sudden decreases in RF with a magnitude $\leq$ -10% and the remaining 76% of droughts to a confluence of factors and multi-year responses.

3.4 AVHRR NDVI correlations with GPCC recorded long rains (LR) and short rains (SR)

Northern Kenya traditionally has two RF seasons per year, the long rains (LR) and the short rains (SR). LR occurs during the first half of the year and SR during the second half. We conducted a 25-year (1982–2006) correlation analysis of AVHRR NDVI responses to GPCC RF during these LR and SR periods and found that the dominant NDVI triggering LR occurred between January and April and the triggering SR between September and December—but are most dominant in October. Essentially, this comprises one period from September through to April. However, November and December rains are sporadic. Over the 60-year study period LR have a mean of 297 mm with a standard deviation of 83 mm; and SR have a mean of 227 mm and a standard deviation of 106 mm (Table 4).

We tested the two populations, LR and SR, for normal distribution of the means and equal variances (Figure 8). LR are very well distributed (p-value = 0.707, 95% C.I.), with one mild outlier for 1981. However, the short rains are not evenly distributed (p-value < 0.005, 95% C.I.) and the data are skewed toward the negative values, but with mild positive outliers in 1997, 1961, and 2006. In addition, the two populations have statistically equal variances (Levene's test statistic = 0.10 and p-value = 0.747, 95% C.I.).

We conducted similar tests for the 20-year sample periods; three periods per population. We conducted one sample T-tests for each twenty-year period, LR and SR, based on each population's mean. At a 95% C.I., we found no statistically significant observations. In addition, we tested equal variances among the three periods for each population using an F-test for the LR samples and Levene's test for the SR samples. At a 95% C.I., the six tests, three combinations per population, resulted in no statistically significant observations.

Table 4: GPCC LR and SR Estimates

Category	LR (January–June) in mm	SR (July–December) in mm
60-year Mean (1948–2007)	297	227
60-year StDv. (1948–2007)	83	106
60-year Max. (1948–2007)	547	683
60-year Min. (1948–2007)	103	102
20-year Mean (1948–1967)	298	237
20-year StDv (1948–1967)	62	109
20-year Mean (1968–1987)	314	207
20-year StDv (1968–1987)	102	77
20-year Mean (1988–2007)	278	236
20-year StDv (1988–2007)	81	130

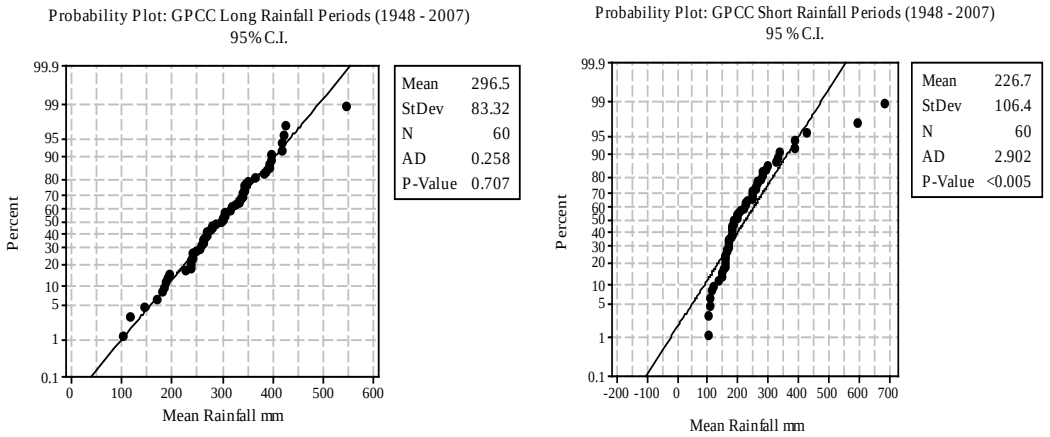


Figure 8: GPCC LR and SR probability distributions

During the three 20-year periods, both LR and SR fluctuate, one distinction might have relevance for understanding the increase of recorded drought events during the 1988–2007 period, namely, the contributing factor to the 10% decrease in mean annual RF from the 60-year mean is entirely attributed to LR—a 7% decrease from the 1948–1967 period and an 11% decrease from the 1968–1987 period, with relatively no change in SR means for all three periods (Table 4). Although SR decreased 13% from the 1948–1967 period to the 1968–1987 period, they increased 13% during the 1988–2007 period. Thus, the smallest difference in mean RF between LR and SR occurred during the 1988–2007 period.

No discernable pattern emerges that links SR estimates immediately preceding a recorded drought event in the following year, other than the occurrence of Category 1 and 3 droughts—which have the highest tendency to describe these events. In the period 1979–1998 a series of five Category 1 events followed each

other. In certain cases, especially for Category 3 droughts, we looked to see if the preceding year's SR (October–December) was a contributor to the following year's recorded drought event, but found no correlation.

Finally, RF variations affect agricultural cycles. Although the standard deviations for both LR and SR vary considerably during the three 20-year periods, these variations remain statistically insignificant. Still, the highest result (130 mm) occurs during the SR 1988–2007 period; 23% higher than the 60-year standard deviation for the short rains. In such a fragile environment, this variation potentially contributed to the increased number of recorded droughts during this period.

With regard to AVHRR NDVI responses to GPCC RF, we calculated the correlation coefficients for both LR and SR for the period 1982–2006 using Pearson's correlation coefficient.[7] We expected that NDVI responses would conform to RF; i.e. more rain should cause a positive vegetation response, as measured in NDVI. During consecutive years of non-drought events, correlations between NDVI and LR are consistently high (> 0.7) and punctuated by single poorly correlated years (< 0.5), e.g. the period 1985–1990. Furthermore, all first years following a drought event resulted in a high correlation, ranging from > 0.6 to > 0.9.

One reason for these patterns might be that reduced livestock herds place less stress on recovering vegetation, which is rebounding to increasing water availability (Schimmer, 2009). But in subsequent years, as livestock herds replenish, more stress is placed on vegetation, and its response to rainfall becomes less correlated. Thus, after the first or second years of intensified breeding, to replenish herd populations following a drought, vegetation begins to respond less well to RF until an equilibrium is reached.

Furthermore, in all but one set of two consecutive drought events, NDVI responses to consecutive annual decreases in LR means correlate well (>0.7) for the first year and not well (<0.4) for the second year (Table 5). The one outlier in this pattern occurs in the mid-1990s during a period of multiple consecutive drought events. However, 1991 and 1992 fit the pattern; 1993 was not a reported drought year; 1994 and 1995 reversed the pattern, but 1995 and 1996 also fit the pattern. One fundamental question is whether this equilibrium is sustainable during periods of decreased RF. The data appear to suggest that decreasing RF is less disruptive to vegetation responses in the first year of LR during a multi-year drought but highly disruptive during the second and, sometimes, the third. In addition to human and livestock resource extraction, this pattern is likely to be influenced by a decreasing

[7] Pearson's correlation coefficient calculates values between -1 and +1 where 0 equals no correlation. A negative value indicates an inverse correlation and a positive value indicates conformity; a resulting p-value less than α means that the null hypothesis is rejected thus the correlation is not zero.

amount of water resources banked in the environment, for which vegetation, livestock, and humans compete.

Whereas NDVI responses to LR reveal a number of patterns, we did not observe any similar patterns of NDVI responses to SR. None of the correlation coefficients for the same drought events is > 0.6 and the majority (82%) is < 0.5. Thus, NDVI responses do not correlate well with SR during drought events. Moreover, we did not observe consistency between LR and SR responses for the same or consecutive years. Compared to non-drought years during the period 1982–2006, LR remains consistently highly correlated with NDVI, either negatively or positively. In 16 of the 25 years analysed (67%), LR correlated with NDVI at > |0.7|. Conversely, in only five years (21%) over the same period, did SR correlate at > |0.6|. This finding further suggests that LR in confluence with human responses to these rain periods have a greater influence on triggering drought events than do SR.

Table 5: GPCC-AVHRR Correlations NDVI Responses to LR and SR

Year (drought year shaded)	GPCC-AVHR Correlation 1st Half (1982–2006)	GPCC-AVHR Correlation 2nd Half (1982–2006)
1982	0.89	0.67
1983	0.95	-0.13
1984	0.37	0.45
1985	0.65	-0.43
1986	0.48	0.10
1987	-0.93	0.82
1988	0.77	0.02
1989	0.90	-0.13
1990	0.96	0.51
1991	0.85	0.57
1992	0.38	0.38
1993	0.93	0.27
1994	0.04	0.34
1995	0.94	0.60
1996	-0.19	0.38
1997	0.74	0.71
1998	0.92	0.19
1999	0.76	0.32
2000	0.33	0.29
2001	0.91	-0.17
2002	-0.29	0.14
2003	0.01	0.02
2004	0.71	0.01
2005	-0.98	0.19
2006	0.91	-0.25

To understand if biomass changes in the study area are purely climate driven or if humans contribute to vegetation growth—positively or negatively—requires an integrated analysis of vegetation and climate parameters (Evans & Geerken, 2004). We only consider rainfall as the forcing climatic variable; temperature, as is typical for these climates, shows only minor inter-annual variations without a significant influence on green biomass. In a first analysis, we calculated the NDVImax trends between 1982 and 2006, resulting in a mixed picture of positive and negative trends showing different spatial distribution patterns for the summer NDVImax and the winter NDVImax (Figure 9).

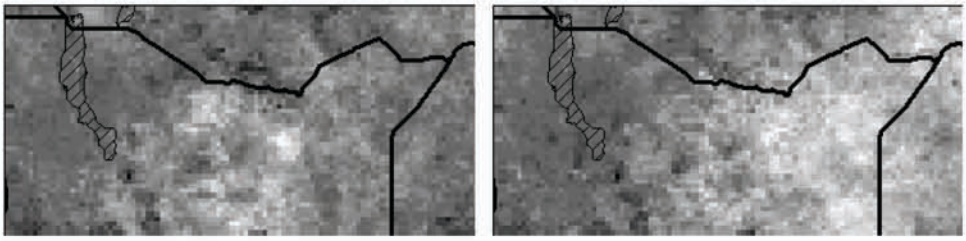


Figure 9: NDVImax trends for summer peak (left) and winter peak (right). Bright areas show improvements of up to 0.018 (NDVI) per year, dark areas NDVI losses of up to 0.0085 per year. Areas shown in grey show no significant changes.

To learn about the driving forces—climate or human—triggering the trends, in Figure 10 we analyzed the development of rainfall over the same period. The integrated NDVI-rainfall analysis shows areas that are very well correlated to a distinct rainfall period, but also some poorly correlated pixels. The latter include floodplains that are more dependent on river discharge; other poorly correlated pixels may have vegetation and land cover that is severely degraded, i.e. which does not respond to rainfall as expected. In addition, some deeper-rooting vegetation cover does not depend as much on seasonal rainfall.

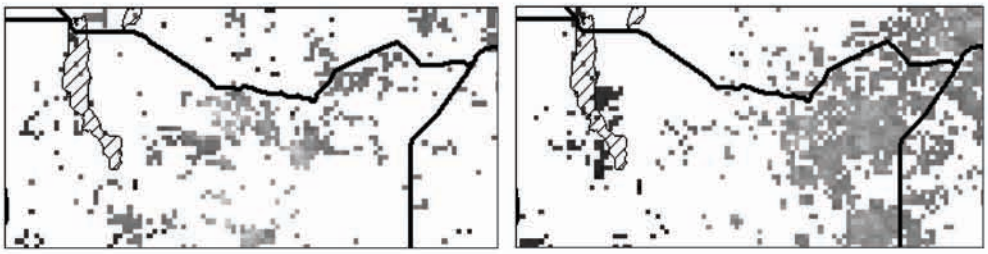


Figure 10: Trend of residuals (change of responsiveness of NDVI to rainfall) for the summer NDVImax (left) and the winter NDVImax (right). Light grey indicates an increasingly better responsiveness; dark grey to black (mostly around Lake Turkana (hatched pattern) or East and South of it) indicates increasingly worse responsiveness.

To find evidence of potential human influence on biomass development, we analysed temporal changes in the NDVI response to rainfall. Changes in the responsiveness of biomass show in the trends of the residuals that are calculated

between the statistically predicted and the measured NDVI, measured in units from -1 to +1 where positive units above ~0.4 generally represent vegetation. Statistical NDVI predictions are based on the best correlating rainfall period, as explained above. In Figure10, we see vast areas in the study region's eastern part where the NDVI shows an increasing (light grey) responsiveness to rainfall (up to 0.018 NDVI response units per year), meaning a total increase in NDVI intensity over a 25-year period of 0.45 units. Areas displayed in dark grey to black respond increasingly worse to rainfall with maximum losses of 0.009 units per year, accumulating to a total 25-year loss in NDVI of 0.225 units.

3.5 The RFE ten-year record

In order to process and analyse the RFE data, we used many of the same methods used for evaluation of the GPCC data (Table 6, Figure 11). Because the period is much shorter, we also checked RFE correlation with GPCC data for the 10-year period (Figure 12). The RFE data are normally distributed, with a mild outlier of above-average rainfall, in 2006 and indicate a mild positive trend for the decade. We tested the two data sets for equal variance and found them to be normal; Levene's Test p-value = 0.379. In addition, the Pearson's Correlation statistic for RFE and GPCC is 0.943 (p-value 0.001), hence the two data sets are highly correlated. Based on yearly percentages of the ten-year mean and the 10% threshold, the RFE record contains three below-average RF years, 2001 (-30%), 2005 (-34%), and 2009 (-21%), and two above-average RF years, 2002 (20%) and 2006 (60%). The remaining five years fall within the -9.99 – +9.99 threshold range of average RF.

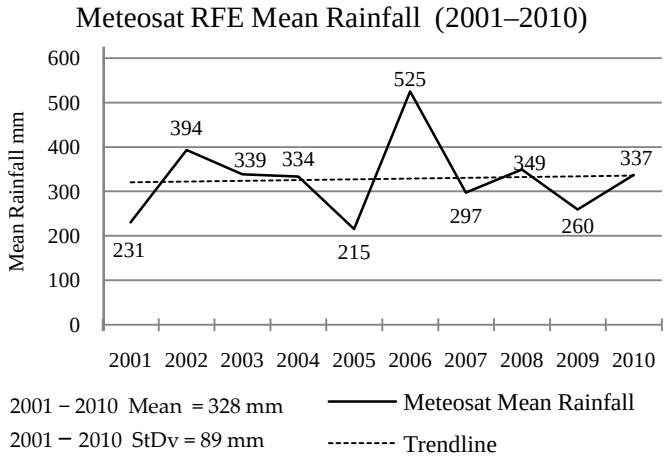


Figure 11: Meteosat RFE mean RF estimates (2001–2010)

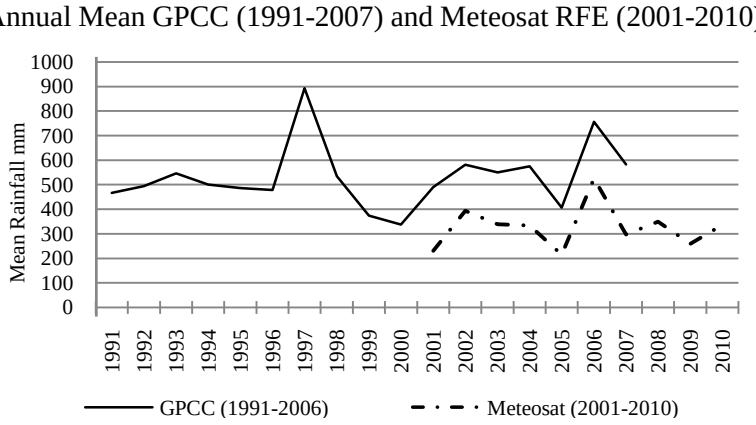


Figure 12: GPCC and Meteosat RFE annual mean RF estimates

Table 6: Meteosat RFE mean RF estimates

Year	Annual Mean RF (mm)	% 60-year Mean	5% Threshold	10% Threshold
2001	231	-30	-30	-30
2002	394	20	20	20
2003	339	3	0	0
2004	334	2	0	0
2005	215	-34	-34	-34
2006	525	60	60	60
2007	297	-9	-9	0
2008	349	6	6	0
2009	260	-21	-21	-21
2010	337	3	0	0
Avg.	328			
StDv.	89			
GPCC v. RFE (2001-2007) Corel. Coef.				0.94

3.6 MODIS NDVI responses to Meteosat RF, 2001-2010

A time series trend analysis of the Meteosat annual mean RF data for the period 2001–2010 results in a mild positive fitted trend equation, $Y_t = 319.267 + 1.60606*t$, with MAPE 19.85%. A time series trend analysis of the MODIS NDVI data set over the same period results in a much stronger negative fitted trend equation, $Y_t = 4662.73 - 20.5333*t$, with MAPE 8.0%. A Pearson's Correlation of the two data sets results in a 0.837 correlation statistic (p-value = 0.003). Thus, the data conform well but for two inverse relations in the years 2003 and 2008 (Figure 13). However, time-series trend lines for the two data sets reveal opposite trends—the mean RF increased while mean NDVI decreased. Thus, some factor other than

RF is causing NDVI to decrease, although annual NDVI responses to RF conform well.

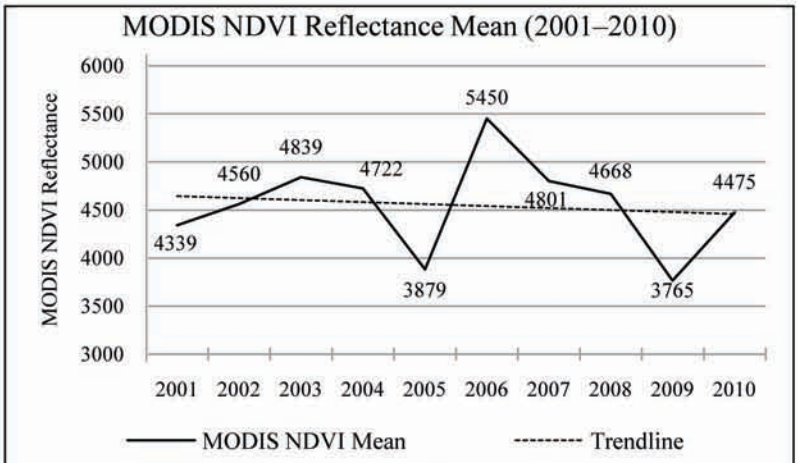


Figure 13: MODIS NDVI reflectance (2001–2010)

4. Cultural values and livestock management of the Turkana

The Turkana, as with many pastoral societies across Africa, keep livestock as the major source of wealth within their communities. This wealth is material and symbolic and has been referred to as the East African "cattle complex" (Herskovits, 1926). Both forms of wealth increase with the size of one's herd. Livestock are used within market economies where their meat is sold, as well as in addition to religious and ceremonial activities. Most importantly livestock is used for bride wealth payments (Henriksen, 1974, p. 17), which, like other forms of exchange among the Turkana, can be paid over long periods of time in multiple instalments. However, East African pastoralists do not give the same symbolic or economic importance to all animals. While cattle are generally given greater symbolic importance (Herskovits, 1926), goats and sheep are more functional and robust because of their greater mobility and resistance to drought (Haro et al, 2005).

Watson and van Binsbergen (2008) explain the difficulties of systematically assessing and reliably reporting livestock populations in districts such as Turkana. They present data collected in 1999: cattle 234,420, sheep 1,084,050, goats 2,168,100, and camels 144,960–owned by 63,655 estimated households (Ibid. p. 12). Though both men and women benefit from large livestock herds, livestock has a more symbolic and material meaning for men than women and functions as the medium for increasing wealth, instead of just a unit of measuring it. Because it is the basic vehicle for increasing wealth and prestige there is a continuous drive to increase herd numbers, through breeding, buying, and raiding (McCabe, 2004).

There are a number of reasons a man desires to have more livestock. The more livestock a man has the greater the number of wives he can attain and thus increase the number of children. These children will eventually provide labour and, in the case of daughters, produce bride wealth.

Larger livestock numbers allow for greater social networks, which are built on the reciprocal giving and receiving of livestock between men. A larger herd provides more security against the effect of livestock raiding. Because there has been, until recently, little access to other forms of investment in the region, livestock also form a currency from which interest accumulates in the form of calves and a source from which things can be bought and sold (Henriksen, 1974; Jones, 1984; McCabe, 2004; McPeak, 2005). However, herders are increasingly diversifying their economic activity, including working as casual labourers and fishermen, and producing market oriented products, such as honey (Lesorogol, 2008; Haro et al, 2005).

The Turkana have a communal ownership system for land, water and other resources that cattle use, as well as a semi-nomadic lifestyle directed by the needs of the herds. Such an "open access" system in which traditional control held by the elders is dwindling, combined with a cultural and economic system that values larger and larger herds, results in only a few factors which limit herd size. Stricter controls on maximizing extraction of common resources are more often found in a social system limited by landownership rights and closed access (Hardin, 1968). Typically, an increase in family size is thought to decrease the amount of resources available per family member, as there is another mouth to feed.

This is not the case with the Turkana social and economic system because with additional wives, and their subsequent children, there is an increased potential for labour for the family herd. This open property arrangement can be compared to ranch systems in which individuals own both livestock and the land on which it grazes. Over several decades, there have been attempts to create landownership within certain pastoralist communities, e.g. the World Bank's pastoral development schemes (de Haan, 1994). The traditional absence of individual land ownership has been an obstacle for these programs and these attempts have often resulted in little change in average wealth, though private land ownership has decreased the amount of economic mobility (Lesorogol, 2008). Moreover, such land ownership conditions can push poorer pastoralists into other economic activities, such as commodity production and selling their labour.

Recent studies present evidence that other resources, particularly water (and not the vegetation growth associated with it), may act as a perennial limit to herd size (Butt et al, 2011; McPeak, 2004). This would provide a more constant check to the growth of herds by (1) limiting water resources necessary to support a large number of animals and (2) increasing the distance and frequency of a herd's

movement. In addition, deficient water resources can lead to weakened animals, resulting in the spread of disease among herds (Lesorogol, 2008).

Theoretical debates have considered how to conceptualise such an ecological and social system that continuously taxes the limits of environmental resources. The most striking factor, which social and environmental scientists must explain, is that the most effective herd size regulation method is population collapse. This collapse is the result of degraded environmental conditions from overgrazing, a decrease in precipitation, or disease, as well as combination of the three (Henriksen, 1974). As is seen in the history of drought and famine, precipitation of 10% below average can result in decimated herds (see the recorded droughts of 1972, 1980 and 1983).

These factors create an ecological system that exists at disequilibrium rather than a stable population size that linearly adjusts to external inputs, such as RF and vegetation, over an extended period of time (McCabe, 2004). Scholars have debated whether to consider such an ecological system adaptive or not. Some have argued that highly fluctuating population sizes are simply a different form of adaptation. However, others have contended that a system, in which the only mechanism for controlling itself is through its own dramatic collapse, cannot be described as "adaptive" in the same sense as a system that adapts without near collapse (Ingold, 1988). This debate may not take into account other limiting factors of herd size in East Africa, such as access to water and not the vegetation growth associated with it. For example, if drinking water for livestock is a continual limiting factor on herd sizes, as some scholars have proposed (Butt et al, 2011), then punctuated drought may not be critical to the analysis, but rather should be acknowledged as an expected event interlaced with systematic cultural responses.

5. Discussion

5.1 A narrative of climate, NDVI, and cultural responses, 2001–2010

Over the last ten years, the average RF in Northern Kenya was approximately 10% less than the GPCC 60-year mean. Such a decrease in precipitation has likely contributed to the increasing number of droughts experienced in this region. However, this trend does not satisfactorily explain whether climate alone caused all the recorded drought events during this period. Conversely, the categorical paradigms we used on which to base these observed patterns in the 60-year period provide a better starting point for our analysis of causal elements during the most recent prolonged drought period, 2007–2010.

We have reported that inverse relationships exist between NDVI and RF, best expressed seasonally and annually. In a natural system where RF and vegetation are in balance, vegetation responses to variations in rainfall should be positively correlated. When they are negatively correlated, assumptions must be made that other factors, natural or anthropogenic, are likely to be contributing to the inverse

observations (Celis, 2007; Schimmer, 2009). Based on our findings of this research, we suggest that following 2005, a below-average RF year, a cultural response to the abundance of RF in 2006 contributed more to the drought period of 2007–2010 than the below-average year in 2009; i.e. below-average RF in 2009 exacerbated an existing drought but it cannot explain the instigation nor wholly account for the severity of the drought period 2007–2010. In this analysis, we use the last ten years of the GPCC record (1998–2007), in combination with the RFE record (2001–2010), to analyse RF and the MODIS record (2001–2010), in order to analyse NDVI.

Following three years of below-average RF years (2002–2004) and two recorded droughts (1999–2000), a near three-year recovery period (2002–2004) ensued. Average and above-average RF allowed livestock herds to replenish while vegetation and water resources recovered. The NDVI data recorded this process, which is especially evident in the inverse correlation between RF (decrease) and NDVI (increase) in 2003. In 2004, a Category-3 drought disrupts this trend, which annual mean RF (neither LR nor SR) cannot explain. The drought continues as a Category 4 in 2005 (GPCC -27%, Meteosat -34%). But the abnormally copious RF (GPCC +35%, Meteosat +60%) the following year likely stimulated an increase in livestock numbers, as NDVI rebounded to well above the ten-year average (+20%). But a Category-3 drought is again recorded in 2007, although GPCC reports an average year and Meteosat reports a below-average year (-9%), but not exceeding the adjusted $\geq$ 10% threshold.

According to the records, this drought persists at different levels of severity for the following three years (2008–2010) as a Category-4 drought; 2009 is the only below-average RF year (Meteosat -21%) and the other two, 2008 and 2010, are average RF years. Similar to 2003, NDVI responds inversely to RF in 2008; i.e. NDVI decreased in spite of an increase in RF. Moreover, although NDVI results show good positive correlations to annual mean RF fluctuations, except in two key years 2003 and 2008, the ten-year NDVI trend is strongly negative—thus not conforming to the slightly positive trend of increasing RF for the decade.

In summary, three important observations suggest that factors other than climate contributed to the two drought periods of the last decade: (1) a poor correlation with the onset of recorded drought events or periods and below-average RF years; (2) an inverse correlation between RF and NDVI for two years, of which one preceded a drought year not explained by below-average RF for that year; and (3) an inverse correlation between a slight positive trend in RF and a strong negative trend in NDVI for the decade.

We provide two potential explanations, either (1) local communities are over-responding to positive RF periods in ways not sustainable during negative RF periods, or (2) local community demands on environmental services and resource availability can only be sustained during normal and positive RF years. Historically

drought events occur in sets of two-four consecutive years. Thus, the recent increasing frequency of drought events is best described as fewer normal years between drought events rather than more consecutive years of drought. However, we are more interested in the highs not lows, because cultural responses to high RF periods appear to contribute to the onset and severity of droughts.

Based on isohyets' mapping, a desert is classified as an environment consistently receiving less than 100 mm annual mean RF. Drought is generally defined as a period of prolonged deficiency of water supply in a region. The 100-year annual mean RF record for this semiarid region of Northern Kenya is 560 mm and the 60-year mean is 559 mm. During the last 20 years, the region has received ~544 mm annual mean RF. Southern Arizona received on average ~416 mm annual mean RF for the period 1971–2000.[8]

What is drought in Northern Kenya? Is drought defined by an institutional or international response or a documented imbalance in environmental services and resource availability? There is no acceptable single operational definition of drought; in meteorological terms, annual drought (the failure of two successive rainy seasons) may occur anytime with a frequency of between one every three years and one every thirty years (Orindi et al., 2007).

We do not attempt to answer these questions but establish them as a fundamental parameter for research which addresses the following. Which organisation or organisations, whether NGO or sovereign government, is a reliable source for recording the period and magnitude of a drought? Defining these sources is important for the establishment of a guideline for the documentation of a historical record of drought events, similar to historical climate records. Moreover, what was the standard for classifying a drought in 1955 versus 2005? For this research, we relied on sources reporting either a drought event or a response to drought-like conditions, for example, provision of humanitarian aid. In the absence of a clear definition, we chose consistent sources to ensure some continuity, namely United Nations agencies, such as United Nations Development Program (UNDP) and United Nations International Children's Fund (UNICEF).

What is a cultural response? Cultural responses vary among groups but are predictable based on historical understanding of how certain social groups and polities will respond to social, political, and environmental stimuli. Responses can evolve based on resource availability, technology, external influences, and political dynamics, at the local, national, and international level. For example, sustaining livelihoods depends on factors such as the geographic range available for a particular form of resource extraction; the level of production given a defined space; the level of technology available to exploit a resource, either finite or renewable; and the security or access to these resources. Cyclical environmental

[8] http://www.currentresults.com/Weather/Arizona/yearly-average-precipitation.php

conditions, whether seasonal, decadal, or multi-decadal, influence cultural response patterns.

Garrett Hardin (1968) describes the tragedy of the commons as resulting from imbalances between resource extraction and resource availability. Hardin argues that eventually the cumulative of this competition will lead to a destruction of the environment on which they rely to maintain their gains but this occurs less often in societies organized by private property. Conversely, converting traditional community property into private or regulated property is not necessarily a desired or functional approach among pastoralist groups—for example the failed outcomes of the "Ranching Phase," promoted by World Bank pastoral development schemes in the 1980s (de Haan, 1994).

Recent research argues that educational or management approaches must embrace the structure of livelihood systems among the cultural groups of these fragile environments (Young, 2009). John McPeak (2005) argues that the record of failure in pastoral development in Northern Kenya may be partially due to a faulty conceptual foundation. He suggests that facilitating herd accumulation may offer more promise than discouraging it. Thus, strengthening pastoralists' positive adaptive responses to climate variations and resource management, based on traditional understanding of the environment, is a preferred and viable option to creating cycles of reliance on external resources (Tarekegn, 2009).

How can climate and vegetation monitoring inform resource management approaches? Acknowledging the effect of short- and long-term influences of biotic and abiotic stresses on individual plant species, plant communities, and cultivated species, and vegetation responses to the combined influence of climate and human activities, will correlate well to intra- and inter-annual RF fluctuations and land-use cycles. Although this does not, per se, exemplify a steady state, the correlation does indicate a predictable response pattern (Celis, 2007).

In addition to human management of water quality and quantity, a number of natural variables affect water resources. As an important source of water, the amount of RF is important. When and where rain falls, and how the environment consumes, reacts, and distributes the water is fundamental to ensuring the sustainable availability of the resource and sustaining vegetation health. For example, varying utilities of water use and conservation by different plant species can attribute to both negative and positive latent responses in NDVI (Celis, 2007). In addition, the level and consistency of water resources contributed by watersheds in adjacent regions, the capacity and recharging of groundwater, and the loss of water due to surface runoff and inadequate catchments, can further contribute to the depletion of water during a period of decreased RF. Finally, intense agricultural activities, especially wet farming, will increase NDVI in spite of periodical diminished precipitation, so long as water resources are available to maintain

production (Celis, 2007). Conversely, overgrazing in open ranges during periods of increased precipitation can inhibit positive NDVI responses.

But not all cultural responses to assure sustainability can remain localised; certain factors lie beyond local geographic and political influence. A geographic example in Kenya is the Mau Forest deforestation problem and its effect on the forest's important role as a watershed catchment for lowland agricultural regions (Baldyga et al., 2008). Our research area does not include the southern portions of the Ethiopian Highlands. Thus, we cannot study how these highlands contribute to water resources in many of the lowland grass and shrub lands we discuss in this research. Watersheds are particularly important to supplement water resources in lower elevation environments that receive erratic seasonal or annual RF. Furthermore, watersheds can replenish aquifers, which provide an additional source of water during dry periods.

Finally, we also acknowledge the balance between water quality and water quantity. Water availability comprises three concerns, access, quantity, and quality. These nuances are not easily assessed without in depth field surveys. But we emphasise that water quality is a fundamental objective of resource management.

6. Conclusion

In applying these findings to the inquiry into whether below-average RF was the primary catalyst for the prolonged 2007–2010 in Northern Kenya, our findings suggest that this was not entirely the case. We argue that traditional resource management practices, as cultural responses to multi-year climate cycles, can contribute to the frequency and severity of drought events. The most important responses likely occur during average RF periods and above-average RF years.

Thus, in order to understand what climate factors trigger drought, it is important to determine what occurs in the periods between droughts—that are not recorded in the climate record. Primarily, how are resources being extracted and managed and how do positive climate events, e.g. above-average RF years, contribute to cultural responses that potentially lead to environmental stress during average RF periods, and subsequently contribute to the severity of below-average RF periods. We suggest that cultural responses to climate occurring during the average to above-average RF periods contribute to environments that are more fragile during periods of decreased RF.

In terms of monitoring the environment as a means to facilitate adaptive cultural responses to climate variability, the 5% threshold range presented in this paper might provide a baseline to monitor and measure cultural responses to climate variations and help achieve levels of sustainability in resource extraction. This could lead to greater stability during the years when RF decreases below the adjusted 10% threshold and, hence, provide an additional 5% buffer. Managing

positive cultural responses to events and periods of increased RF is critical to mitigating losses and the impact of the severity of bad years on local human and livestock populations, and to maintaining food security and adequate water resources.

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Theme 2

Coping with the Adverse Impacts of Climate Change through Traditional Means

Discrepancies between Traditional Coping Mechanisms to Climate Change and Government Intervention in South Omo, Ethiopia

Asnake Kefale and Fana Gebresenbet

Abstract

Pastoral groups in the Horn of Africa are politically and economically marginalized. Marginalization has, unsurprisingly, led to their extreme poverty. They even fare very badly in terms of social and physical infrastructure as compared to the (internationally low) national averages of their countries. Climate change brings newer and more complicated challenges. It is expected that the frequency and severity of extreme weather events will increase in the region, making the probability of flooding and drought high. This will have devastating implications for the peoples of the region in general and the pastoral communities in particular. This paper examines traditional coping mechanisms that the Dassanech and Nyangatom pastoral groups of the Ethiopian sector of the Karamoja Cluster use. The two groups are located in the Omo valley of the Ethiopian southern region.

Using primary and secondary data, the paper contends that there are visible signs of climate change in the Omo valley where the two groups are located. Amongst others there is recurrent drought and extreme weather events. The pastoralists of the region use traditional coping methods, including migration, herd diversification, herd splitting, income diversification, restocking and local alliances. The interventions of governmental and non-governmental development agents by and large overlook the capacity of traditional methods of adapting to climate change. The Ethiopian government, for instance, focuses on settlement in its development intervention in the southern Omo. It believes that settling pastoral communities would bring them a 'stable' way of life. Introduction of large-scale irrigation schemes in the Omo valley by both the government and private investors would bring pastoral communities more challenges than opportunities.

The paper's major conclusion is that the adoption of viable policies to cope with the adverse impacts of climate change in the Omo valley requires a concerted effort to efficiently utilize the traditional knowledge of pastoral groups.

1. Introduction

The Karamoja Cluster is home to fourteen ethnic groups which share language, traditions, culture and means of livelihood. Despite their close affinities, the peoples of the Cluster have been divided amongst several countries in the region. They are found in north-west Kenya, north-east Uganda, south–west Ethiopia and south-east South Sudan. These groups have been politically and economically

marginalized. Marginalization, unsurprisingly, has led to their extreme poverty. They even fare very badly in terms of social and physical infrastructure as compared to the (internationally low) national averages of the countries in the region. The ensuing social tensions on top of climatic stresses and the proliferation of small arms have made the Cluster a very volatile and conflict-prone area (United States Agency for International Development (USAID), 2002).

Though the Cluster is not short of challenges, climate change brings newer and more complicated challenges. It is expected that the frequency and severity of extreme weather events will increase in the region, making the probability of flooding and drought high. This will have devastating implications for pastoral communities. For instance, this year's drought in East Africa is exacting a heavy toll on Somalia. Many pastoral groups in Ethiopia and Kenya are also affected.

Pastoralists of the Cluster have traditional coping mechanisms which have evolved over centuries in response to the harsh environmental conditions they live in. They used their traditional wisdom to cope with past climatic stresses and will continue to do so, especially given the fact that government intervention in these areas remains insignificant. It would even be plausible to assume that traditional coping mechanisms will be more effective than 'alien' concepts imposed by policy makers, state development agents or non-state actors.

Traditional coping mechanisms have been used for generations and are incorporated into the cultures and day-to-day lives of pastoralists. Thus, governmental and non-governmental development agencies should learn from these mechanisms. Examining the resilient and time-tested traditional coping mechanisms of the pastoral communities of the Cluster would help development agents to better plan their interventions. In turn, they could help strengthen traditional coping mechanisms, if they developed a good appreciation of the—often despised and neglected—traditional knowledge.

Despite the huge potential that traditional knowledge offers for climate change adaptation, research efforts on the effectiveness and appropriateness of this knowledge have, so far, been limited. Furthermore, there are no proven approaches to integrate traditional coping mechanisms into mainstream adaptation efforts.

In light of what has been stated above, this study examines the coping mechanisms of the Dassanech and Nyangatom pastoral groups of southern Ethiopia. The two groups constitute the Ethiopian part of the Karamoja Cluster. This paper has three major objectives. First, it examines how local people perceive climate change. Second, it considers how the two groups use their traditional wisdom to cope with the adverse impacts of climate change. Third, the paper also examines how development agents of the government and non-governmental organizations use or ignore local traditional knowledge in their interventions.

This paper is based on primary and secondary information. The primary materials for this paper were gathered during fieldwork which the authors undertook in May 2011 in the Dassanech and Nyangatom *wereda* of the South Omo Zonal Administration of the Southern Nations, Nationalities and Peoples Region (SNNPR) of Ethiopia. During the fieldwork, numerous interviews and focus group discussions were held. The informants comprised elders and officials at zonal, *wereda* and local levels.

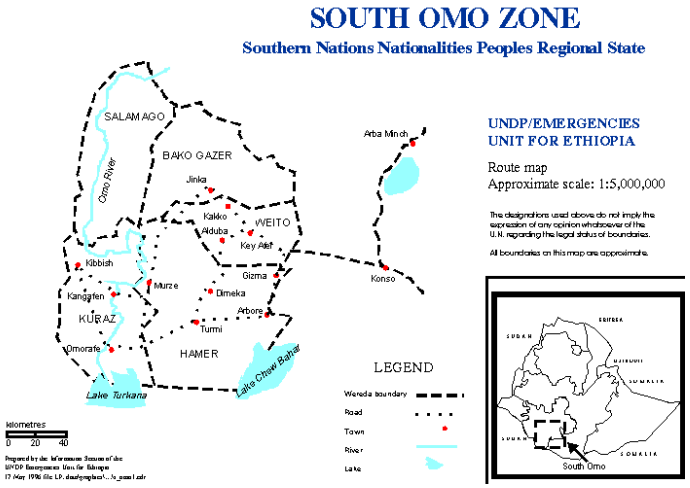

Figure 1: Map of the study area

We tried to use meteorological data in order to correlate the perceptions of people about climate change with rainfall data. However, meteorological data is not available for the study areas, and what is available from nearby areas is unreliable.

This paper is divided into the seven sections. The first provides the introduction. The second part discusses how climate change threatens pastoralists and highlights the importance of traditional coping mechanisms in the design and implementation of adaptation-related activities. The next part provides a background to the study area and the pastoral communities residing there, the Dassanech and the Nyangatom. The fourth section discusses the perception of local people on how the climate has changed in the past decades and their interpretation of the causes. The following part provides a survey of the various coping mechanisms utilized by the pastoral communities to withstand climatic threats. The sixth part gives a summary of interventions, by governmental and non-governmental organizations, which are aimed at decreasing the vulnerability of pastoral communities in the study area. Finally, brief concluding remarks are made.

2. Pastoralism, climate change and traditional coping mechanisms

Climate change threatens vulnerable minority groups, including pastoralists. Some of the smaller groups are feared to become extinct and others might migrate and disperse as environmental migrants. Some are even being forced to change their traditional livelihood strategies completely (Mihlar, 2008).

Pastoralists have highly respected traditional governance structures, with rules governing the use, management and conservation of natural resources, and sanctions against those failing to observe these rules. Recent decades, however, have seen the erosion of these values, norms and governance structures.

Effective traditional coping mechanisms for drought helped pastoralists pass through the most trying times of their existence. However, these coping mechanisms could prove inadequate in the face of frequent severe droughts as well as socio-economic and political changes and long-term climate change (Orindi et al., 2007). Moreover, improper interventions by government and donor agencies tend to produce unintended negative consequences (Orindi et al., 2007), among which is the erosion of local administration and coping mechanisms.

Traditional knowledge can be understood as "a collection of knowledge that is passed down and is developed through generations within these communities" (Mihlar, 2008). From a broader perspective, traditional knowledge includes a variety of information; from being able to predict weather patterns and identify medicinal plants, to adapting new plant and animal conservation techniques (Mihlar, 2008).

Discourse on the traditional knowledge of indigenous peoples, including pastoralists, *vis-à-vis* climate change has been largely limited to the mitigation of those factors that are believed to contribute to climate change. This is despite the fact that many indigenous communities and pastoralists, who usually live in marginal areas, are not only vulnerable to future climate change but also are suffering from its adverse effects currently. The few studies that have dealt with adaptation did not acknowledge the adaptive strategies and capacities of local communities which are, by and large, informed by their traditional knowledge (Macchi, 2008).

Reducing the vulnerability of such marginalized groups to the adverse impacts of climate change requires a multifaceted effort. Macchi (2008), for instance, argues that 'a good starting point' would be to reverse their marginalization and recognize and support their coping mechanisms. Similarly, Mihlar (2008) adds that pastoralists have 'traditional knowledge' which is immensely helpful in developing adaptation and mitigation strategies, as these communities have survived through cycles of environmental change. A report by the Inter-Agency Standing Committee of the UN on the humanitarian challenges of climate change (2009) also stipulates

that, to shield pastoralists from the impacts of climate change their inherent adaptive capacity should be strengthened and they should participate in decision-making. Moreover, some studies presented detailed analysis of the importance of having a participatory approach in devising adaptation strategies (Leary et al., 2007). These approaches emphasize that effective responses to climate change should strengthen livelihoods at the local level and respond to local needs. Leary et al. (2007) further argue that "adaptation is place-based and requires place-specific strategies."

Another argument supporting local adaptation is the easily discernible differences in vulnerability to climate change impacts across and within villages and households (Conservation Development Center, International Institute for Sustainable Development and Saferworld, 2009). The same document further argues that the poorest possess the most developed climate adaptation and coping mechanisms and, as a result, may not necessarily be the most vulnerable.

Many have attested that African populations employed various sophisticated, evolving techniques to respond to risks and take advantage of opportunities presented by climate variability in the past centuries (for a few examples read Hampshire & Randall, 2007; Hesse & Cotula, 2006; Nyong & Fiki, 2005; Smit, 1998). Notwithstanding this, some (such as Boko et al, 2007) fear that many Africans will not be able to keep pace with the scale and speed of current climate change. They argue that an increase in the severity of climate variability due to climate change, and also to other factors which are entirely unrelated to environmental conditions (such as poverty, weak governance and political marginalization), limit the capacity of Africans to adapt to climate stress.

The choice of local coping strategies, whether at the household or community level, is made taking into consideration the types of resources, economic activities and social networks that the people can access. Another factor increasing the palatability of strengthening local institutions is their easy accessibility and adoption coupled with lower technological and capital requirements (Orindi & Eriksen, 2005).

However, state policies often ignore the rights and livelihood strategies of pastoralists. A case in point is the fate of pastoralists in the Karamoja area of Uganda. As Mwebaza (2005) states, 36% of this area is notified as a protected area (thus, no entry) and the remaining 64% is designated as a controlled hunting area, permitting grazing, settlement and resource use. In 1996 part of this area was given to marble and gemstone mining companies. The same is true on the Ethiopian side of the Karamoja Cluster and its adjoining areas (South Omo) with the establishment of the Omo and Mago National Parks and the sugarcane plantations under consideration. This often leads to resource scarcity and conflict (see Unruh, 2005).

Given the fact that wildlife are more adapted to conditions in the marginal semiarid lands and the comparative advantage Africa has in this sector, some have argued that sustainable utilization of wildlife will benefit pastoralists. However, this would materialize only if pastoralists are given the role of making natural resource management choices, thus enabling multispecies management (Food and Agriculture Organization of the United Nations (FAO), 2001).

Institutions, both local (including modern organizations, informal associations, kinship networks and traditional institutions) and provincial/national/international ones, play a crucial role in adaptation efforts, thus the need to have strong institutions. Therefore, remnants of traditional institutions, whose roles have been diminished by various factors, provide a framework which could be revitalized and exploited (Leary et al., 2007).

Non-pastoralists, too, have a lot to learn from pastoralists with respect to adaptation to climate change. Understanding the coping mechanisms and adaptation strategies of pastoralists, therefore, would also be beneficial to farmers, owing to the increase in complexity, non-linearity and non-equilibrium situations everywhere caused by the adverse impacts of climate change. This is the exact situation pastoral communities have thrived under for many centuries, meaning that their traditional knowledge is a mine yet to be exploited (Scoones, 2004). Past failures of development initiatives in dry lands are mainly due to the unwillingness of development agents to recognize the traditional knowledge of pastoralist communities. Even if we couldn't learn the 'how' of living with uncertainty from pastoralists, we should at least not impose adaptation strategies which do not account for the high uncertainty in pastoralist environments. Most development agents (government, donors, NGOs) have not yet realized this dynamic, and remain stuck in policies designed to bring a 'stable' way of life to pastoralists (Scoones, 2004). For instance, in Ethiopia there is a remarkable continuity of government policy about the 'need' to bring a stable way of life to pastoralist communities. Such an attitude fails to appreciate how the pastoralist way of life was developed over many centuries as a response to environmental challenges.

Climate change predictions warn about increases in uncertainty and recurrent extreme weather events. This means living with uncertainty is one of the challenges most of the human race will have to learn to live with. However, pastoralists have been living in uncertain environments for millennia (Mehta et al., 2001; Pan-African Climate Justice Alliance (PACJ), 2009). There is a lot that can be learned from their institutions and local knowledge. At the very least, development interventions should not be imposed on pastoralist communities without considering their traditional knowledge.

Long-term livelihood security is embedded in adaptation strategies, while coping is just about getting past the current challenge. Notwithstanding the fact that adaptation to long-term climate change will be driven by responses to individual

events in the short term (Phillips, 2003), i.e. coping mechanisms, many authors argue, will compromise long term adaptation and future coping ability. Many coping mechanisms, such as selling household goods or crop harvests to pay debts, erode the asset base of the household and lead to destitution (Eriksen & Lind, 2005; Orindi & Eriksen, 2005). Thus, concerted efforts must be made to strengthen the adaptation capacities of pastoral communities.

Furthermore, existing coping mechanisms are restricted by current realities—such as market economy, private property ownership, government intervention and the erosion of traditional institutions (Orindi & Eriksen, 2005)—rendering them less helpful for long-term adaptation. The same authors go on to say that 'most coping strategies are mainly aimed at responding to known extreme or seasonal events like floods and drought; however, fewer strategies may exist that are aimed at dealing with longer term changes brought by global warming.'

3. The Dassanech and Nyangatom pastoral groups of South Omo: General background

The Dassanech and Nyangatom pastoral groups are located in the southern borderlands of Ethiopia, in the lower parts of the Omo-Gibe basin and at the mouth of the Omo River. Neither group is confined to Ethiopian territory. They settle across the boundaries of Ethiopia into neighbouring Kenya and South Sudan, respectively. In this respect, the territory of the Dassanech includes the northernmost part of Lake Turkana. The Nyangatom, for their part, have their ethnic kin in the newly independent South Sudan. Under the current administrative structure, the two groups have their own separate *wereda*[1] within the South Omo Zone of the SNNPR. While the Dassanech *wereda* is home to a single ethnic group, the Nyangatom *wereda* is home to the Koyego (also called Muguji) and Murle minority groups as well.

The South Omo Zone has some sixteen ethnic groups, most of whom are pastoralists. The Zone is characterized by weak physical and socio-economic infrastructure and poor integration with the national economy. The different indigenous ethnic groups in the zone have small populations (see Table 1) and often engage in bloody conflicts, usually over land resources such as pasture and water points. Pastoral conflicts in southern Ethiopia have a cross-border character. In particular, there is a bloody feud between the Dassanech and Nyangatom of Ethiopia and the Turkana of Kenya. There are also occasional conflicts between the Dassanech and Nyangatom over land resources.

[1] Both ethnic groups were under a single *wereda*, the Kuraz *wereda.* In 2006, the Southern regional government granted the Nyangatom their own *wereda* as they had to travel long distances in "enemy territory" (well into Dassanech land) to get justice, aid, medical supplies etc

Table 1: Ethnic composition of the South Omo Zone

Ethnic Group	Livelihood	Total population
Ari	Farmers	290,453
Malie	Agro-pastoralist	98,114
Dassanech	Pastoralist	48,067
Hamar	Pastoralist	46,532
Bena	Pastoralist	27,022
Nyangatom	Pastoralist	25,252
Tsemay	Pastoralist	20,046
Mursi	Pastoralist	7,500
Bodi	Pastoralist	6,994
Arborie	Pastoralist	6,840
Brayle	Pastoralist	5,002
Bacha	Pastoralist	2,632
Koyego	Pastoralist	1,974
Karo	Pastoralist	1,464
Murle	Pastoralist	1,469
Dime	Pastoralist	891
Zone Total		**590,252**

Adapted from: Central Statistics Agency of Ethiopia, CSA (2008)

The Kuraz *wereda*, brought the Dassanech and the Nyangatom under a single local administrative structure. It was established at the end of the 1980s when the former military regime, the *Derg*, restructured provincial administrations following the adoption of the People's Democratic Republic of Ethiopia (PDRE) constitution in 1987. Initially, the *wereda* was made part of the South Omo Administrative Zone with its capital at Omorate. This setup persisted for nearly fifteen years, even after the downfall of the *Derg* regime. In 2006, the Kuraz *wereda* was split into two: Dassanech and Nyangatom. While there is traditional animosity and competition between the Nyangatom and the Dassanech over land resources, the three groups that comprise the Nyangatom *wereda* have good relationships and there are intermarriages among them.

Both the Dassanech and Nyangatom trace their origins to neighbouring countries. According to the narrative of the Dassanech, their forefathers migrated from Eastern Somalia to "Pupe" in north-eastern Kenya but, as they couldn't co-exist with tribes in that locality, they migrated onwards to "Akologn" and later to "Ngmamari" in Ethiopia. In contrast, the forefathers of the Nyangatom came from Karamojong, Uganda (SNNP profile, 2009). Legend has it that the first of the Nyangatom came to areas around the Kibbish River in search of lost cattle. Astonished by the vegetation of the area and its suitability for cattle rearing, they settled there; others went back and stimulated the next rounds of migration. Currently, the cultural importance of Kibbish is one the decline due to the drying-up of the Kibbish River and invasion of the grazing land by prosopis; it is now among the most drought-stricken places in the *wereda*.

Livestock are seen as a sign of wealth in both communities, and more emphasis is given to herd size than quality. As can be seen in Table 2, the Dassanech have more livestock; they therefore feel that they are more affluent than the Nyangatom.

Table 2: Number of livestock in the Dassanech and Nyangatom *wereda*[2]

Wereda	**Cattle**	**Sheep**	**Goats**	**Equine**	**Camel**	**Poultry**
Dassanech	280,000[3]	156,740	206,185	41,172	265	16,650
Nyangatom	100,000	80,000	63,513	20,635	-	3,200

Source: Zone expert

Irrespective of their many similarities,[4] there is seldom peaceful co-existence between the two ethnic groups. The major differences between them are with respect to language and body and hair decorations. The Nyangatom have more linguistic similarity with ethnic groups across the border: the Turkana in Kenya and the Toposa in South Sudan. Although there is no shared border, the Nyangatom language is similar to that of the Karamojong of Uganda. Both the Dassanech and the Nyangatom have ethnic kin across the border in Kenya and South Sudan, respectively. However, the Nyangatom have used this to their advantage more than the Dassanech. As mentioned above, the Nyangatom used the conflict in South Sudan to their advantage (Yohannes et al., 2005) by getting military training and weapons from the SPLA.[5]

Pastoralism is the main livelihood strategy in the area. Both ethnic groups also practice flood retreat agriculture on the river banks of the Omo and the surrounding flats. The settlement pattern of the Dassanech favours this type of agriculture, as the river divides their land into two, making more land available for flood-retreat agriculture than the Nyangatom have, who live on the western side of the river only. Communities which do not have access to flooded land buy sorghum[6] from those bordering the river. In the case of the Dassanech, grazing land is also seasonal: on the east bank of the Omo river from November to March and on the west bank for the remaining months (Elfmann, 2004). The same source also asserts that agriculture plays an equivalent role in the economy of the Dassanech. As a result, diet shows remarkable shifts: agricultural products and milk dominating in 'time of plenty' (beginning from December, when the first harvest is reaped) and meat dominating from June ('time of want') as milk production drops and grain stores become exhausted (Almagor, 1978: 52-54 as cited in Elfmann, 2004).

[2] These estimates were for 2003 E.C (2010/11). They were provided to us by the South Omo Zone Agricultural and Rural Development Bureau.

[3] According to the expert, some estimates put the total cattle population of the Dassanech much higher, but that is only due to the fact that cattle are seen as a sign of wealth and there is a tendency to exaggerate herd size.

[4] These include mobility, dancing style and a strong patriarchal culture.

[5] The opportunities include easy and cheap access to weapons, bullets and military training.

[6] The staple food, and main agricultural crops, of these communities is mainly sorghum, maize, butter and milk.

The southern boundary of the Dassanech is marked by Turkana Lake, and those residing in that vicinity (5% of the Dassanech) also practice fishing, which is considered to be a shameful activity (Tosco, 2001). Almagor (1978) as cited in Elfmann (2004) adds that, although most Dassanech dislike fish, it is eaten as a supplement during the dry season. The Koigu who live on the edge of the Omo River practice retreat agriculture and fishing. For the Koigu, pastoralism is only a recent phenomenon emerging as a result of increasing wealth. The Nyangatom have recently adopted bee-keeping/traditional apiculture from the Murle.[7]

4. Climate change in South Omo: Local perceptions of the Dassanech and the Nyangatom

Ethiopia, like many other countries in Africa, is vulnerable to the adverse impacts of climate change because of its reliance on rain-fed agriculture and nomadic pastoralism. According to Aklilu and Alebachew (2009, p. 22), the International Panel on Climate Change (IPCC) identified three major areas which are threatened by climate change: food security, water resources and health.

The fact that there are changes to climate in this part of Ethiopia is clearly visible from every aspect of the life of the pastoralist communities. The decline in the amount of rainfall, the decrease in the length of the rainy season and the increase in temperature are the most-cited changes. Moreover, the late onset of the rains and increased rainfall variability are also causing strains on the local economy.

Meteorological records of monthly maximum and minimum temperatures and monthly rainfall representative of the study area could not be found from an ecologically representative area. There are meteorological stations in two areas at Turmi and Dimeka, both of which are found in nearby Hamar-Bena *wereda*. Even in these areas, the latest available readings are available until 2007, and the oldest from 1980 (Turmi) and 1987 (Dimeka). The records are intermittent and not fit for analysis, as data are missing for several dozens of months. For instance, data on monthly minimum temperatures for Dimeka is missing for more than 53 months. Moreover, the length of less than thirty years for the data makes it unsuitable for analysis with respect to climate change. One should also not forget the high spatial variability of rainfall in the lowlands, thus the uncertainty of working with station data.

Communities in the study area, however, directly and indirectly explain aspects of climate change by narrating severe changes that have happened to weather patterns. In this respect, elders stated that the rains were much better during the time of the Emperor (before the 1974 revolution). The rainy seasons were longer and there was no problem with pasture. According to the elders, compared to now there used to

[7] The Murle language is dominated by the Nyangatom language and is on the brink of disappearing. Currently, the mother tongue of Murle children is Nyangatom. The Koigu are also very small in number and will face the risk of being assimilated into the Nyangatom.

be good vegetation coverage during the imperial period. During the *Derg* regime (1974-1991), the rainy season became shorter and the rains started to come late. Drought started to last as long as two consecutive years and, as a result, the volume of water in the rivers and streams began to decline as did the vegetation coverage.

The social impacts of climate change in the Omo valley are pervasive. The increase in temperature has led to changes in the dressing customs of the people. Many young people these days, for instance, wear caps to cover their heads from the scorching sun. In addition, the increase in the duration of the dry season, which is called *akamu,* has decreased the festivities, length and beauty of different rituals and cultural activities normally undertaken in the rainy season. A similar account of local perceptions of climate change has been recorded from Nyangatom elders by HoA-REC and GTZ (2010). The same source cites an elder man as saying, 'Nowadays nobody wants to dance during the daytime anymore. The heat is unbearable! You get tired after a short time. That's why all our ceremonies became kind of boring.'

Another aspect of local culture threatened by climate change is the naming of months. For example, the Nyangatom traditionally divide the year into two major seasons of equal length, months of abundance called *akuporo* and months of dry season called *akamu*. The meanings of the names of each of the months correlate with seasonal weather condition. Thus, the names tell what to expect and what to do in each month. However, due to climate change the meanings attached to the months are being lost and, along with this, traditional knowledge about cattle breeding and farming is also lost.[8]

Retreat agriculture produces most of the sorghum and maize consumed among the pastoralists of the Omo valley. Thus, flooding of the river banks and the flat areas near the Omo River is a welcome event. The amount of flood water and alluvial soil brought with it depends on the amount of precipitation in the upper parts of the basin. Thus, extent of flooding does not necessarily correlate well with the amount of rainfall in the pastoral lands. The pastoral communities are affected by the variability of the flood water. If the rains in the upper catchment area of the Omo-Gibe basin are low, the river may not flood out of its course and there would be drought. In some instances, when the rainy season is heavy in the central highlands, the flooding in the lower stream of the Omo River would be high and would have devastating impacts on both human and animal lives. To predict the amount of flooding in the Omo valley, the Dassanech and Nyangatom rely on traditional methods.[9] But in 2006, 2007 and 2008 the pastoralists of the Omo valley were

[8] An informant mentioned that the month of our fieldwork (May 2011) is called *Lokoto*, which means "month of mud", but there was, in reality, no rain let alone mud. The paper by Sagal Joshua Mark and Jean Grade in this volume presents in detail how climate change threatens the naming of months in Karamoja district, Uganda.

[9] These involve the studying of goat intestine by elders and are reputed to be very accurate. This practice is also used to check if an enemy is going to attack.

severely affected by the overflowing of the Omo River. The 2006 flooding, in particular, was devastating. The Dassanech were hit hard; they lost 364 people and an estimated 3,000 livestock. The flooding also displaced 15,000 people from 14 villages (Aklilu & Alebachew, 2009, p. 44). The fact that a large number of the Dassanech during the time of the floods were on islands[10] contributed to their significant losses. These islands are found in the lower course of the Omo River at the point where it joins Lake Turkana, and provide the Dassanech with dry season pasture.

The 2006 floods were also remarkable as they demonstrated the difficulty of using traditional Dassanech 'early-warning' methods to predict high floods. The development of irrigated farms and the installation of hydroelectric dams (Gilgel Gibe I, II and III) in the upper catchment of the Omo River appear to have undermined the ability of the pastoral communities to predict high floods (Ibid.). The erection of dams in the valley has been controversial. On the one hand, the Ethiopian government argues that the new dams, in addition to their contribution to national development, would help regulate the waters of the Omo River and prevent flooding in the lower course of the river, where pastoralist groups like the Dassanech are found. On the other hand, environmentalists complain that no adequate environmental and socio-economic impact assessment was made before the dams were constructed (Aklilu & Alebachew, 2009, p. 44). As a result, the development interventions in the Omo valley could adversely impact on the lives of pastoralist groups like the Dassanech and Nyangatom.

Local people blame climate change for the 2006 flooding. Before the flooding, extreme drought forced both the Dassanech and Nyangatom to settle near the river and, in the case of the Dassanech, on the islands. On top of this, it rained heavily in the upper catchment area while there was only little rain in the lowlands.[11] When the floods arrived in the lower course of the Omo River they were consequently devastating.

Droughts have also increased in both frequency and intensity. While the dry season lasted for a few months some four decades back, in recent decades it has lasted for as much as two consecutive years. This has debilitated the asset base of the pastoralists and reduced their resilience and coping capacity, thus effectively increasing their vulnerability to future droughts. The extent of drought is not uniform in the Omo valley; areas farther away from the Omo River (like Bubuwa of the Dassanech) are exposed to more frequent, severe and entrenched drought and consequent food insecurity. With respect to severity, as a Nyangatom informant has aptly put it, the drought got so bad that [the Nyangatom] people

[10] These land masses, in the strict sense of the term, are not islands, but are conventionally referred as such.

[11] This means little or no pasture and water in areas away from the river. In normal years, as the river gets full it would have rained long enough for the lowlands to re-grow pasture and sustain the livestock. Thus, both people and livestock used to be safe from flooding risks.

travelled to faraway places like the Suri territories, where they have never been. The same informant added that some pastoralists are contemplating the possibility of being relocated to a completely different locality by the government.

Locals cite different causes for the changing climate.[12] The elders of the two communities relate the changes that have happened to the climate to human misdemeanours. The Nyangatom elders, for instance, argue that the rains dried up, the land started to be less productive and the whole situation turned against them after the 1980s, because they disappointed their traditional leader who is considered as a father figure for the group. According to their narrative, in the mid-1980s the Nyangatom waged war on all of their neighbours. In response, the Kenyan military[13] intervened – with implicit approval from the Ethiopian government, they claim – and killed a large number of them. To escape from the attacks, the majority of the Nyangatom fled from Kibbish, against the wishes of their leader. The old leader who was deserted by his people died after cursing his group. Currently, there is no single elder who has replaced the vacated post. Moreover, many Nyangatom believe that the extreme hardship of the local climate, environment and animosity with neighbouring tribes is due to his curse.

A similar account relating the changes in climate with violent conflict is also found in the narrative of the Dassanech elders. They also perceive that the climate started to change during the *Derg* period, and correlate it with the rampant bloodshed at that time. They recite a local saying: "Shedding man's blood dries the rains". They also state that the climate got harsher as the animosity and misdeeds between local groups increased.

Young people in the locality state a more plausible reason. The high number of livestock[14] and unpredictability of rainfall are cited by most of them as the prime causes for the decline in pasture. Some refer to unsuitable soil types, like the sandy nature of the soil in Bubuwa, for local variations in food insecurity.

5. A survey of mechanisms for coping with climate change by the Dassanech and Nyangatom

As it has been stated above, pastoralists have traditional coping mechanisms which have evolved over centuries. It is only because of their efficient, effective and sophisticated tools for coping that pastoralists were able to survive the unpredictable climates of the lowlands. They also use their knowledge to adapt to

[12] None of the interviewees related with the proven cause of climate change, greenhouse gas emissions.

[13] Elders argue that military helicopters and planes were used in that assault.

[14] The high value these pastoral communities put on livestock, as a sign of wealth, status and also dowry, means that it will be a pretty challenging task to convince them to go for a smaller but higher quality herd. Sometimes, the harsher conditions might even force pastoralists to opt for larger herd sizes as an insurance against possible cattle deaths in the future.

the adverse impacts of climate change and increased climate variability. Most coping mechanisms can be summarized as resource management mechanisms. These mechanisms are flexible and spread the risk among the community (Doti, 2010).

The main mode of adaptation in pastoral areas remains autonomous—with little or no help from the government. This makes traditional coping mechanisms even more helpful. The main goal of these mechanisms is to minimize losses or facilitate recovery after drought events (Orindi et al., 2007). Local innovations by pastoralists (for example purchasing water, purchasing with credit and adopting a cut and carry system of forage from protected areas such as parks) can also be seen as changes in traditional coping mechanisms to match current socio-economic realities and climate challenges (Yohannes & Mebratu, 2009).

Interventions by government, and non-state actors as well, should therefore build on what is already available in the stock of traditional coping mechanisms, or at least go in line with these mechanisms. Informal strategies are the main paths through which pastoralists cope with climatic stresses, not government or market-based instruments (Heltberg & Siegel, 2008). Therefore, future adaptation activities should not try to replace, but should complement and strengthen these informal approaches (Parry et al., 2009). To do this, a comprehensive study on traditional coping mechanisms and their effectiveness should be carried out. This will help identify those traditional coping mechanisms that could be streamlined into government policies. In the following section we survey some of the most important coping mechanisms used by the Dassanech and Nyangatom pastoral communities.

5.1 Pastoral 'early warning' methods

People with the skill of predicting seasons (whether good or bad) are highly regarded by pastoralists. Such predictions are made by observing stars, wind and cloud patterns, specific wild animals or the flowering of some plants.

In the study area, drought will be imminent if the Omo River doesn't become full and floods its banks and the adjoining flat areas. According to informants in the study areas, local pastoralists have a traditional 'early warning system' which relies heavily on astrology[15] and the careful observation of wild animals, especially birds. They use such observations to predict the coming of rains and their intensity. Based on this information, different decisions will be made. For example, they will move away from the Omo River, or the islands in the case of the Dassanech, if flooding is expected. This decision will be passed to the youth of the group who will take the herd to a safe location. Birds also tell when and where to migrate.[16]

[15] In the past, it was only the elders who had this knowledge. Now many people, including the young, know it.

[16] A ritual will be held before the young embark on a major migration; goats will be slaughtered and their intestines studied to check if there will be an attack by their enemies.

5.2 Migration

Migration basically defines the pastoralist way of life. Among the Karamojong, mobility is critical to the viability of survival strategies (Easterling et al., 2007; Galvin et al., 2004; Orindi & Eriksen, 2005). Herd owners move in search of water and pasture to different locations during different times of the year. This has also the benefit of reducing pressure on the marginal ecosystems in which they live. Migration is augmented by communal ownership and management of natural resources, which is something not recognized by states. Before embarking on a seasonal migration, pastoralists estimate how long they will have to go (longer in drier years) and also compare livestock deaths from migration and staying on the sub-optimal lands (Orindi et al., 2007). In recent years, pastoralists (like Somalis in Ethiopia) have started taking fuel when migrating, so as to ensure easy access to water from boreholes by using water pumps (Yohannes & Mebratu, 2009, p. 15).

However, migration often brings contact with other pastoral communities and/or farmers. This often leads to resource competition and social tension. Traditional mechanisms, such as the creation and maintenance of grazing corridors, have proved crucial in abating the risk of violent conflict.

When we come to the Dassanech and Nyangatom, the distance to be covered and direction of migration depends on a lot of factors. The most important input to this decision is the intimate knowledge that pastoralists have of their environment. Depending on the severity of the drought, pastoralists may take their herd into enemy territories while being well aware that conflict will erupt and lives will be lost.

The Dassanech have the geographical advantage of going onto one of the islands on the northern tip of Lake Turkana during dry times, while their neighbours the Hamar and Nyangatom migrate to the Mago and Omo National Parks, respectively. In times of severe drought, the Dassanech migrate deep into the borderlands of neighbouring Kenya and the Nyangatom into Omo National Park,[17] increasing the risk of conflict with the Turkana and Mursi, respectively. A Nyangatom elder added that, in times of drought, ‘we will go wherever there is grass, to the lands of the Dassanech, Hamar, Karo and Mursi. We also go to Kenya and the Sudan. We do that irrespective of the conflict that our movement brings to us.’

Migration is not only a coping strategy for shortage of pasture or drought but also a method that pastoral groups like the Dassanech use to escape the overflowing of the Omo River. In such instances, the Dassanech move into Hamar and Nyangatom lands. Migration to towns, to find work as petty traders and daily labourers is not

[17] The Park is also liked by the livestock for its salty soil.

very common in the study area. The Nyangatom effectively exploit[18] the linguistic and cultural similarities they have with the Toposa and their ethnic kinsmen across the border, and use the good quality pasture near/in Southern Sudan (a locality called Naita) in years of hardship.

5.3 Consumption of wild fruits and roots

The consumption of wild fruits and roots, which are not consumed under normal conditions, is a common coping mechanism in many communities in Africa.[19] In times of hunger, these wild plants are usually consumed by human beings; as an interviewee said, "cattle are picky". Sheep and goats eat branches, and herders cut down high branches for them. Interestingly, an informant[20] mentioned that eating fish, especially in the case of the Dassanech, could be seen as a coping mechanism. Additionally, as stored cereals are used up, meals prepared from meat and butter will dominate. The meat will be dipped in butter and it will have a longer storage life, of more than a month.

5.4 Selling livestock

Neither the Dassanech nor the Nyangatom rear livestock for commercial purposes and selling is not a common practice. Furthermore, in both communities, a pastoralist who often sells cattle will be ostracized.

However, during extended droughts both communities will sell their livestock. In the past, as access to markets in Ethiopia was limited because of poor roads, pastoralists of the South Omo used to go to the Kenyan side to sell or barter their animals. Currently, both communities sell their cattle in nearby markets (Omorate and Kangaten) within Ethiopia. One interviewee also added that the Nyangatom sell honey, too.

5.5 Herd diversification

Pastoralists have a good understanding of the importance of keeping mixed herds, especially of grazers and browsers. They do this to take advantage of the heterogeneous nature of the environment and to use different resources (such as grasses, shrubs, twigs etc.). Diversification helps prevent a total herd loss by keeping animals with different tolerance levels to climatic stresses (Hendrickson et al., 1996; Orindi et al., 2007). Reports from the Somali Region of Ethiopia show that herd composition is changing to shoats (sheep and goats) from camels and, among the Afar, from cattle to goats and camels (Yohannes & Mebratu, 2009). The Borana of Ethiopia, who are traditionally averse to camel husbandry, have also started keeping camels due to their resilience to drought and climatic stress.

[18] The Nyangatom used this similarity to get guns, bullets and military training during the North-South civil war in the Sudan during the 1980s and 1990s. This has created the opportunity to benefit from cattle rustling.

[19] For detailed information on the types of plants, plant parts and processing of hunger foods see the chapter by Jean Grade.

[20] Both the Dassanech and Nyangatom have minority sub-clans who eat fish.

Herd diversification is not, however, traditionally used in the study areas. It is only recently, and after encouragement from the government and NGOs, that pastoralists of the study area started keeping camels. The Dassanech used to raid camels from the Turkana in the past, but the Hamar and Nyangatom got their first camels (originally bought from the Borana zone) with NGO support. In Nyangatom areas the adoption is so slow that most camels are still in government hands.

Locals have started consuming camel meat and drinking camel milk. It is also appreciated that a camel can provide more milk than a cow. In the Dassanech areas, a clear increase in the proportion of camels is seen as one moves away from the Omo River, reaching as high as 20% of the total herd in some locations. Moreover, camels and donkeys are not treated as well as cattle/goats, mainly because the former are seen as hardy. To a small extent, the Dassanech and Nyangatom have also started keeping poultry and bees.

5.6 Herd splitting

The impact of climate events (like drought) will not be equally felt in all vulnerable/affected areas. The same is true of the risk of raids and outbreaks of animal diseases. As a result, herd splitting is practiced by pastoralists as a way of mitigating the adverse impacts of climate change. Herd splitting allows pastoralists to easily restock after extreme weather events (Orindi et al., 2007; Orindi & Eriksen, 2005). While herd splitting is not normally practiced by the two groups, there are slight variations between the Dassanech and the Nyangatom. For the Dassanech, splitting their herd is uncommon.[21] The Nyangatom, however, practice it to a limited extent and not in the exact sense of the term. If pasture becomes poor in their locality, they send their cattle to relatives in areas with better pasture, especially to a place called Naita.

A variant of herd splitting was also recorded in the study area. It is customary for a man to give a dowry of as much as 100 livestock (a mixture of cattle and goats) to the father of his future wife. All these animals are, however, not given at the same time. The husband only has to give the agreed amount of livestock in his lifetime. Taking advantage of this, the father of the bride can demand the remaining livestock after a drought shock.

5.7 Income diversification

During severe droughts pastoralists cope by increasing their proportion of off-farm income, by engaging in non-pastoral activities (Galvin et al., 2004; Scoones, 2004). Examples of such activities include charcoal making, seeking employment and raiding (Orindi et al., 2007). Other activities include collection of wild fruits (Eriksen, 2000; Orindi & Eriksen, 2005), living on remittances from relatives who

[21] Informants argue that this is because cattle are worth so much that they don't want to give them to anyone else.

have migrated to towns and cities, engaging in petty trade and sale of assets (Orindi & Eriksen, 2005).

These livelihood diversification schemes usually constitute a shift into low income and unsustainable use of environmental resources, which could be taken as maladaptive practices (Young, 2009). Most of the aforementioned adaptation practices are possible for those pastoralists located closer to urban centres. As a result, they have little relevance to the Dassanech and the Nyangatom. The Dassanech are comparatively better positioned than the Nyangatom, as Omorate town is much older than Kangaten and has a higher number of residents and civil servants.

5.8 Taking advantage of 'good' years

Given the highly unpredictable environments they live in, pastoralists take the opportunity to get prepared for 'bad' times during the 'good' years. Firstly, in the 'good' years, they put productive female livestock in their herd. This ensures the easy replacement of lost livestock. It is also beneficial from a nutritional point of view as pastoralists mainly get their dietary requirements from milk (Orindi et al., 2007). Secondly, pastoralists expand their herd size during the 'good' years and this serves as an insurance against future losses (Easterling et al., 2007; Orindi et al., 2007). In spite of the usefulness of this mechanism, numerous calls have been made by development agencies for de-stocking. Without a proper understanding of pastoral livelihood systems, some tend to blame high livestock populations for environmental degradation and desertification (Orindi et al., 2007).

Restocking, after a climatic shock, might take pastoral households many years. Given the increased frequency and severity of climate variability due to climate change, not restocking in good times makes pastoralists more vulnerable. Different actors have contributed to change this situation, the best example being the response to the August 2006 flooding which especially affected the Dassanech. After the provision of relief aid, government and non-governmental organizations have bought and distributed livestock to the affected groups of pastoralists.

5.9 Alliances with neighbouring communities

The first impact of drought on pastoral households is a reduction in milk production and, thus, levels of nutrition. Pastoralists, in such times, supplement their diet by exchanging livestock products for cereals (see Orindi et al., 2007 for the case of the Maasai and Kikuyu in Kenya, and Hendrickson et al., 1996).

In the study area, the Dassanech produce more sorghum and maize as they are located on both banks of the Omo River. Thus, the Nyangatom buy cereals in peaceful years from the Dassanech to supplement their diet. The Nyangatom, especially in the 1980s and 1990s, were efficient at utilizing their close linguistic affinity with the Toposa of South Sudan and their ethnic kin across the border. They can graze their livestock closer to and well over the border in times of

drought without fear of stealing and/or conflict. They also received armaments, including weapons, from South Sudanese clans (Yohannes et al., 2005).

6. Interventions by governmental and non-governmental organizations

Poor human capital and physical infrastructure are some of the major factors which make Ethiopia one of the countries most vulnerable to climate change. The situation in its pastoral lowlands is much worse than the national average. In the study areas, there is poor road, electricity and telephone coverage. Furthermore, both the number of schools and student enrolment are dismally low.[22]

The various development works (such as expanding school coverage, mobile telephone network, road construction, and the like) will have the long term benefit of decreasing the vulnerability of local pastoralists. However, if climate change adaptation concepts are not mainstreamed into these projects, an increase in pastoral resilience to climate change will not necessarily materialize. For example, education might speed up the loss of traditional knowledge and culture, thus having the negative externality of eroding the coping capacity of pastoralists.[23]

Different state and non-state actors play a significant role in the two *wereda*. Their endeavours range from relief aid and emergency assistance during times of drought, flooding and other emergencies, to long-term development-oriented activities. Recently, these actors have been embarking on different projects to help pastoral communities adapt better to climate change. Scholars argue that understanding the traditional coping mechanisms of pastoralists and building on these mechanisms will be more effective than imposing an externally-inspired adaptation policy.

However, government policies usually take the pastoral way of life as backward. But the poor and ineffective presence of government institutions in pastoral areas leaves adaptation to be a mainly autonomous activity, and thus heavily reliant on traditional knowledge. There might also be the risk of maladaptation as policy makers often do not fully grasp the ecological, cultural and livelihood realities in the lowlands. Therefore, what different actors implement with a genuine interest in helping pastoral communities might, in fact, be counterproductive and further increase their vulnerability.

Looking at the activities that different actors undertake with the intention of increasing the adaptive capacities of pastoral communities in South Omo Zone provides a mixed picture. On the one hand, different NGOs and government institutions are seen as augmenting the traditional coping mechanisms of pastoral communities. On the other hand, they also impose modern development initiatives.

[22] Officials in Jinka claim that Alternative Basic Education (ABE) is proving to be better at attracting more students.
[23] See the paper by Martha Wagar Wright in this book.

A review of some of the major instruments of intervention by governmental and non-governmental actors in the two *wereda* follows.

6.1 Productive safety-net programme and aid

This programme is running in both *wereda*. Local administrators argue that the programme has the intended long-term benefit of helping pastoralists build their household assets through the community development works in which they participate.[24] The community work, which is mainly about natural resource conservation, is also beneficial to the pastoral groups. Payments are normally made in cash (40 Birr per month) for three months and in food rations (15kg cereal, 1kg pulse, 0.5 litre cooking oil and 4.5kg nutritious food), for the following three months.[25] In years of severe drought, however, food rations are provided for the whole duration of the programme.

On a theoretical level, it can be argued that a pastoral household could build household assets by participating in the programme over a few years and graduate from aid dependency. This, however, is not the case on the ground. On the one hand, no participant has graduated out of the safety net coverage. This is attributed to the communal way of life of pastoralists and the fact that a community shares whatever is available, thus halting the asset accumulation process. On the other hand, it creates dependency, as being covered by such programmes is considered as a privilege and pastoralists feel that if you are covered once you are covered for life. The major problem with the policy is the intention to build the assets of individual households, whereas pastoralists tend to be egalitarian and to share their resources.

Notwithstanding the negative consequences of having a community living on aid (such as the development of dependency), aid has been viewed as one of the major coping mechanisms in times of drought/flood in recent decades. The moral imperative of helping communities in hunger drives and sustains the aid industry in western countries. What pastoralists add is that humanitarian aid should include forage and drinking water for their livestock.[26]

6.2 Settlement

Some pastoralists are opting to settle, mainly around river banks, and practice irrigated crop cultivation. Reportedly, the number of Dassanech who stay on islands on Lake Turkana is increasing, as this has the benefit of easy access to water, pasture and fish, and also shields them from raiding attacks (Yohannes & Mebratu, 2009).

[24] These works include the construction and repair of gravel roads, ponds, schools, health posts etc. for six months of a year.

[25] One should note that in, monetary terms, it is better for an individual to get the food ration than the cash.

[26] They argue that, even if human beings survive a drought episode, their life will mean little without their livestock.

Though controversial, the major policy goal of the government is to settle pastoralists along the river banks and acculturate them to (irrigated) farming. This is hoped, in the eyes of policy makers, to bring a stable way of life. The best evidence for this is the speech that PM Meles Zenawi gave in Jinka, on the occasion of the 13th annual Pastoralist Day, when he outlined his government's priority on water development (irrigation systems) in pastoralist areas like South Omo. He said that a solution to the water problem would help bring productive and modern ways of animal husbandry by providing better pasture. The development of irrigations systems also allows pastoralists to settle and practice farming. Affirming the commitment of his government to 'transform' the pastoralist way of life, the PM said:

> There are some people who say they are concerned for the pastoralists, but what really they want is the permanent preservation of pastoralists and their lifestyles as tourist attractions. But the pastoralists do not want to live as tourist attractions. They want a stable and improved life. We are standing strongly by the idea of creating opportunities for pastoralists to live a secure life according to their own interests (Meles, 2011).

6.3 Small-scale agriculture

In what could be construed as a 'scaling up' of the traditional flood retreat agriculture, the government and different NGOs are distributing water pumps for small scale agriculture in the adjacent areas of the Omo River. Pastoralists produce vegetables, fruits, maize and sorghum, and sell at the nearest markets.[27]

The administrator of the South Omo zone confirmed to us that the efforts to expand traditional flood retreat farming by the pastoralists coincides with the government's goal of bringing a stable way of life to pastoralists. This effort is led by what the administrator called a 'command post'[28] structure. In this arrangement, development activities are directed by a combined leadership of the ruling party–the Ethiopian People's Revolutionary Democracy Front (EPRDF)–and the local administration. The 'command post' idea was taken from the EPRDF's campaign machinery for the 2010 national and regional elections, which the local officials assert led to massive mobilization of voters. This structure is vertically organized and allows easy flow of information from the federal to local levels and vice-versa.

[27] Market access seems to favour the Dassanech, as Omorate town is much older and has much higher number of civil servants and petty traders than Kangaten, in the Nyangatom *wereda*.

[28] The effectiveness of such a mechanism was known in the aftermath of the 2010 elections and now it is being implemented in development works. Reports are prepared every three days and transferred hierarchically to the federal government. Relevant people at different levels discuss developments every day, according to our informant.

The government, in its drive to expand irrigated agriculture along the banks of the Omo River, uses model pastoralists and cooperatives that were able to buy their own water pumps. Women are arguably better than men in agricultural skills and constitute 50% of water user associations. There are many challenges to the small-scale irrigated agriculture that is being promoted in the two *wereda*. A fundamental challenge in practicing small-scale irrigation is land ownership. River banks are owned by different clans and sub-clans, and also serve as boundaries, sources of fodder and sources of wild fruit in the riparian forest. There are institutional problems, too: in the past, irrigation issues were handled by the *Wereda* Water Bureau and agricultural issues by the Agricultural and Rural Development Bureau. This made cooperation between different bureaux indispensable and contributed to the slow progress of implementation. This problem has been resolved since the regional government decided to bring irrigation under the purview of the Agricultural and Rural Development Bureau. Moreover, there is a problem regarding the distribution of pumps. Local irrigation experts say that the small pumps are enough to irrigate 5-8 hectares, but under current arrangements a single pump is shared by eight individuals, each cultivating only 0.125 ha of land. Thus, pumps are not being used efficiently and the sharing of a pump by many farmers raises the possibility of competition and failure. Moreover, the suction tubes do not seem to withstand the high temperatures of the lowlands.

6.4 Irrigated agriculture investments[29]

The potential of the lower Omo valley for irrigated agriculture has been known for a long time now. Attempts to harness this potential began as long ago as the late 1980s. The Tringole State Farm, which was established by the Ethio-(North) Korea Joint Agricultural Development Project, was planned to irrigate 10,000 ha of cotton when it reached its full capacity. In 1991, after the collapse of the military regime, the Korean staff based at Omorate left and the North Omo Agricultural Development Enterprise[30] took over (Richard Woodroofe and Associates, and Mascott Ltd., 1996).

In Nyangatom area, a Swedish Philadelphia Church Mission (SPCM)[31] was working on training local pastoralists to use pumps, and also opened a mission church, school and clinic at Kibbish.

[29] In Ethiopia, agricultural investments on less than 200 ha are taken as small scale, 200-3,000 ha as medium scale and more than 3,000 ha as large scale (Yacob, 2007).

[30] We were informed that an Italian investment group took the land and planted palm, which one can see before entering the town. They were not successful and the land is now vacant. The electric generator which was used to power the water pumps now generates electricity for residents of Jinka, the Zone capital.

[31] The mission is closed now and its buildings house government offices. Of the accomplishments of the Mission, education seems to have lasted best. While the Dassanech had to drop out when they get to high school, some Nyangatom finished. The researchers also observed that young Nyangatom informants based in Jinka speak better English than their Dassanech counterparts.

Of the 221,411 ha of irrigable land prepared for investors in the two *wereda*, currently only 15% is given to investors (see Table 3 below). Local experts believe that, in the coming few years, as roads and other infrastructure are expanded, investors will move in and develop the remaining land.

Table 3: Irrigable land prepared for investors and land given to investors

Wereda	Land available (ha)	Land granted to investors (ha)
Dassanech	118,411	30,027
Nyangatom	103,000	3,755
Total	221,411	33,782

Source: *Zone* officials (May, 2011)

6.5 Planned sugarcane plantations and sugar industries

The Omo-Gibe basin is the third largest in Ethiopia, with an annual flow of 17.9 bcm (the first and second being: Abbay with 52.62 bcm and Baro-Akobo with 23.24 bcm) (Yacob, 2007) and the Omo River is the second largest river in Ethiopia (Richard Woodroofe and Associates & Mascott Ltd., 1996, vol. 5). The Omo-Gibe River Basin Integrated Development Master Plan Study (Richard Woodroofe and Associates, and Mascott Ltd., 1996) exhaustively presents the different natural resources found in the basin and outlines possible projects.

Of the projects deemed economical and recommended by the consultants, most are agricultural. The lower Omo Valley has agricultural potential, which the government wishes to tap. The government's intentions do not generally stem from concern for local populations. The government plans to massively expand the sugar industry because of a number of interrelated factors. First, the need to meet the growing demand for sugar. Second, the potential of the industry to employ a large number of people. Third, the prospect of earning foreign exchange by exporting the surpluses from the domestic market. And fourth, the significance of the sugar industry for the production of bio-ethanol, to be mixed with petrol. According to the government's Growth and Transformation Plan (GTP), in five years (2011-2015) the government intends to open ten sugar factories, increasing the number from three to thirteen and increasing many-fold the land covered by sugarcane plantations.[32]

Government officials argue that pastoralists would make up a good proportion of the individuals taking advantage of the hundreds of thousands of job opportunities that will be created by the plantations and factories. Moreover, pastoral communities will be given water for agriculture and also for their livestock by the plantations. Furthermore, the government will prepare land and give it to

[32] The current total acreage under sugarcane plantation nationally is 25,000-30,000 ha. Tendaho plantation (in Afar Regional State) will have about 25,000 ha of plantation (from the originally planned 70,000 ha). News articles put the acreage of sugarcane plantations in South Omo at 150,000 ha.

pastoralists to act as 'out growers' (to grow sugarcane and supply the factories) and also to start ranching. There is a 10,000 ha community farm allocated for pastoralists in Dassanech *wereda* for this purpose, but none in Nyangatom *wereda.*

The introduction of the sugar industry in the lower Omo valley could have both positive and negative consequences. The planned provision of water and expansion of irrigated agriculture could help the pastoralist communities gain stable access to water. As the experiences of the Awash valley show, the introduction of new users to the common resources of pastoralists invites competition and conflicts. The introduction of plantations in the Awash valley limited access to grazing lands for pastoralists there. The Awash River was also polluted by the sugar plantations. As the experiences of the Afar and the Karaayu pastoralists show, more often than not government development policies and their implementation in the pastoral areas show little attention to the plight of pastoralists.

Resource conflicts with large scale irrigation schemes were also among the challenges indicated by the Master Plan, especially if little attention is paid to their interests (Richard Woodroofe and Associates, and Mascott Ltd., 1996, vol. XII, p. 65). This assertion was made in relation to conflicts between the Tringole Farm developers and local pastoralists. Recently, a dispute that happened at the commercial farm in Brayle, which was established on the banks of the Woyto River and is found a few hundred kilometres to the north of the study area, claimed the lives of hired farm workers.

On the part of the pastoralists, there could be difficulties in taking advantage of the employment opportunities which such factories would bring. This is mainly due to cultural reasons and their acculturation to a nomadic life style.

7. Conclusion

Climate change is one of the many challenges that humanity is facing today. The increase in temperature, unpredictability of weather patterns, prolongation of the dry season and recurrence of drought are some of the major aspects of climate change in the Horn of Africa. The Horn of Africa is one of the sub-regions of the world that is highly affected by recurrent drought and the resultant famine. Countries like Ethiopia, whose economies are reliant on rain-fed agriculture, are vulnerable to the adverse impacts of climate change. Pastoralists, because of their historic marginalization from the politics and economics of the countries of the Horn of Africa including Ethiopia, are very vulnerable to the adverse impacts of climate change. The same is true of the Dassanech and the Nyangatom of the South Omo valley. There are already visible signs of climate change in the South Omo. There are recurrent droughts (extended dry seasons), a rise in temperature and extreme weather events (floods). The elders of the Dassanech and the Nyangatom communities narrate how their environment has been changing by using historic milestones–the imperial period prior to 1974, the *Derg* period (1974-1991) and the

present times (since 1991). Some of the major trends of climate change according to the narratives of the two groups include: decline in vegetation; rise in temperature; increasing unreliability of weather patterns; decline in land resources such as pasture and water. Because of these dramatic changes, the normally resilient pastoral way of life is being threatened. In the face of the adverse impacts of climate change, the Dassanech and the Nyangatom communities use time-honoured traditional coping mechanisms such as migration, use of wild fruits and roots, herd diversification and splitting, taking advantage of good years, selling livestock, and income diversification.

Development policies by both governmental and non-governmental actors do not, however, use the traditional knowledge of pastoralists that has been developed over the centuries. For instance, the major policy goal of Ethiopian governments past and present is settlement. Settlement is hoped to bring a stable way of life to pastoralists. But the emphasis that is given to settlement reduces the crafting of policies and practices that would take advantage of pastoralism, which the people of the region are well versed in. While the voluntary settlement of the pastoral groups from the two *wereda* on the banks of the Omo River needs to be encouraged, settlement schemes by direct and indirect government pressure need to be avoided. Forced and poorly planned settlement schemes across the world have brought more problems than advantages.

The planned introduction of large scale irrigated agriculture and of the sugar industry in the South Omo valley brings both opportunities and challenges at national, regional and local levels. At the national level, the realization of the plan to erect large sugar mills across the country could help absorb hundreds of thousands of unemployed youth. Moreover, it helps generate foreign exchange. But at the local level, the sugar industry and large scale irrigated farms bring several challenges. The pasture land which is available to the pastoralists of the region will be reduced. Pastoralists could also face shortages of water. These would bring competition and conflicts among the different resources users.

Therefore, there is a need to mainstream traditional pastoralist instruments of coping with climate change. For instance, one of the major instruments through which pastoralists overcome drought and shortage of pasture is migration. This should be recognized by governments and policies that help its practice should be adopted. With the increasing shortage of pasture and ethnicization of territory, pastoral migration is becoming more difficult. Governments should realize this and adopt policies that help minimize conflict among common resource users. At the regional level, the governments of Ethiopia, Kenya and South Sudan should also develop policies that recognize the movement of South Omo valley pastoralists across national boundaries and develop appropriate policies and practices that minimize conflicts among common resource users.

There is also a need to synchronize pastoral early warning systems with modern climate prediction models in order to prepare for extended periods of drought and flooding.

The contribution of the government and other development agencies in the provision of camels as a way of herd diversification is something that should be encouraged. The same approach should also be extended to the identification and study of wild fruits that pastoralists use to survive during extended periods of drought.

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Karamojoŋ (Uganda) Pastoralists' Use of Wild Edible Plants: A Traditional Coping Mechanism towards Climate Change

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Abstract

Pastoralism came about over 6,000 years ago as an adaptation to climate change, and pastoralists might now provide important answers to the question of adaptability. The transhumant agro-pastoralists of arid/semi-arid Karamoja in Uganda experience hunger on a daily basis, with long streaks of drought and famine. Their diet is primarily sorghum and wild greens, tubers, fruits and insects, moderately supplemented with relief food. This paper is a preliminary survey of wild, un-domesticated foods which have been and currently are used in Karamoja as a coping mechanism to hunger. A total of 132 wild edible foods are identified, the majority being plants (126) although 6 foods are animal/insect protein-based. The most common plant forms used in Karamoja for hunger foods come from trees (51) and herbs (47). The most common plant parts are fruits (45) and tubers/roots (31). Most (84.5%) of the hunger foods listed require some amount of preparation, and 60.7% require a significant amount of time to prepare. Four food categories were defined: famine, hunger, normal and special. Of the 132 wild foods identified, 63 are 'hunger foods', 35 are 'normal wild foods', 29 are 'famine' and 5 are 'special'. Sixty-seven of these foods have multiplication potential. This is invaluable information both culturally and for development initiatives related to household food security. This information should be further examined for domestication of wild, under-utilised edible plants. Finally, the paper concludes that use of wild plants continues to be one of the major coping mechanisms in pastoral areas, thus should be recognised in food security interventions.

1. Introduction

Climate change is a complex, non-linear phenomenon. It is, then, unpredictable and difficult to prepare for. People reliant upon natural resources and those already considered 'marginalised' are most affected by the deleterious effects of climate change (Thompkins & Adger, 2004). Pastoralists have, in response to the harsh environments they live in, developed adaptive coping mechanisms to manage range resources: two key mechanisms being livestock keeping and mobility (MacOpiyo et al., 2008; Morton, 2007).

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A typical area is Karamoja, 28,000 km^2, located between 1°30´ and 4°00´ N and 33°30´ and 35°00´ E in north-eastern Uganda. The region has two rainy seasons and a semi-arid to arid agro-ecology, characterized by an intense hot and dry season (October to April). December and January are the driest months, typically with strong winds. The single rainy season peaks in May and July. Mean rainfall is 100mm to 625mm annually. Daily temperatures average 30-35°C all year round. As a result, the plants grow under very dry conditions. The dominant plant species are xerophytes while the soil is rather basic (Thomas, 1943; Weatherby, 1988).

Karamoja provides an example of complex climatic stress, having struggled in recent years from an increase in variability of rainfall in terms of incidence and amount. Rainfall data is extremely limited, but analysis indicates that the amount of rain that is received annually has decreased by about 15-20% over the last two decades. In addition, the way in which rain now falls has changed, with precipitation being characterised by intense rainfall events of 20-35mm separated by long periods of effectively no effective rain (KALIP, 2009). These erratic rains exacerbate hunger and crop failure. These effects have been attributed to climate change in pastoral areas in East Africa (MacOpiyo et al., 2008).

The people of Karamoja, for the most part, still practice a transhumant lifestyle like that of the entire socio-cultural Karamojong cluster of the Horn of Africa. Men and their livestock become seasonal nomads in search of adequate pasture and water during the intense dry season. This often stretches into extensive drought at their *manyatta*, a semi-permanent collection of huts surrounded by imposing, thick, protective thorn walls, protecting families and livestock from raids. Here, women, children and elders remain while men travel during transhumant periods. Women are depended upon to cultivate, forage and prepare most of the food. Men bleed living cattle to drink or, infrequently, slaughter livestock for ceremony and food. When animals are available, women milk the cows for all to drink and shepherds milk sheep and goats. Livestock products are not preserved, but game-meat is dried. In addition to milk, their current diet[2] is primarily sorghum and wild greens, tubers, fruits and insects, moderately supplemented with relief food.

The transhumant agro-pastoralists of Karamoja experience hunger in the best of times, with long streaks of drought and famine. They rely upon a wealth of indigenous knowledge to help them cope with their harsh surroundings, which are exacerbated by climate change. Their main staple foods have been the products of their livestock (meat, milk and blood). The last few generations have started small scale agriculture with drought-resistant sorghum and millet. Near Karamoja's three mountains, maize is also grown.

[2] Historically the Karamojong did not cultivate, but survived on their livestock's milk and blood and a wide variety of wild foods. Relief food was introduced after a severe famine starting in 1979, its distribution has continued non-stop to current time. These two introductions have greatly reduced the use of wild foods.

Like many other people living rurally in developing countries, when these foodstuffs fail, they identify, locate and painstakingly prepare a variety of root tubers, leaves and tree nuts. These uncultivated and undomesticated plants are known as 'wild, edible plants' (WEP) or 'hunger foods'. Hunger foods are important in rural communities: people in Bunyoro-Kitara Kingdom, Uganda use wild and semi-wild edible plants year-round as a major part of their diet (Agea et al., 2011). Some of the gathered plants, furthermore, are consumed at a higher level than sub-Saharan Africa's mean per capita consumption of cultivated fruits and vegetables (Agea et al., 2002).

Throughout the developing world, WEPs have become even more important in times of climate change that involve drought and hunger (Addis et al., 2005; Asfaw & Tadesse, 2001). The edible parts of many WEPs actually flourish during hunger periods and before cultivated crops are ready for harvest (Addis et al., 2005), thus bridging periods of food scarcity (Cook et al., 1998; FAO, 1988). This makes WEPs an important source of energy and food during times of famine. WRPs are versatile in that they come from a wide variety of plants, therefore some of the plants (herbs and grasses) survive and sprout in spite of heavy rains and floods, while other plants (such as trees and tubers) can survive long periods of low to no rainfall. One can assume that the relevance of WEPs increases as the incidence and severity of weather events (drought and flooding) is expected to increase due to climate change.

Some key WEPs are more drought-resistant than food crops (Dzerfores et al., 1995). Freiberger et al. (1998) showed that most wild hunger foods in Niger were not only drought-resistant, but also highly nutritious. Some WEPs are antioxidants (Cook et al., 1998), while others fulfil 100% of human mineral requirements (Elless et al., 2000) and even help with poverty alleviation and the creation of a sustainable food supply (Addis et al., 2005; Delang, 2006; FAO, 1998).

Despite the high potential of WEPs to address some climate change induced food insecurity, there are challenges to their promotion, use and documentation. Their collection and preparation is time-intensive, and the results are not particularly palatable. Furthermore, the commencement of relief food distribution by international aid organizations after the severe famine of the 1980s has decreased the reliance of the local population on WEPs. Today, relief is being exploited as another adaptation and coping mechanism, as food handouts continue 30 years later. Changing food habits with an increasing reliance on food aid and other new food introductions has diverted attention from WEPs in many cultures (Rascke & Cheem, 2007; Tabuti et al., 2004).

Another challenge to the consumption of WEPs is that they seem to be becoming less available: due to the indiscriminate destruction of their natural habitat, via deforestation, land clearing for cultivation, charcoal burning, overgrazing and changes in land use and land cover related to population pressure and insecurity

(Okia et al., 2011). Therefore, the naturally occurring WEPs are routinely cut down and/or ploughed under the increasingly large garden plots. Documenting this information is difficult. One must know the local language and have botanical knowledge not only to correctly identify WEPs but to find knowledge keepers and build trust and confidence so that they will be willing to share. Overall, the sustainable use of WEPs is challenged by loss of indigenous knowledge (Tabuti et al., 2004) and limited scientific documentation.

Half a dozen studies on WEPs have occurred in limited areas of agricultural Uganda (Agea et al., 2011; Tabuti et al., 2004), but not in pastoral areas like Karamoja. There is only one reference that lists any WEPs in Karamoja—a country-wide technical handbook (Katende et al., 1995). All other known Ugandan studies have taken place in different ecosystems and livelihoods. However, there has been some effort to document WEPs in pastoral area of Kenya and Tanzania (International Center for Research in Agroforestry (ICRAF), 1992; Maundu et al., 2001). Although, pastoralists are most vulnerable to climate change and food scarcity, most of climate change related researches have focused on urban and highland agricultural settings (MacOpiyo et al., 2008). Thus, it is imperative to start cataloguing WEPs, in Karamojong especially while they are still being actively used. This could give insight into the use of WEPs as a coping mechanism for climate change and variability in other similar areas.

WEPs can help lessen the effects of hunger and enhance balanced nutrition, yet this knowledge has not been documented or fully explored in Karamoja. Therefore, this paper will survey and document ‘hunger food’ knowledge and its utilisation by various ethnic groups in pastoral Karamoja. Hunger food application may be incorporated into local NGO development and training, while preserving valuable cultural knowledge.

The ethnic groups surveyed are the Dodos, Ik (Tueso), Jie, Karimoŋ, Labwor (Leptur), Meniŋ, Nyaŋiya, Tepes (Sor) and Upe (Pokot). In the best-case scenario, wild indigenous foods could be systematically researched for the sake of cultivation, domestication and multiplication: for use not only in Karamoja but also in other regions. This paper is a preliminary survey of wild, un-domesticated foods which have been and currently are used in Karamoja as a coping mechanism to hunger at the household level. Some of the foods are only utilised in times of famine when there are no other options.

The objective of this study is to survey wild, edible foods in Karamoja. Specific objectives are to identify the local plant name and the botanical one where possible; to identify the plant type and what part is used; to document the preparation time; to differentiate between ‘hunger foods’, ‘famine foods’, ‘normal foods’ and ‘special’ or preserved foods; and to identify WEPs with potential for multiplication.

2. Methodology

Over the course of five months in mid-2011, four Karamojong districts (Nakapiripirit, Moroto, Kotido and Kaaboŋ, listed from south to north) were surveyed. This preliminary study includes the language and people groups[3] of the Karimojoŋ (Pian, Bokora and Matheniko), Dodos, Ik, Jie, Meŋiŋ, Nyaŋiya and Tepes (see Figure 1 on page 35 for the geographical distribution of these ethnic groups). Kaaboŋ district includes Dodos, Ik, Meŋiŋ and Nyaŋiya. Kotido only has Jie; Moroto has Matheniko and Tepes; Nakapiripirit has Pian and Tepes. Data collection was done by the author in the local language, except in the case of the Ik ethnic group where data from the resident linguist was used (Terrill Schrock, personal communication).

A variety of methods were used: ethnobotanical survey and identification, walk-in-the woods, group discussion, open-ended surveys and semi-structured interviews (Cotton, 2002; Thomas et al., 2007). Care was taken to locate, photograph and collect the plants in situ, prepare and taste if possible, note the plant part used and its natural form (e.g. tree, shrub) as well as to differentiate whether the WEP was a 'hunger food', 'famine food' or just a 'normal' wild but under-utilised food; the amount of preparation time was also noted and subsequently categorised into either 'no', 'minimum' or 'significant preparation' groups.

For this study, 'hunger food' is defined as a food product that is utilised primarily in times of hunger and is not cultivated. This includes the food that the shepherds and warriors would forage while herding animals, or that women would eat while out for long stretches of time searching for firewood and building supplies. 'Famine foods' are those WEPs that take a long time to prepare or that have an unpleasant taste or taboo that would discourage their regular use. 'Normal foods' are those WEPs that are a common part of the diet that women search for to supplement their family's diet, even when other food is available. 'Special' or preserved foods are ones that usually take a long time to prepare but are considered a treat, or foods that can be kept for at least a few months, for example dried milk or preserved edible white ants. For the purpose of this paper, the term WEP shall be used to embrace all 'hunger' foods, even if they are not plant-based. WEPs were also cursorily assessed for domestication potential, i.e. if they could be put into multiplication or cultivation schemes.

As this was a preliminary study, not all of the plants collected and photographed have vouchers. Those previously studied have vouchers and are deposited at

[3] The terms tribe or clan could likewise be used, however, as these can be controversial terms implicating cultural superiority, I prefer to use people or ethnic group. The people living in Karamoja are Karamojoŋ – made up of different distinct ethnic groups. Some (Ik, Labwor, Meŋiŋ, Nyaŋiya and Tepes) have completely different languages while others (Pian, Bokora, Matheniko, Dodos and Jie) can understand one another. Many of the Karamojong, regardless of group affiliation, share many social and cultural activities, lifestyle and beliefs.

Makerere University Herbarium in Kampala, Uganda (Gradé et al., 2009). If particular plants were impossible to find, photograph or taste, an extensive description was taken including plant type (size and shape), form, soil type, availability, colour, taste, preparation time and ingredients, along with as much information as possible for the anticipated full study. Data was tabulated in Excel and simply analysed using the pivot table functionality.

3. Study limitations

Unfortunately, the Upe (Amudat district) and Labwor (Abim district) peoples were not included due to poor road infrastructure and heavy rains during the data collection period (April-August, 2011). This warrants further research. Even though the Napak district was not visited, the Bokora people who live there are closely related to the Matheniko of Moroto district and the Pian of Nakapiripirit district that were surveyed. Earlier personal observations of the Bokora have been added as the author has been living among the Bokora for over a decade. Napak district is also home to the Tepes, but much of their knowledge has been previously collected by the author, as the Bokora, but also that of the Tepes of Mt. Moroto in Moroto district and Mt Kadam in Nakapiripirit district.

Some of the WEPs listed may be the same plant species but with different local names. This is unavoidable as one can find dramatically different spoken languages over a small distance, as is the case for example between Dodos, Meniŋ and Nyaŋiya, who live in Karenga (in Karamoja's most northern district, Kaaboŋ). Their language is also different to the most common language (Ŋakarimojoŋ) used for this study. Some of the plants listed have the same names but are taxonomically different plants.[4]

Certainly, some WEPs from Karamoja were not documented and others could not be located for a variety of reasons. This could be due to seasonality, not all the WEPs were available during the survey period. Other reasons could be land degradation, loss of knowledge, hesitation to share knowledge etc. Further botanical work needs to be done. Vouchers should be taken for all plants described and the ethnic groups in Karamoja that have not been surveyed should be included in a future exercise. For this preliminary study, local names were collected and the author's botanical background and her previous vouchers were used to identify by genus/species. The only other work on Karamoja wild foods is a brief list within a dictionary (Loor, 1976) which is based on a personal paper by V. Rada Dyson-Hudson from 1960, but it is difficult to ascertain how rigorous this research was and where the vouchers are located. Some of the WEPs presented here have other

[4] For example, as reported in this paper, three different parts of *B. aegyptiaca* are used, leading to confusion because each plant part has its own unique name that often has no reference to the original plant name.

purposes as well. Those wild plants which have veterinary health services have previously been documented (Gradé et al., 2008; Gradé et al, 2009).

4. Results

From all the surveyed districts of Karamoja, a total of 132 wild, edible foods were identified (see Table 2). The high number of WEPs shows good local adaptability to climate variability by the Karamojoŋ pastoralists. The most common type of WEPs are plants (126) although six were animal or insect protein-based (meat, milk products or insects). However, one of these six, EMUNE, has a variety of plant seeds in a mixture.

4.1 Common plant type

The most common plant type for Karamojoŋ WEPs is trees (51 incidences) followed by herbs (47), vines (15), shrubs (8), succulents (3) and fungi (2). These results show a wide variability that seems to afford the Karamojong pastoralists many choices. Trees are well-known for being able to withstand both drought and standing water, whereas herbs can grow quickly after a little rain in the midst of a prolonged dry season or even drought (Addis et al., 2005). This concurs with other research that shows that many WEPs are drought-resistant and can help hungry people have a more balanced, nutritious diet than a 'modern diet' that focuses on just a few plants (Raschke & Cheema, 2007). Furthermore, WEPs can be a 'hidden harvest' crop that enables communities in times of food scarcity to make it to the next crop harvest or through a livestock disease outbreak.

One of the most utilised WEPs is the EKORETE tree (*Balanites aegyptiaca* (L.) Del., Zygohyllaceae). It is a multipurpose tree that is used for both human and livestock health treatments and disease prevention, as livestock fodder and human food, and supplies building materials and prized charcoal, as it is a hardwood tree without resin (Gradé et al., 2009). Its leaves are eaten as a vegetable throughout its African habitat (ICRAF, 1992; Katende et al., 1995; Okia et al., 2011). In Karamoja, three different parts of *B. aegyptiaca* are used—the leaves (ŋAKORETO) may be cooked as vegetables, the edible mesocarp fruit (ŋIMOɗO) may be sucked on like candy and the hard, woody endocarp seed coat (AKOIT) can be cracked open and the inner nut (ABALIT) pounded, ground, soak cooked and used as oil-rich seed 'famine food'.

Confusion can ensue because each plant part has its own unique name that often has no reference to the original plant name. For example, one would expect the leaves of EKORETE to be called EDYA KE-EKORETE, or that the fruit would be called 'fruit of EKORETE', but actually each part takes on a new name that is typically unique to that tree or plant. A new entry was used for each unique name in this preliminary report for the sake of completeness; as plants are scientifically identified this list will change.

Okia et al. (2011) documented the use and naming of *B. aegyptiaca* in two regions of Uganda. Each group of people, Teso and Madi, had a local name for the tree (*Ecomai* and *Lugba* respectively) but, except for the fruit (*irorokony* – Teso) and the oil (*edu* – Madi), no special names were used for any other *B. aegyptiaca* product. The naming of trees and their identification is one of the many challenges to rural WEP research, along with finding the community members who are not only knowledgeable, but willing to share their knowledge.

In 2008, the United States Nutritional Research Commission (NRC) ranked the *B. aegyptiaca* tree as one of the top 24 priority 'lost African crops'. The tree is also prioritised second of eight indigenous fruit trees with high domestication potential in East Africa's dry lands (Teklehaimanot, 2008) and 99% of those interviewed in Teso and Madi used *B. aegyptiaca* products (Okia et al., 2011). This is at odds with the observation that the trees are cut down for charcoal making (even in protected areas) and land covered by these trees is ploughed and converted into monocrop farms.

4.2 Common plant parts used

Fruits are the most commonly used plant part. Data also showed that tuber or plant roots were used, seeds/nuts or grains, leaves, sap and pith (see Table 1 for a detailed presentation).

Table 1: WEP; common plant parts used in Karamoja

Plant part used	Frequency from the surveyed WEPs
Fruit	46
Tuber	31
Seed	22
Leaf	22
Sap	5
Pith	1
Total	127

All plants identified except one (EBUNE – diseased sorghum head) were wild, yet sometimes domesticated or other 'regular' foods could be added to the 'hunger' foods. Fruits, the most common plant part used, can be stored for a short period of time but, more importantly, like roots they can be easily transported. There may be income generation potential from transportable WEPs (Delang, 2006). Tubers, the second most common plant part used, are the most drought-resistant of the list. Tubers or plant roots are well protected from Karamoja's scorching sun below the soil. In fact, the Bokora pastoralists of Karamoja dig up a particular medicinal plant tuber and transplant it at their home (*manyatta*) to be used in an emergency–they call this method something similar to 'using vaccine cool box' to preserve the tuber (Gradé et al., 2009). Seeds/nuts or grains were not only commonly used, they also have the highest domestication and multiplication potential (Termote et al., 2010).

Table 3 below has been extracted from Table 2 to highlight those WEPs that might be considered for multiplication or cultivation, of which there are 67–roughly half of the total WEPs described. Only those plant parts which contain seeds have been considered.

Certain preferred WEPs are collected and consumed when available, but may also become very important stored 'famine foods' during periods of food shortage. Leaves can typically be found on trees for all but a few months of the year. Some leaves are stored by the pastoralists for use later or to add flavour to soups. Sap may be available throughout the year, but the informants claimed that most of the five saps recorded should only be extracted at certain times of the year. However, the sap, like seeds and nuts, may be stored for long periods.

Similarly, this information should be further examined for domestication of wild, under-utilised edible plants (Termote et al, 2010). Development of natural grains (see Tables 2 and 3, plant part g in the tables), for example ETOKE *Hibiscus trionum* L., EKAUDA *Indigofera vohemarensis Baill.* and EWUDUWUDU *Indigofera* spp, appear to be the best WEPs for domestication exploration. Grains can most easily be multiplied. Furthermore, as the WEPs are indigenous, they are already well suited to growing and potential domestication or cultivation in Karamoja.

4.3 Categories of WEPs: famine, hunger, normal or special

As defined earlier, there are four categories of foods in this survey: 'famine', 'hunger', 'normal' and 'special'. Of the 132 wild foods identified, 63 are 'hunger foods', 35 are 'normal' wild foods, 29 are 'famine foods' and 5 are 'special' or preserved. Once again, this diversity shows wide adaptation to climate variability.

4.3.1 Example of special food: EMUNA is one of the traditional Karamojong foods. It is a mixture of seeds, nuts, cow's butter and dried meat. Making EMUNA is a laborious, multi-step process which takes several days to complete. To prepare the meat, it is first cut into long, ropey strips. These strips are roasted over fire then hung to dry for a couple of days. Once the meat has dried, it is boiled and pounded so that all fat, fascia and gristle are removed from the meat. After pounding, the meat is finely shredded and placed back in the sun to re-dry. The meat is considered 'dry' when it is breakable to the touch (approximately 2-5 days). As the meat dries, preparation of the seeds can begin.

Table 2: List of WEPs alphabetised by local name, including category of food, brief preparation details, plant form, plant part used, and botanical name (if available).

	Indigenous name	type	preparation	plant form	plant part	scientific name, FAMILY, voucher
1	Abalit	h	2 days	T	S	*Balanites aegyptiaca* (L.) Del., ZYGOHYLLACEAE, JTG-369
2	Abaracumbi	h	cook as vegetables	H	L	
3	Adekela	n	cook	V	S	*Curcurbita* spp, CUCURBITACEAE
4	akimiet aŋaatuk	n	3 hours	NP	psvd	cow butter
5	akit aŋimirio	h	boiled	H	L	
6	akukuroit	h	dig, peel and eat	H	T	
7	amina	h	dig, peel and eat	H	T	wild carrot
8	aŋikaya	h	1 day	T	F	
9	apese areŋen	n	cook as vegetables	H	L	
10	apoŋae	h	peel and suck	S	F	*Grewia villosa*, TILIACEAE, JTG-101
11	asayo ŋakile	h	3 day	NP	psvd	dried milk
12	asuguru	h	boiled	H	L	
13	ebei	h	peel and suck	T	F	*Balanites orbicularis*, ZYGOHYLLACEAE, JT-060
14	ebune	n	direct	H	S	*Sorghum bicolor* (L.) Moench, POACEAE
15	ecarat	h	peel and suck	H	F	
16	edaldalkisin	h	direct	V	F	*Coccinea adoensis* (A. Rich.) Cogn., CURCUBITACEAE, JTG-339
17	edapal	h	2 hours	suc	L	*Opuntia cochenillifer* (L.) Mill, CACTACEAE, JTG-122
18	edoil	h	5 hours	H	L	
19	edya alo kiriketa	n	cook	V	L	
20	eerut	f	1 day	H	S	*Maerua* spp, CAPPARIDADACEAE
21	eerut	h	dig, peel and eat	H	T	*Maerua* spp, CAPPARIDADACEAE
22	ekaliye	n	direct	T	F	*Grewia bicolor* Juss., TILIACEAE, JTG-289

23	ekamiskou	f	1 day	T	S	
24	ekauda	f	5 hours	H	g	*Indigofera vohemarensis* Baill., PAPILIONACEAE, JTG-284
25	ekii	h	peel and eat	T	F	*Ficus thonningii*, MORACEAE
26	ekiliton	n	boiled	H	L	
27	ekolas	f	dig, peel and eat	H	T	
28	ekotiti	h	peel and eat	T	F	
29	ekurikurio	h	dig, peel and eat	H	T	
30	elaca	h	dig, peel and eat	H	T	
31	emanimanakeret	h	dig, peel and eat	H	T	
32	eminae aŋikaramwa	h	dried	T	sap	*Acacia seyal*, MIMOSACEAE
33	eminae ke ekwakwa	h	1 hour	T	sap	*Albizia amara* (Roxb.) Boiv. ssp.*sericocephala* (Benth.) Brenan, MIMOSACEAE, JTG
34	eminae ke epetet	h	1 hour	T	sap	*Acacia oerfote* (Forssk.) Schweinf., MIMOSACEAE, JTG
35	eminae ŋikodiokodio	h	dried	T	sap	*Acacia senegal* (L.) Willd., MIMOSACEAE, JTG-366
36	emuna	sp	4 days	NP	psvd	mixture of 6+ foods
37	enyuwon	h	2 hours	suc	F	*Opuntia* spp, CACTACEAE
38	eŋomo	h	cook	T	S	
39	eputan	h	dig, peel and eat	H	T	*Pseudocedrela* spp, MELIACEAE
40	etekeu	f	grind, add sorghum	H	g	*Hibiscus* spp, MALVACEAE
41	etoke	f	6 hours	S	g	*Hibiscus trionum* L., MALVACEAE, JTG-292
42	ewuduwudu	f	5 hours	H	S	*Indigofera* spp, PAPILIONACEAE
43	kajika	h	peel and eat	T	S	
44	lobolia	h	cook as vegetables	V	L	
45	locumbi	n	boiled	H	L	

46	lodwee	n	5 hours	H	S	
47	lomabus	n	boiled	H	L	
48	lomina	h	dig, peel and eat	H	T	
49	losigiria	n	boiled	H	L	
50	nabutacwe	h	boiled	H	L	*Commelina benghalensis* L., COMMELINACEAE, JTG-311
51	ŋaboce	f	dig, peel and eat	V	T	
52	ŋaboi	f	cook	H	T	
53	ŋabooroe	n	5 hours	H	L	
54	ŋabowoe	n	boiled	H	L	
55	ŋacolicolia	h	dig, peel and eat	T	T	*Lannea humilis* (Oliv.) Engl., ANACARDIACEAE, JTG-276
56	ŋadomein	h	direct	T	F	
57	ŋaduŋo	h	peel and eat	T	F	
58	ŋagwe akidodok	h	direct	H	F	
59	ŋakadoliae	f	12 hours	T	F	*Capparis fascicularis* DC. vor. *elaeguoides* (Gilg) De Wolf, CAPPARACEAE, JTG-303
60	ŋakalio	n	2 days	T	F	*Zizypuhus* spp, RHAMNACEAE
61	ŋakamoŋoe	n	boiled	V	L	
62	ŋakamuria	n	direct	T	F	*Carissa edulis*, APOCYNACEAE, JTG-010
63	ŋakanyer aŋadekela	sp	1 hours	V	S	*Curcurbita* spp, CUCURBITACEAE
64	ŋakanyer aŋakaideit	n	roast, grind	V	S	*Curcurbita maxima*, CUCURBITACEAE
65	ŋakanyer ŋamug	sp	1 hour	V	S	*Curcurbita* spp, CUCURBITACEAE
66	ŋakareta	n	3 hours	T	F	
67	ŋakaruka	n	direct	T	F	*Vitex doniana*, LABIATAE
68	ŋakiaŋimirio	n	boiled	H	L	

69	ŋakibuk	n	3 hours	NP	psvd	fermented milk
70	ŋakibuyo	h	direct	T	F	
71	ŋakido	h	dig, peel and eat	suc	T	
72	ŋakile ka ebobore	f	direct	T	sap	*Ficus sycamorus*, MORACEAE
73	ŋakilit	h	direct	T	F	
74	ŋakimunei	n	peel and suck	V	F	*Dictyophleba lucida* (K. Schum.) Pierre, APOCYNACEAE, JTG-357
75	ŋakipapaiya	h	dig, peel and eat	H	T	
76	ŋakobokob	h	2 hours	V	F	
77	ŋakobokob aŋakolil	h	1 day	V	F	*Cucumis aculeatus*, CUCURBITACEAE, JTG-295
78	ŋakoreto	h	boiled	T	L	*Balanites aegyptiaca* (L.) Del., ZYGOHYLLACEAE, JTG-369
79	ŋakumo	n	peel and eat	T	F	
80	ŋakuŋur	sp	1-2 days	T	F	*Butyrospermum paradoxum* (Kotsch.) Happer, SAPOTACEAE, JTG-417
81	ŋakurukurio	f	dig, peel and eat	H	T	
82	ŋalam	n	direct	T	F	*Ximenia americana* L., OLACACEAE, JTG-300
83	ŋalamilamwo	h	dig, peel and eat	T	T	
84	ŋalebulebwo	n	direct	T	F	*Flacourtia indica*, FLACOURTIACEAE
85	ŋalimo	h	dig, peel and eat	H	T	
86	ŋaloi	h	peel and eat	T	F	*Acacia drepanolobium* Sjöstedt, MIMOSACEAE, JTG-461
87	ŋalomilomwa	h	dig, peel and eat	H	T	
88	ŋamalera	n	peel and eat	T	F	
89	ŋamarwoi	f	1 day	H	T	
90	ŋaminae	f	dig, peel and eat	H	T	
91	ŋanakio	h	peel and eat	T	S	

92	ŋaŋomoin	h	direct	T	F	*Grewia tenax*, TILIACEAE, JTG-401
93	ŋapedur	h	peel and eat	T	F	*Tamarindus indica*, FABACEAE
94	ŋapodoi	n	direct	T	F	
95	ŋapoŋa	n	peel and suck	S	F	*Grewia villosa* Willd., TILIACEAE, JTG-458
96	ŋapwokia	f	direct	S	F	*Hoslundia opposita* Vahl, LABIATAE, JTG-301
97	ŋasegesegei	h	direct	T	F	
98	ŋasogoŋa	h	dig, peel and eat	H	T	
99	ŋatopoj	h	peel and eat	T	F	*Lannea humilis* (Oliv.) Engl., ANACARDIACEAE, JTG-276
100	ŋatopoj - ŋikadoomo	h	direct	T	F	*Rhus vulgaris* Meikle, ANACARDIACEAE, JTG-274
101	ŋatosa	sp	2 days	NP	psvd	dried meat
102	ŋauroŋo	f	long prep	H	T	
103	ŋauryoŋ	n	dig, peel and eat	H	T	
104	ŋaworokos	n	direct	V	F	
105	ŋibeinyon	h	cook	T	L	
106	ŋicokio	h	open fruit, dry in sun	T	F	
107	ŋicurukileŋ	f	dig, peel and eat	H	T	
108	ŋigose	f	dig, peel and eat	H	T	
109	ŋikajika	h	peel and eat	T	F	
110	ŋikalio	n	direct	T	F	*Zizypuhus mauritiana* Lam., RHAMNACEAE, JTG-005
111	ŋikaman	h	1 day	T	S	
112	ŋikamulukuja	f	2 days	T	F	
113	ŋikatete	f	peel and eat	T	pith	
114	ŋikaye	f	1 day	H	T	
115	ŋikeren	h	direct	S	F	*Harrisonia abssynica*, SIMAROUBACEAE

116	ŋikereye	f	1 day	H	T	
117	ŋikokoiya	f	1 day	T	S	
118	ŋikolil	n	2 days	V	S	*Cucumis aculeatus*, CUCURBITACEAE, JTG-295
119	ŋikolil aekaleruk	h	1 day	V	S	
120	ŋikoŋ	n	3 hours	NP	psvd	white ants
121	ŋilacain	h	dig, peel and eat	H	T	
122	ŋimarui	f	2 days	S	F	
123	ŋimaruk	n	boiled	fungi	L	edible large white mushroom
124	ŋimarwae	f	1 day	S	T	
125	ŋimelu/ŋirei	h	2 days	T	S	*Zizypuhus mauritiana* Lam., RHAMNACEAE, JTG-005
126	ŋimoŋo	h	peel and suck	T	F	*Balanites aegyptiaca* (L.) Del., ZYGOHYLLACEAE, JTG-369
127	ŋinyurinyuria	n	boiled	fungi	L	edible small white mushroom
128	ŋiputenin	f	dig, peel and eat	H	T	
129	ŋiroron	h	cook	T	F, L	
130	ŋiru	f	6 hours	S	S	
131	ŋitoira	h	crack cover, eat seeds	T	F	
132	ŋiyale	f	1 day	H	T	

Type of food: f-famine, h-hunger, n-normal, sp-special.
Plant form: H-herb, NP-non-plant, S-shrub, suc-succulent, T-tuber, V-vine. **Plant part:** F-fruit, L-leaf, psvd-preserved, S-seed, g-grain, T-tuber.

Table 3: Karamojoŋ WEPs with multiplication potential.

No. (in Table 2)	Indigenous name	plant part*	scientific name, FAMILY, voucher
1	abalit	S	*Balanites aegyptiaca* (L.) Del., ZYGOHYLLACEAE, JTG-369
3	adekela	S	*Curcurbita* spp, CUCURBITACEAE
8	aŋikaya	F	
10	apoŋae	F	*Grewia villosa*, TILIACEAE, JTG-101
13	ebei	F	*Balanites orbicularis*, ZYGOHYLLACEAE, JT-060
14	ebune	S	*Sorghum bicolor* (L.) Moench, POACEAE
15	ecarat	F	
16	edaldalkisin	F	*Coccinea adoensis* (A. Rich.) Cogn., CURCUBITACEAE, JTG-339
20	eerut	S	*Maerua* spp, CAPPARIDADACEAE
22	ekaliye	F	*Grewia bicolor* Juss., TILIACEAE, JTG-289
23	ekamiskou	S	
24	ekauda	g	*Indigofera vohemarensis* Baill., PAPILIONACEAE, JTG-284
25	ekii	F	*Ficus thonningii*, MORACEAE
28	ekotiti	F	
38	eŋomo	S	
40	etekeu	g	*Hibiscus* spp, MALVACEAE
41	etoke	g	*Hibiscus trionum* L., MALVACEAE, JTG-292
42	ewuduwudu	S	*Indigofera* spp, PAPILIONACEAE
43	kajika	S	
46	lodwee	S	
56	ŋadomein	F	
57	ŋaduŋo	F	
58	ŋagwe akidodok	F	
59	ŋakadoliae	F	*Capparis fascicularis* DC. vor. *elaeguoides* (Gilg) De Wolf, CAPPARACEAE, JTG-303

60	ŋakalio	F	*Zizypuhus* spp, RHAMNACEAE
62	ŋakamuria	F	*Carissa edulis*, APOCYNACEAE, JTG-010
63	ŋakanyer aŋadekela	S	*Curcurbita* spp, CUCURBITACEAE
64	ŋakanyer aŋakaideit	S	*Curcurbita maxima*, CUCURBITACEAE
65	ŋakanyer ŋamug	S	*Curcurbita* spp, CUCURBITACEAE
66	ŋakareta	F	
67	ŋakaruka	F	*Vitex doniana*, LABIATAE
70	ŋakibuyo	F	
73	ŋakilit	F	
74	ŋakimunei	F	*Dictyophleba lucida* (K. Schum.) Pierre, APOCYNACEAE, JTG-357
75	ŋakipapaiya	T	
76	ŋakobokob	F	
77	ŋakobokob aŋakolil	F	*Cucumis aculeatus*, CUCURBITACEAE, JTG-295
79	ŋakumo	F	
80	ŋakuŋur	F	*Butyrospermum paradoxum* (Kotsch.) Happer, SAPOTACEAE, JTG-417
82	ŋalam	F	*Ximenia americana* L., OLACACEAE, JTG-300
84	ŋalebulebwo	F	*Flacourtia indica*, FLACOURTIACEAE
86	ŋaloi	F	*Acacia drepanolobium* Sjöstedt, MIMOSACEAE, JTG-461
88	ŋamalera	F	
91	ŋanakio	S	
92	ŋaŋomoin	F	*Grewia tenax*, TILIACEAE, JTG-401
93	ŋapedur	F	*Tamarindus indica*, FABACEAE
94	ŋapodoi	F	
95	ŋapoŋa	F	*Grewia villosa* Willd., TILIACEAE, JTG-458
96	ŋapwokia	F	*Hoslundia opposita* Vahl, LABIATAE, JTG-301

97	ŋasegesegei	F	
99	ŋatopoj	F	*Lannea humilis* (Oliv.) Engl., ANACARDIACEAE, JTG-276
100	ŋatopoj - ŋikadoomo	F	*Rhus vulgaris* Meikle, ANACARDIACEAE, JTG-274
104	ŋaworokos	F	
106	ŋicokio	F	
109	ŋikajika	F	
110	ŋikalio	F	*Zizypuhus mauritiana* Lam., RHAMNACEAE, JTG-005
111	ŋikaman	S	
112	ŋikamulukuja	F	
115	ŋikeren	F	*Harrisonia abssynica*, SIMAROUBACEAE
117	ŋikokoiya	S	
118	ŋikolil	S	*Cucumis aculeatus*, CUCURBITACEAE, JTG-295
119	ŋikolil aekaleruk	S	
122	ŋimarui	F	
125	ŋimelu/ŋirei	S	*Zizypuhus mauritiana* Lam., RHAMNACEAE, JTG-005
126	ŋimoŋo	F	*Balanites aegyptiaca* (L.) Del., ZYGOHYLLACEAE, JTG-369
129	ŋiroron	F	
130	ŋiru	S	

*F –fruit, S–seed, g–grain

Several different seeds can be used, depending on the availability of the fruit. Below is a list of such fruits and preparation process of the seeds:

1. **ŋAKALIO** (fruit from the EKALE tree)–selected ripe fruits are washed and put in the sun to dry. Once the fruit is dried, it is placed in the mortar and pounded. This process causes the fruit to separate from the pit. The pits are then pounded into a finer powder.

2. **ŋIKARUKA** (fruit found in Namalu, from a tree called EKARUKAE)–the fruit is dried and the flesh separated from the seed. The seeds are pounded until they are a coarse powder.

3. **ŋABUBORIO** (small figs in general)—Different fig varieties used include: EKII (sweeter); EBOBORE; EKUBUI or EKONATOROM (large tree that grows beside river beds and has fleshy, sweet fruit). To prepare fig powder, ripe, clean fruit (they are not washable) are collected, then the skins opened and the flesh and seeds removed from the inside. The flesh and seeds are put in the sun to dry (they are traditionally placed on a goat skin during the drying process). The dried pieces are crushed by hand to remove the soil and then pounded until they become powder. EMUNA will not last as long when using fig seeds as with other fruit seeds; on average it will last from one to four weeks.

4. **ŋAKOLIL** (cucumber seeds)–cucumbers are washed and dried. The seeds are removed and dried in the sun, then washed again and roasted over a fire to cook and dry them. They are then ground into a powder.

In addition to the fruit seed powder, *simsim* (*Sesamum* spp.) and ground nuts are also utilised. *Simsim* must be washed, roasted, winnowed, and pounded into a fine powder. Ground nuts are roasted over a fire, the skins are removed and then they are placed in a mortar and pounded into a coarse powder.

All of these ingredients are mixed together. The final ingredient is the melted 'new' butter, AKIMIET, so that the EMUNA will not be bitter. It is poured on top and stirred with a wooden spoon (ŋIAKOROBOC) until it is well mixed, making the texture thick and gooey. The EMUNA is sweetened to taste by adding sugar or honey. If properly stored, EMUNA can last up to five months. EMUNA is a favourite among the WEPs and is also used as a gift of respect for important men.

4.4 Preparation time

Most 'hunger' and 'famine' foods need some degree of preparation; only 20 foods need no preparation and are eaten directly, e.g. fruits and berries. Of those that require some preparation, most (90) need a significant amount of time, whereas 20 require only minimal preparation. Some preparations take at least four days (ŋIKEREYE, ŋATOSA and EMUNA). Some of the identified plants are very bitter and must be repeatedly boiled and the water thrown away until the bitter (and potentially poisonous) extracts are removed. The 'minimal preparation' grouping

includes all of the tubers, which must to be cleaned and peeled, as well as some of the fruits whose hard or inedible covers must be removed before eating.[5]

In addition to photographic evidence and detailed field notes, 85 of the 132 WEPs (64.3 %) were personally sampled by the author. The most common plant type tasted from May to August was underground tubers. Some were sweet (EKOLAS, EBUNE and EERUT), others were very watery (EPUTAN and ELACA) providing a good thirst quencher and loved by shepherds. This was evidenced by the author spending nights out in the mobile cattle camps and seeing many holes in certain tuber-filled fields as well as the crowd of shepherds wanting a bite of EPUTAN rather than a store-bought food. This contradicts the assumption that 'hunger foods' are bitter or tasteless. A wide variety of plants may have favourable nutritional values and certainly support household food security (Addis et al., 2005; Delang, 2006; FAO, 1998).

5. Conclusions

Based on the above results, it is possible to conclude that many WEPs are, and have been, utilised in Karamoja to help sustain the agro-pastoralists in times of recurrent hunger. This study has enumerated 132 different wild foods, primarily plants (95.3%). Some of the plants and protein sources are described for the first time in the literature. This body of WEP information could be invaluable both culturally and for development interventions on food security–most especially for assets-based community development approaches which can be more sustainable and even honouring to the people and their ancestry (Gradé et al., 2009). Many WEPs are used by the Karamojoŋ pastoralists; this shows the good local adaptability to climate variability of the WEPs. As more of Karamoja's land goes into tractor and plough agriculture and as relief food dependence continues, much of the knowledge and even the plants themselves are being lost. The cost-benefit analysis of allowing land to fall fallow for WEP, pasture land or building materials depends on many factors. Cultivated foods in Karamoja are historically unreliable and, at best, produce only one or two crops and then only if rainfall and other environmental factors are adequate. Meanwhile, the valuable building materials[6] and WEPs are lost, as is livestock fodder. Obviously, overgrazing also reduces the availability of WEPs. Given the arid/semi-arid ecosystem, the land is best suited to pastoralism mixed with some agriculture. This system has proved to be the most resilient in the face of climate variability (Jones & Thornton, 2008; MacOpiyo et al., 2008; Morton, 2007). This needs further investigation, and should vary across the smaller ecosystems within the region.

[5] A full description of each preparation and notes are available from the author.

[6] Almost all building in Karamoja is with local building materials of which 100% are plant-based. These building materials for example, include: grass for roofing; the sisal for tying, the termite resistant poles for walls and roofs; flexible branches and reeds for circular rafters, etc.

Certain preferred WEPs that are collected (and consumed at all times when available), may also become very important 'famine foods' during periods of food shortage. Grains can most easily be multiplied and this warrants more investigation. Furthermore, as WEPs are indigenous, they are already well-suited to growing in harsh conditions and have a good potential to be domesticated and cultivated. Finally, the use of wild plants continues to be one of the coping mechanisms for climate change induced food insecurity and should be recognised in household food security interventions. Strategies should include promotion and encouragement of the use of available natural resources and local knowledge in a participatory fashion, rather than direct distribution of food aid. This could include integration of information on WEPs into school curricula and activities of NGOs. WEP use and exploitation holds considerable significance for the Karamoja Cluster as well as other vulnerable areas in the Horn of Africa and beyond.

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Averting the Tragedy of Commons in Visage of Climatic Change: Forest Resources Management in Western Kenya in Facade of Mounting Pastoral Migrations

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Abstract

Dry land communities such as those who are found in the Horn of Africa (HoA) receive very limited rainfall exposing them and their livelihood activities to great degrees of vulnerability. In many ways the unstable condition of the dry land communities has been complicated by two competing factors: climatic change and population pressure. It is of little surprise that climate change is affecting biodiversity and ecosystem stability in this region. Historically, pastoral communities have responded to this state of affair by migrating to areas with little environmental stress. But what is of essence in this context is that the changing climate has also resulted into increased pastoral migration to areas hither to unconventional to pastoral communities. These areas include forested belts such as Kakamega Forest Belt in western Kenya. In light of the above, this paper interrogates local forest resource management institutions and the adaptive socio-cultural methods employed by the Luhya indigenous people of Kakamega in the face of increased migrations of the Pokot.

1. Introduction

Kenya has a land area of approximately 582,646 km^2, of which only 2.2 percent is water. In general, Kenya's land use can be described as pastoral in semi-humid and semi-arid zones, and agricultural in the moist and humid zones. An enormous section of Kenya's land area is mainly arid or semi-arid lands, commonly referred to as ASALs, which account for 70-80% of the total area. About 20% of the land has medium to high potential for agriculture (Otuoma, 2004). Such lands are termed High to Medium Potential Lands, also known as HMPLs. Kenya is currently facing a biodiversity and climatic change crisis, and the country's environmental management body, the National Environmental Management Authority (NEMA) advocated the Environmental and Management and Control Act (EMCA) (1999) as a framework on environmental legislation that establishes appropriate legal and institutional mechanisms for the management of the environment. With that in mind, NEMA, embarked on every effort to arrest the declining levels of biodiversity resources and avert the potential threats presented by the change in climate.

Severe drought in the Horn of Africa (HoA)[1] threatens over 12 million lives and reminds us of the growing dangers facing dry land communities around the world (Oxfam, 2011). Dry land areas are those that receive an average of not more than 600 mm of rainfall per annum. The precarious condition of the dry land communities has been complicated by two competing issues: climatic change and population pressure. It is little wonder that climate change is affecting biodiversity and ecosystem stability in these regions. Pastoral communities seem to be the worst hit as their livelihood depends on animal husbandry and associated animal products. Therefore, the changing climate can no longer support meaningful pastures. This is compounded by limited state intervention in these areas. In that regard, increased population and climate change have together resulted in increased migration[2] by the pastoral communities as one of the measures to cope with these challenges (Sachs, 2011). In recent years, pastoralists have stepped up their search for viable pasture lands and venture into areas hitherto unknown to pastoral communities. These areas include forested belts such as the Western Kenya Forest Belt.

According to the 2003 Kenyan biomass survey, forests, woodlands, national reserves and game parks account for 10% of the land. Kenya's pastoralist systems hold a significant amount and variety of the country's human and natural capital, including languages, indigenous knowledge, cultures and uniquely adapted livestock breeds (Kisekka-Ntale, 2009). In the face of failing climate, forests have continued to attract a stream of migrants desperate to take up the new land use opportunities. This involves both pastoral and agricultural communities. One such forest that has received the greatest number of pastoralist migrants is Kakamega Forest in western Kenya.[3]

Currently, many forests are under threat, indicating a great loss of biodiversity, especially in cases where people are using forestland for settlement and agriculture or other activities. Increased interest in the restoration of national biodiversity in Kenya has been driven by global calls to link development to environmental conservation, based on the fact that the environment plays a significant role in development. Generally speaking, resources in Kenyan traditional societies are used according to set communal rules. These emphasize elements of sustainability

[1] In this paper, the HoA includes the countries of Djibouti, Eritrea, Ethiopia, Kenya, Uganda, Sudan and Somalia.

[2] It is true that migration has been a common characteristic of the pastoral communities as they follow viable pasturelands. However, as noted by Sachs (2011), the scope and magnitude of the pastoral migrations has reached alarming heights, including the crossing of national and regional boundaries, resulting in conflicts. Pastoral conflicts have increased over the last decade. This violence is, indeed, sweeping the entire HoA up to Senegal in West Africa, to the Sahel, across Yemen, through the Arabian Peninsula and extending into central Asia including Pakistan and Afghanistan.

[3] The geographical focus of this study is four village clusters in the Kakamega forest belt. The forest has experienced several phases of increasing climate variability in the last 100 years, characterized by intensifying human activity, including pastoralism, which has impacted on the forest resources upon which local people depend for their socio-cultural and economic capital.

and preservation for future generations. Collective arrangements, decisions and guiding principles are usually made at the communal level to regulate access to and use of such resources. The organization of the community revolves around parties linked to each other by kinship or reciprocation. The rights of control over resources are vested in the political authority of the community and derive directly from their sovereignty over a given resource area. This rather traditional notion of resource ownership and conservation encompasses a more organized and institutionalized way of natural resource management.

Using the "*Tragedy of the commons*" paradigm,[4] I note that, as a rational being, each resource user seeks to maximize his gain within an existing pasture land, whether consciously or unconsciously, wittingly or unwittingly! For instance we are aware that pastoralist entry into a forest belt unleashes some negative consequences for the native people of the forest, overtime. Although the effects of overgrazing are likely to be shared by all inhabitants, the natives are more likely to face extremely negative effects resulting from any particular resource usage decisions by the pastoralists. In addition, given that the native people will have a particular and different set of local institutions than the newcomers, institutional adaptation and reconciliation is called for. Consequently, the degree to which the newcomers are welcomed depends on the degree to which they reconcile themselves with the natives. In other words, this is dependent on the extent to which such newcomers restrain themselves from causing negative consequences.

In light of the above, this paper interrogates local forest resource management institutions and the adaptive socio-cultural methods employed by the indigenous Luhya people in the face of pastoral migrations into Kakamega forest. The interest in undertaking this kind of endeavour lies in the utmost significance of the forest to the socio-cultural heritage of the Luhya people. But the forest is on the verge of extinction, and a continuation of this will inadvertently affect the climate of western Kenya. In that regard, we set out to find out how the Luhya people perceive newcomers such as the Pokot (pastoralists)? How are the newcomers incorporated in relation to forest resources? Are they assimilated? What are the locally adaptive mechanisms adopted by the Luhya to manage local forest resources amidst mounting Pokot migrations and changing climate?

[4] Conceived by Garrett Hardin (1968), the tragedy of the commons develops in this way: Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably well for centuries because tribal wars, poaching and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning; the day when the long-desired goal of social stability becomes a reality. At this point, the inherent logic of the commons remorselessly generates tragedy.

2. Re-visiting the private versus common property paradigms

In order to have a meaningful debate regarding the operation of commons, it is imperative to re-visit the private versus common property rights paradigms. It is true that different types of rights do lead to different outcomes. Agrawal and Ostrom highlight that common property implies four types of rights. The first is withdrawal rights–the right to use a natural resource in a defined physical area. The second set of rights is management rights–rights that relate to the internal patterns of resource transformation and improvement. The third type of right is the right to exclusion–to determine who will have the right of withdrawal and how the right will be transferred. Lastly are the alienation rights–those rights that relate to lease, withdrawal, management and exclusion (Agrawal & Ostrom, 2001, p. 489). Therefore, whether those rights are held juridically or authoritatively, they can create varying consequences for the use and management of resources. Pertinent questions to ask are: What forms of rights are extended to newcomers within a resource regime? And how do they lose or retain those rights? We shall return to these questions as we discuss the pastoral rights in the case of Kakamega forest.

It is true that commonly owned property possesses potential disadvantages compared to private property (Adhikari, 2005). One of the commonest arguments advanced in support of a free-for-all property regime is that such an arrangement provides varied users with a bigger acreage, from which all users seek optimal utilization, leading to greater success than a resource sub-divided into private pieces (Gibson & Knootz, 1998). Indeed, common property may require much lower investments from the users, although it has also been associated with high transaction costs.[5] This, however, depends on the degree of poverty; if poverty increases the marginal rate of time preference to very high levels, then future environmental effects of current resource use are optimally ignored. High rates of time preference and shorter time horizons may also prevent poor people from investing in environmental conservation (Adhikari, 2005).

Proponents of common property regimes recognize that, for people to cooperate there are certain pre-conditions that must be met. It is arguable that the existence of these rules constitute the basis for order and organization (Sartorius, 2002). Nonetheless, a primary point of agreement among the players in the context of common property regimes is that the perceived benefits arising from following the instituted rules outweigh the costs. It is, however, significant that under conditions of collective or multiple resource usage, resource users can design and enforce resource control rules that govern their individual and collective choices so as to facilitate the sustainable management of common resources.

[5] Transaction costs in community-based resource management are incurred by resource users in their bid to enforce property right rules over common resources similar to those inherent in private property rights.

Unlike the common property regimes, private ownership has been interpreted to constitute an arrangement that helps the owners to achieve the optimal tenure arrangement for sustainable management of natural resources (Tucker, 1999). Indeed, Tucker has ably pointed out that private property regimes provide owners with higher incentives to use resources efficiently and sustainably, because they are able to monopolize many of the benefits of wise management, and they bear most of the costs of poor management (Ibid, p. 203). The argument posited by Tucker seems to suggest that a resource system with property rights (whether common or private) attached to it indicates the intention for some party to ensure that potential users observe predetermined restrictions or prohibitions concerning access to land and other natural resources therein. In pure common resources or common property situations, the rights to resources are shared equally and are exclusive to a well-defined set of people (Edward & Steins, 1999).

The above postulation also advances the claim that private property upholds the strictest rules governing use of resources, hence providing greater incentives for private property users and/or owners to value resources. It is also arguable that private property rights are also linked to the right to alienation and therefore promote voluntary transfers of assets to the market from the lowest to the highest-valued uses (Agrawal & Ostrom, 2001). The same claim has, however, been discounted by a counter-claim that private property does not, after all, guarantee efficient and sustainable resource management. This argument is based on the assertion that individual interests driven by the desire for maximum utilization usually blur rational judgment (Williamson, 1985). In that regard, private property does not necessarily guarantee a resource's future survival.

3. Fieldwork methods

Fieldwork in Kakamega Forest was carried out during the months of July and September, 2006. A local mapping survey based on individual households was undertaken between the months of July and September 2006. The total number of households studied was 220. These were located in Kakamega District, Western Kenya. Specifically, the study included all administrative divisions that make up Kakamega, apart from the Municipality division. These are: Shinyalu, Ikolomani, Ileho and Lurambi. The principal sampling point was the Location, the lowest administrative unit of the decentralization structure in Kenya. Households visited were arranged into clusters. A total of 11 clusters were sampled from the 26 clusters in the district. These clusters also fall under the sampling frame used by the Kenya Central Bureau of Statistics (CBS). Out of the 26 clusters obtained from the District Statistical Office (DSO) in Kakamega, the researcher was able to identify eligible enumeration areas. Each cluster contained 168 households and eventually provided the principle sampling points, the locations, also known as a village. In total 220 households were sampled. The sample size for the households to be covered in the local mapping survey was statistically determined, based on a precision of 5% and a confidence level of 95%. To augment the results from the

survey data, Key Informant (KI) interviews were also held with the different opinion leaders in and around Kakamega Forest. On top of data collected from the individual household respondents, and KI interviews, 11 focus group discussions were held. The data collection centred on the nature of Kakamega Forest, its dual role: on the one hand it is a conserved forest and, on the other, it is a common property, serving the agricultural and pastoral needs of the residents. Specifically, information was sought on the institutional history, geography and demographic characteristics as well as the management of Kakamega Forest. However, the new resource users (Pokot pastoralists) were not covered in the survey.

4. Contextualizing local knowledge, and resource usage and conservation

East African rainforests suffer huge over-exploitation by humans and belong to the most threatened and least explored ecosystems on earth. Only about 0.1 % (about 10,000 km²) of the estimated 10 million km² of tropical rainforest in the world is found in Eastern Africa. Unlike the vast West and Central African forests, the forests of Eastern Africa are highly fragmented–discrete islands surrounded by comparatively arid woodland. Tropical rainforests like Kakamega are not only centres for high biodiversity, but are also known to be home to many people, many of whom, though asset-poor, are rich in enterprise and extractive skills. Land use systems range from the extensive use of natural forest vegetation and subsistence production through to market intensive peri-urban production systems. Although the forest presents a myriad of opportunities, recent studies such as that by Guthiga et al. (2006) demonstrate that there is declining biodiversity, punctuated by continued ecological loss. This state of affairs is aggravated by challenges of changing climate.

One of the most difficult challenges that has continued to dog international resource conservation efforts over the years, has been how best to preserve and protect forest ecosystems, especially in tropical developing countries where forests have competing users from both within and without. Indeed, people manage most of the world's forests, using them for domestic grazing, tree girdling and tree cutting to provide habitats and agricultural areas. At the dawn of the 1990s, global concerns centred on the shortage of wood, erosion and the dangers of forest fires. However, because of the numerous dilemmas emanating from the increased loss of the world's biological resources, a number of international undertakings aimed at recovering from this loss have been started. In recent decades, efforts to arrest continuous depletion of renewable natural resources–particularly forests, wetlands and marine resources in Africa–have been enormous and have taken centre stage in national and international development agendas. The negative effects of climatic change, failing rainfall seasons and declining biodiversity in many of these countries are exacerbated by two factors: the pressure of poverty and the institutional inadequacies which fail to guarantee collective learning processes in natural resource conservation.

More broadly, natural resource conservation entails understanding species richness and interactions in a particular ecological zone. Bearing in mind that, in principle, resource conservation is a physical science issue, we ought to point out that it is one that overflows beyond the boundaries of the physical science world. It is increasingly drifting into the social sciences, because of the complex social and demographic factors, giving this debate another interesting twist. One such factor is the continuing interest in understanding what shapes peoples' interests, intentions and attributes while using forest-related resources. Therefore, it is imperative to point out that there are often diverse and conflicting values regarding resource use priorities beyond the conventionally known attributes and interests. As we strive to get a clear understanding of the relationships regarding forest resource usage in a tropical country like Kenya, it is important to note that communities cannot be treated as static and rule-bound wholes, because they actively monitor, interpret and shape the natural resource world around them in different ways (Leach & Mearns, 1996).

In order to get a clear picture of the complexities involved in the natural resource conservation debate, it is important to focus our attention on the multiple categories of actors, with different and often competing interests in the entire spectrum of natural resource management. We can do this by looking critically at regimes governing forests at sub-national and, more importantly, at local levels. Through this analysis, we can carefully understand how repeated actions among communities reproduce knowledge and institutions, leading to varied notions and perceptions in understanding resource usage at these different levels. As a result, limitations regarding the concept of natural resource usage and conservation emerge.

Local communities surrounding protected and unprotected natural resource areas such as forests, assign values to the diversity of species found in those environments. However, in most cases these are social values and, sometimes, such values don't only reflect direct use values but also cultural and spiritual values. In response to such values, communities living around biodiversity hotspots have actively maintained biodiversity, knowingly or unknowingly (Toner & Franks, 2006). Giddens (1999) notes that linking agency and structures emphasizes how structures, rules and norms emerge as products of peoples' practices and interactions with their environments, both intended and unintended. However, such interactions and values are rarely articulated to give an insight into the social and other related processes underlying the varied manifestations of either the natural or the human-influenced environments.

These limitations, therefore, demonstrate the need to reassess the conceptual meaning of natural resource conservation, focusing on local peoples' knowledge, understanding and perceptions. We also wish to investigate how such knowledge shapes informal regimes relating to resource conservation. Such re-assessment is of profound consequence, since it will help us in understanding what happens when

the local ecological thinking of natives meets with that of migrants and/or newcomers. The foundation for this assessment lies not only in the social and resource intermarriage, but also in the likely variations and conflicts that may emerge and, as a result, warrant mediation. The desired balance between human activity and environmental protection requires a sharing of responsibilities, which must be equitable and clearly defined. This must be done in reference to consumption and human behaviour towards the environment and natural resources (Peluso, 1992). The above postulation implies integration of local peoples' ecological behaviours and choices as constituting the foundation on which local and/or traditional knowledge is built and nurtured. It also manifests effective dialogue and concerted action among partners who may have differing short-term priorities and perceptions (Government of Kenya (GOK), 2005).

5. Management of Kakamega Forest resources

The forest is located at an altitude of 1,500-1,700 metres and receives between 1,500 and 2,300 mm of annual precipitation (GOK, 2005a). Kakamega district has a total population of 643,457 people. However, the total number of those living in and around the forest is not known (GOK, 2005b). Agriculture is the major activity and accounts for 62% of incomes in the households. The area is also characterized by migrant labourers and pastoral communities. Although designated as a protected area, local institutional arrangements conventionally govern the modes of access for those interested in the forest resources. The forest, which is almost the only one of its kind remaining in Kenya, plays a critical role in regulating the rainfall regime and is one of the catchment areas of the East African region. Though there are numerous forest communities, it is not known exactly how many there are. However, in this study I was interested in investigating the institutional practices and perceptions of communities that have been living around the forest for a greater part of their life, and how they reconcile those of newcomers, particularly Pokot pastoralists.

Early accounts of colonial administrations in Kenya show that the country was surveyed at the start of the 19th century. The Kenyan biomass map regarding vegetation and forest cover shows that, at one time, Malava and Kisere Forests were separated. The two forests were only drawn as groups of trees. Isecheno, Ikuywa and Yala regions were connected to each other and to the south Nandi forest system. Up to 1931, Kakamega Forest was managed by local people, with authority in the hands of the village elders. It was then brought under the control of the then Forest Department (FD), which gazetted the forest as a Trust Forest[6] in 1933 (Mitchell, 1947).

[6] According the new Kenyan constitution, Trust land is land which is in the Special Areas (meaning the areas of land the boundaries of which were specified in the First Schedule to the Trust Land Act as in force on 31st May, 1963), and which was on 31st May, 1963 vested in the Trust Land Board by virtue of any law or registered in the name of the Trust Land Board.

After Kakamega forest was declared a Central Government Forest in 1964, three small nature reserves in Isecheno (295 ha), Yala (460 ha) and Kisere (371 ha) were officially created in 1967. The motivation was to protect these areas from exploitation and to preserve the different forest types of Kakamega. Kisere Forest and part of the northern Kakamega Forest, which are part of the 18 forest fragments declared as part of the Buyangu National Reserve in 1986 and fell under the management of the Kenya Wildlife Service (KWS). The Buyangu National Reserve covers an area of about 4,270 ha, of which Kisere covers 458 ha and the Buyangu area 3,812 ha (Njuguna et al., 1999).

The areas outside the Kakamega nature reserves are reserved for afforestation. Here trees are planted because of their economic value. In areas managed by the KWS, strict rules to conserve the forest are enforced. Any use of forest under the control of the KWS is forbidden. The government thinking is that tourism is the long-term source of income for the KWS and local people. In addition, direct benefits for the locals come from employment as field guides or field assistants for several research projects on the unique wildlife flora and fauna in Kakamega Forest. This position seems to have been challenged by the locals, who are demanding more entitlements beyond their direct service benefits. In a nutshell, Kakamega Forest is governed by two different formal management regimes and enforced by two different agencies: the FD and the KWS. These two agencies have different protection priorities. For, instance, the Buyangu National Reserve, under the control of the KWS, is regularly patrolled by game rangers to enforce the conservation and protection of the wildlife resources, while the nature reserves at Issecheno and Yala are controlled by the FD to prevent local communities from harvesting forest resources.

5.1 Geography and climate of Kakamega district and Western Kenya

Western Kenya is situated to the north of Kisumu and the Gulf of Kavirondo. It is also bordered by Mt. Elgon, which extends to the eastern part of Uganda. The Bagishu, Bagwere and the Basamia, the Basoga and the Iteso as well as the Japadhola in eastern Uganda are neighbours to the Luhya of Western Kenya. In large measure, these neighbouring tribes have similar institutional underpinnings to the Luhya people.

The highlands on the other hand are in the region of 2,286 m above sea level, especially on the mountain slopes of Elgon in the north. The district is also characterised by ridges and valleys lying between 1,371 m and 1,524 m above sea level (Ominde, 1963). There are escarpments such as the Nandi Escarpments. There are countless hills, some of which are named after the different Luhya sub-tribes residing in these areas. These include the Maragoli, Nyangori, Samia and Bunyore hills. On the extreme lowland side, the area is characterised by low-lying zones with two major soil zones. Interestingly, there is a side of this province containing high parts of Mt. Elgon with alpine meadows and shallow soils alternating with great alluvium and peaty soils (Baringer, 1996).

It is also imperative to note that there are very large tracts of land in this province that are covered by savannah, making the place look like a park-like zonation. Early writers about this province have indicated that it was once covered by forest from the eastern part of Uganda. Such writers included Johnson, who formed the advance team that laid the foundation for the Imperial British East Africa Company. For instance, Johnson asserts that it was the wasteful type of cultivation that led to the degradation and eventual disintegration of the tropical forest belt in this part of the country (Johnson, 1904). According to him, the whole of present day Western Province was covered by forest, which was only destroyed down by over-cultivation.

The above analysis has, however, been found to be somewhat hollow by scholars like Were (1967). Were, who has extensively researched the Buluya-land and Abaluya people, argues that Johnson's claims were an exaggeration. He states that Johnson's argument cannot be used as a point of departure in understanding the reasons as to why the land that was once forested is now not. Were further asks why the same type of cultivation that has, apparently, been responsible for the destruction of the forested land in Western Kenya has not accounted for the destruction of the forest belt in other parts of West Africa?

While Were seems to have negated Johnson's synthesis, it was too early for him to draw the conclusion. The steady increase in population of Western Kenya can be used to justify Johnson's argument. It is also wise to mention that Were's writings were made forty years ago and, since then, the biodiversity of this area has been declining. Were, on the other hand, doesn't postulate the reasons as to why the area seems to have lost its original forest cover. Today's pastoral migrations are certainly not within the context of Were's argument, given that the area has attracted a significant number of newcomers in the last five decades. Newcomers, in particular pastoral communities, are attracted by the abundant rainfall received throughout the year. The areas of Kaimosi and Cheptul receive the highest amounts of rainfall. Lastly, the area is also watered by a number of rivers: Nzoia, Sio, Lusumu and Malaba (Lung & Schaab, 2004).

5.2 Locating the pastoral question in the wider Kenyan political economy

There is considerable evidence regarding the existence of an anthropogenic crisis, not only in the western parts but in the entire country (ICRAF, 1996). This crisis should not only be construed on the basis of environmental conditions alone, but also the steady increase in the population of these areas and the conducive environment in this region compared to the semi-arid conditions in most of Kenya. It is this good climate in the region that continues to attract new migrants, including pastoral migrants. It ought to be noted that the increase in the population has also led to ecological deterioration.

In western Kenya, there are three common pastoral communities. These are the Western Pokot, found around the trans-Nzoia river belt and also in north-eastern

Uganda; the Turkana and the Kalenjin; the Nandhi who are semi-pastoralists, having combined their livelihood with cultivation. Looking at her work through an ecological as well as a geographical lens, Tully (1985) argues that people can change their lives by moving from one location to another. This is done with the rationale of improving their living conditions. However, it ought to be noted that such efforts are also driven by the environmental conditions. In the same regard, people can also change their economic, social and political situations.

The archaeological and linguistic evidence regarding the origin and migration of pastoralists in East Africa remains incomplete. However, available literature suggests that the stone tool and pottery-using nomadic pastoralists were dependent upon the humpless cattle, goats and sheep for their livelihood (Zwanenberg, 1975). Many of the pastoral communities in East Africa and Kenya, in particular, such as the Pokot, Samburu, Masai and Turkana, had migrated from the Sudan into the Horn of Africa by ca 5,000-4,000. The rationale for their migration may have been the period of widespread aridity in the mid-Holocene that affected much of the Sahara and Sahel regions of north-eastern Africa. Having found a home in Kenya, the pastoralists became a dominant force, with the Masai and the Somali controlling large portions of the territory (Zwanenberg, 1975). Nonetheless, dramatic droughts and diseases, particularly smallpox and rinderpest (between 1880 and 1900), occasioned by a colonial policy favouring settler agricultural production and ranching interests resulted in a complete reversal in the fortunes of pastoral societies (Ibid, p. 80).

The colonial policy was also pursued after independence, accentuating the impression that dry land environs have been characterised by political interference. Adholla-Miggot and Little (1981) note that the interference in the dry lands has been in distinct episodes. First, in 1938, then 1954, followed by 1965 and 1976. However, the most dramatic of all was the 1938 compulsory destocking, which marked the start of range interference and hence, in 1954, a policy in favour of settler-dominated agriculture which led to the establishment of new small farms, even among the pastoralist dry areas. This orientation towards arable agriculture also created a new wave of migrations among those pastoral communities who still preferred livestock husbandry to sedentary agriculture, although many changed their orientation as they found new areas of settlement coupled with the 1965 drought that led to the death of a significant number of animals.

It is worth mentioning that the colonial and post-colonial policy of control, including the separation of tribes through demarcation of tribal boundaries, was resisted by the Somali, the Masai, the Pokot and the Turkana in north-western Kenya. The policy is one which aimed at controlling human and livestock movements as well as limiting the herd size to carrying capacity and adequate land-use through rotational grazing and productive development. Indeed, this policy was later reinforced by the Grazing Scheme and supported by the marketing policies. This represented a policy shift in the colonial and subsequent post-colonial political

economy of assigning another function to the dry and/or rangelands–that of transforming dry land into a source of livestock to the Kenyan market.

This policy shift implied that, away from the politics of pastoral control and containment, the pastoral communities were now being incorporated into the capitalist economy; however, this was not significantly supported by the post-colonial state setting. Following the above postulations, it is logical to point out that the admission of the pastoral communities into the development realm accentuates what Tully (1985) pointed out in relation to the fact that people can change their lives by moving from one location to another and from one activity to another. In light of the above, victims of drought moved as a survival strategy from their home areas to go to the highland and forested areas, riverbanks or even large farmed areas. This practice is common among almost all pastoral tribes in Kenya, such as the Pokot, the Turkana and the Kalenjin.

The Pokot have maintained this practice since the 1920s, moving into the southern Pokot Highlands as well as the Trans-river Nzoia belt. This particular pastoral community, especially the central Pokot, used this as a drought refuge grazing area, but many of them have since ended up settling there as agriculturalists after the 1920s. Indeed, from the 1930s onwards, many pastoral communities who sought refuge around the River Nzoia and the forested belt of Kakamega and Charanganis especially, burned down the forests to make room for arable farming and permanent livestock keeping. What is intriguing to note is that even non-Pokot pastoral communities followed suit. Indeed available demographic data indicates that, from 1963 to 1969, the proportion of newly-migrant pastoralists in the area increased to 8% from 3% of the natives (Zwanenberg, 1975). This begs the question, how did the natives and the newcomers harmonise in terms of institutional setting, in the face of competing and sometimes contradicting interests? To this we now turn our attention in the subsequent sub-sections.

5.3 Forest resource usage in Kakamega

In Kenya, indigenous forests cover just over one million hectares, while plantation forests cover over 120,000 hectares. About 3 million people in Kenya live within 5 km of forest boundaries and benefit from a whole range of goods and services from the forest. This has resulted in pressure leading to encroachment, excisions, over-exploitation and loss of flora and fauna (GOK, 2000).

Talking about forest biological resources entails the summation of the ecosystem and the ecosystem functions, species and genes in a given locality – Kakamega Forest in this case. Biological resources embrace species richness and genetic diversity. Being a forest that has people around it, food, cash crop production and livestock are the main land use activities. However, there are individuals who exploit different wild forest roots, fruits and vegetables from the forest for food. Some of the respondents agreed that they have acquired products for this very reason. Further still, there was another category of respondents who answered that

they had entered the forest to collect animal products in the form of game meat. Kobs and Impalas are some of the animals that were hunted to get animal protein.

Animals such as monkeys, lions and leopards are demanded for spiritual reasons as well as related cultural rituals. Another group of respondents also answered that they used forest resources, especially the forest herbs, for medications. The rapidly increasing human population in areas around this forest has contributed incredibly to the scramble for land for agricultural and related reasons, including the pastoralists' need for pasture lands.

Many respondents agreed that, even though they are aware of the pressure that such land use activities presents to the forest, they badly needed land for food and cash crop production. Others want the land for settlement in order to acquire the accrued benefits from the forest such as firewood, grass and pasture for their animals. This scenario has consequently led to habitat destruction, which has resulted in diminished quality of ecosystems in and around the forest. Hence, a review of the above competing forest uses demonstrates the intricacies of the impact of the human population on the Kakamega Forest environment. The impact of the human population on the forest biodiversity is neither new nor surprising, as evidenced by Olembo et al. (1995). What is, however, attention-grabbing for this debate is how these competing interests are mediated and institutionalised.

Kakamega Forest's position in the moderation of Kenya's climate needs no repetition. The forest has other physical and biological resources that are of considerable domestic, economic and intrinsic value. It is estimated that the forest has over 35,000 known species of animals (Dewees, 1995), which are important to both life and the rural economy. These are based in natural habitats such as water, rocks and soils within the forest. These and their ecosystems are, however, increasingly under pressure from competing users resulting in a situation of further depletion. These biological resources, which are sources of food, medicine, shelter, income and fuel, are only assured if sustainably used (Dewees, 1995).

The government as well as the local traditional leadership is making efforts to conserve the remaining forests by strengthening management, creating awareness and encouraging the planting of trees on farmlands and public utility areas. This, however, has been slow. In Kakamega Forest, there are both formal and informal institutional regimes to manage the forest resources. The aim is to reduce the over-exploitation of the species that are found to be under greatest threat. When asked whether there are penalties aimed at curbing wanton harvesting and usage of forest resources, a large number of the respondents answered in the affirmative. The study also learnt that both formal and informal institutional mechanisms were used in the enforcement of such penalties. These were the Community Disciplinary Council, the Village Chief, Customary Law, the Forest Wardens, the Tribal Heads, the Village Council of Elders and even parents.

In terms of strict enforcement of penalties, the forest wardens were the most highly rated, while village chiefs were rated low. Nevertheless, in spite of all these enforcement mechanisms, it was found that crimes relating to wanton forest exploitation of rare resources continued and the same offenders commit the same crime again, even when the penalties have been served! This same scenario was confirmed by Guthiga et al. (2006). When asked why the people committed the same crime again, even after enforcement of penalties, the study found that an array of reasons accounted for this predicament.

Informants told the researcher that the penalties themselves were weak and flexible. In this, the perpetrators of the crimes found it easier to commit the crime and then face the penalties. Another set of respondents informed the study that the culprits found it easier to pay bribes and other related incentives to the enforcers of the penalties so as to get into the forest and harvest what they wanted. But some of the respondents stated that, overall the enforcement mechanisms were weak and characterised by weakening customary law in some areas. As rare plant and animal species are demanded for different economic, spiritual and medical reasons, it becomes difficult for the enforcement mechanism to achieve the desired results.

5.4 The people of Kakamega

Kakamega district forms the bulk of the province of Western Kenya. There are a variety of peoples in the district of Kakamega, including the Luo, Nandi and Luhya. The Luhya are also known as Abaluuyia, but pronounced as Luhia. The word Luhya refers both to the people and the Luhya languages. The Luhya are the biggest and the most dominant tribe in the district. These Bantu people residing in the Western Province of Kenya are bordered by Uganda to the west. They also face the windward side of Mount Elgon.

According to the 1999 Kenya Population and Housing Census, the Luhya tribe is the second tribal grouping in Kenya, only rivalled by the Kikuyu. They number about 4.6 million people. Kakamega district is one of the few districts in Kenya which can be counted as a food and cash crop basket of the country. Land in this part of Kenya is very fertile and the area receives reliable rainfall. This, in a large measure, explains why Kakamega attracts a lot of people, giving it one of the highest population densities in Kenya (Central Bureau of Statistics (CBS), 1999).

The Luhya tribe is made up of over 17 sub-tribes. These include: Bukusu Maragoli, Wanga, Abanyore, Marama, Idakho, Kisa, Isukha, Abatsosto, Tiriki, Kabras, Abanyala (Busia and Kakamega), Abatachoni, Abakhayo, Abamarachi and Abasamia. The Luhya myths of origin suggest a migration into their present day locations from the north. Virtually all sub-tribes claim to have migrated first from Misri before settling in what is now central Uganda. The same oral traditions also reveal that the Luhya migrated further east, first settling around the Mount Elgon area before displacing a pygmy race to settle in their current homeland.

On the other hand, anthropologists believe that the progenitors of the Luhya were part of the great Bantu migration out of Cameroon (Were, 1967). Other available accounts from Luhya oral tradition mention that they may have pushed out of a pygmy race in the Central African tropical forest. These accounts are very similar to the oral traditions of the Baganda. It is significant to note that the language of the Baganda, who have a close migratory history with the Abaluya, is closely related to the dialects spoken by the Luhya, especially the Maragoli dialect. This in a way points to a common point of origin.

The Luhya are traditionally agriculturalists, and they grow different crops depending on the region in which they live. Close to Lake Victoria, the Samia are mainly fishermen and traders, with their main agricultural activity being the growing of cassava. The Bukusu and the Wanga are mainly cash crop farmers, growing sugarcane in Bungoma and Mumias areas respectively. The Bukusu also farm wheat in the region around Kitale. The Isukha of Kakamega and the Maragoli of Vihiga grow tea. In Bukura area, the Kisa are large-scale rice farmers. The Kabras of Malava area grow mainly maize at subsistence levels, with a few also farming sugarcane.

The farming system in Kakamega district is a mixture of livestock keeping and crop production for both domestic use and for sale. Intercropping is widely practiced in the district. Farmers intercrop maize with beans or some bush millet. Most farmers plant between two and four crops on a piece of land. Many farmers in the relatively high areas plant two or three crops on a piece of land; beans, maize and/or millet. Farmers in the remaining areas intercrop at least two crops on one plot, mainly beans and maize or beans and cassava. The farmers in the highland areas grow a wider range of crops and this is due to the different climatic conditions**.**

The lowland and central plateau areas have relatively less rainfall than the highlands and, as a result, allow fewer plants to be grown. Through a system of intercropping, soil fertility is maintained. In the past, the system of intercropping was practiced together with shifting cultivation, a fact which could somewhat explain why some areas are not as forested as others. This system of shifting cultivation was also combined with charcoal burning. Shifting cultivation was used to clear the field to allow new grasses to grow for the animals. It was also a way of trapping monkeys and other forest animals which were demanded for traditional Luhya spiritual and cultural ceremonies. However, after villagization, especially in the late 1960s, and largely because of the increase in the population, shifting cultivation declined.

The recent increase in demand for land and the exhaustion of current farms has made some farmers start up farms near the forest belt, a practice which may, in future, threaten the forest margins. Another important feature of the farming system in Kakamega district is the influence of relief on agricultural activities. In

the highland areas, where climate and soils favour a variety of crops, farmers have tended to move away from the forest margins, a trend which, wittingly or unwittingly, protects the forest belt. In hilly areas such as the Nandi and Kaimosi villages, the topography of hilly anticlines attracts extensive cultivation of maize and millet.

Apart from the Luhya, there have been pastoral movements into the Kakamega forest belt since the early 20th century. As we have noted earlier, these include the Pokot and the Kalengin. While some of the pastoral migrants have converted into agriculturalists, others have continued to hold both traditions. On the other hand, some pastoral communities have remained true to their way of life. One of the key natural resources in the forest is the presence of water, particularly the flowing rivers Nzoia and Yala. Water is also made available by the consistent rainfall. It is such rainfall that makes the vegetation thicker and readily available for the browsers – cattle, goat and sheep.

In light of the above, the key question one should ask is, how do the newcomers' traditions reconcile with those of the natives? For instance, we are aware that the rivers, the hilltops and thick vegetation in the forest constitute important spiritual collectives for the Luhya, as native to the forest. So how are the newcomers institutionalized and how do they adapt? How are issues like overgrazing and herd population in excess of carrying capacity dealt with? To these we now turn our attention.

6. Local knowledge and biological conservation in face of newcomers

Local institutional mapping would be incomplete without discussing the place and role of local knowledge in the understanding of local biodiversity perceptions in Kakamega. It should hardly be stated that local knowledge derives much of its strength from the presence and continuity of local institutions, such as customary law. Customary law can be understood as an established system of rules that evolved from the way of life and natural desires of the people. It is also seen in the local norms as a matter of common knowledge, retained in the memories of the chief and the chief's councillors, and their sons' sons until forgotten, or until they became part of the rules from time immemorial (Agarawal, 1995).

Therefore like customary law, local knowledge is knowledge held by a specifically defined community, following a strict code of procedure and conduct in the management and transfer of such knowledge, which provides the foundation on which customary law is built; the philosophy that informs life in local communities. When investigating the interface between local knowledge and biological knowledge in Kakamega, we need to appreciate that the two are intimately fused into each other. For instance, most of the respondents linked their current protection of local herbs to the local knowledge they had come across, either through their parents or through their clan meetings.

This same scenario was also encountered when it came to investigating the role of peoples' perceptions towards the protection of animals or trees. Most respondents informed the study that they did protect specific plant species because, culturally, they are forbidden from using and cutting down such species. Asked how the non-natives such as pastoral communities come to learn about the treasured species and places, it was noted that non-natives are taken through an assimilation programme through which they are taught about the merits of upholding the values of the varied ecosystems.

As we have earlier noted, most of the respondents referred to their local knowledge as the reason why they had come to learn about the protection of local trees and animal species. In one of the focus group discussions, the discussants pointed out that cutting down a certain tree species that houses some of their ancestral gods had led to drought and poor yields in their community.[7] Some of the discussants referred to the cutting down of particular tree species as invoking curses and undue suffering for the same offence. One respondent re-affirmed "When drought comes it knows no boundaries and does not discriminate between natives and non-natives, so it is our duty as natives to teach the newcomers about our culture and heritage so that we can live in harmony."

In all, it was established that all these local perceptions helped to build up a strong base for local knowledge, ultimately strengthened by customary law. In the process, this has shaped future biological conservation, especially in areas where there is little formal education. The strict customary law which forbids non-members from reaching some of the sacred places had helped to keep large tracts of the forest biodiversity under community guardianship, especially among the Maragori, Tiriki and the Marama.

6.1 Transfer of local biological knowledge

In the study, it was imperative to find out how local knowledge, that is known to be the cornerstone of understanding local biodiversity perceptions, is transferred. It was also important to establish how such knowledge is managed for the conservation of forest biodiversity in Kakamega. To attain this, respondents were, for instance, asked who they considered to be the custodians of local biodiversity knowledge in the area. In response to this, the study found out that the village chiefs, traditional priests, village elders, parents and tribal chiefs were the key custodians of local knowledge. However, before we delve into further details we must observe that there is a significant relationship between the structure of traditional authority and the custodianship of local knowledge.

It was also established that the local Luhya institutions were also central in the transfer of local knowledge, be it related to biodiversity or otherwise. More than that, age was found to be an important aspect in the control of local knowledge.

[7] Focus Group Discussion: 22 July 2010

Old people such as village elders were considered to be the local society encyclopaedias concerning institutional norms, belief and values. Lastly, within the Luhya institutional setting regarding the transfer of local knowledge, parents were regarded as central since they were the first point of contact when a new generation of children was born. Similarly, we found out that a smaller section of respondents disregarded the village chief, commonly known as the *ligulu*, as the custodian of local knowledge. It emerged that this category of respondents (particularly the conservative Tiriki sub-group) perceived some of the village chiefs across the regions as lacking 'belongingness'–they were not Luhya and could not be great custodians of Luhya values. This brought to the fore the complex politics of identity even after assimilation.

The respondents mentioned that the traditional priests are regarded as so, owing to their position in society. They are perceived to have supernatural powers that enable them to have extraordinary wisdom. They are also known to be intercessors and, therefore, often visit the sacred places in the forest. They are in constant touch with the forest spirits and this makes members in the local community believe that traditional priests have a deep understanding of the local forest biodiversity. On the contrary, other respondents pointed out that village elders were the custodians of local knowledge. These owed their recognition to the fact that they have lived for a long time and have a clear grasp of the local institutions.

Furthermore, village elders are known to be in charge of enforcing the local customary law, so they are construed to be the real custodians of local law and knowledge as well. Other respondents highlighted the tribal chiefs as the custodians of local knowledge. These, the respondents said, are the leaders in their respective sub-tribes and, as a result, are seen as torch-bearers as far as traditional knowledge is concerned. Indeed as custodians of local knowledge, tribal chiefs are consulted on almost all the major issues, including local biodiversity issues.

Lastly, another section of the respondents agreed that parents and relatives were also important custodians of local knowledge. This is largely found within the Luhya tradition, which maintains that parents, and especially grandparents, are holders of the local wisdom. This arises from the fact that wisdom manifests itself in age and, therefore, aged grandparents are hosts of this much desired and cherished wisdom. Likewise, they are consulted on the relevance of different local biotic and non-biotic issues, and they readily provide the answer. Grandparents are also behind the major ceremony of naming newly born children. Many of these names have a connection with biological species, especially animals. The aged grandparents are also the major teachers in the informal education system that is largely based on oral tradition–a method of instruction that has existed since ancient times.

When asked how such people (custodians of local knowledge) are perceived, there were a myriad of responses. Some of the responses informed the study that they

perceived the custodians of local knowledge as protectors of the local and cultural norms. For this reason, they specifically referred to the village elders, whom they described as the people in total control of what "was" and what "should be". They are consulted on all issues relating to the local biodiversity, therefore, their wisdom is given with a view to keeping the cultural norms regarding such biodiversity intact. In another focus group discussion with some of the tribal elders, it was agreed that their information is taken seriously but they hastened to add that some of it is disregarded. But they emphasised that their advice is given with the aim of protecting the cultural norms.

Some respondents perceived custodians of local knowledge as sources of wisdom. This is especially true with respect to the aged. It is believed that most spiritual and magical powers are obtained and retained by the aged. This belief lies at the heart of old people's "monopoly of magical power" and is further reinforced by the Luhya thinking that the most powerful source of wisdom is age. A significant majority of respondents agreed that the custodians of knowledge are also seen as spiritual leaders. This is especially in regard to the traditional priests. These are perceived to be seats for the ancestral spirits, *Baguga*, and, therefore, they are perceived to be close to the Luhya gods. This means that they are able to obtain the goodwill of the ancestral spirits *Misambwa-mu-mi-sambwa*, an enhancement of their ability to guide their people in almost all aspects of the cultural and spiritual nomenclatures which, of course, have a lot to do with the local biodiversity in and around the forest.

Finally, with regard to the Luhya traditional religious beliefs, they are in harmony with the prevailing Bantu idea that the deceased have a continuing influence over the fortunes of the living. This is a crucial aspect of the relationship between the people and the traditional priest. It was found that the holders of local knowledge are perceived as guardians of society. This is construed to mean that, in a way, a society can only be held together by those who have a rich grasp of what the local knowledge systems are. Similarly, local biodiversity knowledge can only thrive on an enriched system of local knowledge, especially in areas where local institutions are well-rooted. It is clear that the local knowledge system informs and guides the local decision-making process with regard to local resource development and usage. In view of this, the custodians of local knowledge are the guardians of society and are also perceived as transmitters of culture.

6.2 Rights to resource usage and adaptation actions undertaken by pastoral migrants

Pastoral rights of access to forestry resources in Kakamega are based on reciprocal arrangements between them as migrant pastoralists and the natives as agriculturalists. This implies that their stay in the forest areas is usually dependent on the social relations between them and the natives. Hence, the ability to honour the reciprocal arrangements creates a form of tenure security and resource user

rights for the pastoralists. Such reciprocity creates fertile conditions for resource sharing between pastoral communities (Cole & Grossman, 2002). We ought to note that gaining secondary rights by pastoralists in the agricultural communities such as those in Kakamega has been one of the institutional innovations relating to gaining resource rights. Pastoralists do this by intermarrying. For instance, daughters from the pastoral communities are offered to the natives. Pastoral men also marry from the established lineages of the natives. Through this arrangement, pastoral communities are allowed to graze from the fields of agriculturalists, especially after the harvesting periods.

It is noticeable that the above innovation is a risk-spreading action, especially among the pastoral communities such as the Turkana of northern-western Kenya, a practice that has been introduced in Western Kenya. The significance of this innovation is that, through marriages between the natives and pastoralists, bigger social networks are built while at the same time acquiring new land expanses for livestock. It is also a means of spreading risk through the re-distribution of surplus. In addition, the offering of gifts in the form of livestock also increases social capital among the newly built kinships and friendships (McCabe, 1990).

In their search for options outside the informal institutional frameworks, pastoral communities have also found alternative ways of re-negotiating access to resources. One such has been the securing of access through the purchase of land in the Kakamega forest belt, especially in the north Nandhi escarpment. This is done by following the formal institutional arrangements. Such arrangements include the 2005 Forestry Act as well as the 2007 National Forestry Policy. Both the Act and Policy encourage communities living in and around the forest to get involved in forest conservation by the formation of Community Forestry Associations (CFA). These consist of user groups such as grazing pastoralists as well as agro-pastoralists. Under this arrangement, pastoralists are allowed to graze their animals after paying grazing fees to the forestry department. In cooperation with the farmers in and around Kakamega Forest, some pastoralists have opted to hire land from the farmers at a given fee to graze their animals during extreme dry years.

The above system has created a framework of cooperation and reciprocity, and helped to stem conflicts between pastoralists and farmers as well as dealing with the negative impacts of pastoral exclusion (Bassett, & Turner, 2007). This formal institutional innovation has been lauded as having caused significant resource conservation, especially in the western Sahel regions where farmers and herders are often in competition over resources, especially during extreme conditions. Using the Bokki region in Burkina Faso as a test case, Brockhaus et al. (2003) note that the ability of rural communities to prevent and manage conflict is largely based on the strength of communication networks between herding and farming interests, respected community leaders, and leaders in neighbouring communities. Overall, when local institutional arrangements are functional, a high percentage of conflicts are effectively managed at local levels. Nonetheless, these need a strong statist

intervention as a way of backstopping the traditional institutional networks, as competition for resources is sometimes driven by population growth, migration and land degradation which can cause institutional dysfunctioning of modern and traditional law (Hagberg, 1998).

As previously noted, some of the pastoral migrant communities in Western Kenya and, particularly, in the forests have acquired land (whether through outright purchase, lease or otherwise) in the Kakamega forest belt and have been assimilated into the Luhya way of life. Some of the Pokot pastoral migrants have since become agriculturalists, even though some maintain small herds of cattle, sheep and goats. On the other hand, some have remained herders although with a view to adapting to existing institutional demands that require selective usage of the forestry resources. It is interesting to note that, in spite of the varied livelihood interests in Kakamega Forest, there is a high level of mediation between natives and newcomers in as far as rights to resource use are concerned. This mediation, however, takes place in the spirit of compromise where the herders are given user rights based on responsibility to protect the forest biodiversity, especially where linked to the Luhya traditional belief system. For the pastoral chiefs and elders of herding lineages have the responsibility to manage the herd sizes through "taxation" and exclusion of other "outsiders".

The aim of the above rule is to create a desired level of carrying capacity in a given forest environment–a form of restraint and means to avoid the tragedy of the commons. In addition, pastoral chiefs and lineage elders carry the responsibility of arbitration and the promulgation of new rules between the varied resource users, including natives, non-natives and other insiders, within their area of settlement. In that regard, outsiders need to ask permission before bringing animals to graze within a specified area of settlement occupied by an existing pastoral group. The Pokot, for instance, allow local Luhya and Nandhi who want to use the resources for charcoal and brick making on a limited scale. This, the researcher was informed, is a measure of conforming to some form of economic justice in resource use among the various users.

Furthermore, in regard to local ecological support, it was found that some of the pastoral migrants have been involved in species regeneration in some of the overgrazed areas. It was established that this is born out of the mutual collaboration and the responsibility for species protection that is championed by the Luhya elders. In that regard, some of the migrant Turkana pastoralist communities, led by their elders in the degraded area of Buyangu, have been involved in the regeneration of *Uvariopsis*, *Funtumia* and *Antiaris*. The elders have also developed species use guidelines including those related to harvesting specific tree spices in their areas of settlement.

Indeed, the local Luyha traditional chiefs, working in unison with the pastoral elders and village leaders, have developed a wide variety of forestry resource

management innovations in areas like Shinyalu and Buyangu. These kinship institutional arrangements have attempted to preserve the most valuable tree species in their respective areas. In some cases, these efforts are linked to the compassionate attempt to encourage both native and non-native resource users to conserve the species that are critical to social, economic and environmental concerns. Examples of the most valuable tree species that have been aided by this innovation include: *Lesch, Funtumia, Africana stapf, Prunus Africana, Kalkm, Aningeria aubrev* and *Pellegr antiaris.* Kiama and Kiyiapi (2001) also found these to be some of the most exploited species in Kakamega Forest.

Clearly, the above efforts demonstrate that pastoral communities have, in a way, obtained extraordinary types of rights. For instance, this is discernible through their participation in internal decision-making and through their involvement in the species regeneration efforts. This is an indication of a genuine desire for long-term investment and harvesting of the resources. In that context, one can argue that the kind of rights that the pastoral communities derive over time, are more or less similar to those of the indigenous Luhya people. It is not surprising; therefore, to point out that, over time, most of the pastoral communities have actually obtained the right of alienation – a kind of right to transfer commodity the way the owner wishes without harming the physical attributes or uses of other owners (Agrawal & Ostrom, 2001).

In addition, the above innovation has also been reported to have been replicated in south-eastern Botswana, where village chiefs banned the felling of village amenity trees–used for shade and lavatory shelter for those too elderly to go out to the bush–and arranged elaborate zoning for different categories of fuel wood collectors. Around Mount Kenya, as elsewhere in Africa, sacred groves were used as the meeting places or burial grounds of chiefs or the members of senior age sets, and, to the extent that these groves symbolized the patrilineage, women were banned from entering them. In Ivory Coast, it has been reported that elaborate arrangements for protecting and resting the forest were originally in force. Punishments for forest misuse, too, are often graded so that villagers are more likely to pay lower fines for local crimes than are outsiders (Dyson-Hudson and Dyson-Hudson, 1980).

7. Conclusion

The above treatment demonstrates that migration is a permanent part of pastoral livelihoods. It emerges, therefore, that the pastoralists as a people are conditioned by environmental conditions and the resources available for their animals to feed. This implies that pastoral movements take place in a restricted space, especially in the case of migrations into areas that have farmers, such as the forest belt of Kakamega. This suggests that pastoral migrations are occasioned by restrictions of access, and a possibility of open conflict between the pastoralists and farmers. However, it turns out that pastoralists have, over time, learnt the importance of

cooperation and building bridges between the different social and environmental spheres, especially in the wetter zones which give rise to dense social networks and social capital. This has significantly contributed to their adaptation strategies in their new-found homes. Indeed, climate change is forcing pastoralists worldwide to adopt alternative coping mechanisms for pressures arising directly or indirectly from global changes. The institutional response analysis of the pastoral cases examined in this paper supports the hypothesis that institutional functioning (both formal and traditional) is key to addressing the pressures imposed by global climatic changes.

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Theme 3

Government Intervention and Adaptation to Climate Change in the Horn of Africa

Unexpected Consequences of Formal Education in Pastoralist Society: Loss of Traditional Knowledge and Practices for Coping with Climate Change

Martha Wagar Wright

Abstract

This paper examines the impact of formal education on the living conditions of the Karimojong people in relation to environmental degradation and adaptation to climate change. It seeks to understand the role of indigenous knowledge in environmental management and its contribution to community resilience to climate change. A detailed qualitative study was carried out, and the data provided by the Karimojong people offer insights into the role and unexpected outcomes of formal education. The main conclusion of the paper is that there is the risk that formal education could be counterproductive in enhancing the capacity of pastoral communities to manage their resources and cope with the challenges of environmental change. Formal education should be of good quality and designed with consideration of the social, economic, and historical situation of the recipients, to increase the adaptive capacities of pastoralists in Karamoja.

1. Introduction

Throughout the world, education is recognised as one of "the social opportunities that are central to development" (Sen, 1999), while pastoralism has been seen as an obstacle to the development process (Krätli & Dyer, 2009). In the Karamoja region of north-eastern Uganda, government agencies and non-governmental organisations (NGOs) alike have claimed for decades that the answers to pastoralists' problems lie in education. The formal education system has offered access to the broader economy outside Karamoja to some families, but overall has discouraged students from pursuing pastoralist traditions. However, through their indigenous informal education, the traditional knowledge of the Karimojong people has provided coping strategies which, for generations, enabled them to survive in this challenging habitat, one of the most vulnerable to climate change (Mubira, 2010).

There is concern among community members as well as outside researchers that the available formal education in Karamoja may actually be counterproductive in enhancing the capacity of pastoral communities to manage their resources and cope with the challenges of environmental change. The current system is not appropriate to the Karimojong context in terms of timetable, curriculum, language use and overall quality of delivery, and indeed may encourage dependence on food aid, settlement and increasingly unreliable agriculture.

The present exploratory study seeks to identify key issues surrounding the actual impact of formal education on the quality of life of the Karimojong, including evidence of shifts in livelihoods in response to climate change in the region. This paper will examine what relationships may be found between the rise in formal education in Karamoja and community practices related to environmental degradation and climate change. It will also consider whether any mechanisms exist to modify the formal education system and other education programs, such as Alternative Basic Education for Karamoja (ABEK), to facilitate transmission of the traditional management strategies, critical at this time to enable the Karimojong people to cope with climate change and also to address other socio-economic factors contributing to the escalation in environmental degradation.

2. Background to the study

2.1 Karamoja and the Karimojong people

Karamoja is the Anglo-Swahili name given to the north-east section of Uganda which has been inhabited for approximately 200-400 years by the Karimojong cluster of linguistically and historically related agro-pastoralists (Pazzaglia, 1982). Karamoja covers approximately 28,000 km^2 bordering Sudan and Kenya, located between 1°30´ - 4°00´N and 33°30´ - 35°00´E. While it is known for large semi-arid areas, with the highest annual temperatures in Uganda, there is considerable variety within the region overall. Some portions are considered most suited to pastoralism; others are agro-pastoral, while the study site of this paper is in one of the sections of Karamoja where people practice extensive agriculture in addition to raising livestock.

In rural Karamoja, the majority of families participate in a semi-nomadic lifestyle like that of the rest of the socio-cultural Karamojong cluster who are spread throughout the neighbouring semi-arid parts of South Sudan, Kenya and Ethiopia. Depending on available grazing and water supplies for their animals–principally cattle, goats and sheep–adult male herders, the warriors, move with their livestock. They are accompanied by a few young people, both male and female, who serve as support staff, preparing food in the kraal and caring for very young animals. Typically the herders and their animals must venture farther and farther from their homes during the dry season, as supplies dwindle in the more arid areas. Most women, children and elderly people remain in the home settlement, *ere* in Ngakarimojong (plural *ngirerya*, also often known as a *manyatta*, from Kiswahili). The Karimojong have traditionally determined the course of these migrations on the level of the *ere*, the *ngirerya*, and, as necessary, through consultations with elders from the larger clans or regions; this is also true of organised plantings and other collaborations. Major issues would be discussed by more senior elders in a formal meeting known as *akiriket*, perhaps near some sacred trees. More ordinary, ongoing management issues would be handled at frequent, less formal *ekokwa* gatherings at people's homes and kraals (Knighton, 2005). In recent years, some of the authority of the elders has been eroded due to government intervention and

drastic changes in economy and lifestyle, at the same time as many young people are participating in formal education.

Karamoja is considered by most other Ugandans to be a significantly inferior part of the country, not only because of its semi-arid climate and limited agriculture, but also because of its distinctive traditional culture, including their pastoralist lifestyle, their attire and ornamentation, and, most particularly, cattle rustling. Traditionally, raiding livestock from neighbouring clans or tribes constituted a significant part of the social and economic systems of the Karimojong, as well as those of the Turkana, Pokot and Jie. Consequently, and particularly due to the widespread availability of automatic weapons since the late 1970s–at the same time that devastating famine hit East Africa–Karamoja has suffered from serious insecurity. This has led to major economic change in the form of impoverishment of many people due to loss of herds, loss of grazing, an increase in diseases affecting both livestock and humans, and stagnation of development in all sectors. According to my informants, it was the advent of *atom*–the gun–which was the fundamental cause of all these problems.

As is widely reported by community members, government officials and researchers, "The region is characterized by the worst humanitarian and development indicators in Uganda" (Ferloni, et al., 2010; United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), 2009). The majority of the population, even in the areas best suited to agriculture, have, for the past 30 years, since those terrible periods of famine, depended heavily on food aid, known locally as *rilip*–from the English 'relief'–or *euga*, supplied in large quantities to the public schools and also through intermittent community distributions. The government has also attempted to ameliorate the situation by controlling movement of people and animals, and encouraging settlement and participation in formal education, as well as recent massive disarmament efforts; all of which are, to one degree or another, controversial among the Karimojong themselves and outsiders.

In recent decades, Karamoja has undergone rapid changes in many aspects of life: increased population, arms proliferation followed by widespread disarmament, introduction of governmental hierarchical systems throughout the villages, proliferation of NGOs with enormous budgets, intensified agriculture, greater interaction with the wider East African economy, introduction of many schools through Universal Primary and Secondary Education schemes, vast quantities of food distributed by the World Food Programme (WFP), and widespread exploitation of the increasingly limited resources of its fragile ecosystem. Instead of collaborating with neighbours under the supervision of elders, as in the past, individuals now take whatever measures they feel are necessary to their survival; in many instances, this means that they plunder the fragile environment to make quick money by, for example, selling vast quantities of firewood and charcoal at low prices to southern traders. Environmental degradation has escalated at an alarming rate as increasing numbers of school-leavers return home to find no job prospects

and discover that they also lack the appropriate skills to cope as pastoralists. This is particularly true now that both raising livestock and sedentary agriculture face new challenges because of crop failures due to change in rainfall patterns.

2.2 Study site

The site of the present study is Nakaale Village, Napienanya Parish, formerly Namalu Sub-County (now Loregae), Nakapiripirit District, in the area of Karamoja known as the 'green belt' (Wilson & Rowland, 2001). Annual rainfall is approximately 1,000-1,200 mm/year, some 30-90% higher than most of the rest of the Karamoja region, and the land is so fertile that it is estimated that this portion of Nakapiripirit District could feed as many as 2 million people (Apap-Apalokori, 2009). That number is probably at least double the population of all of Karamoja, depending on which estimate is used. The local population was approximately 1,800 in a 2004-05 survey taken by the Presbyterian Mission in the immediate area, including Nakaale Village, Kopetatum Village and portions of Alamacar Village near the Mbale-Moroto highway, which together constitute the study 'neighbourhood'.

3. Methods

Because this was an exploratory study in a little-researched area, a variety of methods were used. One of the goals of the study was to examine local people's perceptions of climate change and knowledge of traditional coping strategies; therefore, much of the data was gathered through face-to-face interaction during the spring and summer months of 2011. These events included guided group discussion, semi-structured interviews and focus group guided discussion as well as focused individual and small-group follow-up interviews. In addition, I conducted a review of data on regional climate change and related environmental exploitation, and a review of the available historical record.

My family and I have resided in Nakaale for most of the past eleven years and have also observed some of the climatic, economic and socio-historical phenomena reported by Karimojong informants for ourselves. For this study, I reviewed my own records and recollections of conversations with neighbourhood residents over this time period, notes from participant observation in educational settings and informal interactions in communities over the years. I have taught my own children as well as community members using Ugandan textbooks, including Social Studies, Science and Agriculture, so I am familiar with the content and curricula of those subjects.

Because the study was intended to explore the possibility of loss of traditional knowledge across generations, I considered one family in particular as a case study. I felt it would be useful to conduct the case study with people whose lives we have been closely involved with for an extended period, so I chose a family I have known since 2000, whom we have interacted with as neighbours, employees and

friends. I do not claim that they are representative of all Karimojong families, but perhaps a significant number in the study area; only through further research could the validity of such generalisations be determined.

The interviews I conducted included 21 active participants, and my research assistants interviewed an additional 10. They were Nakaale area residents of different ages, from mid-teens to more than 70 years. This is, of course, a statistically very small sample, but I considered it adequate in light of the goals of an exploratory study.

Interviews were conducted in the Ngakarimojong language with occasional interpretation in English. Portions of recorded interviews were reviewed with one of the research assistants for translation, typed transcription of selected segments and additional discussion, which assisted in achieving more focussed interviews with certain informants. Those interviews were the lengthiest, and included audio and video recordings. I did not write during the course of the interviews or discussions, as I thought it could interfere with the flow of the discussion. Instead, noteworthy comments were taken down in writing from the recordings and during subsequent review with the research assistants.

The interviews which I did not attend personally were with neighbours, friends and family members of my research assistants. In my past experience in this community, the presence of an outsider, a *mzungu* (white person) like myself, can suggest to interviewees that there is a development agenda behind the interview; responses can, in turn, suggest a project proposal. Therefore, I thought it best to absent myself from some of these sessions. However, the responses were reviewed as soon as possible after the interviews and written down in summary form, with as many direct quotes as the assistant could recall.

In addition to the more open-ended interviews, I included a questionnaire regarding knowledge and use of *ngamuja nguna ka akoro* (hunger foods), using a list provided by Dr. Jean Gradé of the Karamoja Christian Ethno-Veterinary Project in nearby Nabilaatuk. I also directed several of the interviews into the subjects of ‘reading’ the weather and environmental signs, as well as traditional knowledge of astronomy and other predictive tools such as haruspication (‘reading’ intestines).

Because of limited access to the internet in Karamoja, not all of the published resources were available to me before I undertook the community interviews. This ‘problem’ actually turned out to be helpful in looking at the data I had collected, as I could be more confident I had not elicited responses which would merely corroborate what I had read–quite the reverse, in fact, as is described in the next section.

4. Findings of the study

4.1 Perceptions of climate change in Karamoja

Karamoja, like other arid areas of Africa, is set to experience severe impacts of climate change. The Intergovernmental Panel on Climate Change (IPCC) has noted the severe expected impact of climate change in Africa (Stites et al., 2007).

There has been considerable concern among international agencies and researchers about climate change in Africa for some time, and places like Karamoja are recognised as being particularly vulnerable (Leroy, 2009). Mubira (2010) notes that pastoralists in Karamoja are also aware of the significant changes in their homelands. Until recently, it could be stated with reasonable certainty that the weather throughout Karamoja followed roughly the same annual pattern: a single rainy season (*akiporo*) beginning mid-March, with peaks in May and July and a brief dry spell during June. The dry season (*akamu*) would then begin in November, with December and January the driest months, typically also extremely windy. Mean annual rainfall in the more arid areas would be approximately 625 mm, approximately double in 'green belts' such as the study area.

Elderly informants, and younger ones recounting their parents' recollections, report that, some 50-60 years ago the rains came far earlier; clearing could begin in December, the rains would begin in January and ploughing could also begin then. All informants agree that the 'usual' time for rain, up until the past few years, was March. However, all informants also agreed that recently, especially in the past 3-6 years, the rain has become completely unpredictable.

Now, maize may dry up and die during unusually long dry spells, which their drought-resistant crops such as sorghum and millet would have weathered in the past. In other cases, entire fields will be swept away in torrents of violent rain so early that plants have not yet matured to a point where they can withstand the force. People then have to try to replant. However, the second planting maybe lost to an unseasonal dry spell, or vast tracts may rot in the field, covered with smut (the fungus *Sphacelotheca sorghi*),which destroys the grain heads or even the entire plant. People are profoundly frustrated and largely pessimistic or, if they have the means, they try to grab opportunities. One experienced agriculturalist states he simply plants whenever it rains, hopes for the best and plants again if he has to. However, people whose resources are limited do not have that option. Worse yet, those who are waiting for government supplies of seed may miss the window of opportunity, as distributions may still be organised along now-outdated seasonal calendars.

One of the striking features of all the sources I have consulted is the consistency throughout Karamoja that, as reported in Moroto District, "the seasonal calendar for the area started changing more than 20 years ago but during the last five years

the changes have intensified leading to over-exploitation of natural resources" (Magunda, 2010).

4.2 Coping with impacts of climate change through harvesting natural resources

All sources consulted, both published works and local informants, report several significant changes in the economy of Karamoja, some of which can be attributed, at least in part, to the changes in climatic trends described above. All sources report significant crop failures in recent years because of erratic rainfall leading at times to crop-destroying floods and field rot, at others to insufficient rain for crops to mature. According to my informants, dependence on agriculture is far greater than in the past, in part because of insecurity, which has led to a reduction of herds over the past generation, as well as encouragement from government and NGOs.

With the failure of now critical rain-fed crops, there has been a drastic increase in the need for hard currency in Karamoja. The people there have always been reluctant to sell their livestock, but now some have none at all to sell, even if they wanted to; in any case, sale is not always possible because of not-infrequent quarantines in Karamoja due to diseases such as foot and mouth. My informants report that, as a result, exploiting natural resources has taken on enormous importance, particularly harvesting trees. In the immediate area of the study site, this has been most obvious in the past 2-3 years. Production and sale of charcoal (*ngamakae*) and firewood (*ngakito*) is reported by all respondents as the primary source of cash for most families, along with selling local beer (*ngagwe*), illegal distilled alcohol (*etule*) or sachets of commercial hard liquor such as Sunny Gin.

The effects of tree harvesting are obvious throughout the region. Informants report that the valley of the study site was a 'forest' perhaps 30 or 40 years ago, before large tracts of land were cultivated by major landowners. The area just beyond the seasonal river, the Kakamongole, was indeed a forest until just the last couple of years. Neighbours say it is being stripped bare for charcoal production, that it is becoming *alapatu*, a bare clearing. Formerly, the methods for harvesting firewood were much more sustainable; people would seek out trees scattered throughout the fields, their branches would be coppiced and the trunk left undisturbed, such that the branches would simply grow back during the next season. Indeed, many of the hillsides in the study area remain intact and are being used in this traditional way. But the biggest trees are disappearing entirely, especially from areas which had remained untouched for a generation because of insecurity. Local informants often expressed concern that what is today *alapatu* (a bare clearing) will become *alongisat* (desert, wilderness) and that, if there were more trees, the rain would be good.

Karimojong respondents, as well as other researchers (Mubiru, 2010; Magunda, 2010; Stites et al., 2007), report that harvesting these natural resources creates many significant problems for the Karimojong:

> Deforestation and tree cutting were the most frequently mentioned biophysical changes that communities observed in the past 30 years. Several communities in Moroto, Nakapiripirit, Kotido, Abim and Amudat reported high rates of deforestation. Apart from the known environmental impacts of deforestation this problem has affected women in Karamoja in a special manner (Magunda, 2010).

Not only is the environment being degraded, but the work itself subjects women especially to extremely strenuous, time-consuming labour, in addition to the excessive workload they already bear. Community women receiving assistance from an NGO to combat their children's malnourishment all reported that they spent 2-5 days every week involved in some aspect of charcoal harvesting, processing, transporting or selling. In the end they probably make only about Uganda Shillings (USh) 1,000-2,000 (less than USD$0.50-1.00) per day for their work, which was not at all enough to live on when a tin of maize had reached USh 5,000 locally. They complained that part of the reason their children were malnourished was that, not only did they not have enough money to buy food, but they also had to leave the children unattended all day, with no-one to prepare food for them.[1] Community health workers complain that mothers gone *namakae*–to the charcoal–is a chronic problem in many of the poorest households (personal communications, 2010).

There was a remarkable degree of consensus among informants regarding climate change, economic change and attitudes toward education in general. All informants interviewed for this study reported that they have perceived significant change in weather patterns even in the past 8-15 years. Younger people report that they also know from what their elders have told them that there have been major changes in the environment over the past generation or two, perhaps 50-60 years. At the same time, all agree that the more children attend school, the better off Karamoja will be.

4.3 Climate change and livelihood changes: a Nakaale family case

Ngikasikou (elderly men) describe with unmistakable joy and affection the times gone by in this place, when "*alalak ngaatuk NOOI*"–cattle were TOO many. According to these elders, many families had 100 each, and big men had as many as 1,000 in a herd, fenced, well-fed and cared for with the latest veterinary techniques of the day. The place was so good for raising cattle that these wealthy landowners even introduced exotic breeds which produced far more milk than the zebu cattle, and instituted hygienic processing facilities. On these farms, not only were there cattle and goats but also pigs, and the owners invested in a large number of fruit trees, as well as exotic medicinal trees such as *elira* (neem) and *moringa*.

[1]Concern Worldwide Uganda focus groups, multiple personal communications, February 2010.

To hear the old people talk, South Karamoja was The Promised Land itself, a land of milk and honey. Village children were, in fact, raised on milk morning and night, as well as blood, from their family's herd, which might be 20 or even 100 cows. Shepherd boys at the kraal could have an entire calabash full each morning, enough to save some for rest-time at midday, and another in the evening, along with sorghum *atap*. The rain came at fairly regular intervals and, while there were dry spells each year, true famine was an extraordinary occurrence. Women raised small gardens of sorghum and millet, which was enough to supplement the milk and blood diet, and wild greens and fruits that people could gather among the native plants. Wildlife was abundant, including not only duiker and small antelopes but even *ngikosuwa*, massive Cape buffalo now found only in game reserves, as well as many kinds of birds and small carnivores of various kinds. The place we now see almost treeless was *amoni*, a forest, all 'bushy', back across the seasonal river to Akuyam.

Because of the favourable ratio of livestock to people in the past, the Karimojong could survive largely on renewable animal products–milk and blood–and local plants, along with relatively small amounts of rain-fed crops, which were somewhat unreliable in this precarious environment. During the dry season, herders would bring back better-fed animals from the kraals to their family homes and exchange them for weaker animals which they would then take out to the grassier places to fatten up. As a researcher with Oxfam in 1969 noted, "At the grazing grounds of the cattle, the men, boys and young girls who are present live extremely well. There is no lack of milk and blood and, by report, young bulls are cooked and eaten, or wild game" (Aerni, 1969).

One of my main informants, the father of the case-study family, described the enormous change which took place in Karamoja during his childhood years. He was born and raised in Lorengedwat, a more sandy and arid area than Karamoja, about halfway to Moroto along a seasonal river. The Pokot raided his home and speared his father to death, then took all the family's cattle, about 100 at the time. In revenge, Lokiru (a pseudonym) chased them, scouted their location, and then helped warriors organise an attack, during which he himself speared a number of Pokot to death, causing a group of women to flee the village. After that he was known as *Asurungaberu*, the Chaser of Women.

Lokiru did not, however, get back his father's cows, and he decided to come south to the more fertile plains of Napienenya Parish, where some wealthy Karimojong landowners kept vast herds and had hugely successful farms. Lokiru mostly gave up raiding, and took a job as a groundskeeper on one of the farms, where the only guns at the time were in the hands of the landowners' guards. In those days, people still fought with shields and two spears, but there was relative peace, according to Lokiru, in this part of Karamoja. Peace agreements had been brokered by very senior elders who would meet from time to time to determine how their clans would interact with one another. Time and again, Lokiru and other older

Karimojong have said to me that the advent of the gun changed everything. Herds were decimated, people were displaced, insecurity curtailed grazing, cultivating, and even sleeping at night. They believe that God may bring back cows now that many of the guns are gone, but realise that surrounding tribes and countries have to disarm their people as well, or the Karimojong will be victimised. The study area was one of the last to get guns but one of the first to be disarmed. People here, the sub-tribe known as the *Ngipian* ('spirits'), resent the fact that they are left so vulnerable, and many of the homes have thick weeds in the centre where dozens of cows were once kept.

Lokiru has mostly raised a few goats for his family over the years, rather than cows, and has managed to keep some kind of job. His sons did some herding when they were younger but now the eldest, who did not attend school but is quite capable in business, works part-time for the Mission and has various small enterprises, charcoal among them. His younger brother was sponsored through school by American visitors and has worked in various positions for the Mission for several years, as he is particularly gifted in both Karimojong and English. They have had little involvement in raiding. Lokiru and his sons remember that the last raid by warriors from this neighbourhood was in 2004, when ten young men from Nakaale and Kopetatum villages went toward Amudat and all were killed by Pokot warriors, except one who was an especially fast runner and escaped. According to them, this event, which the neighbours remember as a devastating loss to the entire community, caused people to give up raiding. The disarmament followed not long after.

Lokiru and his sons report that, in recent years, people have become very dependent on food aid, both in distributions and through the public schools, because agriculture is not reliable. They never know whether they will have an adequate crop from one year to the next.

Today in Nakaale, my case-study family report that the first call in the morning is the shriek of *eko-o-o-o-ni!* – "it's ready", meaning 'come and get the beer'. Children in villages rarely start the day as their grandfathers did, with milk from their father's herd, but instead may have sorghum or maize porridge, or only scrape sorghum husks and residue from the bottoms of the jerry cans their parents have drunk beer from. Many rely on the soy porridge the WFP has sent in truckloads to the schools, but it usually runs out long before the end of the school term, possibly sold or otherwise misallocated. Despite the grossly inflated enrolment numbers, it seems the schools never have enough food, not even for a single term. Parents send their children to school expecting them to receive breakfast porridge and maize posho with beans for lunch, only to find that the children sat at school hungry all day, or only received thin, watery soy porridge mid-day. Many *ngirerya* (homes, villages) have no cows at all, as they cannot defend them and it is reported they were raided years ago. Some homes do maintain herds, but not in numbers proportionate to the needs of the rapidly growing human population. Informants

report high rates of disease among their cattle and veterinary personnel complain they cannot even keep enough brucellosis tests in stock to keep up with the demand. School feeding programs have become an important coping mechanism (Krätli, 2009).

Karamoja is considered by aid agencies to have famine nearly every year, and untold tons of food has been distributed here, even in this South Karamoja green belt, continuously since the 1980 famine, which was indeed disastrous here and in much of East Africa. Local residents remember seeing their neighbours literally die of starvation at that time, which we have heard about only very rarely in the 10 years we have lived here, although both drought and famine have been declared at various times in that period. There are not only relief distributions but settled organisations people can turn to, which did not exist before 1980. These charity groups have provided not only food and other material aid to residents, but established schools and clinics, and trained local people in farming and other skills which could replace livestock rearing. Some successful government officials and NGO employees still mention how much was done for them by Inter-Christian Aid (ICA), an NGO functioning in the Namalu, Karamoja area during the 1980s and 1990s, and local informants talk glowingly of how generous the aid groups were in dressing the children in the *unipom*. Informants of about 30 years old who grew up here and in nearby Namalu even said that they recalled no seriously bad years because *rilip* had always come.

However, periods of very little food were considered normal up until recently; indeed, the yearly cycle most people expected included several weeks of *akoro*–hunger–during the weeding time. As one of the neighbours remarked, one year of intermittent rains,"*Emam nyerono akoro. Erono edeke!"* (Hunger is not bad – illness is bad!).[2] Such *akoro* was expected to last only a short time, not like *eron*–famine. Those who were better off were expected to provide work for their poorer neighbours so that they would have something to get them through these few weeks, and weeders could take home the edible greens from their work to feed their families. Neighbours note that they send their children *lodya*–to get greens–in Mission cultivated fields, as the group have invested in improving the soil over the years and there are far more edible greens there than in surrounding weedy, fallow fields. This relationship between cultivation of grain crops and availability of indigenous greens may be worthy of further study; some observers are concerned that crop cultivation may have a negative effect on soil quality, erosion and overall environmental conditions. However, properly managed, cultivated land could result not only in adequate food but also in increased availability of indigenous foods, particularly in more difficult years, when the indigenous plants would have an advantage in surviving erratic rainfall. However, some of the women mentioned their concern that excessive tree-cutting is already noticeably decreasing the availability of indigenous wild fruits.

[2] Adokoro Simon Peter, personal communication.

4.4 Traditional knowledge of wild foods and weather patterns: pastoralists' adaptation strategies

Wild foods have constituted an important component of the diet of the Karimojong for generations, particularly during times of less abundant harvest, informants explained:

> At the time of famine, even the tamarinds produce much–God is wise, in those days when there was little rain the wild fruits produced more… *Ayakasi ngapedur* (there were tamarinds), *ekadelwae, ngimongo* (fruits of *ekoreete*), ngalurui (*quails*). Any terrible year, wild fruits and animals will be many. God will bring some substitutes [for crops]. Even one time there was a great rain which killed all the rats, and people could just go in the morning and pick.[3]

One of the goals of the study was to see what, if any, correlation there might be between participation in formal education and traditional knowledge of the strategies employed by the Karimojong people to cope with challenges of climate change such as erratic rainfall. To that end, as mentioned above, a group of informants were interviewed regarding their knowledge of *ngamuja nguna ka akoro*–"hunger foods"–based on an inventory compiled by Dr. Jean Gradé (Gradé, 2011) in various parts of Karamoja, including this district. The results of this exploratory survey are as follows.

All interviewees appeared fascinated by the questionnaire, insisted that they knew most of these foods, and that it was common for people to eat them, even now. Recognition of names and knowledge about the plants' harvesting, use, preparation, taste, availability and other details were much greater among the older generation, those of approximately 60 years and older. The elderly women interviewed were by far the most knowledgeable, and also supplied another dozen items for the list. Younger informants, mostly in their 20s and 30s, recognised the names of approximately ⅔ of the foods on the list and knew that people ate them, but most preferred the tastier fruits, complaining that a number of the hunger foods were very bitter. In the family I interviewed at greatest length, the old mother knew and used the most by far the entire list plus 15 additional items–the father knew nearly all on the list plus a few others. Among the younger generation, the unschooled son and daughters knew nearly all. The educated (Senior 3)[4] son admitted he knew some but had really only heard of most of them and didn't harvest or consume them much himself. However, his wife (also educated, to

[3] Tete George, personal communication, July 2011.

[4] In the Ugandan system, there are 7 years of primary school, so Senior2 would be a 9th year and Senior 3 a 10th year. Ugandans take school leaving exams following S4 for O-levels ("ordinary"). They can take an additional 2years, up to Senior 6, for A-levels ("advanced") if they wish to pursueuniversity or professional education.

Senior 2) knew perhaps ⅔ of the list, unlike her own mother who also knew them all plus another 15.

I also surveyed selected informants regarding their knowledge of weather signs and patterns, including knowledge of astronomy. The distinction between older and younger informants was not as clear-cut as with the wild foods. The older men explained at some length how the *ngimurok* (traditional religious leaders, "dreamers," healers, wise men) of various types would use their particular gifts to predict the coming of rain so that the elders could advise their people. Some would kill a bull and examine the intestines for certain patterns (the system of which my informants did not know and could not explain). This would indicate whether rain was imminent; one informant said they had to kill a bull which was completely black–*iryono cuc!*–and then rain would come. Other *ngimurok* had the gift of foretelling the future through dreams, and they would announce to the elders and community what God had revealed to them about rain and when to plant or move livestock. Some *ngimurok* recognised the arrival of certain kinds of birds to mark changes in the season, as well as leaves changing colour and/or falling from the trees.

Young people interviewed said they knew that old people would do these things, and some agreed that they also believed the elders had exceptional powers to know how the weather would change; others claimed these were tricks the *ngimurok* played on people to be given chickens or other payment. The younger informants explained, however, that they did not have these gifts themselves and did not know anyone young who did.

When asked about 'reading' the stars for weather signals, the younger interviewees from my focus-interview family said that they had heard that old people could do that, but they personally had no idea how it worked. Their father, however, said that in the old days he could follow the changes in seasons by the positions of stars, but that he could not predict weather himself, as only the 'dreamers' or other *ngimurok* could do that. A young informant from another family, however, reported that 'everyone' knew how to 'read' the sky and recognise the changes in season.

All informants agreed that the skills which were valuable in the past for recognising weather changes and planning agricultural or pastoral moves are no longer as useful, because the seasons have become so unpredictable and even mixed. We often hear people complain that *akamu* (dry season) has returned, even partway through *akiporo* (rainy season), with long spells of little or no rain and even scorching winds from Kenya, or the reverse–unseasonable rains during *akamu*.

4.5 Informants' perceptions of people's influence on climate and environment

When asked why such changes have come, informants respond that it is what God has ordained: "It is not man who brings about the changing of years, it is God himself."[5] They do not claim that anything people have done has caused the change, nor can people remedy it. Some educated men, in their 30s and 40s, reported that they knew that *apukan*– the government–had told them they should plant five trees for every tree harvested, then corrected themselves, saying even ten trees should be planted. However, when I asked if anyone did, they said no, and when asked why, they only replied *ngao*–"I don't know, who knows?"[6] Local people explain that it is not customary to plant trees because it is assumed they will shift their homes frequently, so it is pointless to invest in a place. Actually, however, some of these homes have been here since the early 1980s, and a few have a couple of fruit trees. Local residents complain there is no point in planting such trees, however, because their neighbours will steal all the fruit and they won't get any.

It is also reported from other parts of Karamoja that there are 'governance gaps' in managing these natural resources:

> Plant-based materials do not fall within the realm of customary systems of governance based on ties of social capital and exchange...women increasingly attribute natural resource availability to God rather than to management decisions within direct human control (Stites et al., 2007).

There are reports of some tree-planting schemes in Karamoja, but these were not observed in the immediate area during the course of the study. Instead, one can see tree after tree hacked down and smouldering by the roadside.

4.6 Education in Karamoja

The Karimojong are regarded throughout East Africa as illiterate, backward, devoted to their traditional culture and fiercely resistant to formal education. The Karimojong are barely represented in school textbooks provided by the central government, and much of the information is erroneous. However, Karimojong people interviewed over the past several years have consistently reported positive attitudes toward education in general, particularly if their schools are "feeding centres" supplied by the WFP (Hill, 2005; Krätli, 2009; Stites & Akabwai, 2009).

Local informants as well as published reports indicate that the Karimojong believe the purpose of education is to provide certain members of their families with the opportunity to access salaried jobs:

[5] Tete George, personal communication, July 2011.
[6] Tete George, Lodim Tomas, Akol Andrew, Nakaale focus group, personal communication, July 2011.

> ‘It is not just a question of food,’ says Minister of State for Disaster Preparedness, Christian Aporu. ‘This programme has enabled the Karamojong to value education.’ …policymakers hope to use education to integrate Karamoja with the rest of Uganda and tackle insecurity in the region by creating skills and jobs. (Cocks, 2010)

Despite this reported enthusiasm, actual school attendance levels remain the lowest in Uganda, especially for girls (Integrated Regional Information Network (IRIN), 2008a; Krätli, 2001; Stites et al, 2007), and parents and students claim they do not see the value of formal education unless it leads to employment or other material benefits. Those who have been through the system also express concern that the “disculturation” they have experienced leaves them alienated from their people and no longer able to participate in traditional Karimojong life and economics (IRIN, 2006; Mafabi, 2010; Novelli, 1998).

According to the Government of Uganda’s plan ‘Creating Conditions to Promote Human Security and Development in Karamoja, 2007-10’, “significant intervention in improvement of education” has been achieved, including teacher training, infrastructure development and the provision by the World Food Programme of massive amounts of food to more than 230 primary and secondary schools. However, according to the same report, “Karamoja has remained by far the least literate region in the country, with a literacy rate at 6 percent compared to the national average standing at over 70 percent currently” (Office of the Prime Minister (OPM), 2007, p. 21).

> …what is perceived as useless is refused…The Karimojong, in fact, learn what they are supposed to know, through the experience of their everyday life and not through a formal instruction…More than to a dialogue, the Karimojong were subjected [in formal education] to a sort of monologue on the part of persons of a different culture in a different cultural language than theirs, proposing things largely incomprehensible and, for this reason, irrelevant to their interests. (Novelli, 1999, pp. 305-6)

Another issue is the use of time at school. It is widely acknowledged that the loss of rural children’s labour to formal schools is already an enormous sacrifice for their families; as Krätli & Dyer (2009) explain:

> School-based learning necessitates a trade-off between the formal educational experience provided by the conventional system, and the fundamental, informal learning opportunities available to children as members of a wider caring and complex social network.

Because of chronic food shortages in the region, the government and aid agencies hoped that provision of food to schools would be an irresistible enticement to Karimojong parents to educate their children. However, even when the WFP began supplying schools, it was reported, "The children with their parents say that the school is not profitable to their lives. The gun brings much more profit. With the gun one can get in one raid a whole herd of cows" (Apap-Apalokori, 2009).

In part in response to many complaints about the education system in Karamoja, the ABEK program was instituted in 1998-2000, to try to improve educational prospects for pastoralist children in much of the region. The original concept included mobile schools and a unique curriculum relevant to pastoralists. By many accounts, ABEK is popular in communities in that it does bring classes close to homes at convenient times, so children involved in pastoralist work can attend. According to a recent account:

> 'The aim of ABEK is to see children becoming doctors, teachers, politicians.' The syllabus is also adapted to the Karamojong way of life. 'The Karamojong are semi-nomadic,' explains Henry Nickson Ogwal, the coordinator of the Commonwealth Educational Fund (CEF), 'so children look after cows. So we start the child's education with a cow. How many legs does it have? How many if you add the number of its front to its back legs? In this way, they learn arithmetic.' (Cocks, 2010)

It is noteworthy that ABEK has become more of a bridge to the formal school system than a genuinely *pastoralism-oriented* program. Notice in the above quote that there is no mention of ABEK serving to educate successful pastoralists! Recently, according to the NGO in charge, the vision for the programme has become: "A full course of primary education can be completed by all children directly involved in pastoralism in Karamoja" (Krätli, 2009).

5. Discussion

5.1 Environmental degradation as a concern among informants in Karamoja

At first the connection between increases in formal education and environmental degradation might not be very obvious. Indeed, the WFP incorporates tree-planting into its provision to many schools, particularly north of the study area where the habitat is more arid and fragile. It was reported by the OPM that, "WFP is assisting 200 schools to establish woodlots and vegetable gardens... 89,314 people are expected to benefit from WFP's Food for Education programme which is valued at US$1,616,000 in 2007/08" (OPM, 2007).

Community respondents and local leaders all express concern that environmental degradation has escalated at an alarming rate, and they have the expectation that, if it continues at the present rate, it will result in desertification of their homeland.

However, my informants believe they have no alternative but to burn charcoal and sell firewood, as their need for cash has risen due to loss of herds and increased dependence on unreliable agriculture.

At the same time, there are increasing numbers of school-leavers returning home to Karamoja only to find no job prospects. They lack appropriate skills to participate in the pastoralist economy and not only do a significant number of these supposedly educated youth lack basic skills, because of the very poor delivery of some teaching, but worse yet they have little or no way of contributing to the family economy and repaying the investment their family has made in their education. Because their families had counted on these educated members gaining access to the economy outside Karamoja and pastoralism, and participating in the cash system, families and idle school-leavers now have to make cash some other way. The young men typically refuse to work as herders or agriculturalists, preferring to pass their days on the roadside, playing cards, drinking and fighting, sometimes using what little cash they may get from relatives to invest in legal or illegal hard liquor, which they sell for about 10%-20% profit or 50-100% on the illegal substances. Still, according to all informants, the primary source of cash is charcoal.

5.2 Formal education and adaptation to climate change in Karamoja

In taking this preliminary look at the relationship between education and coping with impacts of climate change in Karamoja, I did not find quite the correspondences I had anticipated. I had imagined a greater knowledge gap from generation to generation. I did find from interviewing people of different generations about their overall perceptions and specific knowledge of hunger foods and weather observation techniques, that there is a loss of knowledge amongst the youth; however, I do not think that can be attributed only to school attendance, but also to the broader change in economic and social practices in this area. I do think that school feeding programmes have lessened interest among the Karimojong in wild foods and, indeed, have increased young people's preference for more palatable foods such as maize.

Instead of the knowledge gap being the most significant issue, my respondents have brought to my attention their concern about their increased dependence on agriculture, which the government and NGOs encourage. However, they fear this exposes them to extreme risk because of erratic rainfall; at the same time, government and NGO encouragement to send *all* children to school—not just one or two, as the Karimojong have preferred in past generations—encourages sedentarism, not pastoralism, which further increases their dependence on rain-fed crops. Informants also expressed concern that, while the lure of free food is great, rumours circulate every year that WFP is going to "pull out" of schools and leave families starving who have become dependent on schools as feeding centres for more and more of their children. My informants also reported that they recognised

that traditional knowledge was not being passed on to many of their youth, but no one suggested such knowledge be incorporated into the school curriculum.

Informants also pointed out another relationship among education, the current economy in Karamoja, and environmental degradation; this could possibly be a contributor to reducing pastoralists' coping capacity to negative consequences of climate change and is certainly a matter for serious consideration in East Africa. Informants explained that paying for children's education actually is a major reason for the drastic rise in environmental degradation due to charcoal and firewood production. This is because families no longer have sufficient livestock to sell and must, instead, find other ways of making cash to pay for school costs; however, these are then not paid back, because the schooling does not lead to gainful employment. Their household food costs are much higher than previously because of poor harvests and lack of livestock to barter for other food. The former students' knowledge gap has become critical as they are not fit to enter the pastoral economy, and those with the most education are also the least inclined to take up any kind of subsistence farming–they see themselves as now belonging to a different class of people, those who do not get their hands dirty.

Informants report that there are now two *ngirotin*, 'roads'–classes–of people in rural Karamoja: those who attend school and those who do not, whose education is training to become agro-pastoralists. Local people refer to schooled youngsters as ones who "cannot even milk a cow."[7] In this area, young people report that those who have only gone to primary school can still be accepted back into traditional society, as in many cases they lived at home throughout their schooling and did actually acquire the basics of animal management and agriculture. Many families are torn between supporting themselves through pastoralism and investing in education.

However, those who have gone to secondary school have usually spent more time at boarding school, and many regard themselves as belonging to a class above those in their home villages. Some will participate in agricultural work schemes organized by NGOs or groups like the Presbyterian Mission, but many refuse, preferring to be involved in some kind of commerce, legal or otherwise. Young men in the nearest village report they are hoping to have an opportunity to be hired by the police or to join Local Defence Units. Few girls reach 20 without marrying and/or bearing children, so most of them are focused in that direction. Female respondents to a recent survey (Faraone, 2010) indicated they did not hope to pursue a paid career, as there are so few available.

A major complaint regarding education is the recent escalation in attainment level; formerly, as local informant Lokwii Daudi reported, "It used to be that a person

[7] Lokwii Daudi, personal communication, July 2011.

could reach P7[8] and get something, but now you have to go to S4[9], and that is *egogong NOOI* [very expensive/difficult]."[10] Everyone in the study area agrees that the cost of boarding, transport and supplies makes secondary school completely out of the reach of most families, unless they have a wealthy relative, typically outside Karamoja, or some other outside sponsor to pay for their education. In addition, families have lost a potentially very valuable contributor to the family economy in sending a child to boarding school. When these children return to their villages and, rather than getting a paid job, possibly in a town or city, are 'just seated' around, they become burdens rather than assets; this, in turn, forces the family to find other sources of cash.

Data from a recent FAO/EU study indicate, however, that pastoralists can make far more money from their livestock than from harvesting natural resources or selling alcohol. This is a very significant finding, in light of the tremendous amount of labour that goes into, for instance, charcoal production and sale (Levine, 2010).

6. Conclusions

This exploratory study provides us with a brief look into some of the interrelationships between education and the environment in one part of Karamoja. It is not possible to identify simple correlations, as they are part of a complex web of influences including economics, social networks and belief systems, all of which are continuing to undergo significant changes.

The government of Uganda and most aid agencies, indeed most people in Karamoja, claim that education can solve most of the problems of Karamoja. Even local informants in this study stated firmly that they expected that, when the children have been to school and received an education, they would learn to plant trees, take care of the environment, and their lives would improve. Of course education should ultimately lead to great improvement in the quality of life in Karamoja. However, at this time I think the argument can be made that, in its current form, formal education is part of a set of processes which are actually contributing to the impoverishment and environmental degradation of the region.

The present education system does not train the Karimojong in the best ways of managing the resources they have, as it is part and parcel of an overall push toward sedentarisation favoured by the central government and many NGOs. One concern, perhaps only tangentially related to formal education, is that of the livelihood shift

[8] Primary 7 is the highest level of primary education in Uganda. Passing the Primary Leaving Examination is a significant accomplishment for many throughout the country but especially in Karamoja. However, because of Universal Primary Education a student can complete this course at very little cost.

[9] Senior 4 represents the next highest level of education in Uganda –Ordinary Levels. Very few students in Karamoja complete this level of schooling or the O Level examinations.

[10] Lokwii Daudi, personal communication, July 2011.

toward charcoal burning, which many cite as contributing to environmental degradation. Because of people's desperation for money–which is needed to participate in schooling but is not then repaid or added to by the recipients of that education–they are wantonly destroying the environment. At the same time, current research cautions dependence on agriculture, because "settlement of agro-pastoral and pastoral households is counter-productive…[It] will almost certainly create 'artificial droughts'" (Levine 2010).

There are convincing arguments that pastoralism is much more resilient to environmental change than settled agriculture, which will always be risky in much of Karamoja. However, as found among the Karimojong's close relatives, the Turkana in Kenya, "many projects have been directed by outsiders in a top-down manner, and tend to treat the Turkana as helpless–as though they had only needs and no capacities. The Turkana have been treated as incompetent and unskilled for over 40 years" (Acacia et al., 2002).

It is abundantly clear at the present time, however, that "The literature on pastoralism and climate change points out that the future seems to develop precisely in the direction of pastoralists' specialisation" (Krätli, 2009). Indeed, rather than "helpless…incompetent and unskilled", the pastoralists themselves have some of the most critical knowledge and experience for managing the intricacies of the very world outsiders find impossible to deal with. But is the education that people expect to save them actually helping to promote such expertise? As Krätli has recommended for the ABEK program,

> An overall negative view of pastoralism in Karamoja is still deeply entrenched in the mainstream culture, including key institutions like the education system. [Improvement] needs to be done by challenging the mainstream prejudicial perspective, filling the information gap about pastoralism and promoting favourable change in attitude, relevant formal institutions and practices.

One of the difficulties with this line of thought, however, may be current attitudes and practices among the Karimojong themselves whose their world divided into two or more distinct 'roads' with education serving solely to provide cash jobs. Officials, however, should at least ensure that the schools provide the services they are intended to, and hope that, as the youth of Karamoja grow up, they can creatively utilise the skills they have acquired to enhance their quality of life.

On a practical level, making available different 'tracks' of education might be a reasonable solution to the disparate aspirations. Certainly, in the developed world such options are offered, so that those who are university-bound can focus on one kind of preparation while others pursue vocational instruction. In Karamoja, training in traditional knowledge could form an excellent component of an agro-pastoral programme, rather than the current type of agricultural instruction, which

focuses exclusively on sedentary agriculture as practiced in southern Uganda, a completely different climate zone with different challenges and approaches to agriculture and animal rearing.

Knowledge of indigenous plants for animal and human food and medicines would be very valuable in promoting a type of agriculture which is more suited to these climates—for instance, cultivating indigenous plants which already flourish despite erratic rainfall. In addition, the micro-level study of weather patterns practiced among traditional pastoralists might fill the very need, mentioned by a number of researchers, for closer monitoring of rain patterns (Levine, 2010). This could enable people to adjust their practices to the now wildly erratic rainfall. This close ground-level monitoring using traditional signals might actually be far more accurate and useful, not only for livestock management but also for agriculture.

To many outsiders and those who work in development in East Africa, it may appear ridiculous to claim that education could be a detriment to development in Karamoja. Indeed, I would agree that education *should* be foundational to progress and improvement in the quality of life. However, it must be good quality education, rather than bad schooling. Good education will have been designed incorporating the perspective of wise counsellors from the community, who can bring into the system the best qualities of the indigenous culture. Those involved in development of curriculum, materials and instruction will seriously consider the social, economic and historical situation of the recipients. Bad schooling, on the other hand, will not provide actual education; instead, it can condition youngsters to expect education to represent something false, a façade, and in many instances deception, theft and even verbal or physical abuse. There is, in my opinion, far too much bad schooling in rural Karamoja, and it is undermining what development efforts there are.

At this stage we have only preliminary concepts and hopes for significant change in approaches and attitudes, which are unlikely to occur without well-researched, well-thought-through implementation of genuinely appropriate interventions. What is needed now is a substantial corpus of information from knowledgeable pastoralists throughout the region, along with detailed data regarding current and projected climatic conditions. Consultation with a variety of Karimojong, non-Karimojong residents in Karamoja, education personnel and, possibly, outsiders with some experience in education among pastoralists could provide basic data. Then authorities can take a hard look at the unexpected impact of formal education on environmental degradation in the region during this period of significant climate change, and begin to work on changing the “landscape of educational provision” (Krätli, 2009) in Karamoja.

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Pastoralism and Climate Change in the Horn of Africa: Comparative Review of Policies and National Adaptation Programs of Action

Yohannes Aberra Ayele

Abstract

Global climate is already showing unmistakable signs of significant future change. Pastoralist livelihoods are among the first to be severely affected by climate change impacts. It is a paradox that pastoral communities, that have proved to be resilient to the vagaries of nature through traditional coping and adaptation mechanisms, would be so easily weakened by the impacts of climate change. It is believed that policies that are neither consistent with the needs of nor responsive to the uniqueness of the pastoral system are primarily to blame for pastoral vulnerability to climate change. Even when there are policies and intervention strategies that are aimed at improving pastoralist livelihoods, they turn out to be ill-advised. In view of the need to enhance pastoralist adaptive capacity to climate change impacts, the relationship between existing policies and pastoralist vulnerabilities has to be clearly understood. More specifically, probing into how pastoralist vulnerabilities are addressed in the National Adaptation Programs of Action (NAPA) of the respective countries is of critical importance. This paper tries to review policies related to pastoralism and explore the preparation processes of the individual NAPA documents in four Horn of Africa countries (Ethiopia, Eritrea, Sudan, and Uganda); it also seeks to evaluate how pastoralist-friendly they are. This is qualitative research based on comparative design. Qualitative document analysis (content analysis) was employed to review the policy as well as the NAPA documents. The results of the comparative review show that, in spite of some largely superficial differences in policy attitudes between the states reviewed, there seems to be a consensus about the fate of pastoralism: its gradual disappearance. The NAPA documents also have differences in their methodologies and how they have addressed stakeholders and vulnerabilities, but their unmistakable vagueness in the phrasing of the priority projects vis-à-vis pastoralism reveals the prevailing dilemma about what should be done to this particular system of livestock production.

1. Background

For most its existence the human race has survived by hunting and gathering. Until the Neolithic period all but a few areas of the world, including habitats from the northern boreal forests of North America and Asia to the moist tropical forests of Africa and southern Asia, were inhabited by people subsisting by hunting and gathering (Bailey et al., 1989). It was only around 10,000 years ago, in what has come to be known as the “Neolithic revolution”, that people learned to domesticate

plants and animals. The years between 10,000 and 7,000 BC saw the spatial expansion of, and increase in, the human population, probably due to the amelioration of Holocene climates in the tropical and subtropical areas of southwestern and southern Asia, northern and central Africa and Central America, enabling people to domesticate plants and animals on a large scale, establish permanent settlements and expand urban-based societies (Gupta, 2004).

Pastoralism is defined by Bianco (2006) as "a finely honed symbiotic relationship between the local ecology, livestock and people in resource-scarce and highly variable regions, often at the threshold of human survival." The use of extensive grazing on rangelands for livestock production, covering about 25% of the earth's land surface, is an important economic and cultural way of life for 100 to 200 million pastoralists throughout the world (Convention on Biological Diversity (CBD), 2010). This production system has many variations in terms of the composition of herds, management practices and social organization. There are three theories about the origin of pastoralism, as described in Sleight (2011), which are relevant to different regional realities:

1. Sustained crop farming enabled forage production and, thus, the possibility of keeping animals nearby,
2. Rain-fed crop production could only be realized in limited areas, whereas other areas could grow grass but not crops and were left for animal rearing,
3. Direct transition from hunting to pastoralism, where tribes developed their pastoral farming skills from generations of following herds and learning their dynamics.

The latter theory is deemed more appropriate to pastoralism in the dry lands of Africa in general, and in the Horn of Africa in particular. As the dry lowlands cannot support sustained and reliable agriculture because of high temperatures and low, erratic rainfall, pastoralism is well-suited to them. An extensive livestock system is practiced, involving mobility according to where and when fodder becomes available, and the use of different herd management strategies such as herd splitting, herd diversification and herd maximization to spread the risk of livestock loss from droughts and diseases (Humanitarian Policy Group (HPG), 2009). Mobility is the key way of life for pastoralists. Mattee and Shem (2006) have detailed the positive effects of mobility as follows:

1. It results in the optimal utilization of existing natural resources, by taking advantage of temporal and spatial variations in the distribution and quantity of rainfall and forage, as well as the best nutritional status of the forage
2. It is an effective way of risk management by evading drought conditions and actual or potential disease or pest outbreaks, which usually depend on climatic conditions

3. It avoids the overexploitation of natural resources by reducing concentration of livestock in one area, thus leading to conservation of biodiversity
4. As evidenced in some African countries, animals reared in mobile systems are up to three times more productive per hectare than those reared under similar climatic conditions in ranches or sedentary systems in either Australia or the USA.

Global climate is changing and is already showing unmistakable signs of significant future change. The looming climate change, which is going to be unprecedented in recent human history (Adger et al, 2003), will involve temperature rises, precipitation variability, sea level rises and the increased occurrence of extreme events, which will have adverse effects on ecosystems, water resources, food security, settlements and human health (Intergovernmental Panel for Climate Change (IPCC), 2007). Pastoralist livelihoods are among the first to be severely affected by climate change impacts. Although projected increases in grassland production as a result of fertilization by the extra CO_2 in the atmosphere may be beneficial, increased frequency of extreme weather events such as flooding and droughts may overwhelm the existing resilience of pastoral systems. Moreover, diseases affecting livestock are projected to increase in scope and scale, while more frequent wildfires are expected to affect the vegetation upon which pastoralists depend (CBD, 2010). Climate change in pastoral areas has added further dimensions to the old debate about whether vulnerability in the context of pastoralist areas is driven by natural or man-made factors (Feinstein International Centre (FIC), 2011). Although it is difficult to associate the recent drought in the Horn of Africa with the trends in climate change, it has revealed beyond doubt the underlying vulnerability of the people affected. It is the worst drought in 60 years affecting more than 9 million pastoralists: 3.2 million in Ethiopia, 3.2 million in Kenya, 2.6 million in Somalia and over 100,000 in Djibouti (BBC News, 28 June 2011).

It is a paradox that pastoral communities that have proved to be resilient to the vagaries of the environment through traditional coping and adaptation mechanisms, would so easily be weakened to the impacts of climate change. Although the speed and frequency of the changes or variability of the elements may test the stamina of their long-standing adaptation strategies, it is argued that policies that are neither consistent with their needs nor responsive to the uniqueness of the pastoral system are primarily to blame for pastoral vulnerability (HPG, 2009). A case in point is the current Horn of African drought where, according to Oxfam (2011), the worst-affected areas are those suffering from entrenched poverty due to marginalization, conflict and lack of investment.

Policy attitudes towards pastoralists seem to have been influenced by the world views of the decision makers. Colonial administration's European views of the herders, which have most likely influenced postcolonial perceptions, are based on

the Kantian argument that the most rational basis for land use is agriculture (cultivation). This implies that pastoralism is legally non-existent and the land it uses can be taken by anyone else because it belongs to no-one (Biber-Klemin & Rass, 2011). Pastoralism is conceived as experiencing limited capacity, overgrazing and desertification, and is associated with the tragedy of the commons (Morton, 2005). This has fuelled state-sponsored encroachment into traditional pastoral lands in the form of national parks and game reserves, and small-scale and commercial cultivation (Mattee and Shem, 2006).

The demise of pastoralism as a social and economic system is of little advantage to national development. In fact, the decline or disappearance of pastoralism is deleterious to the economy, the environment and social justice. Pastoralism adds billions to national economies; the majority of the region's animal wealth is kept by pastoralists in the dry lands; they also produce all the milk and meat they consume, contributing to their own food security. There is direct employment in the pastoral production system, but also the employment of others in livestock trade, transport services, leather industries, slaughterhouses, butchers and restaurants (HPG, 2009). There are also significant environmental benefits that are accrued from a pastoralist production system. Due to their close links with the environment, pastoralists have a significant role in the conservation and sustainable use of biodiversity at genetic, species, and ecosystem levels. Moreover, the pastoral rangelands, at more than 5,000 million hectares, account for about 30% of the world's soil carbon stocks with a sequestration potential of up to 2,000 metric tons of CO_2 equivalent by 2030 (CBD, 2010).

Even when there are policies and intervention strategies aimed at improving pastoralists' livelihoods, they often turn out to be ill-advised. It is felt that implementation of pastoral development, which is proposed as a means of achieving long-term food security by increasing pastoralist involvement in national food and economic systems, could come at a heavy cost to both the pastoralists and governments (Cultural Survival, 2010). Rangeland management, the most notable approach to pastoral development, according to Mattee and Shem (2006), is inspired by practices that come to Africa from totally different and irrelevant eco-social regions such as North America and Australia.

In view of the need to enhance the adaptive capacities of pastoralists to climate change impacts, the relationship between existing policies and pastoralist vulnerabilities has to be clearly understood. More specifically, probing into how pastoralist vulnerabilities are addressed in the NAPA documents is of critical importance. The NAPA documents are expected to address all groups or communities vulnerable to climate change and prioritize projects aiming to reinforce their adaptive capacities. This paper tries to explore to what extent the NAPA documents have lived up to such expectations, and also how much the NAPA preparation process was free from the influence of pastoralist-unfriendly policies. No such comparative review of NAPA documents, pertaining to how

pastoralist issues are addressed, has yet been done for any region of the world, including the Horn of Africa. It is hoped that this may contribute to the improvement of the NAPA documents with regard to what should be done to reinforce the adaptive capacities of pastoralist communities.

2. Study area and methodology

Although pastoralism exists in many parts of the Eastern Hemisphere, including eastern and north-eastern Africa, southern Africa, the Sahel Belt, the Middle East, Central Asia and Northern Scandinavia, this study is limited to the Horn of Africa. Physiographically speaking, what is known as the Horn of Africa is restricted to the Somali peninsula that protrudes towards the Arabian Sea. Political geography has added more countries to the region; however, the lack of explicit criteria for inclusion into the region has resulted in too many variants of the 'Horn of Africa'. Some consider Somalia, Ethiopia, Djibouti, Sudan, Eritrea and Kenya to be Horn of Africa states. Others add Uganda to this group, while others further incorporate Tanzania, Rwanda and Burundi in the region.

In this paper the Horn of Africa is taken to include the seven member states of the Intergovernmental Authority on Development (IGAD): Djibouti, Eritrea, Ethiopia, Kenya, Somalia, Sudan, South Sudan and Uganda. The review of pastoral policies and NAPA documents has been carried out for only four states: Eritrea, Ethiopia, Sudan and Uganda. Somalia and Kenya have not yet submitted their NAPA documents to the United Nations Framework Convention on Climate Change (UNFCCC). Although Djibouti has already done so, the NAPA document available online is in French, posing difficulties for this reviewer in understanding the contents. Pastoralists make up 60%, 30%, 12% and 5% of the populations of Sudan, Eritrea, Ethiopia and Uganda, respectively (Pastoral and Environmental Network in the Horn of Africa (PENHA), 2011).

The research design adopted for this paper is a comparative design. The research strategy is qualitative, relying entirely on qualitative document analysis of the four NAPA documents. Specifically, content analysis is employed, searching out the underlying meanings of themes in the documents.

3. Recommended policy options in pastoral areas

Although there is a deep-seated conviction that the pastoralist system of production in marginal lands is more resilient and more adapted to natural stress, it is becoming increasingly difficult to assume that pastoralism in its traditional form will persist merely on the basis of its own intrinsic ability to respond to changes (Kisamba-Mugerwa, 1992). Hence, scholars and advocacy organizations have put forward some recommendations for consideration in policy making. In this paper, national pastoralist policies and NAPA documents from four Horn of Africa states

will be evaluated in terms of which of these recommendations are addressed and how.

Mattee and Shem (2006) proposed five areas of intervention, which they considered to be critical to ensure the sustainability of pastoralist production systems: promote efficient utilization of rangelands; improve access to reliable water supplies; improve access to veterinary services; empower pastoralist institutions and promote income generating opportunities. What Tezera (2011) referred to as key areas of policy intervention additionally include: support for livelihood diversification; building robust conflict management institutions and effective drought mitigation systems; enabling herd mobility and securing rights to critical resources like dry season pastures and water; and strengthening the capacity of pastoral groups to engage in policy debates on issues directly affecting their livelihoods. Inseparable from policies that provide for mobility are policies and legislation that recognize pastoralists' communal land tenure as a viable tenure system extremely well-suited to areas of climatic variability (Nassef et al., 2009). Legal recognition of this tenure system also needs to be improved.

The recommendations of the CBD are framed in what are referred to as the four elements of good pastoralism practice: policy considerations; management tools; economic and financial instruments and capacity building. The former includes integrating indigenous knowledge, innovations and practices, securing land rights, mainstreaming gender, risk management, mixed conservation-production landscapes, improving market access for sustainable production, exploring emerging financial mechanisms, and institutional and individual empowerment and education (CBD, 2010).

Policy making must be focused on the removal of the two root causes of pastoralist problems; namely, inadequate understanding and misrepresentation of the pastoral system, and little influence by pastoralists over policy and decision-making processes. Suggestions made by HPG (2009) are: make research findings and standardized data accessible to policy-makers; inform and challenge the myths about pastoralism; document the contribution of pastoralism to the economy; advocate for the need to increase investment in pastoral areas; build pastoralist organizations and improve their governance and effective representation.

The courses of action that are felt by Pavanello (2009) to be indispensable, if the livelihoods of pastoralists are to be rescued from deterioration, have emanated from her literature review which had three focus areas: pastoralist political marginalization, cross-border issues and policy engagement. Thus, she has put forward the following recommendations:

1. support pastoral livelihood systems with timely and appropriate interventions such as saving lives by protecting pastoralist assets and livelihood strategies,

2. enhance pastoralists' wellbeing and contribute to building their resilience,
3. promote capacity building of technical know how and skills to influence policy,
4. understand the dynamics and workings of customary institutions and mechanisms,
5. support local institutions and organizations to strengthen the relationship between pastoralists and formal institutions,
6. support a two-way process of strengthening and building the capacity of civil society groups, while working with state institutions to change the dominant paradigm driving national policies that keeps pastoral communities on the margin,
7. promote peace and reconciliation initiatives to enable cross-border movement, access to vital natural resources and trade,
8. support pastoralist-led cooperatives to improve livestock marketing in the region and to address the poor market access of pastoralists,
9. improve the quality of livelihood assessments to ensure timely and effective livelihood interventions which are more prominent in drought responses and management.

4. National pastoralism-related policies

In this section, pastoralism-related policies and interventions, based on reviews by different sources— for Uganda (HPG, 2009; Kisamba-Mugerwa, 1992; Morton, 2005; PENHA, 2011), for Ethiopia (HPG, 2009; Morton, 2005; Pantuliano & Wekesu, 2008; Pastoralist Communication Initiative (PCI), 2011), for Sudan (Fahey, 2008) and for Eritrea (Bianco, 2006) will be reviewed in Tables 1.

Pastoralist policies in the four Horn of Africa countries have more similarities than differences. These differences are only superficial, often arising from economic, social and political peculiarities of the countries under consideration. It is only the constitution of Ethiopia that has explicitly stated that it endorses the pastoralist way of life. There are, however, no tangible mechanisms for realizing the constitutional provisions. Administrative decentralization in Uganda and Ethiopia can be seen as favourable to pastoralist influence in local decision-making, but this benefit is dwarfed by other policies and legislation that debilitate pastoralism as an economic and social system. Sedentarization is the most powerful strategy in the toolbox of policy makers in Uganda, Sudan and Eritrea. Ethiopia's sedentarization policy is not explicit in order to avoid contradicting the supreme law of the land.

Commercial crop growing on pastoral rangelands is the most favoured policy item in the three countries, except Ethiopia, which prefers deeds rather than words in this regard. The Pastoral Parliamentary Groups of Uganda and Ethiopia, although they have attained some successes, are less representative and less powerful when it comes to influencing major decisions pertaining to pastoralism. The uniqueness

Table 1: Summary of pastoralism policy review findings for Ethiopia and Eritrea

Country	Findings
Ethiopia	• Ethiopia's Constitution recognizes pastoralist rights, including rights to communal land, to economic development and to self-government. Nevertheless, there is a lack of mechanisms or legal instruments for enforcing these rights. Statutory provisions such as the 2005 Rural Land Administration and Land Use Proclamation seem to undermine opportunities for communal land-holding. • Decentralization policies provide opportunities for pastoralists to influence decisions at the local level. The 2005/06-2009/10 Plan for Accelerated Development and Eradication of Poverty (PADEP) focuses on building pastoralist institutions and improving their livelihoods and provision of basic services. But there is a contradiction in the policy document. While it states that pastoral development will be based on traditional pastoralist systems, it contains plans for sedentarization along river banks. Moreover, while it stipulates the development of livestock through range resources, it also mentions irrigation schemes as key to pastoral The five-year Growth and Transformation Plan (GTP) of Ethiopia also initiated water-centered commune programme in all pastoralist areas; but still vigorously going for resettling them. • Ethiopia's Parliamentary Standing Committee for Pastoralism, the Pastoralist Parliamentary Group (PPG) has succeeded in creating pastoral departments in various ministries and contrib988uted to broader awareness building, but it has had no fundamental impact on policies.
Eritrea	• According to the Eritrean Constitution, land belongs to the state. Usufruct rights are determined by law. The 1994 land proclamation provided for individual land holdings while disregarding pastoral rights of communal tenure. • The Eritrean Government advocates sedentarization or villagization of pastoral communities. It uses the pastoral lands for resettling people from other regions and thousands of ex-combatants. • Agricultural policy encourages big commercial farms, which displace pastoralists from their ancestral lands. • It is alleged that the pressure exerted on pastoralists who are, in the main, followers of Islam, to relinquish their age-old traditional livelihoods is motivated by the attitudes of the dominant Christian highlanders towards them. It is also alleged that animosity between the Kunama and the Eritrean Government underlie the policy attitudes towards them.
Sudan	• Government land policies have favoured individual rights whilst eroding customary community land rights. Laws were enacted that resulted in the seizure of pastoral rangelands and migratory routes as well as disruption of local judicial and conflict resolution mechanisms.

	• Development projects always have the aim of settling pastoralists. Some projects displaced nomads from rangelands to facilitate urbanization and expanded production of marketed agricultural crops. The policy of making Sudan the "bread-basket" of the Arab world attracted agricultural investment from Saudi Arabia, Kuwait and other Arab states, which were provided with large tracts of land; the result was that pastoralists were pushed into more marginal areas or into the lands of farmers and other pastoralists, leading to conflicts. • The focus on crop production probably has its roots in the fact that the core support for the ruling National Congress Party (NCP) comes from the elites of northern riverine tribes with strong interests in agricultural production and trading. The membership of the Pastoralists Union of the Sudan is also mainly traders, veterinarians and rich herders. It is highly politicized, weak, unrepresentative, and is alleged to function as part of the NCP apparatus. • Although livestock has historically been central to Sudan's economy, the recent boom in oil production has diminished its importance as a foreign exchange earner.
Uganda	• The Constitution of Uganda does not provide for pastoralism, although decentralization policies have created some opportunities for it to influence local level decisions. • Customary rights and social institutions of pastoralists, in their traditional grazing land, are no longer recognized by law. Ownership is individualized with greater focus on cash crops. • Forest reserves, game reserves, and national parks have rigid regulations that exclude activities by pastoralist communities who had customary usage rights over the land. • Uganda's rapid development has bypassed pastoralists like the Karamoja. Even Uganda's strong record of promoting gender equality has turned a blind eye to women's subordination in the pastoralist communities, reflected in very low literacy rates, high maternal mortality rates, and low levels of economic and political participation. • The Ugandan Pastoralist Parliamentary Group (PPG) members are not unanimous; some support traditional mobile systems, others support modernizing and sedentarization. They were unable to influence the policy of agricultural modernization in favour of pastoralists, and they were powerless to expose ministries that embezzled money allotted to pastoralists. Ultimately, they were unable to survive as a group. The only thing they succeeded in doing was to stop evictions of some pastoralists and get permission for certain pastoralist groups to graze in a particular national park during drought. This was actually done through a presidential favour.

in policy attitudes towards the pastoralist way of life in Sudan and Eritrea is alleged to have been influenced by political and ethnic prejudices.

5. Review of NAPA documents

According to the US Environmental Protection Agency (2011) some degree of future climate change will occur regardless of future greenhouse gas emissions. That is, adaptation will be necessary to address impacts resulting from the warming which is already unavoidable due to past emissions (IPCC, 2007). This is particularly true for the most vulnerable Least Developed Countries (LDCs). The UNFCCC recognizes the special situations of the LDCs and has decided to support their adaptation plans through a global financial mechanism. The NAPA process and eventual implementation is meant to address the limited ability of LDCs to adapt to the adverse effects of climate change. The NAPA documents focus on urgent and immediate needs, those for which further delay could increase vulnerability or lead to increased costs later on. The documents take into account existing coping strategies at the grassroots level. Prominence is given to community-level input as an important source of information, recognizing that grassroots communities are the main stakeholders.

Forty-six countries have submitted their NAPA document to the UNFCCC by September 2011, 31 of which are African countries. Here the NAPA documents of Eritrea, Ethiopia, Uganda, and Sudan will be reviewed in terms of the institutional arrangements, identified key vulnerabilities, stakeholders consulted, criteria for the prioritization of adaptation projects, and the final prioritized NAPA projects. The review (see Table 2) will focus on how pastoralism was addressed in the preparation processes and the final document.

The analyses of the NAPAs reveal inconsistency and vagueness in the contents of the documents. Meteorological agencies have led the NAPA preparation process in Ethiopia and Uganda, and environmental agencies in Eritrea and Sudan. This may have resulted from the respective governments' perceptions of adaptation to climate change as a meteorological or environmental phenomenon. Adaptation is, however, more of an economic, social, political and technological issue rather than a mere analysis of meteorological and environmental trends. This is typified by the institutional arrangement needed for addressing pastoralist adaptation to climate change impacts, which calls for the social sciences and multidisciplinary fields. Of course, members of the steering committees and/or the core NAPA preparation teams were drawn from different ministries and academic fields.

The steering committee for Ethiopia's NAPA document includes, among many other departments and ministries, representatives of the Ministry of Water Resources, Ministry of Agriculture and Rural Development, Disaster Prevention and Preparedness Agency, Ecosystem Conservation and Dry Land Research Directorate, which are deemed extremely relevant for the purpose.

Table 3: Components of the processes of NAPA document preparation in Ethiopia, Eritrea, Sudan and Uganda. (a, Institutional arrangement; b. Identified key vulnerabilities; c. Key stakeholders consulted, d. Criteria for prioritization of proposed climate change adaptation projects)

(a)

Country	Institutional arrangement
Ethiopia	• Responsible Organization (RO): National Meteorological Agency (NMA) • Steering Committee (SC) composed of NMA (chair), Rural Energy Development and Promotion Centre; Hydrology Department of the Ministry of Water Resources; Earth Science Department of Addis Ababa University; Crop Development Department of the Ministry of Agriculture and Rural Development; the Christian Relief and Development Association; Disaster Prevention and Preparedness Agency; Department of Mines, Water and Energy of the Ethiopian Science and Technology Agency; Ecosystem Conservation Department of the Institute of Biodiversity Conservation and Research; Dry Land Research Directorate of the Ethiopian Agricultural Research Institute; Ministry of Finance and Economic Development; Meteorological Research and Studies Department, National Meteorological Agency; Climate Change and Air Pollution Studies of National Meteorological Agency; a UN Volunteer in NMA. • Role of SC: overall guidance and oversight for the project, the entire preparation of the NAPA Technical Report was left to a consulting firm, B and M Development Consultants PLC
Eritrea	• RO: Ministry of Land, Water and Environment • NAPA Project Team (PT): drawn from Ministry of Land, Water and Environment; Ministry of Health; Ministry of Fisheries; Ministry of Energy and Mines; Ministry of Trade and Industry. The Ministry of Agriculture was not represented except for one representative on the steering committee.
Sudan	• RO: Ministry of Environment and Physical Development • PT: drawn from Higher Council for Environment and Natural Resources; Ministry of Agriculture; Ministry of Health; Ministry of Finance and Economic Planning; Ministry of Science and Technology; Meteorological Authority; University of Khartoum (Faculties of Agriculture, Environment, and Forestry); Ahfad Women's University. • This composition was replicated in the Regional or zonal NAPA project teams.

Uganda	• RO: Department of Meteorology in the Ministry of Water, Lands and Environment • SC composed of: Ministry of Agriculture, Animal Industry and Fisheries; Ministry of Health; Ministry of Finance, Planning and Economic Development; Ministry of Tourism, Trade and Industry; Wildlife Authority; Ministry of Water, Lands and Environment; Department of Disaster Preparedness; Ministry of Education and Sports; Ministry of Local Government; Ministry of Justice and Constitutional Affairs; NGOs; UN Focal Points. • The NAPA Team (NT) was composed of technical officers drawn from key stakeholders. Under the NT three task forces were organized to consider close inter-linkages between sectors: agriculture and water resources, health, forestry and wildlife.

(b)

Country	**Identified key vulnerabilities**
Ethiopia	• Vulnerable Sectors (VS): agriculture, water and human health • Vulnerable Livelihoods (VL): smallholder rain-fed farmers and pastoralists
Eritrea	• VS: agriculture; livestock; forestry; water resources; coastal and marine environments; public health • Vulnerable Groups (VG): subsistence farmers, rural dwellers, pastoralists, the urban poor, fishermen and island residents
Sudan	• VS: agriculture, water, and public health • VG: traditional rain-fed farmers and pastoralists
Uganda	• Vulnerabilities are identified as regional impact: landslides in the highland ecosystems, flooding in the lowland ecosystems and drought all over the country.

(c)

Country	**Key stakeholders consulted**
Ethiopia	• claimed to have undertaken the “best stakeholder participation to elicit information from the grass roots” • but only two national and eight regional workshops were conducted to solicit information about project prioritization from 500 participants with varying expertise • photographs presented in the document are marked by the conspicuous absence of poor farmers and pastoralists (apparently a strategy to minimize cost by the consulting PLC).
Eritrea	• rural heads of households; farmers; pastoralists; fishermen; urban and semi-urban dwellers; government

	officials; academic researchers; NGO representatives; CBO representatives; community leaders; regional officials; women's groups; agriculture/health extension workers; local school teachers.
Sudan	• rural heads of households; farmers; pastoralists; village sheiks; government officials; academic researchers; NGOs; CBOs; community leaders; regional officials; women's groups; agricultural extension workers; local teachers.
Uganda	• elderly women and men; opinion leaders; NGOs and CBOs; youths; district political leaders; technical officers.

(d)

Country	**Criteria for prioritization of proposed climate change adaptation projects**
Ethiopia	• poverty reduction potential (wt. 0.2); avoidance of climate change risk to poor people (wt. 0.3); complementarities with national and sectoral plans (wt. 0.15); synergy with action plans under multilateral environmental agreements (wt. 0.15); cost effectiveness (wt. 0.2).
Eritrea	• reduction of threats or impacts of climate change; cost-effectiveness and feasibility; impact on vulnerable groups and resources; synergy with multilateral environmental agreements; synergy with national plans; contribution to poverty reduction; equity.
Sudan	• increase income and reduce poverty; benefit large number of people; enhance security and social stability; promote food security; support sustainable development; enhance vegetation cover and environmental balance; build ability to apply technology; empower women; reduce malaria cases/deaths; increase public awareness.
Uganda	• adherence to development priorities like the Poverty Eradication Action Plan and Millennium Development Goals; environment concerns including multilateral environmental agreements; equity and gender issues; consideration of disadvantaged groups; enhancing resilience to impacts of climate change; multiple benefits; replication; sustainability; cost-effectiveness; cultural acceptance; urgency or immediacy; coverage.

Table 3: Final list of ranked priority adaptation projects selected in the process of NAPA preparation in Ethiopia, Eritrea, Sudan and Uganda.

Country	Ranked priority projects
Ethiopia	1. Promoting drought/crop insurance program 2. Strengthening/enhancing drought and flood early warning systems in Ethiopia 3. Development of small-scale irrigation and water harvesting schemes in arid, semi-arid and dry sub-humid areas of Ethiopia 4. Improving/enhancing rangeland resource management practices in the pastoral areas 5. Community-based sustainable utilization and management of wetlands 6. Capacity building program for climate change adaptation 7. Realizing food security through a multi-purpose, large-scale water development project in the Genale-Dawa Basin 8. Community-based carbon sequestration project in the Rift Valley System of Ethiopia 9. Establishment of a national research and development center for climate change 10. Strengthening a malaria containment program 11. Promotion of on-farm and homestead forestry and agro-forestry practices in arid, semi-arid and dry sub-humid parts
Eritrea	1. Breeding drought- and disease-resistant crops 2. Introducing pilot community-based rangeland improvement and management schemes in selected agro-ecological areas in the eastern and north-western lowland rangelands 3. Introducing community-based pilot projects to introduce suitable sheep and goat breeds in eastern and north-western lowland rangelands 4. Encourage afforestation and agro-forestry 5. Groundwater recharge for irrigation wells
Sudan	1. Enhancing resilience to increasing rainfall variability through rangeland rehabilitation and water harvesting in the Butana area of Gedarif State 2. Reducing the vulnerability of communities in drought-prone areas of southern Darfur State through improved water harvesting practices 3. Improving sustainable agricultural practices under increasing heat stress in the River Nile State

	4. Environmental conservation and biodiversity restoration in northern Kordofan State, as a coping mechanism for rangeland protection under conditions of increasing climate variability 5. Strategies to adapt to drought-induced water shortages in highly vulnerable areas in Central Equatorial State
Uganda	1. Community Tree Growing Project 2. Land Degradation Management Project 3. Strengthening Meteorological Services 4. Community Water and Sanitation Project 5. Water for Production Project 6. Drought Adaptation Project 7. Vectors, Pests and Disease Control Project 8. Indigenous Knowledge (IK) and Natural Resources Management Project 9. Climate Change and Development Planning Project

Nevertheless, the assemblage of relevant experts seems to have been wasted by relegating the role of the steering committee to only providing overall guidance and oversight for the project. Preparation of the entire NAPA technical report was left to a private company, which will understandably have been engaged in cost-benefit calculations. This has revealed itself clearly in how the entire process of stakeholder identification and consultation was carried out. While smallholder farmers and pastoralists were pinpointed as the livelihood groups most vulnerable to climate change impacts, the nine workshops conducted to solicit information about what to prioritize were attended by only experts, a total of 500 experts.

Although a member of the steering committee, the Eritrean Ministry of Agriculture was conspicuous by its absence from membership of their Central NAPA Project Team. Given the importance of the available expertise in the Ministry, which is indispensable for addressing key pastoral adaptation issues like land tenure, livestock and rangelands, absence from the team that does the real job of preparing the NAPA seems strange. The Central NAPA Project Team for Sudan can be commended for having the most relevant composition of all. The fact that it has a member from a University for Women has clearly put them in front of the others, at least on gender matters. Uganda can also be said to have had the right composition in the steering committee for its NAPA document preparation. However, the actual preparation of the NAPA was done by task forces, whose origins were not revealed except that they were technical officers drawn from key stakeholders.

Ethiopia, Eritrea, and Sudan have clearly indicated that pastoralists are one of the key vulnerable groups, but only the latter two have included representatives from this livelihood group in the stakeholder consultations. In line with the UNFCCC guidelines, there are commonalities between the Horn of Africa states in some of the key criteria set for the prioritization of NAPA projects. The potential for poverty reduction is set as a criterion by all states. This concerns all communities, including pastoralists. Complementarity with national plans is another criterion which is set by Ethiopia and Eritrea only. National plans, in most cases, are firmly founded on policies which, in turn, are sectoral and growth-oriented. When policies and their sectoral strategies become unfavourable for pastoralist production systems, national plans, which are based on these policies and strategies cannot be favourable. The other criterion, set by all but Sudan, is cost effectiveness. In view of the fact that positive interventions to improve pastoralist adaptive capacities involve more expenditure than revenue, this particular criterion seems to be an anomaly. One of the most basic concerns in pastoralist livelihoods is the status of women. Only Sudan and Uganda have given this due regard. Uganda has listed it as one of the criteria alongside equity considerations, and Sudan has explicitly set women’s empowerment as one of the key criteria for NAPA project prioritization.

The final list of ranked priority projects contains 11 for Ethiopia, five for Eritrea and Sudan, and nine for Uganda. Those Ethiopian projects that are wholly or partly related to pastoralist systems are ranked 2nd, 3rd, 4th, 7th, 8th and 11th. There is no doubt about the huge benefits of improved disaster early warning systems for pastoralist communities. However, the remaining projects, except the 4th, imply sedentarization although it is not explicitly stated. Arid and semi-arid areas are predominantly pastoralist; the development of small-scale irrigation (project 3), and agro-forestry (project 11) in these zones can only mean that it is the pastoralists who are expected to carry them out. Carbon sequestration (project 8) could be done on pastoral rangelands. However, in Ethiopia there is much preference for trees as carbon sinks. As the woodlands and dry forests, in crop producing areas of the Rift system could be the most likely targets attention will be shifted away from pastoralists. The lower reaches of the Genale-Dawa basin is a pastoral zone. The large-scale water development (project 7) envisaged there implies nothing else but the settling of pastoralists or their eviction from the would-be large-scale farmlands. Although project 4, improving/enhancing rangeland resource management practices in the pastoral areas, could be a genuine intervention into the livelihood system of pastoralists, there is a possibility that it could take the form of "modern" rangeland management, which is anathema to pastoralists.

Since pastoralism is the predominant livelihood system of the lowlands, two out of the five priority NAPA projects in Eritrea pertain to pastoralists, although this is not explicitly stated. As Eritrea has sworn to sedentarize pastoralists, the improvement of rangelands and animal breeds in the lowlands could be undertaken in the context of settling pastoralists. In Sudan's NAPA document, three of the five priority projects, those ranked 1st, 2nd and 4th, are related to pastoralist systems. However, in what context rangeland rehabilitation is to be undertaken is not explicit. The proposed improvement of rainwater harvesting practices could hint at a desire for reduced mobility. Of the four NAPA documents reviewed, the haziest as far as pastoralism is concerned is Uganda's. All of the nine priority projects are relevant to pastoralism, but it seems less likely that they will be applicable to it. Pastoralism was neither considered as a vulnerable production group, nor were pastoralists consulted during the preparation of Uganda's NAPA document.

6. Conclusions

Pastoralism seems to be experiencing an unfavourable and probably irreversible change. There is a great deal of ambivalence about pastoralism among policy makers and scholars alike. Be it for political/economic reasons or a conviction for social justice and environmental stewardship, the policy attitude towards pastoralism swings from one of readiness to allow it to persist, to complete rejection of it as an obsolete system. In spite of some, largely superficial, differences in policy attitudes of the states reviewed, there seems to be a consensus about the fate of pastoralism: its gradual disappearance. The NAPA documents also have differences in their methodologies and how they have addressed stakeholders

and vulnerabilities, but their unmistakable vagueness about the phrasing of the priority projects vis-à-vis pastoralism reveals the prevailing dilemma about what should be done with this particular system of livestock production. Pastoralism is drowned in the sectoral approach used for the analysis and presentation of the NAPA documents, which doesn't put the projects in a clear livelihood context.

The fact that the documents are national is another testimony to the existing policy attitudes towards pastoralism. Pastoralism in general, and in the Horn of Africa in particular, is more a trans-national phenomenon than a national one. Pastoralist mode of life knows no political boundaries. If the vulnerability of pastoralists is to be genuinely addressed, it has to be in a regional context and not in national documents. In view of their uniqueness in the spatial context, adaptation programs of action for pastoralists have to be applied separately from other vulnerable groups, and have to take the form of a Regional Adaptation Program of Action (RAPA), focusing on pastoral communities straddling the borders of the countries of the Horn of Africa.

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Aspects of Climate Change, Adaptation Strategies and Information Sharing in the Nile Basin

Tesfaye Tafesse

Abstract

The mighty Nile River traverses eleven countries (Burundi, Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, South Sudan, Tanzania and Uganda) that possess varied biophysical and socio-economic features, including climate, soils, vegetation, history, culture and politics. Of the varied problems that the co-basin countries face, a key one is the vagaries of climate change leading to the recurrence of natural shocks, such as droughts and floods. The Nile riparian states also differ in their degree of exposure to climate change as well as in their capacity to cope.

In order to design mitigation and adaptation strategies to cope with the problem of climate change in the Nile Basin, regional, national and local institutions and actors become indispensable. So far, emphasis has been laid on regional institutions, such as the Nile Basin Initiative, to facilitate the gathering and dissemination of regional information and provide the urgently needed regional connection that can enable the formulation of coordinated and cooperative regional response strategies. Of late, the Nile Basin Sustainability Framework (NBSF) has been established with the intention of providing a conceptual framework through which the different basin-wide policies, strategies and guidelines—that are needed to attain sustainable socio-economic development through the wise use of water resources—can be organized, formulated and applied.

The overall aims of the study are three: (a) to illustrate climate change, its impacts and adaptations in the Nile Basin, (b) to assess the mechanisms by which information and knowledge exchange on climate change in the Nile Basin has been used in the implementation of adaptation strategies, and (c) to draw lessons from the Nile Basin that can be adapted by pastoralists in the Horn of Africa. The study appraises the role of regional institutions in the exchange of information and knowledge on climate change, and proposes the inclusion of local and national institutions for the same purpose. The synergy that can come as a result of the existence of three-tier information sources, viz. local, national and regional, in averting the impacts of climate change is underlined in the study.

1. Introduction

The Nile is the world's longest river that passes through varied climatic regions, traversing eleven riparian states.[1] The three tributaries of the Nile that spring from the Ethiopian highlands contribute 86 percent of the volume of water, while the White Nile accounts for the remaining 14 percent. Of the many challenges facing the Nile River Basin, the dominant ones are related to climate. The high seasonal variations in river flow bring about water shortages; flood risks on the lower flood plains; regular drought sequences and cycles, at times leading to food shortages and famine; loss of vegetation cover and threat to biodiversity and fisheries stock. Climate change could be defined as 'the variation in mean climate conditions on a multi-decadal or long-term scale', whereas adaptation refers to 'adjustments to systems in response to a sudden or gradual change or stimulus that modify its impacts' (Goulden & Conway, 2008).

The climate in the Nile Basin is highly variable, ranging between dryness in the north and wetness in the equatorial lakes region and the Ethiopian highlands. Historical records show variations in climate with periods of dryness alternating with wetness. Climate change puts pressure on water resources due to a possible increase in the already high variability in rainfall and river flows and changes in the geographical distribution of water resources with some areas possibly becoming drier whilst others become wetter. In addition, water resources can be exposed to pressures from increasing demand from agriculture and other competing uses. As stated by Goulden and Conway (2008), water users and water resource management institutions at all levels (local, national and regional) have to adapt to climate variability, changes in water demand and the effects of climate change.

Climate change affects the quantity and quality of water resources as well as the amount of evapo-transpiration influencing the livelihoods of various communities in the Nile Basin, including sedentary agriculturalists, pastoralists and city dwellers. There are cases where communities are being forced to adopt different lifestyles and use varied survival strategies to cope with the adverse effects of climate change. Given these circumstances, it becomes indispensable to develop strategies for the exchange and sharing of information and data on climatic variables. Towards this end, the Nile Basin Initiative (NBI) has attempted to develop basin-wide response strategies and information sharing.

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[1] The birth of South Sudan as an independent state on July 9, 2011 has increased the number of Nile riparian states to eleven.

be made to appraise the NBI's attempts to develop basin-wide response strategy and information sharing to address climate change. The study relied on secondary data and information obtained from various literature and Nile-based organizations.

2. Hydrographic setting of the Nile

The Nile is the world's longest river, flowing south to north for about 6,825 km over 35 degrees of latitude (4^oS to 31^oN), draining a 3.1 million km^2 catchment area, which is equivalent to one-tenth of the African continent. Generally, the basin represents a large and highly varied hydrological unit and, as described by Collins (1990), the Nile River passes through countries with a variety of climates and natural formations, from mountainous highlands to barren deserts. In the Equatorial Lakes Region, particularly around Lake Victoria, the average amount of rainfall is estimated at 1,400 mm per year and in the Ethiopian highlands around 1,700 mm per year (Zewdie, 1990). At the other extreme, when one moves downstream from north of Khartoum towards the Mediterranean Sea, the river flows through semi-arid and arid areas where it gets little or no rainfall. The average annual rainfall in Khartoum, Aswan, Cairo and on the Mediterranean coast is estimated at 200, 25, 25 and 200 millimetres, respectively. Conversely, the rate of evaporation in these areas and the Equatorial Lakes Region is higher, with, for instance, the northern parts of the Sudan, most parts of Egypt and the Lakes Region having 1,000, 2,800 and 1,400 millimetres of evaporation per year, respectively (Khashef, 1981). The evaporation rate is, however, minimal in the Ethiopian highlands, averaging about 600 mm per year.

The Nile River has two major tributaries, namely the Blue and White Niles, and about six major cataracts. The White Nile's source is the upper catchment of the Luvironza River that is located near to Lake Tanganyika in south-central Burundi (see Figure 1). The Luvironza is a tributary of the Kagera River which, in actual fact, is considered by many writers as the source of the White Nile (Khashef, 1981; Shahin, 1985). The Kagera River empties itself into Lake Victoria which, in turn, is discharged as the Victoria Nile into Lake Albert after crossing through a series of cascades known as the Rippen Falls. Lake Albert receives two-thirds of its total inflow from the Victoria Nile and the remaining one-third from rainfall. The equatorial portion of the Nile's course ends after the Upper White Nile exits Lake Albert and moves northwards to South Sudan. Within South Sudan, until the river reaches Malakal it is known as Bahr-el-Jebel. At this stage the Nile carries some 22 billion cubic meters of water per annum. Inside South Sudan, Bahr-el-Jebel is joined by a number of right and left bank torrents including Bahr-el-Arab and Bahr-el-Gazal. None of these rivers are perennial but, rather, run in full force only after the onset of the rainy period.

Given the fact that most of the aforementioned torrents, particularly the Bahr-el-Gazal, lose much of their water while passing through the extensive Sudd Swamp (about 6,000 km^2 in size) which envelops a good portion of South Sudan, they add

no more than 4 billion cubic meters of water per year to the Nile (Kliot, 1994). All in all, about 60 percent of the water discharge that enters into the Sudd Swamp, about 14 billion m^3/year, disappears due to seepage and evapo-transpiration. Additionally, the flow contribution of the White Nile tributaries in the Equatorial Lakes Region is reduced by the high volume of evapo-transpiration that takes place within the region. It is stated that Lakes Victoria and Albert alone lose about 3.5 and 2.5 billon cubic meters of water per year, respectively (Ibid).

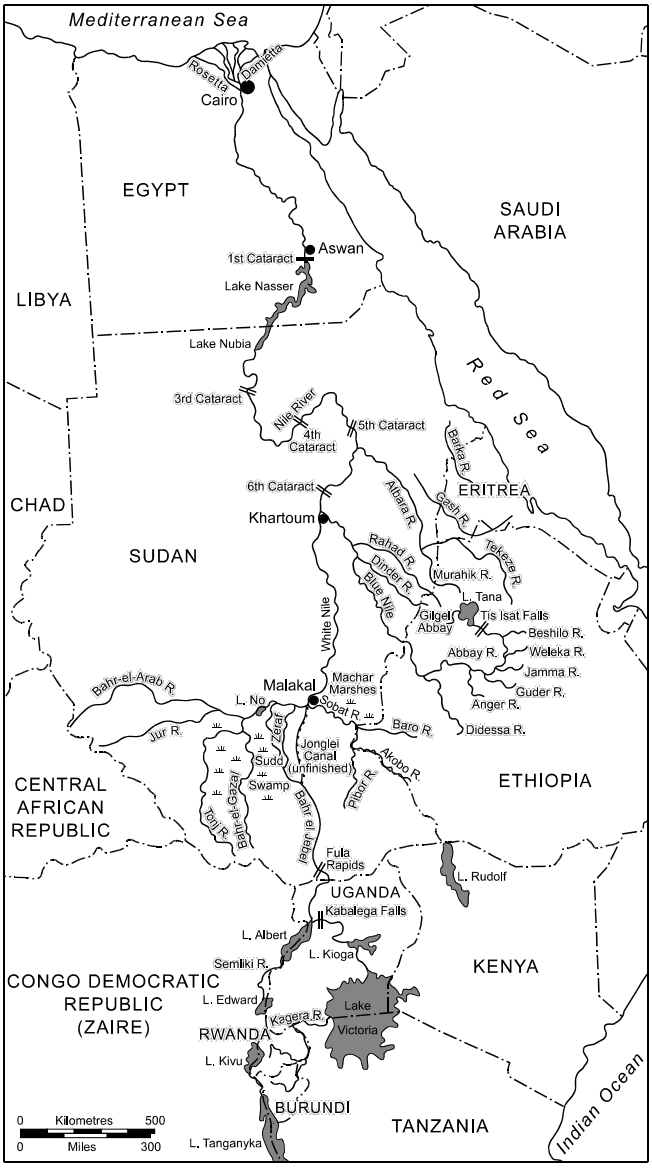

Figure 1. The Nile Drainage Basin

The Blue Nile originates in the Ethiopian highlands from a small stream called Gilgel Abbay, which is found about 100 km to the southwest of Lake Tana (see Figure 1). After exiting Lake Tana, the Blue Nile (known as Abbay in Ethiopia) changes direction from southeast to south then west and lastly north until it reaches its final destination in Khartoum. In its long journey towards the Sudan, it is fed by a multitude of tributaries rising in the Ethiopian plateaus that have elevations ranging from 2,000 to 3,000 meters above sea level and rainfall between 1,400 and 1,600 mm per year, on average. The Blue Nile gushes through deep gorges and steep-sided valleys, which at times are as deep as 1,200 meters, until it reaches the Ethio-Sudanese border to the west (490 meters above sea level). After crossing the Ethio-Sudanese border, the river becomes much gentler and collects two more seasonal tributaries that originate in Ethiopia, the Dinder and Rahad, that together contribute about 10 per cent of the Blue Nile's total annual flow. In the end, the Blue Nile makes a confluence with the northbound White Nile at Khartoum to form the Nile River per se.

While making its long, gentle and arduous journey towards the Mediterranean Sea, the Nile River is joined by one last tributary that originates in Ethiopia, the Atbara (known as Tekezzie in Ethiopia), at a location about 320 km north of Khartoum. The remaining course of the Nile—about 3,000 kilometres in length—that leads to the mouth on the Mediterranean Sea is characterized by two aspects: firstly, it is devoid of any additional inflow and, secondly, it passes through a formidable environment that has intense heat and little or no precipitation. About 200 km short of its final destination at the Mediterranean Sea, the Nile bifurcates into the Rosetta branch in the west and the Damietta in the east. These two arms of the delta, also called distributaries, are located in the triangular Egyptian Delta that has a width of about 200 km. They channel the last drops of the Nile to the Mediterranean Sea.

Of the four major tributaries of the Nile drainage system, three of them that originate in Ethiopia, the Blue Nile, the Sobat (known as Baro-Akobo in Ethiopia) and the Atbara, have a mean annual discharge of 59, 14 and 13 billion cubic meters of water, respectively. These figures usually rise to 68, 15 and 22 billion cubic meters of water during the summer rainy periods, respectively. The White Nile contributes, on average, about 14 billion cubic meters of water annually (Collins, 1990; Kliot, 1994). By virtue of the three river systems, Ethiopia contributes 86 per cent of the total volume of water, while the White Nile provides the remaining 14 per cent. Ethiopia's contribution to the Nile flow rises to 95 per cent during the summer rainy season *(*referred to as *kiremt* in Ethiopia) that stretches between late June and early September (Tafesse, 2001a).

3. Climate change in the Nile Basin

It goes without saying that climate change is one of the major global development challenges that human beings face today. Now, more than ever, we see fluctuations in rainfall, increase in temperature and rising or falling sea levels that could induce

droughts and floods, population displacements and changes in the length of growing seasons. As mentioned earlier, the Nile Basin's climate varies between extreme aridity in the north (mainly in Egypt and the Sudan) and relative wetness in the Equatorial Lakes Region and the Ethiopian highlands. The *kiremt*, or summer downpours, in Ethiopia spanning late June and early September contribute the bulk of the rain feeding into the three tributaries of the Nile. These summer rains in Ethiopia are associated with the shift of the Inter-Tropical Convergence Zone (ITCZ) over the Ethiopian highlands, attracting the southwesterly winds that unload their moisture as monsoon rains. The resulting rainfall is often intense, causing overbank discharge and rapid runoff, leading to major soil loss and, at times, flooding. The seasonal changes in the pattern and movement of the ITCZ cause major shifts in rainfall across Ethiopia and some of the Nile Basin countries. In some years, the northeastern highlands of Ethiopia, that are located on the leeward side of the rain-bearing winds, are badly affected by low and unpredictable rainfall patterns, contributing to severe crop failure and drought and, at times, to major famine (Nicol, 2003).

One of the key factors affecting rainfall variability in the Nile Basin Region is the El Niño–Southern Oscillation (ENSO), which is characterized by the occurrence of positive anomalies in sea surface temperatures over the Central and Eastern Pacific Ocean. This phenomenon can have dramatic global impacts on regional weather systems. In the case of the Nile Basin, studies by Whetton and Rutherford (1994, cited in Conway and Hulme (1997) have shown significant correlation between the ENSO index in May and Ethiopia's *kiremt* rainfall. The authors showed that Nile floods were significantly lower than average in all El Niño years.

The variable rainfall patterns in the Nile Basin in recent years have prompted the creation of mechanisms aimed to better forecasting of floods and droughts in the basin. In particular, the successive years of low rainfall during the mid-1980s, in some years barely one-half that of a "normal" year, led to a decline in the level of Lake Nasser to such an extent that, by the time a major rainfall event occurred in August 1988, the hydroelectricity turbines were just short of being turned off (Conway and Hulme, 1997). Such a situation illustrates the degree to which all the Nile Basin countries are vulnerable to climatic variations. It also shows the need for the development and adoption of a basin-wide information-sharing strategy on climate and water resources.

The climate of the Nile Basin is temporally as well as spatially variable. This variability in rainfall has, in turn, resulted in fluctuations in the Nile flows and the levels of the lakes in the basin (Goulden and Conway, 2008). The water levels of Lake Victoria and the intensity of runoff in the Ethiopian highlands are particularly sensitive to variations in rainfall. As stated by the same authors, testimonies to this include the climatic extremes observed with prolonged dry period in the 1970s and 1980s alternating with above-average rainfall that led to sharp rises in the level of Lake Victoria and other lakes in the equatorial region in the early 1960s and

1997/1998. In addition to changes in the average climatic conditions, climate change is expected to cause changes in climate variability, in particular to the frequency and severity of extreme events, such as floods and droughts. Surface water resources in the Nile Basin will be impacted by increased evaporation due to higher temperatures and also due to changes in rainfall patterns. Nile flows and the levels of the lakes in the basin will also be reduced unless increases in rainfall outweigh the effects of increased evaporation.

4. Impacts and adaptation strategies

The impacts of climate change on water resources, most particularly those aspects that are related to future changes in overall magnitude, variability and timing of the main flow events, are the most frequently cited hydrologic issues (Frederick 2002; Wurbs et al., 2005). These changes could have a higher impact on transboundary river basins such as the Nile, where competition for water resources comes from different users and runoff variability in upstream countries can immediately be felt downstream. These impacts and effects become much more visible for river basins such as the Nile that are sensitive to climatic variations (Conway, 2005; Conway & Hulme, 1996; Yates & Strzepek, 1998 a,b). The Nile gets all of its water from rains falling in upstream countries, most particularly from Ethiopia. Climatic variability caused by climate change could seriously affect rain patterns and runoff variability so much so that it affects the amount of water available in downstream countries. The increasing water demand by upstream countries in the Nile Basin, coupled with climate change impacts on rivers and river basins, can affect the availability of water resources for downstream countries.

The hitherto existing studies that have examined the impacts of climate change on water resources in the Nile Basin have mostly focused on changes in runoff and their consequences for the economies of downstream countries (Conway, 2005; Conway & Hulme, 1993; 1996; Gleick, 1991; Sene et al., 2001; Strzepek & Yates, 1996; Yates & Strzepek, 1996, 1998 a,b). However, the effects of climate change do undoubtedly go beyond these changes and consequences. They can affect multiple features of water resources, including, but not restricted to, quantity and quality of water, flow extremes and water temperatures. All these aspects, that affect livelihoods in the Nile Basin, have not received the much desired attention in planning for future water allocation and design of water infrastructure. As stated by Goulden and Conway (2008), periods of high and low rainfall in the basin lead to impacts such as drought and food insecurity; flooding and population displacement. Low water levels in rivers and lakes also impact on hydropower, municipal water use and irrigation agriculture. As enunciated by Verhoeven (2011), a significant rise in the number and frequency of debilitating droughts and floods in the Nile Basin can, in turn, produce a systemic crisis affecting agricultural production and pastoralist livelihoods. For instance, the Nuer pastoralists in South Sudan, who live in the swamps and open savannah on both sides of the White Nile, are affected by the impacts of climate change on the basin directly, while

pastoralists and agro-pastoralists in the four districts of Karamoja in the Equatorial Lakes Region and the Beja traditional pastoralists in Sudan, who live between the Nile and the Red Sea, are affected indirectly.

The United Nations Environment Programme (UNEP, 2011) defined climate change adaptation to include all human responses that would be used to reduce vulnerability. The capacity to adapt is closely linked to the degree of dependence on natural resources and the level of socio-economic development. High reliance on natural resources in developing countries has been noted to account for high levels of vulnerability and low adaptive capacity to climate variability and change (World Bank, 2000). It has also been found that the degree of vulnerability to climate change varies, amongst other factors, in terms of geographical location and the degree of resilience of the population. The livelihoods of communities in environmentally sensitive areas such as the Nile Basin and the Horn of Africa have evolved under variable climatic conditions and the associated uncertainty in the supply of natural resources (Dube, 1992). The survival of communities in the basin depended to a significant extent on maintaining adaptable lifestyles, marked by multiple livelihood and survival strategies deployed in response to changing environmental conditions. These have been noted not only for communities inhabiting the Nile Basin but also for similar natural resource-dependent agro-pastoral and pastoral communities in different parts of the world (Burton, 2004; Hulme, 2004; Thomas & Twyman, 2005). The livelihood practices of the communities are supported by a traditional knowledge system that has evolved through accumulated experiences of changing environmental conditions and interactions with land use management systems being cited as one example. It is this capacity to withstand climatic variations, known as ‘coping range’ or ‘resilience,’ that has up until now served and saved vulnerable communities from climate-change related stresses such as drought and flood.

5. Information and data sharing

Sharing of information and data on the impact of climate change on water resources and the ecology is central in assessing and responding to the development needs of basin states as well as in developing effective and transparent institutions and cooperation processes. Part of the challenge lies in knowing how and where to develop the basin resources in order to maximize the benefits for states through more efficient as well as equitable use of resources. When it comes to river basin studies in general, much of the data generation and exchange to date has focused on flows due to the desire to address problems of water management.

As stated by Nicol (2003), data collection on the Nile River Basin provided the thread that wove together early attempts at collaborative development. The same author said that such an attempt on its own falls far short of providing a sound framework for development and of overcoming differences and disputes between

riparian states. This also partly reflects the concern felt by some co-basin states that earlier efforts were little more than a distraction from key water allocation issues, a stance repeatedly promoted by Ethiopia over a long period.

The history of collecting data on the Nile is thousands of years old, and testament to this is the proliferation of 'Nilometers' along the river. However, real and concerted data collection and sharing commenced in the 1960s. The first such effort was made when some of the riparian states decided to establish the first Nile-based organization in 1967. Known by its acronym Hydromet (hydro-meteorological survey of the equatorial lakes), it was established jointly by Egypt, Kenya, Sudan, Tanzania and Uganda. As the name itself implies, its original aim was to undertake a 'hydro-meteorological survey of the equatorial lakes,' including Lakes Victoria, Kioga and Albert. The genesis of the organization could be traced back to the sudden and unpredictable increase in rainfall in the equatorial lakes region in the 1960s, which caused flooding on the shores of the lakes and in the wetlands of South Sudan. In order to mitigate recurrences of this and similar natural calamities, the World Meteorological Organization (WMO) proposed the establishment of the Hydromet project and submitted it to the United Nations Development Programme (UNDP) for funding.

The main objective of Hydromet was to collect and analyze hydro-meteorological data from the equatorial lakes for the purpose of deriving the water balance of the White Nile catchment and, possibly, make predictions. All the Nile riparian states except Ethiopia and the Democratic Republic of Congo (DRC) joined Hydromet. The fact that the objectives of Hydromet failed to include volumetric water allocations forced some of the riparian states to distance themselves from the organization. In short, as stated by Tafesse (2001b, p. 586), "suspicions and lack of trust amongst the Nile riparian states, the non-membership of principal riparian states such as Ethiopia and lack of confidence-building measures by the downstream states" could be singled out as underlying factors that hindered the implementation of most of the planned Hydromet projects. Notwithstanding this state of affairs, the organisation managed to generate important climatic and hydrologic data for the Nile Basin, most particularly for the equatorial lakes region.

Hydromet was succeeded by the formation of Undugu (Swahili for 'brotherhood') in Khartoum in 1983 under the aegis of the Organization of African Unity (OAU). It drew its members from six Nile riparian states—Egypt, Sudan, Uganda, Rwanda, Burundi and DRC—and one non-riparian neighbouring state, the Central African Republic. Ethiopia, Tanzania and Kenya opted to distance themselves from the grouping and chose, instead, to remain as observers. The objective of the Undugu grouping had been to forge cooperation in areas of infrastructure, environmental cooperation, culture and trade. As stated by Bram (2000), the grouping was disbanded before achieving what it intended. The member states of Undugu had spent most of their time in organizing and attending conferences and ministerial meetings that bore no fruit in terms of the desired results. In the opinion of this

author, the failure of Undugu can be attributed to two factors: (a) the non-inclusion of important Nile riparian states and (b) its digression from the central issue of water allocation. The grouping has even failed to generate the much-needed hydrologic and climatic data for the basin.

In the early 1990s, the Technical Cooperation Commission for the Promotion and Development of the Nile, known as TECCONILE, came into being. TECCONILE was formed as an extended version of the previous Hydromet through the agreements reached by the Nile Council of Ministers of Water Affairs (Nile-COM) in 1992 in Kampala, Uganda. Six of the riparian states, namely DRC, Egypt, Rwanda, Sudan, Tanzania, and Uganda, became members while the remaining four opted to participate as observers.

Like its predecessors, TECCONILE was concerned at first with issues around environment and water quality control. Over time, however, an equitable entitlement to the Nile waters by the co-basin states was included for the first time as an objective, when a Nile River Basin Action Plan (NRBAP) was drafted and submitted in May 1995. Despite such a move, not all of the planned projects came to fruition mainly because the money that was actually raised was too small to cover the cost of the intended projects. It was under these circumstances that TECCONILE's unfinished jobs, particularly the pending projects, were ceded to its successor organization, the NBI.

As a successor to TECCONILE, the NBI was launched in Dar es Salaam, Tanzania, in February 1999. The fact that it contained the issue of water allocation in its agenda from day one induced the otherwise non-conformist riparian states such as Ethiopia to become fully-fledged members. Ethiopia has all along called for negotiations on water allocation issues to be included in the cooperation process; in effect, they have become *sine qua non* for participation in the NBI as a full member.

One of the major outcomes of the NBI is the promulgation of the Nile Basin Sustainability Framework (NBSF), the aim of which is to realize the shared vision sought by the co-basin countries through sustainable actions based on mutually agreed policies, strategies and guidelines that focus on identified priorities. Of the many priorities and key strategic directions included in the NBSF, one is related to climate change mitigation and adaptation. Now, more than ever, all riparian countries have created awareness about what the changing global climate means for them as sovereign nations and co-basin states. That is why all the basin countries have opened climate change monitoring offices of some sort and are planning to include both mitigation and adaptation measures. The problem that still bedevils the basin is the absence of a basin-wide response strategy and lack of information sharing to address climate change and climate variability related issues. NBI and its component organizations are making efforts to bring basin-wide

research together in an integrated way and, more importantly, to provide a vehicle for connecting science with policy and strategy development at a regional level.

Outcomes and actions associated with climate change mitigation and adaptation focus on gathering and disseminating basin-wide information, and on providing the urgently needed regional connection between science and policy-makers so as to enable the formulation of coordinated and cooperative response strategies at a regional level. Efforts are now being made to give responsibility to the NBI to focus and facilitate cooperation among Nile Basin states in water-related mitigation and adaptation measures to climate change. Such a move will assist the states to harmonize approaches to addressing climate change, enhance climate and water resource data collection and processing, identify measures to increase climate change adaptation capacities, and promote sharing and dissemination of information on the impacts of climate change on water resources and the ecology.

6. Implications of the study for pastoralists in the Horn of Africa

As stated by Oxfam International (2008), pastoralists in the Horn of Africa face four major challenges that hinder their livelihood and stifle their adaptation capacities. These are climate change, political and economic marginalization, inappropriate development policies and increasing resource competition. Of these challenges, we will briefly discuss climate change.

According to data obtained from the Intergovernmental Panel on Climate Change (IPCC) (quoted in Hartman, 2009), climate projections in the Horn of Africa for 2080-2090 predict a 3.2 ^{O}C temperature rise and a 7 percent increase in rainfall. In the short run, i.e. 10-15 years from now, pastoralists could be exposed to successive poor rains, an increase in drought-related shocks but also unpredictably heavy rainfall. When pastoralists are exposed to rains that are far below the norm for successive years, pasture availability shrinks and regeneration potential becomes very low (Oxfam, 2008). Frequent droughts could deter the rebuilding of pastoralists' assets, including their livestock. Lastly, the heavy rains would damage crops and kill livestock.

Pastoralists employ various coping strategies to mitigate and, if possible, overcome the impacts of climate change. It is much more effective to strengthen pastoralists' indigenous adaptation strategies and coping mechanisms to mitigate the impacts of climate change among the pastoralists of the Horn of Africa (Nassef et al., 2009). Pastoralism receives little or no attention by policy-makers and development interventionists or is subject to inappropriate policies that do not allow it to function properly. It is high time for policy-makers, governments and non-governmental organizations to pay special attention to pastoralism with the intention of integrating their indigenous coping strategies and traditional knowledge into natural disaster management plans (Oba, 2001).

Since pastoralists such as the Nuer in South Sudan, and some others in the Great Lakes Region depend on the Nile directly or indirectly, the impacts of climate change in the basin will have some effects on the livelihood of pastoralists. In order to adapt to the adverse impacts of climate change, one needs to strengthen the coping capacities and resilience of pastoral communities living in the Horn of Africa. This could be done if policy-makers, governments and non-governmental organizations give due recognition to traditional knowledge. If the latter is dovetailed with 'modern' information sharing and exchange, it could strengthen the adaptive lifestyles or survival strategies of pastoralists enabling them to cope with adverse climatic extremes, such as recurrent droughts and floods.

Some lessons can be learnt from the NBI that could be helpful in data and information sharing on climate change impacts, regional response strategies and adaptive capacities. In the opinion of this author, it is high time for institutions or organizations or ministries that are responsible for pastoral affairs in the Horn of Africa to establish what one may call 'Pastoral Societies Initiative for the Horn' (PSIH). Information sharing, as used in the strengthening of the adaptive capacities and mitigation strategies of pastoralists to the impacts of climate change, can be facilitated by PSIH in two ways. Firstly, the Initiative could be given a mandate to collect time series regional data and information on climate and hydrology, analyze them by using statistical techniques, such as moving average, and make prediction for some years to come. Such an exercise could help in preparing pastoralists to mitigate and if possible withstand extreme weather conditions, such as droughts or floods.

Secondly, PSIH could also undertake studies on the ways and means by which traditional or indigenous knowledge of pastoralists can be used to predict, mitigate and adapt to the impacts of climate change. The synergy that comes out of the two study results (traditional and modern) can enable pastoralists to employ more effective response strategies and mitigation measures to alleviate the impacts of climate change on their livelihoods.

The study results produced by specific countries and PSIH on climate change impacts, adaptation strategies and mitigation measures in the Horn of Africa could also inform policy-makers to look for mutually agreed policies, strategies and guidelines on climate change mitigation and adaptation in the region. In short, the study results by PSIH can improve policy makers' and practitioners' understanding of pastoral production systems, indigenous knowledge and adaptive lifestyles of pastoralists that enable them to cope up with extreme climatic patterns.

7. Conclusions

This study has discussed the existence of extreme variability in climate between upstream and downstream countries in the Nile Basin. The former are characterized by high rainfall and wetness, the latter by aridity and semi-aridity. Data-sharing

and better forecasting ability within the basin have been necessitated by the rainfall variability and climate change that has characterized the basin for the past five decades. The impacts of climate change have been vividly demonstrated by fluctuations in Nile flows and by the rise and fall of water levels in the series of lakes found in the basin. While the mid-1960s and late-1990s were characterized by huge amounts of rainfall, leading to rises in lake levels and flooding, the 1970s and 1980s were drier periods with much reduced lake levels. Interestingly, the anomalies in climatic patterns necessitated the establishment of Hydromet in 1967.

Due to population increases and the impacts of climate change on water resources, the upstream countries insist time and again on changing the *status quo* in as far as usage of the water resources of the Nile is concerned. In so doing, they are, in effect, calling for a fair and equitable utilization of the Nile's water resources. Naturally, the upstream demands have not been welcomed by downstream countries. Such unwillingness has brought about a stalemate in the area with the 'Cooperative Framework Agreement' (CFA) still awaiting ratification by all concerned parties. Be that as it may, institutions at the national and regional levels, and the communities at large, should pay particular attention to the changing circumstances in the basin and beyond. In the face of climate change, communities depending on the Nile Basin should be encouraged to strengthen their adaptive lifestyles, survival strategies and traditional knowledge in order to cope with adverse climatic situations.

If traditional climate change adaptation mechanisms are combined with 'modern' information/data sharing and exchange, there is a good possibility to build resilience and to mitigate the impacts of adverse climatic situations. The NBSF that has been adopted by the Nile riparian states is geared towards this purpose. It aims at developing basin-wide response strategies and information sharing to address climate change and its impacts on communities. The sharing of climate and water resources data in the basin will help the states to harmonize the various approaches used to address climate change. It will also help to enhance the capacity of local communities to cope with the impacts of climate change. Notwithstanding its importance, there is still a long way to go in terms of data sharing and information exchange among Nile Basin states. In order to fill such a gap, it is recommended to build synergy via three-tiered information sources, namely local communities, national water and water-related institutions, and regional bodies such as the NBI and the upcoming Nile Basin Commission (NBC).

Since some pastoralists in the Horn of Africa are dependent on the Nile directly or indirectly, the impacts of climate change in the basin can have some effects on their livelihoods. In order to mitigate the adverse impacts of climate change on pastoral communities, one needs to strengthen the coping capacities and the resilience of people inhabiting the peripheral areas of the Horn of Africa. This could be done if policy-makers, governments and non-governmental organizations give due recognition to traditional knowledge. If the latter is dovetailed with

'modern' information sharing and exchange, it could strengthen the adaptive lifestyles and survival strategies of pastoralists.

The author believes that it is high time for institutions that are responsible for pastoral affairs in the Horn of Africa to establish a regional body that will be responsible to garner climate change related issues to pastoralists. It could serve as a think-tank that will be involved in the study of both traditional and 'modern' climate change impact and adaptation strategies. The regional body could also inform policy-makers to look for mutually agreed policies, strategies and guidelines on climate change mitigation and adaptation in the region.

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Theme 4

Climate Change and Pastoral Conflicts

Fighting in the Rain: Monthly Rainfall Extremes and Social Unrest in Africa

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Abstract

Over the past two decades, studies in the environmental security literature have examined the relationship between rainfall variation and conflict outcomes in an attempt to better understand potential future consequences of climate change on political stability. The literature, however, has yet to converge on a consensus about the nature of the relationship or the causal pathways involved. Case-based studies have presented several potential mechanisms but lacked generalizability while empirical studies have focused almost exclusively on international or civil war onset as the dependent variable to the exclusion of other types of conflict. In this paper I advance the literature in two significant ways. First, using the newly released Social Conflict in Africa Dataset (SCAD), I broaden the commonly used definition of conflict to include strikes, riots, demonstrations and communal conflict, both violent and non-violent. Second, I use deviations in monthly rainfall patterns as the independent variable rather than annual aggregates as used by earlier empirical studies. This is more appropriate because: (1) climate scientists predict increased intra-annual rainfall variability and more frequent extreme events – droughts and floods; and (2) changes in historically established rainfall patterns can negatively affect agricultural productivity in African countries reliant on rain-fed agriculture. I find that, on the continental scale, receiving overly abundant rainfall in a given month significantly and substantially increases the likelihood of social conflict, but receiving too little rain does not seem to have such an effect, at least in the short-term. When the analysis is limited to the nine countries of IGAD and EAC, the significant effect of too much rain disappears and receiving too little rain actually reduces the likelihood of unrest. I argue that receiving too much or too little rain leads to conflict through distinctly different causal mechanisms. Additional research using this approach complemented by case study investigations is needed to illuminate causal mechanisms between rainfall variability and conflict.

1. Introduction

The dramatic political tumult in Tunisia, Egypt and Libya in early 2011 has quite clearly demonstrated how social or political unrest can be politically destabilizing and can quickly spread throughout an entire region. While decades of political repression undoubtedly created conditions ripe for revolution, worsening economic conditions in the recent past clearly played an important role in triggering the

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downfall of long-tenured autocratic rulers. Among the economic woes cited by the populations involved are rising food prices that place increasing pressure on limited resources. Furthermore, at least major international agenda-setter, the International Monetary Fund (IMF), as well as prominent members of the media have connected these rising food prices to climatological events around the world in the past year–wildfires that destroyed Russian wheat crops, floods in Australia and Pakistan, and droughts in Argentina, Eastern Europe and China (Helbling & Roache, 2011; Krugman, 2011). It is this, admittedly tenuous, connection that has led some to publicly question whether the future effects of climate change might lead to an increase in political instability. Rising food prices, however, might have more to do with rising oil prices and market speculation than distant climate events, and the global financial crisis of the past few years is more likely the underlying source of much of the economic difficulty in these countries. These competing views need to be investigated thoroughly, and while past research has shed some light on the issue it is far from settled (Gleditsch, 1998; Salehyan, 2008).

In this paper I attempt to determine the extent to which changes in monthly rainfall lead to social unrest. In so doing, I contribute to the existing literature in two significant ways. First, I use a new dataset, the Social Conflict in Africa Database (SCAD) that expands the definition of conflict by including strikes, protests, demonstrations, riots and other episodes of low-level conflict that may or may not be violent. This differs from the often-used indicator of armed conflict onset; i.e. conflict between rival armed groups, at least one of which is a government and that requires a certain threshold of battle deaths (either 25 or 1,000) to be considered. Second, I examine the relationship on a much shorter time scale than previously investigated. Existing studies in this field focus either on changes in annual precipitation totals, which are expected to increase at the high end and decrease at the low end, or on the occurrence of drought within a given year. In contrast, I focus on deviations in monthly rainfall totals for two reasons. First, climate scientists predict increased intra-annual–i.e. seasonal and monthly–variation in rainfall and an increase in the frequency and magnitude of hydrometeorological extreme events–droughts and floods. Second, changes in rainfall generally affect people in less than a year. That is, floods impact populations within days or weeks rather than years and crops fail by season, often within weeks (although the effects of drought are certainly more extended as will be discussed below).

The remainder of this article is divided into three sections. The first section develops a theoretical perspective on the environmental scarcity literature as well as the subset relating to rainfall. In this section potential causal pathways leading from droughts and floods to social conflict are outlined, although these specific causal linkages are not explicitly tested in this study. The second section explains the analytical framework including the SCAD, the monthly rainfall deviation data and the statistical methods employed. The third section presents the findings and a discussion of their potential implications for future research.

2. Theoretical perspective

Climate change is a reality. Even if the world succeeds in limiting the increase in global average temperature to two degrees Celsius–the target set in Copenhagen in December 2009 and widely regarded to be overly optimistic–the world will undoubtedly experience a host of changes to natural systems that will affect human societies in a number of ways (Busby, 2010). Chief among these natural consequences are: sea-level rise and inundation of low-lying coastal areas; increasing variability in access to renewable resources–primarily fresh water and arable land; increased frequency and magnitude of hydrometeorological extreme events (Buhaug, et al., 2009; Hendrix & Salehyan, 2011; IPCC, 2007). In some areas these consequences might be beneficial to human societies. For example, parts of northern Europe and Canada may become warmer and more suitable for agriculture, at least in the short term (Parry, et al., 2004).

In other areas, however, these natural consequences will likely lead to new challenges and, potentially, to conflict or political instability. In this article I leave aside sea-level rise as a long-term challenge to a significant but limited segment of the population and focus on consequences associated with changes in rainfall patterns–variability in access to renewable resources and increased frequency of extreme events (droughts and floods), both of which are driven by deviations from historically typical rainfall patterns. Rainfall deviations are likely to be more frequent and extreme in a changing climate, but they have occurred in the past and the effects of those past occurrences are useful for predicting the potential consequences of future deviations. At the extremes, too much rainfall can lead to devastating floods, while too little can lead to debilitating drought. More moderate changes, however, can also have disruptive effects. In rural areas, changing patterns can impact agricultural practices that depend on rainfall in adequate amounts at particular times of the year. Urban centers can be left struggling with chronic shortages of available water or can find their water management systems overwhelmed, especially in informal settlements that already lack adequate water supply, sanitation and drainage infrastructure.

Africa as a continent is particularly vulnerable to climate change and changing rainfall patterns for a number of reasons (Boko et al., 2007; Collier, et al., 2008a). First, poor infrastructure leaves African populations unable to store water from rainy periods for use during dry periods. The Food and Agriculture Organization (FAO) estimates that only 5.9% of the cultivated land in Africa is equipped for irrigation and, if Egypt–where nearly 100 percent of cultivated land is irrigated – is excluded from the calculations, then that estimate drops to 4.5% (Food & Agriculture Organization (FAO), 2010). Second, Africa is home to 30 of the 31 lowest ranking countries on the Human Development Index of the United Nations Development Programme and 37 of the 53 African countries are categorized as Low Human Development (United Nations Development Program (UNDP), 2010). Low levels of development can multiply the effects of hydrometeorological events

on African populations. A flood that would be a minor problem in a developed country can have devastating effects on a population that is already on the edge. Third, 33 African countries rank in the bottom half across all six of the World Bank's World Governance Indicators, and another seven rank in the bottom on five out of the six (The World Bank, 2010). Poor governance and limited institutional capacity severely hamper the ability of governments to respond to hydrometeorological events or to adapt to the expected consequences of climate change. All of these factors combine to create an 'ingenuity gap' that makes African countries less able to develop infrastructure, institutions and economies that are resilient against changing rainfall patterns (Homer-Dixon, 2000).

2.1 Environmental scarcity

Early literature on environmental scarcity was broadly focused on how environmental degradation or change can lead to acute conflict. Homer-Dixon identified environmental change as 'only one of three main sources of scarcity of renewable resources; the others are population growth and unequal social distribution of resources' (Homer-Dixon, 1994, p. 8). He argued that increasingly limited access to resources such as water, arable land and forests due to any or all of these sources of scarcity can lead either to conflict between states over shared resources or to insurrection against the state because of increased popular grievances combined with diminished state capacity. Hauge and Ellingsen (1998) reclassified Homer-Dixon's sources of resource scarcity as three 'dimensions' of the concept of environmental scarcity: supply-induced scarcity associated with dwindling stocks of environmental resources; demand-induced scarcity created by increased consumption or population pressure; structural scarcity, the inequitable distribution or control of existing resources.

The early literature focused on a myriad of independent variables associated with supply-induced scarcities, while also attempting to control for demand-induced and structural scarcities. The specified causal mechanisms were extremely complex and involved an array of intervening variables, including decreased agricultural production, decreased economic activity, migration, political regime type, demographic structure, trade openness, level of development and urbanization. The empirical findings were also mixed. Hauge and Ellingsen (1998) found that deforestation, increased land degradation and reduced freshwater availability all led to an increased likelihood of conflict, while Etsy et al. (2004) found that environmental change was not directly linked to state failure. Theisen (2008) is unable to replicate the findings of Hauge and Ellingsen and, like Etsy et al., finds very little support for a link between environmental resource scarcity and violent internal conflict. He argues that the complexity of causal mechanisms specified by Homer-Dixon and the lack of a direct link between environmental scarcities and conflict make large-N studies difficult while case study-based approaches are plagued by problems of selecting on the dependent variable. Additionally, he argues that aggregation to the national level is often a challenge when linking localized scarcities to wider conflicts (Theisen, 2008).

Later studies focused more narrowly on the demand-induced scarcities–population pressure–either alone (Urdal, 2005) or in combination with supply-induced scarcities–environmental degradation; they have found limited, if any, support for a connection to violent conflict (Raleigh & Urdal, 2007). At least one study has found robust support for the hypothesis that large population and low economic development increase the risk of civil war, especially in combination with political variables, but no support for the proposition that scarcity of environmental resources increases the risk of civil war (Hegre & Sambanis, 2006).

Still other studies have found empirical evidence for connections between resource abundance and conflict (de Soysa, 2002) and between greater environmental exploitation and an absence of conflict (Binningsbø, et al., 2007). These findings are more relevant to structural scarcities. This line of inquiry is closely aligned with the so-called 'greed and grievance' literature, which investigates the relative importance of structural inequalities as determinants of civil war (Collier & Hoeffler, 2004; Collier et al., 2008b). These structural inequalities may include access to resource wealth, political rights and ethnic and religious divisions.[2]

2.2 Droughts and floods: Causal pathways to conflict

Water is perhaps the most important environmental resource and is naturally renewed by the process of evapotranspiration and precipitation. Variability in rainfall has been an attractive dependent variable in the environmental scarcity literature because it generates supply-induced scarcities–limited freshwater availability and decreased agricultural production–and is generally not endogenous with demand-induced and structural scarcities, as are deforestation and soil degradation. In other words, rainfall variability is generally not affected by human activities, with the exception of anthropogenic climate change.[3]

Before investigating causal pathways from rainfall variability to conflict, one must recognize that there are qualitative differences between too much and too little rainfall. On the one hand, negative or dry deviations–too little rainfall–lead to droughts, which are slow-onset events. On the other, positive or wet deviations–too much rainfall–generally lead to floods, which are swift-onset events. This is, however, not always the case. Floods can destroy crops and lead to the same food shortage effects as droughts, while droughts can produce conditions conducive to wildfires, swift-onset events with similar destructive impacts as floods. In large part, however, too much rain has much more immediate effects than too little.

[2] For a thorough discussion of the environmental scarcity literature see Buhaug, H., Gleditsch, N. P. G. & Theisen, O. M. (2009). Implications of Climate Change for Armed Conflict. *The Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World,* 75.

[3] Some studies have found a connection between environmental degradation and local weather patterns. For example, there is some scientific evidence that deforestation on the slopes of Mount Kilimanjaro altered weather patterns, including rainfall, in the surrounding area. See Fairman Jr., J. G., Nair, U. S., Christopher, S. A., & Mölg, T. (2011). Land use change impacts on regional climate over Kilimanjaro. *Journal of Geophysical Research, 116*(D3).

Whether either type of event rises to the level of a disaster depends on the resilience of the population affected and the response of appropriate institutions. For the remainder of this article, the use of the term disaster implies that, unless a climate-related event has some serious negative impacts on a society, or portion thereof, it will likely not have conflict-inducing effects.

Setting aside conceptual subtleties in resource scarcity, slow- and swift-onset disasters have distinctly different causal mechanisms leading to conflict. As a slow-onset disaster, drought has many of the same characteristics as broader environmental degradation. Swift-onset disasters, such as flooding, create more acute shortages of basic necessities.

2.2.1 Swift-onset disasters: In a broad study of the effects of natural disasters on conflict, Nel and Righarts (2008) distinguish between the ways in which swift- and slow-onset disasters can alter the motive, incentive and opportunity of actors and give rise to violent conflict. Swift-onset disasters, they argue, decimate the population's means of survival and create widespread suffering that leads to acute competition for scarce resources. At the same time, the state's capacity to respond is tested and its legitimacy may be questioned, if that response is considered to be inadequate. The state may also be challenged if it is perceived to be responsible for underlying conditions that contributed to the disaster. In contrast, slow-onset disasters, typically drought and famine, have longer-term, structural effects more similar to environmental degradation. Increased inequality in access to resources can lead to increased poverty and rising income inequality. This may, in turn, create resentment against the state and can weaken institutions. Ultimately, the authors find that swift-onset disasters significantly increase the risk of violent civil conflict (Nel & Righarts, 2008).

In the context of earthquakes, Brancati (2007) argues that swift-onset disasters increase the potential for intrastate conflict because they increase scarcities in 'basic, life-sustaining resources (e.g., food, water, and housing).' She also draws on relative deprivation theory to argue that these scarcities create feelings of frustration and desperation among affected populations 'when they are denied material benefits that they once had in the past or that other groups have over them and respond to these situations through anger and violence.' She further claims that relative deprivation theories are particularly relevant to earthquakes because they 'do not generally affect all groups equally and individuals commonly blame government leaders for natural disasters regardless of whether they are actually responsible for them' (Brancati, 2007, p. 722).

Floods, like earthquakes, do not affect all populations equally and can be exacerbated or ameliorated by existing infrastructure. Dams and flood control systems can protect populated areas when resources are available to construct and maintain them. But the physical vulnerability to flood of millions of urban poor in African cities is, in fact, amplified because the informal settlements in which they

live are often situated in low-lying areas, flood plains and river basins, and are often awash with sewage after even moderate rains that have little discernable impact on other urban areas.

2.2.2 Slow-onset disasters: In contrast to the acute shortages and resulting tensions associated with swift-onset events, slow-onset events–i.e. drought, famine, desertification and changing patterns of arable land–lead to conflict through structural changes in (1) how populations are distributed geographically or (2) how resources are allocated amongst populations. The former can be characterized as migration mechanisms, while the latter are referred to as economic mechanisms. These are not separate and distinct categories; rather, they are often interrelated.

Migration mechanisms

Migration mechanisms involve any movement of people from one location to another and can be grouped into the following sub-categories: rural-to-urban migration, regional migration, and international migration. Rural-to-urban migration involves the movement of vulnerable rural populations, particularly those reliant on subsistence rain-fed agriculture, to urban centers in search of alternative livelihoods after their crops and/or livestock have been decimated by environmental shocks. This can lead to resource competition and/or ethnic tension between newcomers and existing residents. In cities with public service sectors already under stress, the growth of informal settlements–i.e. slums–can lead to tension between different groups of slum-dwellers over housing and other resources, between slum-dwellers and the government over delivery of public services, or between slum-dwellers and other urban residents in the form of increased criminal activity (Hendrix & Salehyan, 2011; Theisen, et al., 2009). While this type of population pressure might not be as acute as the displacement resulting from a swift-onset disaster such as flood, it can have similar detrimental consequences and conflict outcomes. Furthermore, rural-to-urban migration can either be within individual countries or it can involve movement to cities outside of the country of origin.

The traditional movement of pastoralist groups who travel from area to area in order to graze and water their livestock is characterized as regional migration. When decreasing rainfall leads to increasingly scarce water sources and grazing areas, pastoralist groups are forced to venture farther and farther outside of their traditional migration routes. This can lead to competition between pastoralist groups over the same water sources or pasturelands or to conflict between pastoralist groups and agriculturalists who already reside in areas into which pastoralists are encroaching (Hendrix & Salehyan, 2011; Meier et al., 2007; Theisen et al, 2009). In contrast to scarcity-induced conflict, Meier et al. (2007) argue that overly abundant rainfall can also lead to increased cattle raids amongst pastoralist groups because cows fattened on fertile pasture are more attractive prizes and high grasses provide more cover for raiders. Just as above, regional pastoralist movements can be either within individual countries or across

international boundaries. For example, the Karamoja triangle, which includes parts of northwestern Kenya, northeastern Uganda, South Sudan and southwestern Ethiopia, is home to several pastoralist groups, among them the Karamajong, Turkana, Teso, Toposa and Jiye. While some of these groups may reside more in some countries than others–e.g. the Karamajong in Uganda and the Turkana in Kenya–they largely do not respect national borders and migrate according to where they can find sufficient water and pasture.

International migration includes both of the above types as well the movement of people between cities and areas in different countries for a variety of reasons, including direct environmental scarcity such as water shortages, or economic stress driven by environmental conditions, including changing rainfall patterns. This type of migration is closely related to or is the direct result of the economic mechanisms discussed below.[4]

Economic mechanisms

Economic mechanisms include increasing food prices or general economic decline. Some have argued that food prices can be driven up because of failed crops in times of drought, which can, in turn, lead to conflict between urban consumers and rural producers. Increased food prices can also lead to unrest through increased pressure on the resources of urban populations (Hendrix & Salehyan, 2011; Theisen et al., 2009). While demonstrations over increasing food prices–so-called food riots–have been observed on several occasions over the last few years, it is less clear whether rising food prices are the result of failing rains or are the consequence of structural changes in the global food system, including population growth, changing preferences of consumers in developing countries toward more meat-intensive diets and the diversion of much of the world's corn/maize crop to the production of bio-fuels.

The economies of many African countries are highly dependent on agriculture either for domestic consumption or for export to international markets. In 2005, the average agriculture value added as a percentage of GDP was 23.72% (The World Bank, 2011) and, as noted above, only 4.5% of agricultural land in Africa, excluding Egypt, is irrigated. Consequently, failed rains can quickly and easily lead to a general decline in national economic output. This can, in turn, lead to unrest over the lack of economic opportunities within the general population. Alternatively, individuals employed in the agriculture sector, as farmers or otherwise, may migrate to other countries or regions in search of alternative livelihoods after such a decline. This can, in turn, lead to conflict in the ways discussed above. In this way, economic and migration mechanisms are often interrelated and difficult to differentiate. Figure 1 illustrates many of these potential causal mechanisms.

[4] For a thorough discussion of the potential impacts of climate change on migration and conflict see Raleigh, C., Jordan, L. & Salehyan, I. (2008). Assessing the Impact of Climate Change on Migration and Conflict. *World Bank Seminar on Exploring the Social Dimensions of Climate Change*.

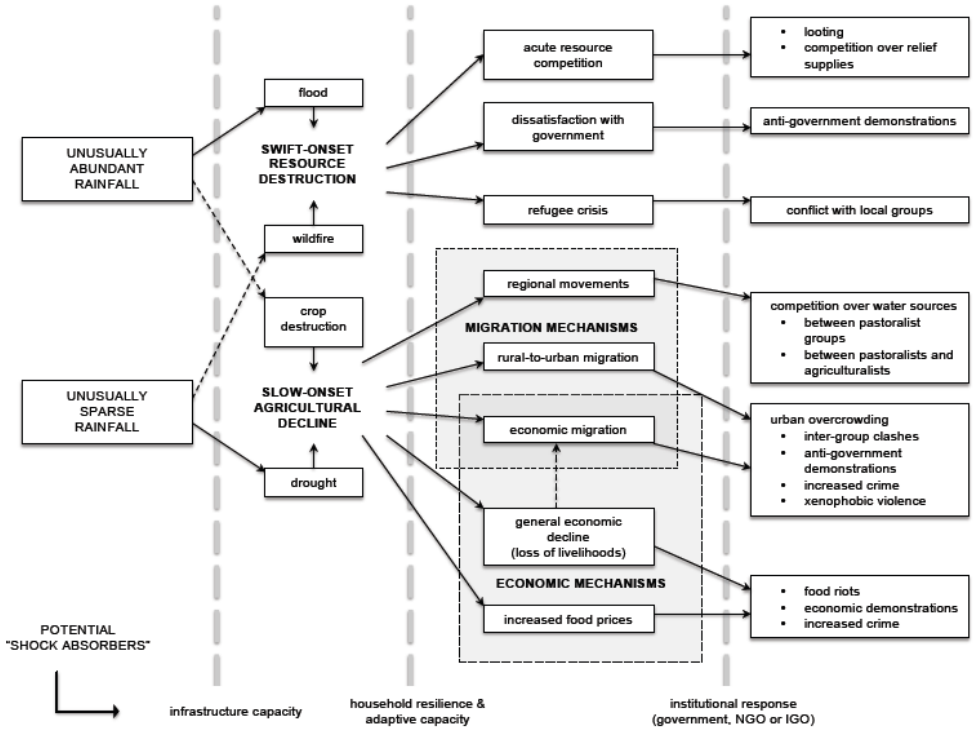

Figure 1: Potential causal pathways from rainfall variability to social conflict

2.3 Rainfall variability and conflict: Prior research

Studies relying on these causal pathways have employed a variety of methods and datasets, and generated mixed results. The methods and findings of these studies are summarized in Table 1.

In perhaps the only study that sheds light on causal mechanisms, Miguel et al. (2004) innovatively use annual rainfall as an instrumental variable for economic growth, which they find is strongly negatively correlated with the risk of civil conflict in Africa. For the dependent variable they used the Armed Conflict Dataset (ACD) from the International Peace Research Institute of Oslo and the University of Uppsala (PRIO/Uppsala), which codes for conflict between two armed parties, at least one of which is a government, which result in a minimum of 25 battle deaths. They use rainfall data from the Global Precipitation Climatology Project (GPCP) aggregated annually.

Levy et al. (2005) conducted a logistic regression analysis of the effect of rainfall–measured with the Weighted Anomaly Standardized Precipitation index (WASP) aggregated annually–on the risk of civil war, using the ACD data. They used grid cells of 2.5 degree latitude by 2.5 degree longitude rather than countries for their analysis, but they applied buffers of varying sizes to the conflict events and

trimmed them to national boundaries. Ultimately they find ‘a strong relationship between rainfall deviations, lagged one year, and the likelihood of high-intensity conflict outbreak’ (Levy et al., 2005, p. 17).

Hendrix and Glaser (2007) again use the PRIO/Uppsala data and an annual time unit. They used the GPCP data to develop their independent variables: the percentage change in rainfall from the previous year, which they called a rainfall trigger, and dummy variables for one and two standard deviations from mean annual rainfall. They find some evidence to support the hypothesis that ‘lagged measures of increased (decreased) rainfall are negatively (positively) associated with the risk of civil war onset’ (Hendrix & Glaser, 2007, p. 700).

In their analysis of sub-national localized drought, political exclusion and civil war, Theisen et al. (2009) use a 0.5 degree by 0.5 degree grid cell and the PRIO/Uppsala armed conflict data. Their independent variable is the occurrence of drought as defined using the Standardized Precipitation Index (SPI6), which ‘measures negative deviation from normal rainfall during the six preceding months’ (Theisen et al., 2009, p. 13). This indicator codes annually for the occurrence of no drought, moderate drought, severe drought or extreme drought. Although they find evidence to support the hypothesis that political exclusion increases the likelihood of civil war onset, they find no correlation between drought and civil war.

Finally, Hendrix and Salehyan (2011) use the occurrence of social conflict rather than civil war as their dependent variable. They have developed an the innovative new SCAD which records events of low level social conflict–e.g. strikes, protests, riots and communal conflict–rather than conflict between two armed groups resulting in at least 25 battle deaths. Their independent variable is standardized rainfall deviation, which they calculated by dividing each year’s deviation from the long-term (1979–2008) annual mean by the long-term standard deviation. They find evidence to support the hypothesis that both positive and negative deviations from mean annual rainfall increase the likelihood of social conflict. They further find that this relationship is strongest for violent events and that positive deviations in rainfall lead to the largest increase in the likelihood of social conflict.

Although most of the studies referenced above use a country-year unit of analysis, two of them geographically disaggregate countries to grid-cells along lines of latitude and longitude. Such disaggregation is undoubtedly a valuable contribution because it captures structural differences between areas within countries. Structural differences that might have a bearing on the occurrence of conflict include population density, rural and urban dynamics, demographic and ethnic composition, dominant economic activities, topographic and floristic characteristics, and differences in rainfall patterns that are certainly not the same across countries.

Table 1: Summary previous studies of rainfall and conflict

Study	Dependent Variable	Rainfall Indicator	Unit of Analysis	Key Finding
Miguel et al. (2004)	PRIO / Uppsala	GPCP	Country year	Rainfall as an instrumental variable for economic growth is negatively correlated with risk of civil war
Levy et al. (2005)	PRIO / Uppsala	WASP	Grid cell year	“strong relationship between rainfall deviations, lagged one year, and the likelihood of high-intensity conflict outbreak”
Hendrix & Glaser (2007)	PRIO / Uppsala	GPCP	Country year	“lagged measures of increased (decreased) rainfall are negatively (positively) associated with the risk of civil war onset”
Theisen et al. (2009)	PRIO / Uppsala	SPI6	Grid cell year	No correlation between the occurrence of drought and the risk of civil war onset
Hendrix & Salehyan (2011)	SCAD	GPCP	Country year	Annual rainfall deviations positively correlated with number of social conflict events

All of the above studies, however, interrogate the correlation between annually aggregated rainfall measures and the occurrence of conflict within the corresponding or subsequent year. This is perhaps due to the nature of available conflict data, but it fails to capture a number of important dynamics. First, climate scientists predict that intra-annual rainfall variability will increase in many areas; that is, the difference between annual high and low extremes and the monthly variance are expected to increase (Meehl, 2005; Räisänen, 2002, 2005; Tebaldi et al., 2006). Furthermore, seasonal discontinuities from historic patterns are likely to be more important than annual deviations because farmers have particular expectations for timing and amounts of rainfall. When monthly, and even weekly, rainfall deviates from these historically established patterns, it is likely to be more disruptive than deviations in annual totals. Not to discount local resourcefulness, it may be possible for farmers to alter planting times or make some very short-term adaptations. Still, repeated months with significantly below normal rainfall are likely to have negative consequences on seasonal yields. Second, as discussed above in the context of swift-onset disaster, individual months with extreme amounts of rainfall can be extremely destabilizing as people are displaced from their homes and animals and crops are killed in a matter of hours or days. These short-term shocks are likely to be captured in monthly data but may not be observable in annual rainfall totals. Third, individual and group behavior may not be consistent throughout the year. For psychological and physiological reasons, people are likely to behave differently during different times and seasons of the year. As will be shown below, this holds true for the proclivity to unrest. While using annually aggregated measures may balance out many of these intra-annual or seasonal differences, it may also fail to capture important factors that facilitate or mitigate unrest.

3. Methods and evidence

3.1 Hypothesis

Given this theoretical grounding and evidence from previous studies, my hypotheses in this study are stated as follows:

- H1a: Countries experiencing overly abundant rainfall in a given month will be more likely to experience social unrest in the same month.
- H1b: Consecutive months of overly abundant rainfall within a country will increase the likelihood of social unrest in that country.
- H2a: Countries experiencing overly sparse rainfall in a given month will be more likely to experience social unrest in the same month.
- H2b: Consecutive months of overly sparse rainfall within a country will increase the likelihood of social unrest in that country.

3.2 Unit of analysis

I use country-months as the unit of analysis. The reasons for the monthly time frame are discussed thoroughly above and this innovation is an important

consideration in examining the potential future effects of climate change on social conflict. Researchers differ over the appropriate geographic unit of analysis. As discussed above, sub-national disaggregation can capture important structural differences between areas within a country. Similarly, difference in terrain, vegetation and bodies of water mean that the distribution of rainfall is not equal across countries. This has led some researchers to look for disaggregated rainfall effects (Levy et al., 2005; Theisen et al., 2009). Notwithstanding these important sub-national differences, potential violent actors are mobile; they can direct their action at strategic targets wherever they are located (Hendrix & Glaser, 2007). Similarly, potential demonstrators stage their protests where they can be most effective. To the extent possible, the events in SCAD have been geolocated, so it may be possible to perform a geographically disaggregated analysis. But nearly one third (32.7%) of all events are located in the capital city while another 21.1% are located in other major cities. Obviously, rainfall does not follow a similar pattern.

3.3 Data

3.3.1 Dependent variable: social unrest: Following the model of Hendrix and Salehyan (2011), I focus in this study on social conflict rather than the more narrow armed conflict data used in most other studies. I use the newly released SCAD (Hendrix et al., 2010), which includes data on over 6,300 occurrences of demonstrations, strikes or riots in 47 African countries between 1990 and 2009. These events are categorized by type–i.e. demonstration, riot, strike, pro- or anti-government violence, extra- or intra-government violence–by actors involved and targeted, and by motivating issue(s). These events were compiled from Associated Press and Agence France Presse news reports, the major English- and French-language news services.

Although the underlying data are the same, I operationalized the data differently than Hendrix and Salehyan (2011). While they were interested in the total number of each type of event in a given year, I focus on whether a given country is in a *state of social unrest* in a given month; that is, whether a country experienced any potentially politically destabilizing event in a given month regardless of number or specific type. I recoded the SCAD event data as a set of binary variables, one for each type of event (listed above) to indicate whether such an event occurred in a given country in a given month.[5] The indicators included in this study are: (1) the occurrence of any social unrest, nonviolent or violent; (2) the occurrence of non-violent unrest; (3) the occurrence of violent unrest.

This methodology has some distinct benefits. First, it avoids the problem of determining whether separate events are truly distinct or simply expressions of the same grievance on different occasions. Second, while it is undeniable that some occurrences of unrest are more severe than others, this methodology removes the

[5] Indicator variables were also generated for whether an event occurred that involved each of the issues or targets in SCAD, but these variables were not used in this study.

need to make that judgment. One potential source of bias, however, is that events lasting only a few days may appear in two separate months while other events lasting several days or even weeks may appear in only a single month. This is of minimal concern, however, because less than 1.3% of the events (85 events) in SCAD are seven days or less and span the end of one month and the beginning of another. In contrast, 63% of the events (3,983) are single-day events.

I should note that this definition of social unrest does not include any normative judgment. Included events are not necessarily negative, if they are the legitimate expression of popular opinions or demands and existing institutions, political and social, are resilient enough to withstand or adapt to such opinions or demands. For example, a political demonstration can lead to improved human rights, if the government is responsive to the will of the people, or a labor strike can lead to better working conditions, if the target company ultimately gives in to employee demands. Still, these events are potentially destabilizing and indicate that some segment of the population bears some grievance against the government or another group. Furthermore, as discussed later, continued non-violent unrest can increase the likelihood of violence.

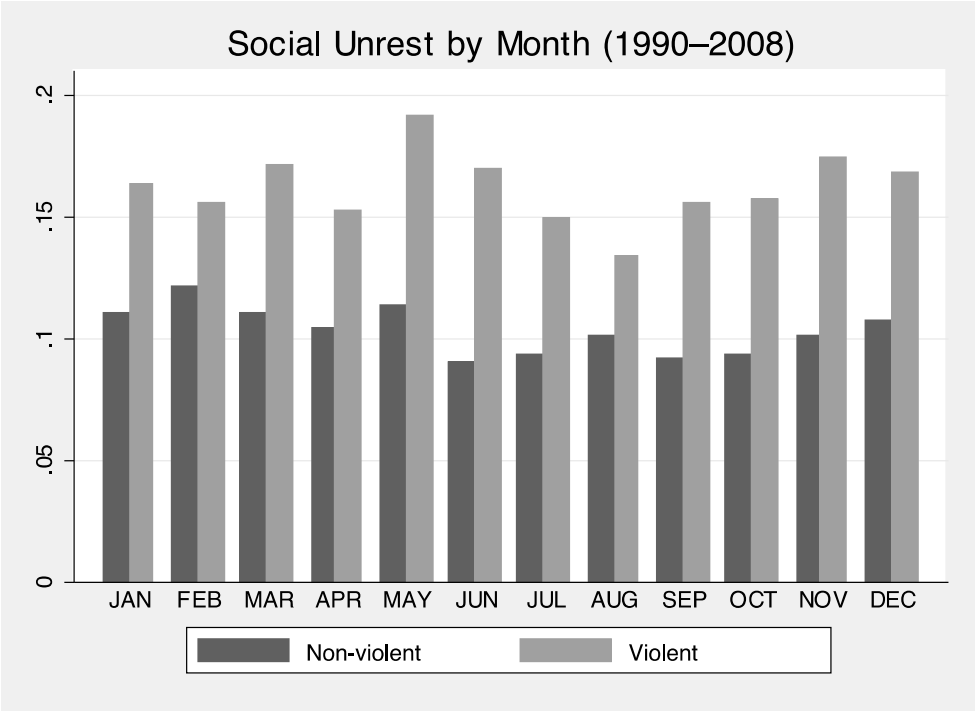

Figure 2: Social unrest in Africa by month

An examination of the distribution of violent and non-violent events reveals that the likelihood of unrest in African countries is not equal across the months of the year. Figure 2 shows that, across the continent as a whole, violent unrest is least

likely in August and most likely in May. Furthermore, this is a statistically significant difference. Upon closer examination of regional variation (Figure 3), it appears that this difference is most pronounced in coastal west Africa but is also discernible, at least in part, across north Africa and the Sahel to east Africa and the Horn; in other words the northern hemisphere, where August is generally the peak of summer.[6] These monthly behavioural differences were not, however, further dealt with in this study, except to control for months of the year in the final analysis. Nonetheless, it is an example of the type of behavioral inconsistency across months that could potentially be misattributed to others factors, if not recognized.

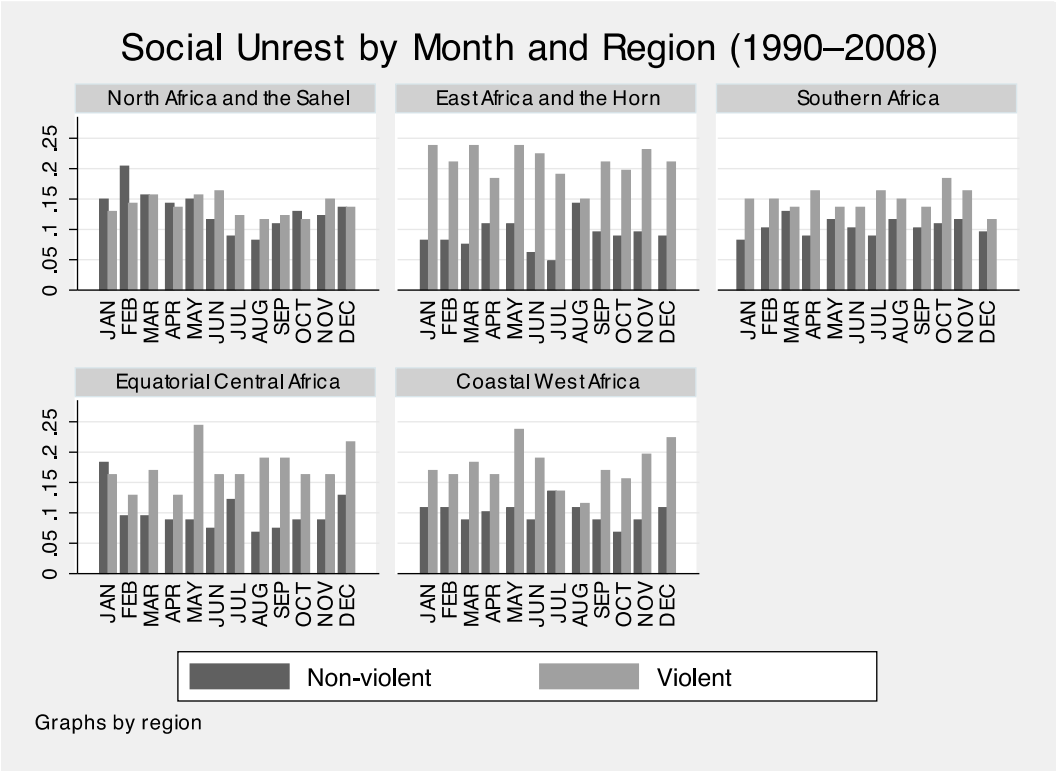

Figure 3: Social unrest in Africa by month and region

3.3.2 Independent variable: wet and dry months: The independent variable of primary interest is rainfall deviation from monthly norms. This was developed using data from the GPCP (Adler et al, 2003; "Global Precipitation Climatology

[6] One might interpret this to mean that people are less likely to strike, demonstrate or riot when it is hot outside. This is somewhat in contrast with early research into the effect of temperature on riots in the United States that found a positive correlation between riots and heat (Cohn, 1990), as well as research that has found a positive relationship between temperature and crime in England and Wales (Field, 1992). This observation and its seeming inconsistency with earlier studies certainly warrants additional research.

Project (GPCP)," 2010). This dataset is a composite of three different sources, rain gauge data and two satellite sources, and has the benefit of greater global coverage and correction of potential errors in any one data source. These data are reported at a geographic resolution of 2.5 degrees latitude by 2.5 degrees longitude, but they are aggregated to the country level for this study. The time coverage is for 360 months from January 1979 to December 2008 for all countries except Ethiopia and Eritrea, which are covered from January 1993 to December 2008.

As discussed above, Hendrix and Salehyan (2011) used *standardized rainfall deviation* as their independent variable. They argue that calculating standard deviations from the long-term mean creates an approximately normally distributed variable that is valid for both positive and negative deviations from the mean. While this may be valid at the annual level, it is not valid when examining monthly rainfall deviations because rainfall is not identically distributed across months–it is governed by seasonal variations. Furthermore, these seasonal variations differ across regions. In statistical terms, this means that the data are skewed. Although there are some exceptions, they are generally positively skewed, meaning that there is more variation at the upward end of the distribution. In other words, extremes above the mean have the potential to be more standard deviations away from the mean while deviations below the mean are limited to zero rainfall per month. Figure 4 illustrates these seasonal variations for selected countries in various regions of Africa.

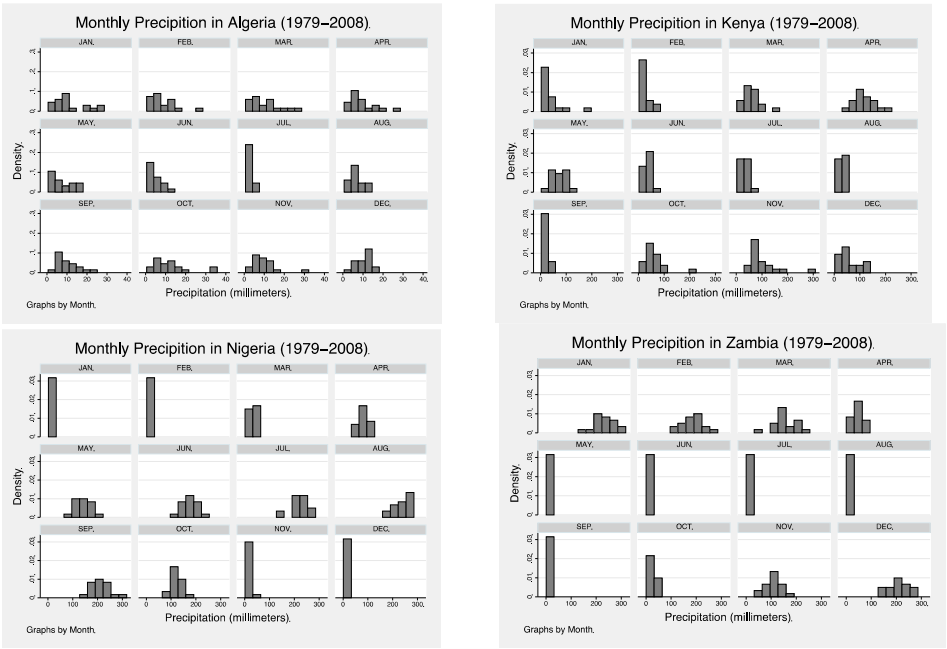

Figure 4: Distribution of monthly precipitation for Algeria, Kenya, Nigeria and Zambia

I, therefore, use a more robust determination of rainfall deviations. Rainfall totals are grouped by calendar months and country. Those months that received total rainfall in the top two deciles for each calendar month in each country are coded as experiencing unusually abundant rainfall–wet months–and those that received total rainfall in the bottom two deciles are coded as experiencing unusually sparse rainfall–dry months. For example, of the thirty months of June in Tanzania between 1979 and 2008, the six with the most rain are wet months while the six with the least rain are dry months.

Table 2 presents a cross tabulation of normal, wet and dry months with months experiencing no unrest, non-violent unrest or violent unrest. Even this basic analysis reveals some information about the data. There seems to be an increase in the number of non-violent events in wet months. Non-violent unrest occurs in 12.21% of the wet months as opposed to 9.96% of the dry months or 9.79% of the normal months.

Table 2: Social unrest and rainfall deviations

	Rainfall			
Unrest	Normal	Dry	Wet	Total
None	4,871	1,437	1,510	7,818
	74.19%	74.19%	70.93%	73.53%
Non-violent	643	193	260	1,096
	9.79%	9.96%	12.21%	10.31%
Violent	1,052	307	359	1,718
	16.02%	15.85%	16.86%	16.16%
Total	6,566	1,937	2,129	10,632
	100%	100%	100%	100%

Next, although floods can occur with less than a day's heavy rain and crops have failed in as few as ten days without rain, it is likely that the effects of unusually dry or wet months will be compounded, if they continue for more than one consecutive month. This is especially true of dry months that can lead to the depletion of water reserves over prolonged time without sufficient rain. Variables are, therefore, included for the number of consecutive wet months and consecutive dry months.

In this data there are twelve occurrences of five consecutive dry months in a single country and three occurrences each of six and seven consecutive dry months (see Table 3). In no country are there more than seven consecutive dry months. There is some indication of increased non-violent unrest with more consecutive dry months–16.67% at four, 25.00% at five and 33.33% at six–but the occurrence of such pronged dry periods is rare and the significance of these increases is questionable. The maximum number of consecutive wet months is six and similar patterns are observed in the occurrence of non-violent unrest, but now there are noticeable increases in the proportion of months of violent unrest as well.

Table 3: Social unrest and consecutive dry or wet months

Unrest Status	Consecutive Dry Months								
	0	1	2	3	4	5	6	7	Total
None	6,354	1,044	255	86	24	8	2	2	7,775
	73.36%	73.31%	73.70%	81.13%	80.00%	66.67%	66.67%	66.67%	73.45%
Nonviolent	894	151	35	6	5	3	1	0	1,095
	10.32%	10.60%	10.12%	5.66%	16.67%	25.00%	33.33%	0.00%	10.34%
Violent	1,413	229	56	14	1	1	0	1	1,715
	16.31%	16.08%	16.18%	13.21%	3.33%	8.33%	0.00%	33.33%	16.20%
Total	8,661	1,424	346	106	30	12	3	3	10,585
	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Unrest Status	Consecutive Wet Months							
	0	1	2	3	4	5	6	Total
None	6,266	1,097	294	82	27	6	3	7,775
	74.04%	71.93%	72.41%	63.57%	57.45%	50.00%	100.00%	73.45%
Nonviolent	866	169	29	17	12	2	0	1,095
	10.23%	11.08%	7.14%	13.18%	25.53%	16.67%	0.00%	10.34%
Violent	1,331	259	83	30	8	4	0	1,715
	15.73%	16.98%	20.44%	23.26%	17.02%	33.33%	0.00%	16.20%
Total	8,463	1,525	406	129	47	12	3	10,585
	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

3.3.3 Control variables: It is necessary to control for the time-dependent nature of the risk of social unrest. A country that has not experienced any type of unrest in the recent past will be less likely to experience unrest in the present. Similarly, there is likely to be some temporal inertia to unrest–that is, once it starts it may be difficult to stop. Most researchers attempt to control for such effects by the inclusion of lagged variables. I include a lag of the dependent variable as well as a variable for consecutive months without experiencing unrest and the square of consecutive months without experiencing unrest. These variables allow the inertia or deterioration effect to take either a linear or curvilinear shape, and should allow for unbiased estimates of the rainfall deviation variables. Furthermore, in the analysis model for violent unrest, I include an additional variable for the number of consecutive months of non-violent unrest because I believe that the longer non-violent unrest persists in a given country without being adequately addressed by the government, the more likely it is that violent unrest will erupt.

Finally, a collection of control variables suggested by the literature is included to satisfy curiosity. These include the Polity2 score from the Polity IV dataset (Marshall & Jaggers, 2011), the log of population (in millions), the annual population growth rate, the log of Gross Domestic Product (GDP) per capita, and the GDP growth rate (The World Bank, 2011).

3.4 Model specification

Because the dependent variable is an indicator variable for the presence of unrest in a given country in a given month, I employed a logistic regression model and report the results as odds ratios. Furthermore, I report the results of separate models for the occurrence of any social unrest and the occurrence of violent unrest. Robust standard errors were used and clustered on individual countries to control for potential systematic differences in variances between countries. Other model specifications used as robustness checks included linear probability models, and fixed and random effects models.

4. Findings and discussion

Models were run with and without the time-effect variables, with and without control variables, and with and without year and month dummies. The results for the models with the dependent variable of any social unrest – non-violent and violent – are reported in Table 4. The coefficients are reported as odds ratios, meaning that effects above one indicate a positive effect on the odds of experiencing unrest, while below one are negative effects. The time controls are always strikingly statistically significant and have substantively large effect sizes. The occurrence of some form of unrest in the previous month is the best predictor for the occurrence of unrest in the present month. There is also strong evidence of a linear relationship between the number of consecutive months without unrest and the odds of occurrence of unrest. Although the square of the term is significant, it has very little substantive effect. Each additional month without unrest decreases

Table 4: Logistic models of the likelihood of any social unrest

Variable	Model 1A	Model 1B	Model 1C	Model 1D	Model 1E
Unrest (t-1)	3.201***		3.189***	2.585***	2.503***
	(0.497)		(0.494)	(0.240)	(0.245)
Consecutive months without unrest (t-1)	0.940***		0.940***	0.956***	0.957***
	(0.006)		(0.006)	(0.006)	(0.006)
Dry month		1.014	0.992	0.994	0.996
		(0.066)	(0.065)	(0.064)	(0.065)
Consecutive dry months		0.999	1.013	0.985	0.990
		(0.042)	(0.084)	(0.080)	(0.081)
Wet month		1.158**	1.166**	1.171**	1.154**
		(0.072)	(0.076)	(0.072)	(0.074)
Consecutive wet months		1.107***	1.080**	1.089**	1.081**
		(0.042)	(0.041)	(0.042)	(0.042)
Polity2				1.025*	1.013
				(0.015)	(0.018)
Polity2 (squared)				0.999	1.001
				(0.003)	(0.003)
Log of population (mil)				1.581***	1.595***
				(0.135)	(0.136)
Population growth				0.004	0.036
				(0.022)	(0.181)
Log of GDP pc				1.088	1.067
				(0.095)	(0.103)
GDP growth				0.291	0.121*
				(0.306)	(0.141)
Year dummies	no	no	no	no	yes

Month dummies	no	no	no	no	yes
Constant	0.312***	0.327***	0.296***	0.074***	0.031***
	(0.033)	(0.048)	(0.031)	(0.045)	(0.019)
N	10227	10227	10227	10227	10227
pseudo log-likelihood	-5206.635	-5830.833	-5200.407	-4975.898	-4928.372
Chi square	142.22	9.457	168.191	370.220	24929.239
p(Chi square)	0.000	0.051	0.000	0.000	0.000

Coefficients reported as odds ratios; (cluster robust standard errors on countries); significance level: 0.1*, 0.05**, 0.01***
Source: GPCP v2; SCAD

Table 5: Logistic models of the likelihood of violent unrest

Variable	Model 2A	Model 2B	Model 2C	Model 2D	Model 2E
Violent Unrest (t-1)	3.978***		3.967***	2.847***	2.762***
	(0.845)		(0.839)	(0.374)	(0.368)
Consecutive months without violent unrest (t-1)	0.960***		0.960***	0.972***	0.971***
	(0.006)		(0.006)	(0.005)	(0.005)
Consecutive months of non-violent unrest	1.516***		1.512***	1.325***	1.304***
	(0.121)		(0.122)	(0.098)	(0.094)
Dry month		1.007	0.995	0.990	0.977
		(0.095)	(0.098)	(0.102)	(0.104)
Consecutive dry months		0.975	0.989	0.985	0.983
		(0.049)	(0.049)	(0.048)	(0.048)
Wet month		1.043	1.026	1.020	1.018
		(0.104)	(0.098)	(0.092)	(0.090)
Consecutive wet months		1.108**	1.102**	1.100**	1.100**
		(0.054)	(0.047)	(0.045)	(0.045)
Polity2				1.036**	1.031
				(0.015)	(0.021)
Polity2 (squared)				0.997	0.998
				(0.003)	(0.003)
Log of population (mil)				1.708***	1.715***
				(0.165)	(0.168)
Population growth				0.011	0.030
				(0.063)	(0.175)
Log of GDP pc				1.067	1.062
				(0.114)	(0.120)

GDP growth				0.200 (0.257)	0.131 (0.162)
Year dummies	no	no	no	no	yes
Month dummies	no	no	no	no	yes
Constant	0.171*** (0.023)	0.176*** (0.029)	0.167*** (0.022)	0.038*** (0.026)	0.021*** (0.012)
N	10227	10227	10227	10227	10227
pseudo log-likelihood	-3885.753	-4396.104	-3882.766	-3678.320	-3652.599
Chi square	93.795	7.288	144.545	377.596	4686.209
p(Chi square)	0.000	0.121	0.000	0.000	0.000

Coefficients reported as odds ratios; (cluster robust standard errors on countries); significance level: 0.1*, 0.05**, 0.01***
Source: GPCP v2; SCAD

the odds of unrest in the following month by between seven and nine percent. Amongst the control variables, only log of population size is robustly significant, although there is some evidence for a significant effect of the Polity2 score and GDP per capita.

Of the rainfall deviation indicators, only deviations on the wet side of normal appear to be statistically significant, and this significance is robust to the inclusion of control variables, substantively important and in the hypothesized direction. The odds of the occurrence of some form of unrest in a given country are estimated to be 15.4% to 17.1% greater in months with unusually abundant rainfall than in normal or dry months, and this effect is significant at the 95% confidence level.[7] This is fairly strong evidence in support of hypothesis 1a. Additionally, there is evidence for a linear relationship between consecutive wet months and social unrest. Each additional consecutive wet month increases the odds of the occurrence of social unrest by between 8.0% and 10.7%, and this effect is always significant at the 95% confidence level. This is evidence in support of hypothesis 1b.

There does not appear to be a statistically significant change in the odds of unrest in unusually dry months, at least in this specification.[8] In other words, there is no evidence to support hypothesis 2a. Neither is there support for hypothesis 2b. There is no observed statistically significant effect of additional dry months on the probability of the occurrence of unrest.

Similar models were also run with the violent unrest dependent variable and the results are presented in Table 5. Aside from the different dependent variable, the main difference between this set of models and the earlier models is that the time effects of violent and non-violent unrest are disaggregated. This is operationalized by the inclusion of two variables: one variable for consecutive months without violent unrest, which includes months with no unrest and with non-violent unrest, and another variable for consecutive months with non-violent unrest. Unsurprisingly, each additional month without violent unrest reduces the odds of violence in the following month by between five and seven percent. This effect, however, is overwhelmed by non-violent unrest, each additional month of which increases the odds of violent unrest from 30 to 50 percent.

[7] The square of consecutive of wet months is not included in the final models because there is no evidence of a curvilinear relationship between consecutive wet months and the odds of occurrence of unrest. The inclusion of the square term resulted in a finding of no significance for both consecutive wet months and its square term but together these variables were found to be strongly jointly significant.

[8] There is some evidence that the number of consecutive dry months lagged by three to twelve months may increase the likelihood of at least non-violent unrest. These results, however, require further exploration and are not reported in this study.

In this model, the wet month variable is not found to be statistically significant. The variable for consecutive wet months, however, is statistically significant. Each additional consecutive wet month increases the odds of the occurrence of violent unrest by between 10.0% and 10.8%, and this effect is always significant at the 95% confidence level. This is further evidence in support of hypothesis 1b but not for hypothesis 1a. This may be partially understood in conjunction with the findings from the first set of models and the finding that consecutive months of non-violent unrest increase the odds of violent unrest. It is plausible that the occurrence of a flood event may lead to an increased risk of social unrest, but that this unrest is initially non-violent in nature. If, however, people do not receive relief, their concerns are not addressed, or they cannot come to a peaceful resolution of some sort, this unrest is likely to escalate into violence. As was the case with the first set of models, unusually dry months, either alone or in succession, are not found to have a statistically significant effect on the occurrence of violent unrest. There is still no evidence to support hypothesis 2a or 2b.

These findings are broadly consistent with the earlier literature. The correlation between overly abundant rainfall and social conflict in an individual month could plausibly be the result of acute resource deprivation stemming from a swift-onset event such as a flood. This is consistent with the causal mechanisms associated with natural disasters, as described by Brancati (2007) and Nel and Righarts (2008). There is also some support for the pastoralist cattle-raiding hypothesis of Meier et al. (2007). The increased probability of violent conflict with consecutive months of overly abundant rainfall might suggest that cattle fattened on good pasture over several successive months become increasingly attractive to cattle raiders. I question, however, whether overly abundant rainfall of the type captured by the definition of ‘wet month’ employed in this analysis–rainfall in the top two deciles of given calendar months in a given country–would create significantly fatter cows than merely sufficient or even moderately abundant rainfall. Additionally, cattle are lost in floods just like other resources. Although the mechanisms are not necessarily mutually exclusive, they are distinctly different and should be examined further. This is entirely possible by looking into the event descriptions in SCAD, but such investigation is outside the scope of the current study.

In contrast, the slow-onset nature of a drought event may take longer to manifest social unrest for a number of reasons. First, it may take more than a single month of failed rains to significantly affect crop production. Second, if the causal pathway to social unrest is expected to operate through increased food prices, crop failure in one area may take longer to manifest in national or regional markets. Furthermore, the economic effects may be transferred to other countries or regions, if agricultural products are bound for foreign markets. Finally, the longer time from event to conflict offers more opportunity for intervention or mediation by governments or other institutions. This finding is consistent with that of Theisen et al. (2009) related to drought and civil war. I further maintain that both of these

Table 6: Logistic models of the likelihood of any social unrest in IGAD & EAC sample

Variable	Model 1A	Model 1B	Model 1C	Model 1D	Model 1E
Unrest (t-1)	0.757***		0.762***	0.497***	0.413***
	(0.107)		(0.103)	(0.120)	(0.136)
Consecutive months without unrest (t-1)	-0.081***		-0.082***	-0.053***	-0.051***
	(0.018)		(0.018)	(0.015)	(0.013)
Dry month		0.196	0.241*	0.217	0.246*
		(0.140)	(0.140)	(0.142)	(0.130)
Consecutive dry months		-0.062	-0.081	-0.115	-0.113
		(0.103)	(0.084)	(0.084)	(0.079)
Wet month		-0.062	-0.028	-0.004	0.011
		(0.154)	(0.174)	(0.188)	(0.184)
Consecutive wet months		0.090	0.101	0.094	0.070
		(0.081)	(0.066)	(0.071)	(0.087)
Polity2				0.076***	0.070*
				(0.028)	(0.040)
Polity2 (squared)				-0.002	0.003
				(0.006)	(0.007)
Log of population (mil)				0.072	0.097
				(0.201)	(0.208)
Population growth				1.298***	1.366***
				(0.293)	(0.297)
Log of GDP pc				-1.541*	-1.870**
				(0.929)	(0.922)
GDP growth				-8.402**	-
				(3.310)	(3.955)
Year dummies	no	no	no	no	yes
Month dummies	no	no	no	no	yes

Constant	-0.908*** (0.258)	-1.010*** (0.289)	-0.962*** (0.233)	-7.805*** (1.942)	-9.597*** (2.099)
N	1744	1744	1744	1744	1744
pseudo log-likelihood	-936.262	-1023.047	-933.632	-879.228	-857.098
Chi square	66.586	13.016	226.512	–	–
p(Chi square)	0.000	0.011	0.000	–	–

Coefficients reported as odds ratios; (cluster robust standard errors on countries); significance level:
Source: GPCP v2; SCAD

Table 7: Logistic models of the likelihood of violent unrest in IGAD & EAC sample

Variable	Model 2A	Model 2B	Model 2C	Model 2D	Model 2E
Violent Unrest (t-1)	0.755***		0.774***	0.478**	0.353
	(0.172)		(0.163)	(0.215)	(0.259)
Consecutive months without violent unrest (t-1)	-0.064***		-0.064***	-0.047***	-0.044***
	(0.019)		(0.019)	(0.013)	(0.012)
Consecutive months of non-violent unrest	0.472***		0.471***	0.310***	0.274***
	(0.093)		(0.084)	(0.080)	(0.102)
Dry month		0.355***	0.457***	0.422***	0.448***
		(0.125)	(0.134)	(0.141)	(0.173)
Consecutive dry months		-0.073	-0.090	-0.133	-0.143
		(0.151)	(0.118)	(0.113)	(0.107)
Wet month		-0.057	-0.022	0.003	-0.003
		(0.297)	(0.327)	(0.328)	(0.334)
Consecutive wet months		0.045	0.056	0.041	0.039
		(0.086)	(0.081)	(0.081)	(0.111)
Polity2				0.052***	0.037
				(0.020)	(0.028)
Polity2 (squared)				-0.007	-0.002
				(0.006)	(0.007)
Log of population (mil)				-0.040	0.004
				(0.194)	(0.214)
Population growth				-8.553***	-9.632**
				(2.527)	(3.807)
Log of GDP pc				1.429***	1.498***
				(0.299)	(0.373)
GDP growth				-1.660	-2.598**
				(1.304)	(1.251)

Year dummies	no	no	no	no	yes
Month dummies	no	no	no	no	yes
Constant	-1.321*** (0.341)	-1.583*** (0.319)	-1.410*** (0.297)	-8.612*** (1.949)	- (2.095)
N	1,744	1,744	1,744	1,744	1,744
pseudo log-likelihood	-728.874	-816.032	-724.487	-686.051	-661.884
Chi square	525.845	38.602	–	–	–
p(Chi square)	0.000	0.000	–	–	–

Coefficients reported as odds ratios; (cluster robust standard errors on countries); significance level:
Source: GPCP v2; SCAD

findings are consistent with Hendrix and Salehyan (2011). Because their study examined the effects of rainfall annually it might be expected that they would find effects of too little rain that would not be reflected in a monthly analysis.

This study has, so far, demonstrated a strong relationship between overly abundant monthly rainfall and the likelihood of social unrest. While this finding seems consistent with the theoretical mechanisms associated with swift-onset disasters such as floods, it is far from conclusive. A comparison of the distribution of event types–demonstrations, riots, strikes etc.–and issues cited as the source of tension[9] reveals no significant differences across SCAD events occurring in normal, dry or wet months. This is somewhat confusing. If, indeed, unrest in wet months were associated with resource conflict or with resentment towards the government for failure to deliver relief supplies, I would expect to observe an increase in the number of events citing 'food, water and subsistence' as a primary issue or with 'anti-government violence' events. This is not, however, the case. Wet months seem to experience an increase in the likelihood of any unrest regardless of type of event or issue cited.

Limiting the analysis to the nine countries of the Intergovernmental Authority on Development (IGAD) and the East Africa Community (EAC)[10] leads to interesting changes in the results. Table 6 shows the results of the models with the dependent variable for any unrest. In all models, the effect of wet months is no longer significant. The effect of consecutive wet months is not significant, either. This indicates that too little or too much rain does not have the same effect in all areas. The area of East Africa and the Horn varies in climate from the arid and semi-arid regions of North Sudan, Somalia, and northern and eastern Kenya to the consistently wetter areas of the Great Lakes. There is no reason to think that the effect of rainfall would be the same across these different climatic regions.

Perhaps more interesting are the findings on the effect of little rainfall on violent conflict in East Africa and the Horn. As indicated in Table 7, areas that receive too little rain in a given month are between 55 and 64 percent less likely to experience violent conflict than months with normal or more than normal rainfall, and this effect is significant at the 99 percent confidence level. In other words, I find no evidence to support any of the casual mechanisms outlined above in the IGAD and EAC countries.

[9] SCAD includes coding for fourteen potential issues: (1) elections; (2) economy, jobs; (3) food, water subsistence; (4) environmental degradation; (5) ethnic discrimination, ethnic issues; (6) religious discrimination, religious issues; (7) education; (8) foreign affairs/relations; (9) domestic war, violence, terrorism; (10) human rights, democracy; (11) pro-government; (12) economic resources/assets; (13) other; (14) unknown, not specified.

[10] The member countries of IGAD are Djibouti, Ethiopia, Kenya, Somalia, Sudan and Uganda. Eritrea was a member but has been suspended for the past four years. The EAC consists of Burundi, Kenya, Rwanda, Tanzania and Uganda. Eritrea and Djibouti are not included in this sample because SCAD does not include data for these countries. Although South Sudan has recently become independent, Sudan was a single country for the entire period under analysis here.

Examination of individual SCAD events leads to further questions about potential causal mechanisms. Although it is not possible in a single article to examine all the events in SCAD, or even all events occurring in wet months, I did some initial investigation into the twelve instances of five consecutive months of overly abundant rainfall. Four of these instances were in East Africa–Somalia, Kenya, Uganda and Tanzania–in March of 1998. There was an especially severe El Niño event in East Africa in late 1997 and early 1998 that led to widespread flooding across the region. Cooperative for Assistance and Relief Everywhere (CARE) claimed that it was the worst flooding in 40 years in Somalia, that 200,000 people were affected and the flooding in northeast Kenya limited access to isolated villages and interrupted delivery of aid to Dadaab refugee camps (CARE, 1998). This is exactly the type of shock that we might expect to lead to social conflict. An examination of SCAD events occurring in March 1998, however, might lead one to question this. Only the events occurring in Somalia seem to have any relation to food or shelter–in one event SCAD reports that gunmen shot at a food plane. Events in Kenya were student protests at the lowering of medical school admission requirements and against the arrest of classmates. Other protests were over tax rate increases. In Tanzania, Muslims protested at the police cancellation of a scheduled demonstration, and in Uganda, Sudanese prisoners of war rioted against alleged illegal detention. Apart from the events in Somalia, which has experienced such chronic unrest over the past few decades, it is difficult to assign causality to rainfall; these events seem to have no connection to flooding or natural disaster. Another plausible explanation is simply that potential protesters were kept indoors throughout months of consistent rains until; when the weather eventually cleared they took to the streets and gave voice to grievances unrelated to rain in any way. Similarly, in his study of the effects of weather and crime, Field (1992) found no significant effects of rainfall on crime, but suggested that rain may keep potential criminals indoors and thus serve only to postpone their criminal activities.

Given this evidence, or lack thereof, it is clear that more research is needed to shed light on the causal pathways leading from rainfall to social unrest. This research should be both quantitative and qualitative. Empirical studies can further investigate potential intermediate effects, while case study research can more thoroughly analyze individual occurrences of extreme rainfall that led to social unrest.

5. Conclusion

Through the innovative use of ‘country months’ as the unit of analysis, this article has advanced the literature on rainfall and conflict in both methodological and substantive ways. Methodologically, I first observe that the longer a country stays at peace, the less likely unrest is to occur and the longer a country experiences non-violent social unrest, the more likely it is that violence will occur. In other words, social conflict within a society, or the absence thereof, has temporal inertia. While this finding is not surprising to anyone who studies such issues, it should not be

forgotten and should be taken into consideration in any analysis. Second, I have demonstrated that intra-annual disaggregation can illuminate important patterns in human behaviour. That is, the likelihood of unrest is not consistent across seasons and months, and this should be addressed analytically.

Substantively, this article has provided further evidence for the proposition that overly abundant rainfall can significantly increase the likelihood of social unrest. This issue is, however, far from conclusively settled, in large part because the causal mechanisms still remain unclear. The observed correlation between overly abundant rainfall and social unrest within a single month suggests that the causal connection may be the shock of flood-induced acute scarcities. In contrast, no significant effects of overly sparse rainfall have been observed in this study. This is likely to be because any potential effects are farther removed, either temporally or geographically, and operate through mediating factors that have not been considered here. Further research is needed into these potential mechanisms but, again, drought and flood are different phenomena and this difference should be acknowledged. Alternatively, the explanation for the observed correlation between overly abundant rainfall and social unrest may lie in the psychological effects of weather. Simply put, maybe people just fight in the rain.

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Pastoralist Resources, Conflict and Climate Change in the Horn of Africa

Wario R. Adano

Abstract

Mobility is the single most important pastoralists' adaptation to spatial and temporal variability in rainfall and rangeland resources in the Horn of Africa. The region has experienced continued conflicts and violent casualties. The conflicts in the region are attributed to increased populations, growing competition over resources, ecological stress and climate change adversaries. The competition for environmental resources under climate variability in arid areas is stated to be greater among pastoralists, who are most vulnerable to climate related risks. This paper examines long-term trends in pastoral conflict in the dry lands of northern Kenya. The data for the study was collected through extensive review of archival sources and individual interviews. The results show no evidence of increasing violent conflict incidents in the long-term perspective. Rather, long-term historical rainfall and violent conflict data consistently show more violent casualties in wet years than in dry years, and wide deviations of inter-seasonal and inter-annual variability in rainfall. The claims of increasing violent pastoral conflicts and scarcity-causes-conflict arguments in the dry lands are empirically unsupported. Instead, it is the recent subdivision of communal grazing areas to ethnic territory, through the creation of more administrative boundaries that severely limits pastoral mobility, hinders efficient use of resources, constrains the pastoral production system and alters traditional mechanisms for negotiating access to rangeland resources. The current changes in the use of pastoral commons along ethnic lines has produced a new reality which triggers conflict over territory and lead to marginalisation of pastoral groups and increased poverty. An understanding of temporal variability and patterns of pastoral conflict would demand better weather monitoring and early warning systems, in order to enhance herd mobility and improve human security and livelihoods in the dry lands. The current climate change phenomenon and increased variability in the dry lands calls for better local knowledge of fluidity in property rights and access to pastoralist resources, climate change tailored adaptations and cooperation over available resources.

1. Pastoralism in the dry lands

Mobile pastoralism is the most dominant and viable way of life in the Horn of Africa's dry lands, as arable agriculture is feasible only in pockets of highland areas. Pastoralists are by definition mobile, which entails movement of people with their livestock. Mobility and migrations are absolutely essential if pastoralists are to survive in the dry lands.

Pastoralists obtain a substantial part of their livelihood and human welfare needs from livestock assets, which in turn are heavily dependent on communally-shared rangeland resources. The availability of rangeland resources is, in turn, influenced by erratic rainfall that varies considerably between and within years (Livingstone, 1991). The spatial distribution of rainfall in the rangelands also has direct implications both for livestock mobility and the grazing pressures of the rangelands. The production potential of livestock and the rangeland resources in the arid pastoral areas are low due to erratic patterns and low amounts of rainfall. Since livestock significantly contributes to production of the pastoralist communities, herd size affects human welfare and therefore livestock wealth accumulation is a desirable goal. For this reason any restocking effort is stated as a major cause of pastoral conflict during drought periods (Osamba, 2000), a time of heightened scarcity of key rangeland resources.

Rainfall is generally minimal in Africa's dry lands (Scoones, 1995). It varies greatly in time and space in terms of both inter-annual and inter-seasonal scales. As a result of such environmental influences, the dry land areas are harsh and difficult environments prone to high agricultural production risk. The per capita livestock wealth of pastoral households has continued to decline over the years due to recurring droughts (Adano & Witsenburg, 2005; Dietz et al., 2001; Fratkin & Roth, 1996). Today, pastoralists rank high in terms of poverty levels when assessed on social welfare indicators such as educational achievement and nutritional status among children less than five years old. They also frequently face security challenges, and inter-ethnic conflicts that are attributed to competition for, or getting access to blocked former, natural resources. The creation of administrative boundaries (Schlee, 2010) or nature preservation areas also often constrain access to natural resources in the community-shared pastoralist areas.

This paper draws on research carried out between 2007 and 2010 in the Turkana and Marsabit Districts of Northern Kenya. Review of grey literature, focus group discussions and conflict management related issues was used to collect information. In addition, archival sources and participatory observations have been used to obtain quantitative data and other qualitative issues of resource related conflict.

2. Natural resources and conflicts in pastoral areas

Northern Kenya is largely inhabited by over a dozen different pastoralist groups from several distinct ethnic backgrounds, including Turkana, Samburu, Rendille, Gabra and Borana. Over many decades, the region has been characterised by chronic insecurity and development neglect attributed to conflict and inter-ethnic rivalries (Leff, 2009). To date, there are divergent views regarding the relationship between the availability of natural resources and the incidence of pastoral conflict (Witsenburg & Adano, 2009). Although no consensus exists on the connection between resource scarcity and pastoral conflicts, the mainstream stipulates that conflict between pastoralist groups result from limited availability of, or access to,

resources (Mkutu, 2008). Access to natural resources has diminished because of a whole range of interrelated causalities. For example, an ever-increasing demand for resources may result from population growth, ecological degradation and competing claims over rangeland resources (see Homer-Dixon, 1999). On the supply-side the trend is of diminishing resources because of natural and man-made disasters, such as climate change.

Beside divergent views on the relationship between the availability of natural resources and the incidence of pastoral conflict, the main arguments about pastoral conflict can be framed as follows: First, severe droughts and outbreaks of animal diseases regularly occur in the dry lands. These factors cause livestock wealth differentiation between households and between different ethnic groups (Fratkin & Roth, 1996). Second, the need to rebuild herds after periods of heavy livestock losses provides a strong motivation for inter-ethnic raids and violent pastoral conflict (Osamba, 2000). According to this way of reasoning the periods after drought episodes would show increased incidence of pastoralist conflict, because of many livestock mortalities during droughts motivating a greater re-stocking effort through raiding ethnic others. Others also remark that pastoralist communities fight especially during the dry spell because livestock tend to concentrate in the limited sections of the rangelands with pasture and water (Mwangi, 2006), while others have pointed out a well site is sacred place where violence is strictly controlled (Helland, 1997). The fighting argument builds on the common belief that predatory herd accumulation is one of the main causal factors of pastoral conflict. According to this view livestock raiding constitutes a vehicle for climbing out of herd-poverty as well as for gaining a culturally endorsed social status (Mieth, 2007). It has been suggested that the increased frequency and intensity of droughts in the past decades, and associated livestock losses in the dry lands have increased inter-ethnic conflicts and the number of violent killings in recent years compared to the distant past.

The pastoral system of production is based on a flexible property rights regime, negotiable access to resources and on herd mobility that optimises production by rearing diverse livestock species and exploiting the varied patchiness of rangelands (Scoones, 1993). The pastoral system is based on herd mobility that transcends national borders. Studies have consistently shown that the pastoralists have lost dry season fallback grazing areas due to other land uses in Africa. The creation of protected areas and national boundaries tends to disadvantage the pastoralists' strategic and opportunistic use of rangeland resources. The reduction of herd mobility due to restrictive policies results in rangeland degradation (Homewood, 1995), which subsequently is followed by increased livestock deaths. The low per capita wealth of pastoral households' challenges human needs obtained from livestock, puts the pastoral way of life at a critical point and raises doubts about the survivability of pastoralism. Thus, geopolitics clearly becomes a factor in environmental conflicts and a cause of environmental insecurity as political powers define territories and create physical boundaries that hinder herd mobility.

Water is the single most important resource in the Horn of Africa's dry lands. The different water sources and their surrounding rangelands are of immense value to the pastoral peoples in the dry seasons. The real shortage is of grass and browse for the animals, as in time of drought people and animals often die of starvation but not of thirst. Thus, the connection between water availability and pastoralism is an obvious one. Coping and living with water scarcity is normal and a daily life experience in the dry lands. Local elders have over centuries perfected skills to negotiate use of communally shared resources, such as shallow wells and pastures (United Nations Development Programme (UNDP), 2010). These notwithstanding, there is a popular claim that pastoralists fight over scarce natural resources. This is hardly accurate in situations where these resources had nothing to do with conflict; political instigation is entirely to blame for this misunderstanding. There is need for closer investigation into those who actually engage in fighting and those who benefit from conflict among pastoralists.

To date, empirical evidence on the ethnic (violent) conflicts in Africa has tended to rely on isolated incidents (Adano & Witsenburg, 2008), weakening its validity. The trend in conflict incidence has yet to be clearly understood, and a better analysis of the underlying causes of the problem is urgently needed. This paper uses case studies from northern Kenya to assess the significance of natural resources, particularly pasture and water availability directly linked to rainfall, as the cause of conflict in the semi-arid areas. It specifically describes the cause-effect relationship between long-term climate change and conflict. The results are expected to have relevance for finding long-term solutions, which address the challenges of resource-related conflict in the Horn of Africa.

3. Rain and conflict in pastoralist areas of northern Kenya

The different views concerning conflict and resource scarcity are testimony to the complex issues that have continued to inform academic debate (Homer-Dixon, 1999; Kahl, 2006). In the Horn of Africa, conflict has persisted due to a number of factors, including the proliferation of small arms, failed governance, and a growing population (Kaplan, 1994; Mkutu, 2008). Cattle rustling, political differences, ethnic differences and, foremost, natural resource related causes, were also seen to trigger conflict (Osamba, 2000; Schlee, 2008). Opinions on the relative importance of such causal factors differ widely in the conflict literature.

In Northern Kenya, ethnic violence relating to cattle rustling is erroneously seen as an extension of the traditional practice of cattle rustling among pastoral people (Osamba, 2000; Mkutu, 2008). Violent conflict among the pastoral groups inhabiting this region (estimated to be over 6 million) has existed since the 19th century. This form of violence has led to displacement of many people from their homes, and caused many human and livestock deaths, and the destruction of property and local economies (Pkalya et al., 2003). What prompts mass killing is

routinely viewed as competition for the diminishing supply of natural resources, especially pastureland and water (Kagwanja, 2001). The conflicts pit several pastoralist groups living in the northern Kenya and the neighbouring countries of Uganda, Sudan and Ethiopia against each other. The negative impact of climate change[1] on the survival of pastoralism has also been stressed in recent years. The connection between rainfall and violent conflict in the Marsabit and Turkana districts is the investigation that the paper addresses in the next section.

3.1. Long term trends in rainfall in the dry lands

Both Marsabit and Turkana districts are located in northern region of Kenya. About 75% of the total land surface area in the districts is classified as rangeland and the main form of land use is extensive livestock grazing. In addition, 80% of the districts' residents are pastoralists who derive a substantial share of their livelihoods from livestock or livestock related industries. The districts are also located in the driest region of the country, and experience a bi-modal rainfall pattern (long rain March-May, and short rain October-December), with two dry seasons. The mean annual rainfall ranges from 200 mm to 1,000 mm depending on the elevation. Despite being highly erratic and unpredictable, spatially and temporally, rainfall remains the single most important factor that influences the productivity of rangeland resources, livestock and human welfare.

Over the entire data period, Figure 1a above shows that rainfall for Marsabit is declining; this corresponds with increasing resource scarcity. Figure 1b shows that annual rainfall for Turkana is increasing, indicating decreasing resource scarcity. This subsection tests if there is a statistical difference in the mean annual rainfall between past decades, by splitting the periods of the available data into two periods. The annual rainfall recorded in the Marsabit district, for the periods 1921-1964 and 1965-2009, does not show a significant statistical difference (t-value: 1.78; statistically *not* significant). But, the annual rainfall recorded for the Turkana district, for the periods 1919-64 and 1965-2009 does show a significant statistical difference (t-value: 2.16, statistically significant). On the basis of these findings it would be correct to state that there is no statistically valid decline in rainfall for Marsabit but there is a certain rainfall increase for Turkana over the periods under consideration. Indeed, the Intergovernmental Panel on Climate Change (IPCC, 2007) suggests that rainfall is likely to increase in East Africa, but also there are good data to show that temperature is going to rise in the region as well. This will result in more evaporation and the region will become drier, even if rainfall increases as figures for Turkana show.

[1] In this paper, climate change is used to refer to a long term or permanent change of the mean precipitation and temperature.

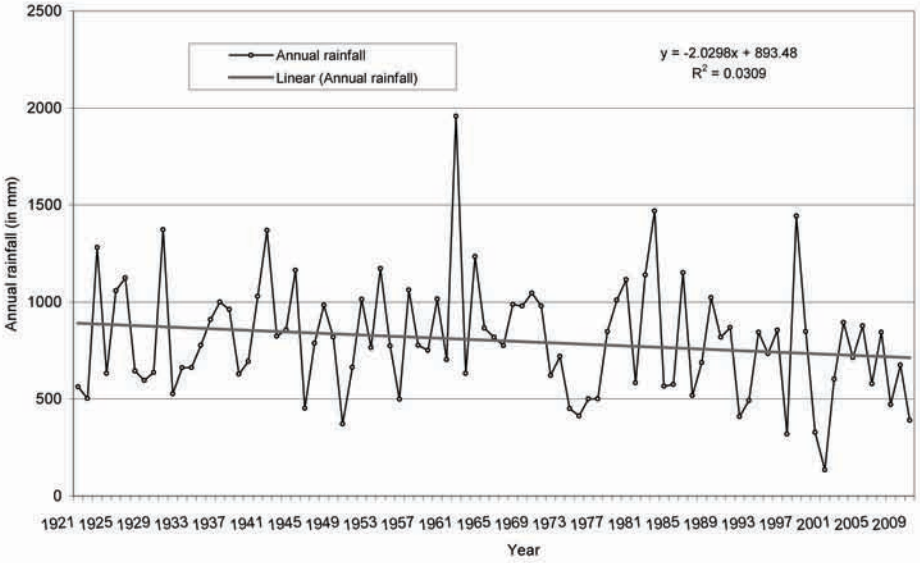

Figure 1a: Rainfall trend for Marsabit in Northern Kenya

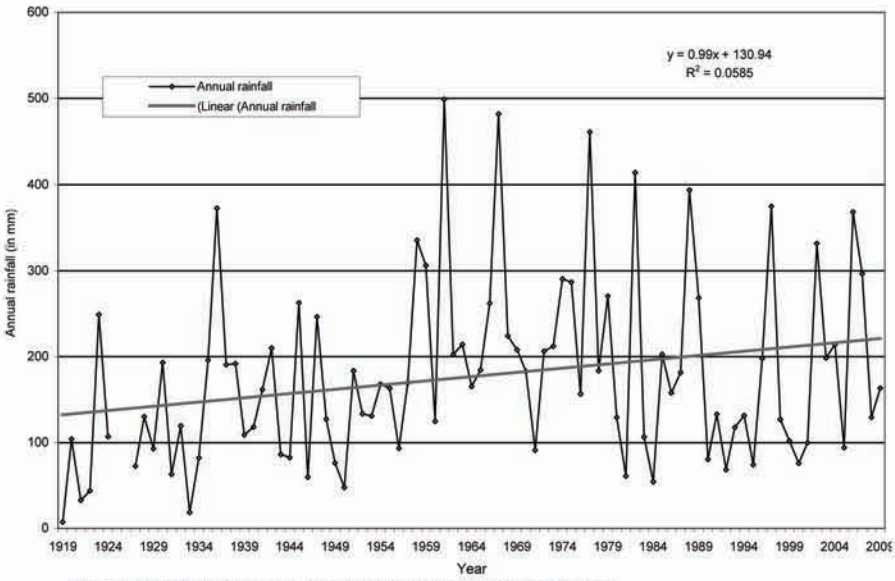

Figure 1b: Rainfall trend for Turkana in Northern Kenya

3.2. Trends in violent conflict in northern Kenya's dry lands

The root causes of conflict in pastoralist areas are principally competition for shrinking pasture and water resources (Greater Horn of Africa (GHA), 2005, p. 1). These conflicts revolve around livestock and involve the use of arms. It is also argued that over the years pastoralist conflicts have become more frequent and unpredictable, exhibiting a marked escalation in violence, and resulting in an

increased number of violent casualties in recent years (Leff, 2009). Here, this paper tests the claim that pastoral conflicts have increased in recent years, compared to the distant past (Figures 2a & 2b).

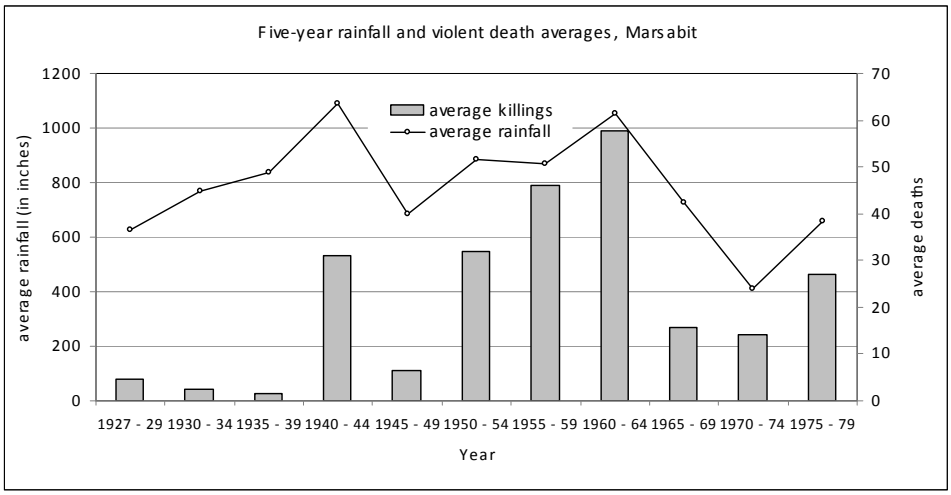

Figure 2a: Conflict and rainfall trend in Marsabit district, 1927 - 1979

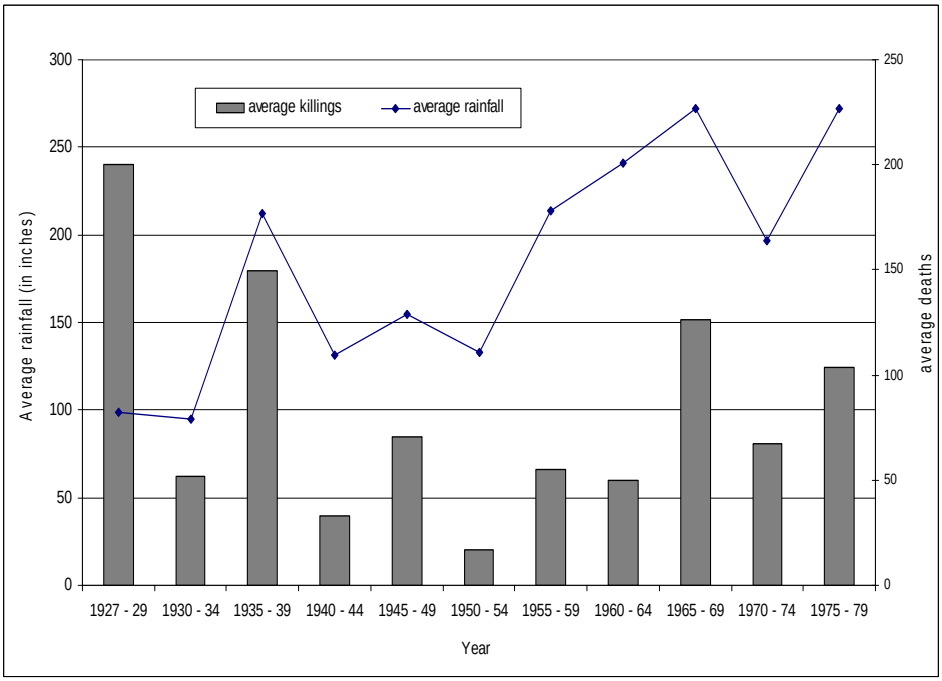

Figure 2b: Conflict and rainfall trend in Turkana district, 1927 - 1979

One major result from Figures 2a & 2b is the close association between average numbers of people killed (violent conflict) and the average rainfall,[2] both in Turkana and Marsabit in the long term perspective. In other words, years that receive relative increase in rainfall amount also show a corresponding increase in casualties of violent conflicts or intensity of conflict as demonstrated by the number of killings. These results are consistent with Witsenburg & Adano (2009) who found that more violent conflicts occur in the dry lands during the rainy season, as opposed to the dry season. The Turkana data shows increasing rainfall trend over the past decades, but this was not accompanied by an increase in incidents of conflict. There were more conflict incidents between 1950 and 1964 in Marsabit, and a slight rise in conflict incidents between 1965 and 1979 in Turkana, which clearly move with changes in rainfall (Figures 2a & 2b). The data also show wide variability in rainfall, especially for Turkana. The results however show no evidence of more violence occurring in the recent years than in the distant past. However, since the conflict incidents have not been normalised for changes in the human population, that is changes assessed in per capita terms to allow comparison of individual incidents over time, any strong statement cannot be made. But conflict incidence in later years would become lower if population numbers were taken into account. Thus, in light of this result, while the popular argument is that scarcity induces conflict, in fact it seems that resource scarcity might, under certain circumstances, bring about cooperation between competing resource users. Considering the fact that sub-Saharan Africa is more vulnerable than any other region to climate-induced water scarcity, Africa should now be on the frontline of climate change adaptation, in order to cope with diminishing resources.

It should be pointed out that today raids are not carried out for the same reasons as in the past, where herd accumulation, appreciation of the raiders by other members of the group or the need to earn praise for killing an enemy dominated. Violent pastoral conflicts in northern Kenya have escalated, not only in terms of the level of violence, but qualitatively as well: where deliberate killing is the aim (Mwangi, 2006). Conflict has become a way to express resentment against unfair treatment by the government, and a means to create new boundaries that exclude ethnic others from traditionally-shared local commons. For the marginalised pastoralists there is no other way to express resentment of perceived injustices, apart from through violent protest and raiding. Conflict is also about opportunity, in the presence of security lapses. If one group goes out fighting over land, and sees unattended goats or donkeys, there is no way they will leave them behind. In other words, during raiding event there is likelihood that the raiding party steals or loots anything left for opportunity. Thus, the various causes of conflict show up as conflict incidents in the region at different opportune times.

[2] It is possible to carry out a similar long-term investigation of the relationship between temperature and conflict incidents given relevant data are available. However, no temperature data is available for any of the areas over the same period for which there is rainfall and conflict data.

3.3. Seasonal fluctuations in violent conflict and rainfall

Pastoral conflicts are linked to and influenced by a combination of factors that complicate the nature of the problem, and challenge the understanding of the causal factors and their interaction effects. Almost all claims about conflict and resource scarcity have been based on analysis of only a limited number of incidents and the statistical relationship between resource scarcity and pastoral conflicts is limited. That is, empirical evidence regarding scarcity of resource induced conflict is quite limited (Adano & Witsenburg, 2008; Meier et al., 2007; Witsenburg & Adano, 2009).

Adano & Witsenburg (2008) investigated long-term trends and carried out empirical testing of the relationship between resource scarcity and violent conflict among pastoralists in northern Kenya. The key research questions were: Have inter-ethnic raids and incidences of violent conflict increased with the downward trends in rainfall and substantial decline in livestock wealth in per capita terms? And, do conflicts mainly occur during and after droughts, and during dry seasons? The authors considered both seasonality and general long-term trends of the association between natural resources and inter-ethnic conflict. This approach was inspired by the recognition that inter-ethnic conflict can be addressed with regard to resource availability (with rainfall indicating the level of resource availability) and the dynamic changes in livestock wealth.

The study found a negative correlation between violent conflict and drought, as well as in the immediate post-drought periods. Yet these are the periods when scarcity is experienced most, and livelihood tensions in pastoral communities are expected to be high. Violent conflict clearly occurs more often in rainy seasons and during relatively good years, than in dry season and during droughts. The evidence further shows twice as many people are likely to be killed in a violent conflict during a relatively abundant rain years (i.e. in a time of relative resource abundance) than in drought (drier) years. This result supports the view that violent conflict diminishes when resource scarcity increases. Thus, it seems clear that there is time lag between the times of scarcity (during a dry year) and when that group raids (during a subsequent wet year). This finding is supported by herders' own explanations that during difficult times (droughts) animals are weak, survival in the dry lands gets harder, and people are more inclined to stop fighting, patch up their differences, renegotiate access rules and rights, and reconcile to cooperate (Witsenburg & Adano, 2009). This suggests that when survival becomes difficult, like during drought, herders decide to defer raids until an appropriate opportune time in the future. During the rainy seasons animals are in a good condition and strong enough to withstand long distance treks, rain washes away tracks and rich vegetation cover reduces visibility. Unlike in the dry seasons when demand for labour is usually high, the rainy seasons' manpower demand for tending livestock is low in the pastoral areas, and the additional labour is potentially available which can engage in raiding activities. Each, or all of these factors in combination, increases the chances of successful raiding in the rainy seasons.

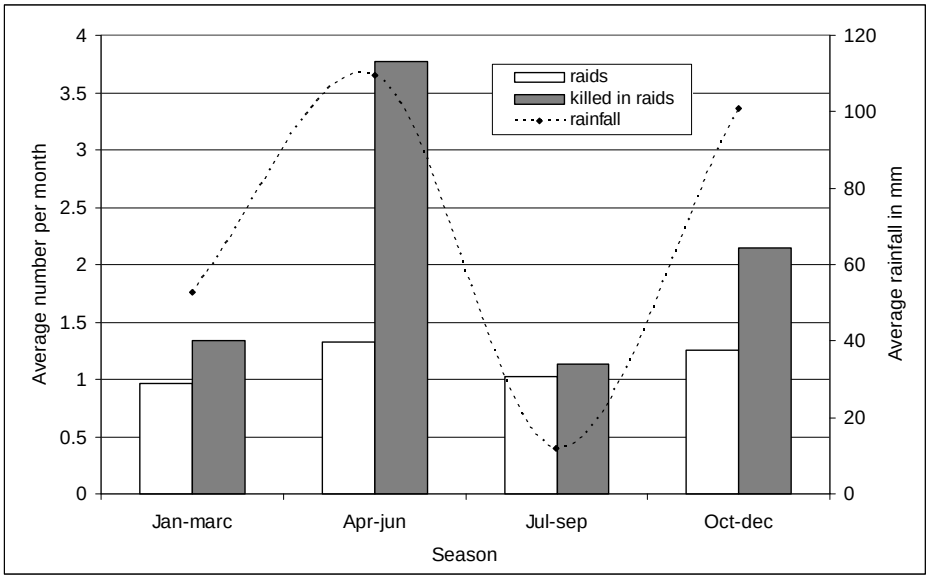

Figure 3: Average seasonal fluctuations in killings and rainfall, 1960-1994
Source: Witsenburg & Adano (2009, p. 525)

Based on these results, the view that the scarcity of natural resources causes conflict among pastoralists is not supported. One may argue that scarcity in one year may cause conflict in the subsequent years. In this regard too, the results reveal no direct association between rainfall and conflict incidence in a lagged form, and in the occurrence of violent conflict in years following a drought/flooding—when pasture and water resources in the dry lands become less scarce. Thus, the claim that pastoral conflict is induced by scarcity of natural resources may not hold always true (Osamba, 2000); so the cause for these conflict remains an intriguing question.

This evidence raises the question why pastoralists may not fight over resources they do not have or only have in short supply; thus hinting at instances of human cooperation in the face of resource scarcity in the dry lands. This remark resonates with observation in the neighbouring Mandera district, that negotiation for access, water use rights and pasture during droughts are common and the neighbours are not expected to dishonour such a request (UNDP, 2010, p.14), as long as control over resources are clearly defined and not contested.

Moreover raiding is generally seen as a ‘bad thing’ that should be addressed at the community-level. However, according to some informants warriors are often secretive about their raiding behaviour and they do not always inform elders about when they intend to launch a raid on neighbouring communities, which is a common feature of raiding practice among the pastoral groups (see Almagor, 1979). This means that the local elders are not always in control of the raiders, and, therefore, their attempts to ensure a peaceful co-existence between the groups are challenged. Yet other informants emphasised the role of women, who compose

nasty poems and provocative war songs, which humiliate warriors and encourage their raiding practices. These issues, taken together, are instrumental in providing insights into the nature and intensity of ethnic rivalry between pastoral people, and in future should attract the attention of researchers and intervention efforts. Conflict resolution and peace-building strategies between contentious pastoral groups in the Horn should, thus, aim either to ease tension or pre-empt conflict.

4. New forms of conflict in the dry lands

Theoretically, the traditional common land tenure systems were considered an obstruction to development and western management rules had to be imposed to bring about efficient land use (Hardin, 1968). The 'Tragedy of the Commons' justified colonial and post-independence government policies which led to privatisation of rangelands—that often failed at the expense of pastoralists (Adano & Witsenburg, 2005; Homewood, 1995). For instance, the tragedy of the commons argument was used to encourage the settling of nomadic pastoralists (Hardin, 1968; Lamprey & Yusuf, 1981). It was also thought legitimate to provide an alternative system of production for pastoralists rather than leaving them roaming about with excessive numbers of poor quality herds (Brown, 1963). Since the 1980s the rhetoric of nomads must settle has become questionable and put in doubt the rationale of settlement policies (Salzman, 1980). The emergence of localised environmental degradation around water points and permanent settlements in the dry lands (Schwartz et al., 1991), due to reduced pastoral mobility, are later used as an argument to discourage sedentarisation. The negative accounts of external development interventions show how colonial government policies have encouraged the settlement of nomadic people and, in so doing, have disrupted the traditional pastoral setting, causing more environmental degradation. However, Ostrom (1990) explains that self-governing institutions under common-property regimes are able to regulate common pool resources, such as water and pasture in the rangelands. Much of the conflict in the pastoral areas occurs along ethnic border-lines, where institutional structures for resource management are themselves weak, or have been weakened by external influences, including politics.

Ethnic violence relating to cattle rustling in northern Kenya, as described above, is erroneously seen as an extension of the traditional practice of cattle rustling among pastoral people (Mkutu, 2008; Osamba, 2000). Generally, conflict in the pastoral areas' dry lands is attributable, among many other factors, to culture (the age-grade system)[3], the proliferation of small arms, socio-economic marginalisation, raiding motivated by predatory wealth accumulation and assertion of historic claims to grazing territory (Katsuyoshi & Turton, 1979). In addition, the fast growing human

[3] An age-group among the pastoral groups is, theoretically, initiated to fight off the neighbours from their territory and raid livestock (the principal pastoralist asset) from the neighbours. The more an age-group executes successful raids and brings in livestock, the more praises they would collectively receive.

population and a myriad of social, economic and political changes have become causes of conflict in Kenya's dry lands.

The creation of political administrative boundaries, without consultation with the local populations, features a new form of conflict on top of already existing causal factors. This process has led to unclear boundaries that fuel new forms of (violent) conflicts that in turn pit different ethnic groups against each other—even in places where communities co-existed peacefully for several decades sharing typically scarce dry land resources (see UNDP, 2010 for Mandera district). Thus, the recent creation of administrative territorial borders in the dry lands apparently becomes an additional factor that triggers (violent) conflict, serves to intensify pre-existing tensions, or exacerbates conflict between neighbouring ethnic groups. The following three examples demonstrate how demarcation of administrative boundaries in the pastoral areas has resulted in conflict, with negative impact on the lives and livelihoods of the people concerned.

4.1. Moite on the shore of Lake Turkana

The creation of administrative boundaries in Kenya dates back to the time of British rule. During the colonial period, the colonial administration created boundaries, which split ethnic groups. Afterwards there was resistance but despite the creation of new boundaries people realised that they could still use local resources (Personal Comm., Hilary, 2008). The colonial administration recognised and respected what local people said (UNDP, 2010, p.11) and consulted them when they drew up new boundaries. Today's border making process is different, unclear and not transparent.

Different ethnic groups have over the years used Moite, an area bordering the south-western shores of Lake Turkana. By 2008, Moite has been already a sub-location for 20 years. The Turkana and Gabra have been grazing together in the region for many years. Then, all of a sudden in 2008, the government said that Moite area of Loiyangalani Division, and the new boundary would be the road going to Sibiloi National Park, on the south-western shore of the lake. This process was not transparent. This demonstrates that boundaries in the pastoral areas are never considered with the care and the caution they deserve. It seems that the politicians sit down together and decide where the boundary passes, simply using a map, but without enough local knowledge to anticipate what problems the boundary might cause in the dry lands. Often the community that is marginalised by a boundary protests against its imposition afterwards. As one informant interestingly observed:

> It is the customary or traditional ownership of the water point that demarcates the ownership of the land. And these wells are situated in such a way that the Gabra have a well on the Turkana side, and Turkana have a well at the Gabra side. It is not measured by kilometres or roads. The neighbouring communities know even

> though water holes are owned by a specific group pasture belongs to everyone (Interview Hilary, a local and civic worker for peace building organization, August 2008).

The Gabra are in the north of Moite and Turkana on the south, but each group has wells on each other's land. Pasture belongs to anyone as property right regimes are flexible and access rights to resources are negotiable between the groups. The wells make the pasture accessible. The people were confused by the new administrative boundary in the pastoral areas, so the boundary had the wrong effect, as regards to how adjacent communities relate to each other and access resources at different times of the year. In effect, the grazing land has diminished because even though there is a lot of grazing land, people cannot access it. The development of administrative boundaries in the pastoral areas is certainly another and very serious way in which pastoralism is being killed off, because boundaries naturally close off pasture water points to some groups. In light of the pastoralists' opportunistic use of rangeland resources, influenced by the wide spatial and temporal distribution of rainfall, the politically-driven sub-division of the rangelands into parcels has a negative consequence for pastoralism.

According to the Constitution of Kenya (2008), the creation of a sub-location comes with position of a local chief in line of provincial administration. After Moite became a new sub-location and a Turkana chief was employed, neighbouring groups feared that they would not be able to use the water point anymore. Suddenly ownership rights of range resources have become the overriding priority and people have started to resent this. When a new administrative boundary is created, it implements a process of control and ends the use rights for other groups—which becomes a source of contention between the different groups. The fear is real; as the Chief is an ethnic Turkana, Moite automatically became exclusively for the Turkana and a no-go zone for other ethnic groups. The decision to make Moite a sub-location cannot be reversed, and this remains a bone of contention not only about water, but also about land. The Turkana feel this land is now theirs, through their claim for use and ownership rights of resources, and that other groups should stay away. The other groups will not accept this, because they need to access water like before. The fighting will only stop if other groups can access the water.

When a sub-location is created and a local chief put in place, he waves a flag over the land. However, it is not the central government which is creating boundaries and employing chiefs, rather it is the politicians in close liaison with the local-level administrators who use this system to oppose each other. They use government officials, such a local chief, to alter ownership, use rights and access to resources, such as water and pasture, and to fuel conflict. Usually new boundaries are not needed by local communities; rather they result from the actions of a politician who wants to gain mileage in the electoral process. In many cases it would have been better if the sub-division had not been created. Demarcating territorial

boundaries with a view to providing improved local services in the pastoral areas is a false goal, as the practice is at odds with the indivisible and flexible nature of the pastoralists' communal rights to land.

4.2. The Turbi massacre of northern Marsabit area

Several reports indicate the complex causes and nature of the violent conflicts among communities in the borderlands (Bizenuh, 2008; Witsenburg & Adano, 2009). Between 1940 and early 1960s, the southern Ethiopia borderland experienced a growing contestation among the pastoralists for access and control over key natural resources. In Kenya, pastoral conflicts were blamed on the introduction of the grazing territory, on the lines of earlier grazing blocs introduced in the 1920s in the pastoralist inhabited areas, including the northern Frontier of Kenya, which was then British territory. In 1965, the Borana claimed they were the only victims of violence in the region, but on several occasions they attacked neighbouring ethnic groups, such as the Garri and Gabra (Adugna, 2009; Bizenuh, 2008) and looted stock, contributing to the violence in the southern Ethiopian borderlands.

On 12 July 2005 raiders from the north (northern Kenya-southern Ethiopia) attacked the Turbi trading centre in northern Marsabit District, killing more than 90 people (Mwangi, 2006). This is now referred to as the Turbi massacre. It was then argued that raiding between these groups was unusual. Indeed, the communities around Turbi had peacefully lived together and shared resources until the Borana families and villages near Turbi trading centre moved over night. Children were taken out of school and become internally displaced persons, as their families moved to the Walda trading centre. It is not difficult to guess who informed and moved these people the evening before the early morning raid on Turbi village. The northern Kenya borderland became hostile since the 2005 Turbi Massacre (Wachira, 2009). An illustration of this is the illegitimate operation of the Oromo Liberation Front (OLF) in the southern Ethiopia-northern Kenya borderlands for a couple of years already (Salih, 1999). In a regional peace meeting in August 2009, Officer-in-Charge and Governor of the Borana Zone of the Oromia Regional State of Ethiopia blamed the conflict along the borderlands on the presence of OLF fighters in the region. The problem of boundary dispute and scarcity of resources are partly blamed for the violent attack on Turbi village. At two separate meetings, held in Sololo on 16 July 2005, the issue of boundary creation and the subsequent splitting of Moyale from the Marsabit District in the mid-1990s cropped up. In meetings called to find answers to the genesis of the clashes a civic leader from Moyale requested the provincial administration to clarify on which side of the border Turbi village lay. The leader emphasised that:

> We are still bitter for having been thrown out of our area [Turbi]. It is common knowledge that it is us [Borana] who developed the area and drilled the water hole ... We want you, Bwana (Sir) PC, to tell us whether Turbi is in Moyale or in Marsabit district (Njeru, 2005, p. 11).

The leader claimed that the water point near Turbi and the school, among other social amenities, had been developed with his constituents' funds but that the area has been pushed out by the government through the influence of a local politician from a neighbouring community. Thus, the question of boundary disputes is intricately intertwined with competition for scarce resources, as the groups dispute boundaries that affect the ownership of water points; at the very least, the resource question has been used as a pretext for conflict. Consequently, this conflict has pitted the Borana and Gabra communities against each other.

4.3. Tana River in south-eastern Kenya

The creation of a boundary is also in line with the Tana River problem, which touches on the difference between ownership and use rights. While use rights is good, ownership rights create tension because a new boundary creates a resource map and limits access. Ownership rights also exist in the pastoral areas, but it is the use rights that are more important to the herders. In peaceful times, a Pokomo herdsman can go anywhere and use the water and the land. He knows he is in a land belonging to a specific group, but he is there to graze and then go back. In other words, within the traditional property rights regime use rights of natural resources override ownership rights as in principle everybody has an access right, but the underlying thing is ownership of land in areas which are permanently settled.

Land and water resources in the Tana River area have been a cause of conflict between pastoralists (Pokomo) and farmers (Orma) (Martin, 2005). The government embraces the principle of private ownership rights, which creates a lot of problems in the dry lands. Increasingly, political power determines access. The government's land adjudication undermines the pastoralists' flexible access rights to resources. As a result, pastoralists fear the loss of dry season access for their livestock. The source of the problem arises from the fact that privatization is not compatible with pastoralism. In particular, pastoralists demand access to water and riverine pastures, especially during the dry season. This situation is similar to creating a sub-location and giving private ownership rights to one group while excluding others. If the other groups own a well in the created sub-location, they will not be in a position to access those resources.

All the three cases described above, and many other land sub-divisions across the country, illustrate how recent sub-division of former communal grazing areas into ethnicized territorial parcels through the creation of administrative borders has created conflict over territory (Schlee, 2010). This trend is widespread across Kenya. Several violent conflicts have resulted from clashes between neighbouring clans within Mandera district over the demarcation of new districts and constituencies, and land redistribution following creation of administrative borders (UNDP, 2010). The demarcation of land parcels has been the subject of conflicting claims because the process assigns exclusive use rights to land over which several

clans (subsections of an ethnic group) have had historic and overlapping resource rights. As a result, demarcation of parcels in the rangelands increases uncertainties associated with pastoral land-based livelihoods. In the same vein, we can draw parallels between the processes of land demarcation along ethnic divides in Kenya with the neighbouring Ethiopia. Adugna (2010, p. 48), for example, describes how, following the constitution of the federal government, ethnic-based administration zones divided communities and intensified existing inter-ethnic violent conflicts in pockets of south-western Ethiopia.

As elsewhere, the pastoral groups living in the Horn of Africa's dry lands use seasonal mobility as a major traditional coping strategy that depends on extensive and opportunistic use of the widely dispersed rangeland resources. Administrative borders attempt to determine control over time-invariant resources and thus, when combined with the politics of ethnic differentiation lead to tension and conflicts between neighbouring groups (cf. Schlee, 2010). The creation of ethno-boundaries, therefore, severely limits herd mobility, hinders efficient use of dry land resources, constrains pastoral production, and alters traditional access mechanisms and negotiation over territorial and resource claims. Reduced herd mobility has major potential consequences for livestock mortality and poverty of pastoralists in the dry lands.

5. Concluding remarks

Today, a few thousand pastoralist groups in Africa face a bleak future more frequently than ever before. Some scholars view population growth as the main cause, while others see frequent droughts, reduced access to former rangeland resources, and unfavourable political and economic conditions as other potential explanations. Such situations are worsened by the failure of governments to address and resolve competing claims and rights for rangeland resources but instead, at times, exacerbate contests over territorial spaces and associated resources between neighbouring pastoralist groups.

Since the mid-1990s, a number of development organisations and local groups have started discussing the conflict and security problems in northern Kenya. This is imperative, as various development plans and initiatives failed to take-off due to lack of security. That conflicts between pastoralists are mostly motivated by declining per capita livestock wealth or induced by scarcity of natural resources is a widely held view. Recurring droughts that diminish livestock populations, growing competition over natural resources, and constrained access to rangeland resources are often seen to be interlocked with cycles of raids and livestock rustling. Yet little empirical evidence exists on the relationships between scarcity of natural resources and pastoral conflicts based on long-term time-series data.

The causes of conflict in pastoral areas are complex to understand according to micro/macro-level categories. This paper has shown that more people are likely to

be killed in violent conflict in wet periods of relative abundance than in the dry times of relative scarcity. The incidence of conflict is not higher in the recent past compared to the distant past. Even so, whether climate change constitutes a serious security risk would depend not only on the climatic variables per se but also very much on the interplay between several causal factors of conflict, including the role of traditional institutions, pace of social change and political influences, the trade in small arms, and religion. In the absence of a framework to broker peace evolving out of local peace-building processes and committed conflict avoidance, finding a lasting solution is as difficult as costly. For example, water conflicts are most likely to occur when the capacity of governance structures and local institutions to regulate resource access are outstripped by changes such as abrupt extreme weather. In this regard, weather monitoring and early warning systems will be critical to enhance herd mobility and improve security in the pastoralist areas, especially in inter-ethnic and administrative border lands.

The causal factors of conflict are varied across groups and over time, but neither can the problem be isolated from today's global issues such as proliferation of small arms, increased connectivity in information flow or differences in geopolitics in the Horn of Africa. For example, the lack of a common pastoral policy and ad hoc approach to disarmament efforts has blocked a systematic approach to security concerns in the borderlands. Pastoral conflicts therefore seem to recur because of inefficiencies ingrained in the poor enforcement of the rule of law by African countries individually or collectively. In particular, the recent government's subdivisions of the pastoral lands into new territorial administrative units in Kenya have led to both ethnic disputes over such decisions and conflicts of resentment. What clearly emerges is the role of 'formal politics'; local politicians create violent conflict by manipulating ethnicity and emphasizing the politics of ethnic difference for electoral gains, and by the creation of ethnic-based boundaries in the dry lands. The recently-established border lines are emerging as causes for conflict in addition to the traditional reasons behind pastoralist conflicts. The government particularly needs more commitment in resolving such conflicts, by involving people in decisions regarding demarcation of new administrative units and territorial land parcels in order to nurture peaceful co-existence between neighbouring pastoralist groups.

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Investigating the Link between Environmental Scarcity and Conflict in Darfur[1]

Paul Omondi

Abstract

Although it is widely acknowledged that environmental factors are seldom, if ever, the sole cause of conflict, there is increasing recognition that the effects of climate change contribute to security risks as a result of changes in environmental conditions and increased competition for natural resources. This paper takes the view that an important impact of these environmental stresses in Darfur was resource scarcity. In turn, increased shrinkage of livelihoods undermined the resilience capacity of the local communities to drought-related shocks, creating opportunities for conflict. The central aim of this paper is to interrogate the resource scarcity-security relationship, focusing primarily on two types of evidence. The first relates to rainfall records, which is primarily associated with supply-induced scarcity. Rainfall patterns showed a declining trend and variability from the mid-1970s through to the 1980s. The second relates to population pressure, which is primarily associated with demand-induced scarcity. On this evidence, demographic trends show that a marked increase in population density since the mid-1970s has put pressure on both the pastoral and agricultural livelihood systems. Placing the above into perspective, this paper provides the basis for a more holistic appreciation of the Darfur problem, and for looking at the ongoing conflict in depth.

1. Introduction

Darfur continues to experience violent conflict that severely affect human security, resulting in considerable loss of life and displacement. Over the years, the conflict has become more widespread, in terms of frequency and geographical spread. It is widely recognised that the conflict has been driven by a range of factors, including such disparate dimensions as economic and political marginalization and land use and ownership differences. In recent years, however, much research has tended to situate the conflict within the context of environmental risks. Geographically, Darfur lies on the Sudano-Sahel belt,[2] a region on climatic stress thresholds, where insecurity is also a highly salient issue.

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[2] Sudan-Sahel Belt is an ecological zone spread across the continent from Senegal to Sudan. The zone

Ideally, understanding the climate change context of the continuing conflict calls for more analytical attention to the underlying causes of the localised violence prior to the outbreak of the civil war. The climatic patterns associated with climate change in Darfur started to manifest themselves from the early 1970s. These changes occurred during a time when the region witnessed an increase in the frequency of localised conflicts. The combination of persistent drought and population growth resulted in shrinkage of natural resources and livelihoods and, consequently, movements and possible resettlement of the northern Darfur populations into southern Darfur. The argument here is that these conditions nurtured the circumstances in which ethnic cleavages and violence seethed since the mid-70s, contributing to conflict as a coping strategy against scarcity.

It is clear that, over generations, the inhabitants of Darfur had devised livelihood techniques and coping mechanisms that were suitable and sustainable for the region, with the apparent goal of mitigating potential security risks between the pastoralists and farmers. Mamdani (2007) points to "community-level split inside Darfur, between nomads and settled farmers, who had earlier forged a way of sharing the use of semi-arid land in the dry season." Unfortunately, the climatic and demographic transitions that set in towards the late 1970s seemed to have generated consequences that could no longer be covered by these strategies. With the disintegration of these livelihood techniques and coping mechanisms, "co-operation turned into an intense struggle over diminishing resources". In a large way, therefore, the resultant conflict can be viewed as a result of diminished ability of the inhabitants to cope with the emerging ecological challenges.

This paper seeks to further the understanding of the relationship between climate change and security in Darfur prior to the outbreak of the large-scale civil war in 2003, and to provide some insights on the changing dynamics of pastoralist-farmer interaction and emergent risk of conflict. Whereas political dynamics and governance issues have also influenced the security circumstances in a major way, the main focus of this paper is on the ecological dimension as a possible causal link in the insecurity situation. It is therefore important to note that this paper's intention is not to present environmental pressures as the singular cause of the conflict, overlooking the role of high politics.

The remaining sections of this paper have the following structure: section two provides a brief conceptual review relevant to an understanding of environmental degradation, scarcity and conflict in Darfur. Section three provides a discussion on environmental degradation, scarcity and conflict in Darfur, first sketching out the broad ecological context of Darfur. The section then proceeds to examine the context and drivers of localized conflicts in the region. Finally, this section interrogates the resource scarcity-conflict relationship, specifically focusing on the

constitutes the transition between the hyper-arid Sahara desert to the north and the savanna regions to the south.

role of rainfall and population. Section four looks at response to climatic risks in the context of adaptation versus conflict. More specifically, it examines the dynamics of the pastoralist-farmer relationship, providing an assessment of the community coping and conflict management strategies, and examining the factors that appeared to have contributed to the collapse of these mechanisms. The paper concludes with section five, providing two key conclusions: first, that reduced resilience and adaptive capacities resulted in the collapse of the community coping and conflict management strategies, in turn creating deep-seated ecological traps that, over time, transformed the pastoralist-farmer relationship into one of inter-ethnic competition. Second, that the ethnic dimension of the conflict is largely a manifestation of competition for resources.

2. Conceptual issues

2.1 Scarcity and conflicts: Exploring the links

This paper uses the 'scarcity' paradigm as a framework for analyzing the ways in which climate change mediates between environmental stress, competition over natural resources and conflict. Although environmental degradation does not, of necessity, mean scarcity, epistemological perspectives on resource scarcity closely link it with environmental degradation. The operative definition offered by the UN Interagency Framework Team for Preventive Action succinctly sums up 'environmental scarcity' as "a situation where renewable resources–such as water, forests or productive land–are degraded or decreasing (in the sense that the resource is used faster than it is replenished)" (UNEP, 2010, p. 4). Homer-Dixon, Boutwell & Rathjens (1993, p. 42) provide broad account of the means through which scarcity is generated. Arguably, three processes that constitute sources of scarcity include the decrease in quantity and quality of resources at a rate faster than their renewal, population growth, and unequal resource access.

The conceptual development of scarcity underscores the interrelated issues of resource competition and violence, and has of recent gained prominence as a central point for clarifying conflict motives. A Situational Analysis Report from the UN Office for the Coordination of Humanitarian Affairs (UNOCHA) (2009, p. 3) observed that the pressure on scarce resources like water, biomass and pasture has become the trigger for most conflicts in the pastoral regions of Africa.

Progress made in the exploration of environmental security over the past two decades has presented different ways of understanding environment, scarcity and conflict. Making a contribution to the understanding of the connection between environment and conflict, Libiszewski (undated, p. 12) defines environmental conflict as "…traditional conflicts induced by environmental degradation". According to Libiszewski, environmental conflicts are characterised by the principal importance of degradation in one or more of the following fields: overuse of renewable resources; overstrain of the environment’s sink capacity; impoverishment of the living space (Ibid). Certainly, Homer-Dixon and the

Toronto Group deserve tribute for attempting to disentangle the scarcity-conflict dynamics. They operationalized three possible pathways that link environmental change or scarcity to conflict. These are classified as: 'Simple scarcity conflicts' in reference to resource wars between and within states; 'Group-identity conflicts' in reference to conflicts arising from scarcity-induced population movements; 'Deprivation conflicts' in reference to scarcity induced by economic hardships and socio-institutional disruptions.

Harris (cited in Herrero, 2003) adjudicates the environment, scarcity and conflict model, drawing attention not just to the resource scarcity-conflict relationship, but ties the occurrence of conflict to diminished resilience and capacity to cope with the climatic transitions. He posits that conflict, like many other cultural features, was a matter of cultural adaptation to conditions of demographic pressure and scarcity of natural resources. From this perspective, we can view environmental conflict as a legacy of resource crisis shaped by cultural adaptation rather than, as he observes, "an instinctive reaction to ecological stress" (Herrero, 2003, p. 8). Viewed in this manner, it is instructive to see conflict as a coping strategy against livelihood shrinkage. Harris' conceptualization offers one fundamental conclusion: that conflict is but a means of coping with or adapting to livelihood shrinkage. This position indicates that any useful analysis of environmental conflict requires the contemplation, in combination, of both ecological transition and capacity to cope.

2.2 Theoretical alliances

The theoretical alliances that gather around the scarcity-conflict argument lend themselves to the Malthusian assumption, which underlines a possible causal link between population increase, resource shortage and violence. This neo-classical posture is represented quite explicitly in two schools. One school is represented by the aforementioned Toronto Group. Thomas Homer-Dixon, who is essentially the most renowned representative of this school, outlines four social effects of environmental degradation. These are: a decrease in agricultural production; general economic decline; population displacements, and disruption of institutions and social relations. Accordingly, the group argues, these social effects generate and reinforce instability, leading to violent conflict.

The second view on the scarcity-conflict viewpoint emerges from the 'Environmental Conflicts Project' (ENCOP) of the Swiss Federal Institute of Technology in Zurich and the Swiss Peace Foundation in Bern. The mainstay of ENCOP is that environmental conflicts manifest themselves as fighting over resources, although the emphasis here is on environmental change or degradation rather than on the concept of resource *per se*. The ENCOP school highlights degradation as occurring in the following ways: overuse of renewable resources; overstrain of the environment's sinking capacity (to deal with pollution), and impoverishment of the living space. Ultimately, degradation leads to environmental conflicts that "manifest themselves as political, social, economic, ethnic, religious,

ideological or territorial conflicts, or conflicts over resources or national interests, or any other type of conflict" (Libiszewski, undated:12).

The 'Toronto Group' is generally credited with attempting to more thoroughly elucidate the concept of environmental scarcity. Howard and Homer-Dixon (1996, p. 5) differentiate three variants of scarcity. These are: demand-induced scarcity caused by population growth or increased per capita resource consumption; supply-induced scarcity, caused by degradation and depletion of environmental resources; and structural scarcity, caused by an unbalanced distribution of resources that severely affect less powerful groups in the society. The three types of scarcity provide important conceptual clarifications of the scarcity-conflict nexus in Darfur. The three paragraphs below briefly discuss the three types of scarcity and the possibilities of increasing the risk of violent conflict in Darfur.

Supply-induced scarcity: Supply scarcity was generally caused by a decrease in rainfall. This was chiefly visible in considerable rainfall variations and decline from the 1960s through to the 1990s. One important implication of these climatic changes was diminished resilience of the nomadic groups to cope with the climatic variations, subsequently leading to conflict as a coping strategy. The most notable is the great drought and famine of 1984-85 that "led to localized conflicts that generally pitted pastoralists against farmers in a struggle for diminishing resources, culminating in the Fur-Arab war of 1987-89" (IRIN, 2007).

Demand-induced scarcity: Population is identified as an important factor in demand-induced scarcity. In Darfur, this can be better appreciated by looking at the demographic shifts. Driven by population growth, the period 1973-83 saw considerable expansion in population density, growing from 4 to 10 people per square kilo meter. As the amount of rainfall declined, large groups were forced to migrate from the northern to the southern parts of Darfur, in so doing setting deep traps that degenerated into ethnic violence shaped by increasing resource competition and emerging anti-'outsider' mobilizations.

Structural scarcity: An important factor at the core of structural scarcity and source of political tension has been land use and land ownership issues. Land resource is a central function of the livelihoods, both for the inhabitants of African descent who are predominantly sedentary farmers, and those of Arab descent who are primarily pastoralists. The two groups have dissimilar land-use requirements and patterns, and therefore also customarily asserted control and claimed rights over land in different ways. The administrative boundary changes imposed by the predominantly Arab regime in Khartoum served to alienate the farming tribes (Paglia, 2007, p. 34). Tensions were reinforced by contemporary land administration issues influenced by nearly 35 years of land-related legislation. The most notable legislative events were the 'Unregistered Land Act' of 1970 and 'Civil Transactions Act' of 1984, which underscored the "principle of state ownership of the land" (USAID, 2003, p. 46). These legislations conferred ownership of all non-

registered customary lands to the state, thereby removing the control of poor rural communities over their land (Ibid, p. 9). This became the rallying point for radicalism and rebellion by the African communities, and as a result, the racial meaning (of the term African) came to take a strong hold in both the counter-insurgency and the insurgency in Darfur (Mamdani, 2007). On the other hand, the Arab migrants from northern Darfur, hitherto 'guests', were ready to claim rights for establishing their own native administration structures in their new homes since the land they occupy belongs to the government (Abdul-Jalil, 2006, p. 18).

2.3 Conceptualizing the Darfur conflict: Causal link between scarcity and conflict

Debate on whether competition over natural resources led to conflict is confronted by one critical question: is it logical to expand the notion of natural resources into the origin of conflict in Darfur? Attempts to answer this question have rendered Darfur a ubiquitous case study as far as emerging discussions of the environmental dimension of human security is concerned.

Figure 1 below presents a conceptual diagram of the causal link between scarcity due to climate change and conflict in Darfur. Drawing on the synopsis of the three types of scarcity outlined in the diagram, it is easy to recognise that the issues related to the environment largely emerge as 'proximate causes'. Due to ecological stress, the mainly northern populations moved and settled in the southern parts of Darfur, heightening pressure on grazing land and water. The decline of rainfall resulted in reduced production, and for compensation, horizontal expansion of farming became an option for the farmers. On the other hand, due to population increases, the average land holding per household or person has decreased (Fadul, 2004, p. 36). The result is that ethnic fault-lines became more concrete, with these differences expressed through violent conflicts.

3. Environmental degradation, scarcity and conflict in Darfur

3.1 A look at Darfur's ecology

Darfur is located in the western part of Sudan. The region is relatively expansive, covering an area of about 496,400 km², which represents approximately 26 percent of the total area of Sudan Republic. Darfur lies within a region where ecological risks are relatively high. Virtually the entire Darfur region is characterised as arid. In spite of this broad categorization, however, the region has different ecological configurations, typically desert, semi-desert and low-rainfall savannah woodland settings. The northern region of Darfur is desert, the Sahara, and years may pass without any rainfall. The eastern region is semi-desert, similarly with little water. The western region of Sudan is generally characterized as arid. The southern region of western Sudan is known as the *qoz*, a land of sand dunes that in the rainy season is characterized by a rolling mantle of grass and has more reliable sources of water with its bore holes (Bilsborrow, et al., 1990; Robinson, 2004).

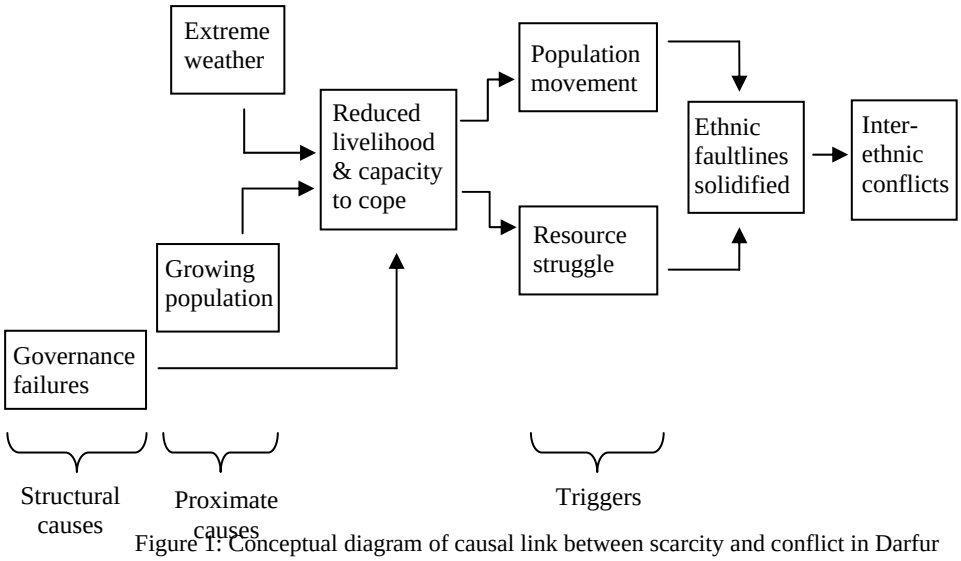

Figure 1: Conceptual diagram of causal link between scarcity and conflict in Darfur

The important threats related to environmental deterioration in Sudan, and for that matter in Darfur, are primarily linked to long-term aridity associated with increased temperatures and decreased precipitation. Thus, for a region that is already exposed to many environmental hazards, the existing ecological trends, if not addressed, are likely to intensify vulnerability. Climate models in Sudan's First National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) project a scenario of warmer temperatures relative to the baseline (1961-1990). Accordingly, average temperatures are expected to rise significantly by 2060, by 1.5°C - 3.1°C above the baseline during August and 1.1°C - 2.1°C during January. In contrast to the increases in temperature, the projections indicate that average rainfall will reduce by about 6mm per month during the rainy season (Government of Sudan (GOS), 2007:5).

One of the most salient features of environmental degradation is annual loss of forest and other wooded land. In Darfur, there is a total annual loss of 251,333 ha against an annual regeneration of 153,201 ha. Furthermore, Darfur, together with Kordofan and Equatoria States, faces a further loss of forest, due to desertification, war, and so on. In Darfur, the total annual additional loss of forest is 18,281 ha (FAO, 2010, p. 7).

But perhaps more important is that continued insecurity in Darfur has sustained negative impacts on the environment. More specifically, displacement into slums, camps and informal settlements sets the stage for continued environmental degradation. UNEP findings (2007, p. 104) indicate that impacts related to the concentration of people in camps or settlements include deforestation and the fuel wood crisis in dry land camp areas; land degradation; unsustainable groundwater extraction; and water pollution. However, it should, however be considered that, at

another level, massive population movements is a major factor in regeneration of vegetation.[3]

One way to examine the manner in which climate change is inducing scarcity in Darfur is to look at potential impact on water resources and agricultural production. Both water resources and agriculture are identified in the National Adaptation Programmes of Action (NAPA) of Sudan to be sectors that are quite vulnerable to climate change (GOS, 2007).

Access to water: Climate change is predicted to pose an ongoing threat to water resources in Sudan. It is shown that, at the country level, Sudan's water resources will be adversely affected by climate change. Water scarcity is primarily a result of decreased precipitation and/or increased temperatures and evaporation, with a subsequent impact on groundwater recharge. The projections also indicate that, under these conditions, soil moisture is likely to decline (GOS, 2007, p. 6). But what is probably of more immediate concern is continued groundwater depletion. According to the UN Secretary General Ban Ki-moon, "The scarcity of water in Darfur is growing, with reports of a significant number of wells drying up," (Charbonneau, 2010).

Agricultural production: Although agriculture remains the major economic activity of Darfur, productivity is affected by climatic change and environmental degradation. Drought threatens approximately 12 million hectares of rain-fed agriculture land, particularly in the northern Kordofan and Darfur states (Zakieldeen, 2007, p. 15). The predictions of Sudan's NAPA for the food production system is one of dwindling output, chiefly as a result of desertification of arable areas. Accordingly, the humid agro-climatic zones are likely to shift southward, rendering areas of the north increasingly unsuitable for agriculture (GOS, 2007, p. 6). This representation accords with recent UNEP outlook on long-term crop production. Using climate model to project the scale of potential changes in crop yields for sorghum, millet and gum arabic, the results suggested a significant drop in crop production in the region of El Obeid, predicting a drop by 70 percent, from 495 kg/hectare to 150 kg/hectare (UNEP, 2007, p. 61).

3.2 Context and drivers of localised conflicts in Darfur

The scope of the analysis of the localised conflicts in Darfur in this paper covers the period 1963 to 2002. This span of time was chosen for the fact that the period was characterised by increased incidences of localised tribal violence, and it was also considered that the post-2003 data may introduce biases in the analysis because most of the violence by then pertained largely to emerging ethno-political dynamics, which propelled the conflict into higher-level political dimensions.

[3] Russell Schimmer (2009, p. 324) established a steady increase of non-agricultural vegetation coverage and vigour, in formerly agrarian and livestock grazing ranges deserted due to the conflict.

The wider literature on Darfur suggests that the region has been an arena for inter-ethnic conflicts throughout recorded history. Conception of how the ethnic dimension has influenced the security circumstances is espoused from two perspectives: ethnic identity and means of livelihood. On the basis of ethnic identity, the inhabitants are broadly classified as either African or Arab. Ethnically, Arabs constitute 39 percent while Africans make up 61 percent (Schimmer, 2010, p. 24). Notably, the ethnic pattern of identity seems to be the one that has shaped the region's socio-political trajectory.

On the basis of means of livelihood, the inhabitants are classified as either sedentary farmers or nomadic pastoralists. Most people of African descent are sedentary farmers and reside mainly in the southern region of Darfur, exceptions being Zaghawa and Bedeyat tribes, that together with most people of Arab descent are nomadic herders and inhabit mainly the northern zone of Darfur.[4]

The two sources that were reviewed during the preparation of this paper: UNEP (2007, p. 82) and Suliman (2000, p. 12) established a total number of 45 conflict incidents occurred over a 34-year period, between 1968 and 2002. According to the records, the conflicts involved a total of 34 ethnic groups, comprising 16 African and 18 Arab communities, in essence representing 14 sedentary farmer and 20 pastoralist communities.

3.3 Livelihood patterns and links to local conflicts in Darfur

Inherent in the debate around the localised conflicts in Darfur is the aspect of livelihoods. The patterns of livelihood are broadly classified as either nomadic pastoralism or sedentary farming. Although the conflict that has afflicted the region is widely viewed as a conflict between the Arab and Black African communities, it is patterns of livelihoods that appear to have, in the main, influenced the security threats.

Figure 2 provides information about the livelihoods of the main parties in the local conflicts in Darfur during the specified period. Conflict records suggest that, out of the 39 incidents for which we are able to identify the main actors, the highest number (26) were those that pitted a pastoralist group against a sedentary farmer group. On the other hand, 13 incidents involved two pastoralist groups. An observation that deserves attention is that none of the incidents played out as a ‘farmer-farmer’ clash, notwithstanding the fact that up to 14 sedentary farmer groups were involved in conflicts with Arabs. Although it is difficult to tell who between the pastoralists and sedentary farmers were the aggressor, the pattern of violence compellingly suggest that it was the pastoralists. A plausible answer lies in the fact that, among pastoralists, migration constitutes an important mechanism to deal with climatic stress, putting the pastoralists and sedentary famers into conflict with each other. Viewed against the backdrop of the ethnic identities of the main actors, the livelihoods issue appears to be a more nuanced factor than

[4] Unlike the Arab pastoralists, the Zaghawa and the Bedeyat are primarily camel herders

ethnicity, which in a way goes against the inherent assumption regarding the influence of ethnicity as the single most important factor in the occurrence of violence.

Fig. 2: Livelihoods of the main parties in the local conflict in Darfur between 1968 and 2002. Sources: UNEP (2007); Suliman (2000)

3.4 Assessment of the conflict drivers

The debate over the factors responsible for the conflict in Darfur illustrates the intricacy of a conflict that has various dimensions. There is no doubt that many of the drivers of local violence in Darfur were, at least in part, environmental. The way to corroborate this is to look at causes of conflict at the local level. Figure 3 presents the issues revolving around the local conflicts prior to the large scale war.[5] A clear observation that emerges is that issues related to natural resources–resource disputes and territorial disputes–constituted the overriding causal factors of the violence. Additionally, aspects of resource issues, notably grazing rights, can be discerned as having played an important role, in combination with other factors in the occurrence of tribal conflicts.

Taking the above into account, there is certainty that resource scarcity was an important aspect of insecurity in Darfur. This is mainly due to the fact that the environmental pressure that prevailed in northern Darfur since the 1970s rendered, particularly, the pastoralist groups vulnerable to losing their livelihoods. In the face

[5] For the purposes of this discussion, the conflict drivers are classified into four broad categories: Resource disputes (grazing and water rights); Territorial disputes (administrative boundaries, land disputes); Administration and leadership disputes (local political); Combined factors (local politics, grazing rights and cattle raiding).

of these stresses, the pastoralists adopted a range of coping strategies, some of these making them more vulnerable to conflict. The findings from the UNEP assessment (2007, p. 86) draws attention to three pastoralist coping strategies (among others) that generate the risk of conflict. These are: competing directly with other grazers for preferred areas of higher productivity (conflict risk), moving and grazing livestock on cropland without consent (conflict risk), and reducing competition by forcing other pastoralists and agriculturalists off previously shared land as a last resort (proactive conflict).

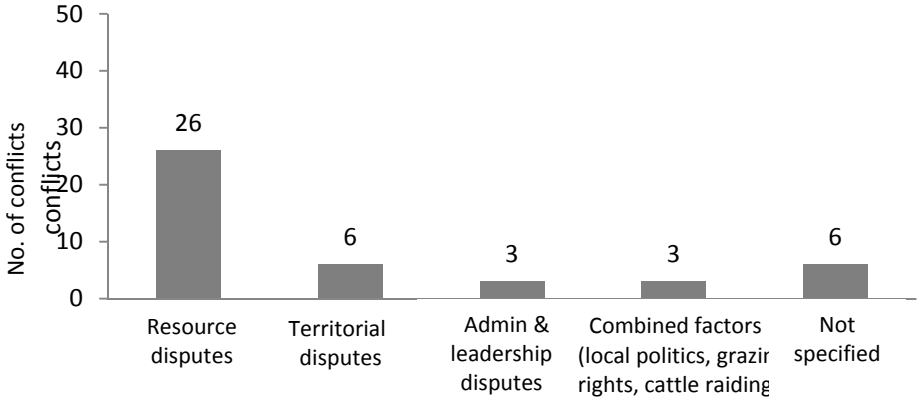

Fig. 3: Drivers of local conflicts in Darfur between 1968 and 2002
Sources: UNEP (2007); Suliman (2000)

3.5 Environmental scarcities, vulnerability and conflict risk

As noted in an earlier section in this paper, the three types of scarcity (supply, demand and structural) all predisposed Darfur to security risks, in one way or another. As a basis for discussion, however, the analysis in this section focuses primarily on the supply and demand variables of scarcity, which are key to the case and, therefore of more relevance in this context. The linkages between these scarcities and conflict are discussed in detail below.

3.5.1 The role of rainfall as a contributing cause of scarcity and conflict: The existing literature is replete with evidence of linkages between rainfall shortage and the occurrence of local conflict. It is important to note that, although the analysis provided in this section is made for Darfur as a whole, rainfall has a very high variability both spatially and temporally. Figure 4 presents the annual mean rainfall in Darfur for the period 1963-2002. As reflected in the inter-annual means, the data shows evidence of dynamic variability virtually throughout the 1960s to 80s rainfall history. The most outstanding negative outliers occurred during the 1980s period, which was also associated with the period of the most intense drought in Sudan's recorded history.

A useful way to look at rainfall trends is also to examine long-period average precipitation, in this case based on inter-decadal means. Considered wholesale,

there is indication of lower rainfall between 1972-82 and 1983-92 decadal interludes. Notable inter-decadal outliers are evident in 1972, 1982 and 1988. Kevane and Gray (2008, p. 5) established that the series exhibited one structural break in 1972, which accords with the dating of negative outlier in 1972.

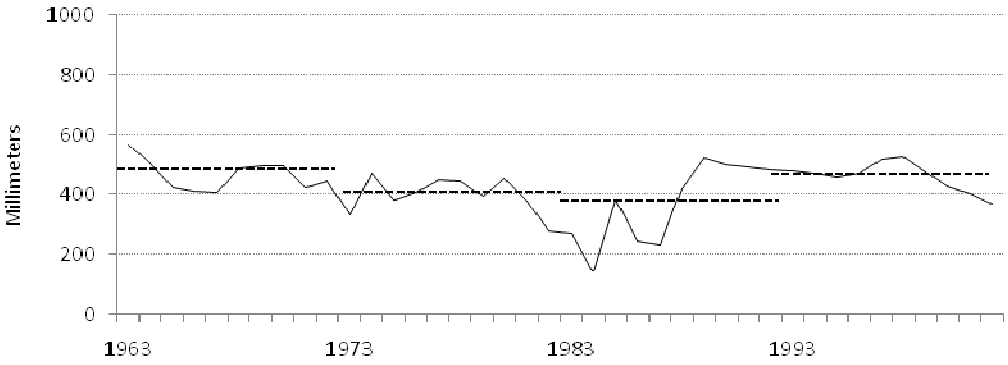

Fig. 4: Annual mean rainfall in Darfur between 1963 and 2002
Sources: Suliman (2008); Kevane and Gray (2008)[6]

Table 1 again displays the rainfall estimates for Darfur between 1936-2002, presented as minimum, maximum, mean and coefficient of variation (CV)[7] in five-year bases. Overall, the data points to relatively high rainfall variability as reflected in an overall CV of 21.0 percent. Of note here is the five-year period between 1983 and 1987 in which the most variable rainfall was recorded, with a CV of 34.0 percent.

Having noted this, we can now look at the interrelation between rainfall and conflicts in Darfur during this period. In Figure 5, rainfall is plotted against conflict records. The conflict data is presented in stacked columns, with each stack representing numbers of conflict incidents. It can be seen that the period since the mid-70s saw a definite increase in the level of local conflicts in Darfur. It is, however worthy of note that fewer violent incidences occurred between 1983 and 1986 in spite of the particularly low rainfall.

[6] For the period between 1989 and 2002, the overall precipitation estimates are based on the combined average for four latitudinal-longitudinal nodes: Northwestern (lat. 13.75, long. 23.75); Northeastern (lat. 13.75, long. 26.25); Southwestern (lat. 11.25, long. 23.75) and Southeastern (lat. 11.25, long. 26.25), based on David Lister, Climate Research Unit. As such, the 1963-1988 and 1989-2002 datasets are not necessarily comparable.

[7] The CV represents the ratio of the standard deviation to the mean of the five-year integrated precipitation values, and is useful for comparing the degree of variation.

Table 1: Mean rainfall for Darfur in five-year period between 1963 and 2002

Period	Minimum	Maximum	Mean	CV
1963-1967	408	565	462	15
1968-1972	424	496	469	7
1973-1977	330	468	407	13
1978-1982	275	451	388	18
1983-1987	143	381	253	34
1988-1992	418	520	481	8
1993-1997	455	513	478	5
1998-2002	370	523	440	14
Overall	**143**	**565**	**422**	**21**

Sources: Suliman (2008); Kevane and Gray (2008)

Interestingly, what we seem to observe is that years of negative outliers appeared to record none or lower incidents of conflict. On the contrary, an increase in conflict incidents appeared to coincide with the years of positive outliers, notably 1990-91 and 1996-97. It is perhaps for this reason that scholars such as Kevane and Gray (2008) critique attempts to correlate rainfall with the emergence of Darfur conflict. They argue that, although there is evidence of structural break to a lower level of rainfall in northern Darfur in the early 1970s, rainfall in Darfur did not decline significantly in the years immediately prior to the crisis. They, however, appear to observe caution on this conclusion, noting that, for longer periods of time, say 50 year periods, there is considerable evidence of a decline.

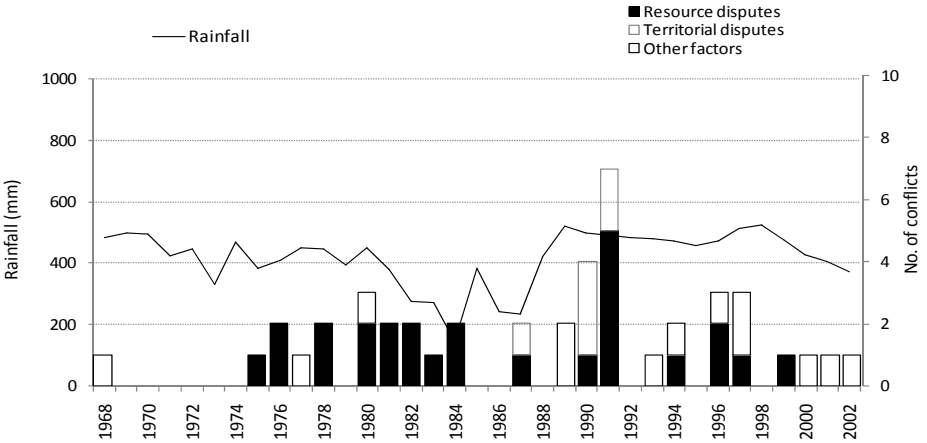

Fig. 5: Relationship between rainfall and conflict in Darfur between 1963 and 2002
Sources: Rainfall records: Suliman (2008); Kevane and Gray (2008);
Conflict records: UNEP (2007); Suliman (2000)

To discount the rainfall-conflict linkage, Kevane and Gray make the observation that structural break to lower mean rainfall levels appear to be uncorrelated with subsequent conflict in other Sahelian African countries, yet levels of violence have been nowhere near those of Darfur (2008, p. 2). But probably more interesting is

their second observation that many African countries that have not experienced structural declines in rainfall nevertheless saw increased conflict over the past several decades. To understand the rainfall-conflict relationship, nonetheless, we must first acknowledge the fact that pastoralists have over generations become well adapted to coping with harsh environments of Arid and Semi-arid Lands (ASALs) of the Sahel. Putting this into perspective, analysis of the rainfall-conflict relationship can therefore never be based on the presence or absence of immediately identifiable violent events, rather, conflict can be understood as the effect of long-term reduced adaptive capacity to conditions of low rainfall, which makes it more difficult to pinpoint the relationship.

Having noted the above, it becomes necessary to draw a distinction between the conflict drivers relative to rainfall over time. As shown, factors related to resource competition have been the most pronounced throughout the history of local conflicts. As such, resource scarcity may indeed be the common factor behind the eruption and surge in local conflicts. An important observation is that issues related to territorial disputes began to emerge during the late 1980s and became particularly intense in 1990-91. This may be attributed to the massive movements of people as a result of the drought and famine of the mid 1980s, which more profoundly affected the pastoralists. Virtually all reports from past studies investigating environmental linkages to local conflicts in Darfur cited pastoralist movements from the northern to southern parts of Darfur as a major cause of conflict. The UNEP (2007, p. 59) assessment shows that "Annual variability and relative scarcity of rainfall–in the north of Sudan in particular–have a dominant effect on agriculture and food security, and are strongly linked to displacement and related conflicts."

3.5.2 Population growth as a contributing cause of scarcity and conflict: The notable factor affecting demand-induced scarcity is population growth (UNEP, 2007, p. 85). That said, population pressure has, in effect, been identified as an important contributor to the increase in local conflict in Darfur. Comparison of the population growth rates between 1956-2003 censuses portrays a sharp demographic shift, indicating a population rise from just over 1 million in 1956 to approximately 6.5 million people in 2003 (Fadul, 2004, p. 35; United Nations Statistics Division, 2008, p. 18). In line with this growth, the almost half century period witnessed a relatively large increase in the population density, growing from 3 to well over 18 persons per km^2 (Ibid).

Differences in growth rates are, however, evident when comparison is made between North and South Darfur. For example, between 1983 and 1993, North Darfur's population dropped from approximately 1.3 to 1.2 million. On the contrary, South Darfur witnessed an increase from approximately 1.8 to 2.2 million (Mundt, 2011). Continued differences in the population growth rates are further noted for the period 1998-2003. Expressed as percentages, the population growth rates are given as 3.2 percent and 3.5 percent in North and South Darfur

respectively (World Bank, 2003, p. 1). This may partly be reflective of the well documented population movements and resettlement from the North to South Darfur during the period. A review of the literature shows that numerous Zaghawa pastoralists lost their livestock and moved south, where they became farmers. Tama and Gimir populations also moved south. At the same time, Arab nomads from northern Darfur and Chad established *damras* (nomad settlements) further south in Darfur (Tearfund, 2007, p.21).

Studies of relationship between population movements and unfavourable environmental conditions in the greater Sudan confirm that intensified migration patterns as a result of unfavourable environmental conditions were in fact not confined to Darfur. For example, the drought of the 1980s had a dramatic effect on pastoralist movements in the Jonglie region of Southern Sudan. The durations of stay seem to range from few months to well over twenty years (Omondi, 2011, p. 7). It is clear from the foregoing that, the propensity for longer periods of stay is what breeds inter-ethnic conflicts. Longer periods of stay can be interpreted as going against the customary system of seasonal migration, which is the essence of the right of access to resources during the dry seasons (Ibid).

Other than the general population increase, again what is remarkable is the decline of population segment identified as nomadic. A comparison of the nomadic population from four censuses conducted between 1956 and 1993 shows dramatic decline in Darfur's nomadic population. Relative to the total population, the nomadic population was only about 4 percent, down from about 15 percent and 19 percent in 1983 and 1973, respectively (Darfur Relief and Documentation Centre (DRDC), 2010, p. 25). This, in a way, points to increased motivation amongst the nomadic groups to turn to sedentary farming, particularly during the 1980s. This perspective accords with the observation that "nomadic groups are currently subject to the severe constriction of their pastoralist domain, accompanied by the blocking of livestock migration and trade routes by conflict-related insecurity, which has in turn badly affected traditional livelihoods" (Mundt, 2011).

An important implication of the population pressure and increasing demand for higher levels of food production, particularly in southern Darfur, is the effect on the extent and intensity of land use, which ultimately had a long-term impact on food production. Concomitant with this argument, traditional land use has been significantly altered. For example, this has led to shorter fallow periods and hence to the removal of vegetation cover and the dismantling of the top soil layer on the *qoz* sands, opening the possibilities for reactivation of the consolidated sand dunes and the advancement of moving sands (Mangouri, 2004, p. 46). Farming has also been extended the light clay and *gardud* soils on the *wadi* beds, which previously were reserved for dry season grazing areas for the livestock of nomads and settlers (Fadul, 2004).

4. Response to climatic risks: adaptation versus conflict

4.1 Inter-community mechanisms and conflict management strategies

While it would be unrealistic to claim that relations between pastoralists and agricultural communities in Darfur were consistently good, the capacity of Darfur's inhabitants to cope with the climatic variations in large part was derived from the complementary nature of their dissimilar livelihood. It is noted that, until 1970, there is also a well-documented history of local resolution for such conflicts, through established mediation and dispute resolution mechanisms (UNEP, 2008, p. 83). For that reason, the level of inter-ethnic cooperation has been a key element of both ecological adaptation and conflict management strategies.

The strategies of the local communities involved livelihood techniques that were suitable and sustainable for the fragile Western Sudan habitat where Darfur is located. Research shows that communities in Darfur developed a range of coping mechanisms that involved regulations governing the use of natural resources. These strategies were underpinned by a system of reciprocity between nomadic and farming groups. Accordingly, the ecological variations between different *duur*[8] (homelands) encouraged tribal leaders to establish close, symbiotic relations, amounting almost to alliances, that became important mechanisms ensuring the access of pastoralists to land and natural resources (Young et al., 2009, p. 40). As a general rule, the communities tried to avoid acts that would cause tension. Essentially, these measures were institutionalised and became well-recognised within the local government and community systems.

One approach involved the accommodation of newcomers, known as *hakura*. This system allowed for settlement[9] of newcomers, whether they are individuals or groups, provided that they adhered to customary regulations, the most important of which is to remain subject to the administrative authorities of the host tribe, irrespective of whether they are temporary visitors or have the intent to settle permanently (Abdul-Jalil, 2006, p. 17). As noted, for the nomadic groups, this arrangement afforded them the advantage of exploiting a variety of resources in different ecological zones (Ibid).

Another approach was the communal grazing scheme known as *talaig* that tended to create a symbiotic relationship between sedentary farming and nomadic pastoralist groups. *Tailag* enabled pastoralists to cope with the harsh environment by allowing free use of the crop residue by all the pastoralist communities. Local governments enhanced the practice by issuing legislation and local acts, by determining a certain time after the rainy season for the farmer to collect their crops and leave the crop residue to be used by animals from all the community (Fadul, 2004, p. 40).

[8] The term *duur* refers to homelands, and is the plural form of *dar*.
[9] Settlement in this regard did not imply ownership of the land.

The third approach involved the designation of cattle routes known as *marahiel* and *masarat* (cattle routes up and down the region), to prevent potential conflicts between the pastoralists and farmers (USAID, 2003, p. 21). Livestock migration routes enhanced pastoralists' ability to cope with climatic variability. Some routes were officially recognised by the local government and communities, although some tribes also followed routes that were negotiated but not officially recognised. In Darfur, this arrangement provided for eleven passages on the eastern and western parts of Jebel Marra Plateau (Fadul, 2004, p. 30).

4.2 Scarcity and collapse of inter-community mechanisms

The ecological pressures on inter-community mechanisms can be appreciated from the well-documented population movements from the north into the central, southern and western parts, especially attributed to the drought of 1984-85 (De Waal, 1989). However, these movements also created deep-seated ecological traps that, over time, transformed the pastoralist-farmer relationship into one of inter-ethnic competition and conflict rather than cooperation and co-existence. The supply- and demand-induced scarcity factors go a long way in explaining the collapse of the existing conflict management strategies. It stands to reason that these coping and conflict management systems began to disintegrate due to reducing rainfall and diminishing resilience of the local communities.

First, looking at mechanism based on *hakura*, the collapse of this mechanism has been variously attributed to population thresholds. The toll from these movements reduced "the ability of local people to adapt to the new realities and the subsequent questions of land use and resource sharing continued to threaten peaceful coexistence in the area and the social cohesion of the entire community" (King and Osman, 2004, p. 12). This makes a case that the migrating pastoralists extended the duration of their stay or chose to permanently settle in their new locations. As noted, this situation that was destined to incite local tensions and provoke violent resource-based conflicts (Ibid).

The collapse of mechanisms based on *tailag* is similarly most often blamed on changing rainfall. Farmers could not start planting or harvesting according to the cultivation cycle. Accordingly, the expected dates of crop harvest became unpredictable. On the other hand, the environmental stresses also disrupted nomadic grazing practices; pastoralists had to move earlier to escape the drought and the lack of grazing land and water (USAID, 2003, p. 44). The migratory movements of nomads during the rainy season caused crop damage and eventually led to open conflicts between farmers and herders (Okello et al., 2004, p. 10).

The factors that led to the collapse of the mechanisms based on *marahiel* and *masarat* are, however, not quite as straightforward, but can possibly be explained on the basis of all three types of scarcity. Migration routes that have traditionally been used are no longer available due to the introduction of mechanised farming, which took away crucial farming and pastoral rangelands and migration routes. To

a large extent, this may explain the apparent decrease in the population of the nomadic groups. For example, due to the uncontrolled expansion of mechanised farming, pastoral migration routes are increasingly becoming narrower and shorter, between 150 and 300 metres wide as compared to 2 to 4 miles during the colonial time (Babiker, 2011, p. 5).

5. Conclusion

This discussion has addressed the main issues at the centre of the debate about whether climate change and, for that matter, environment, is responsible for the human security situation in Darfur. While there is no agreement as to the extent environmental phenomena have played a role in producing the current conflict in Darfur, the evidence presented shows that the periods during which Darfur witnessed climatic transition and a demographic shift overlapped and these periods were accompanied by local conflicts. This view corresponds with the large body of literature that similarly suggests a link between scarcity and security.

Revisiting the coping and conflict management strategies in Darfur, it is has been shown that pre-existing inter-ethnic relationships were shaped by cooperation and interdependence between the herder and farmer communities. These measures were well integrated in the local government and community systems. The prevailing circumstances in Darfur therefore point to the collapse of the traditional inter-community mechanisms for coping and conflict management, which in the past facilitated accommodation of newcomers, communal grazing and designated cattle routes. The failure to practice prudent governance management measures in the region included obliteration, through legislation, of the long-established land tenure system that played an important role in the pastoralist-farmer symbiotic relationship.

The evidence offered in this paper points to two observations: The first observation is that the localised conflicts that eventually led to large-scale conflict were not simply the result of environmental scarcity, but rather can be viewed as a response to increased vulnerability and reduced resilience. Reduced resilience and adaptive capacities as a result of the collapse of the above mentioned inter-community mechanisms for coping and conflict management strategies created deep-seated ecological traps that, over time, transformed the pastoralist-farmer relationship into one of inter-ethnic competition. From this, we take the view that climatic change on its own was essentially not an immediate cause of conflict; rather it is the diminished resilience and ensuing collapse of the community coping and conflict management mechanisms that most critically set the stage for the violence.

The second observation relates to the ubiquitous ethnicity-environment question. It is apparent that the ethnic perspective is often dichotomised on the basis of Arab and Non-Arab, continues to be emphatic, and has often masked the livelihood dimension in a variety of ways, which is in every respect the most salient factor.

Notably, in Darfur, ethnicity and livelihood are closely related aspects of identity formation, and it is probably this that makes it difficult to map out causalities when it comes to the ethnicity-environment question. Thus, whereas ethnicity lies at the heart of this conflict, the ethnic dimension is a product of the wider environmental stress, and can therefore be considered, at most, an indirect cause of the conflicts. By this account, environmental challenges are a more real and immediate problem in Darfur. In contrast, ethnic fault-lines are solidified once conflicts emerge, and at that point ethnicity begins to have a more causal effect in perpetuating violence (Suliman, cited in Kuznar & Sedlmeyer, 2005, p. 5-6).

Overall, this paper provides a basis for a more holistic appreciation of the Darfur problem, and for looking at the ongoing conflict in depth. The Darfur conflict can only be more adequately addressed by getting to the underlying causes, which are environmental. Therefore, the following recommendations will be pertinent:

- It is necessary to separate between the different layers of causes of the Darfur crisis, to allow for more focused intervention. Currently, the Darfur problem straddles political, security, ethnic, economic and ecological dimensions. Placing the above into perspective, what is of relevance to this discussion is that the ecological dimension needs to be tackled through relevant approaches. This underscores the need to particularly address issues such as deforestation, which have significant consequences on the environment.
- Sustainable natural resource management needs to be incorporated at the local community level. This means that the carrying capacity of a given area should be assessed against demand and appropriate strategies implemented to ensure environmental degradation are mitigated.
- Policy-wise, this paper speaks to the value of instituting indigenous or contemporary adaptation, conflict management and early warning mechanisms. This calls for a return to institutionalization of community-based mechanisms in order to facilitate collaborative regulation of the use of communal resources, including water, pasture and agricultural land, and migration routes.
- Given that Darfur is an ecologically fragile region with economies largely dependent on the environment, the over-dependence on primary production is very delicate and brings into question the sustainability of current livelihood systems. Grappling with the challenges of livelihoods and rising population, it is prudent to put together measures that trim down demand-induced scarcity by supporting alternative livelihoods away from primary production.

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Inter-Ateker Discord: The Case of the Nyangatom and the Turkana

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Abstract

This paper explains the longstanding inter-ethnic discord between the Nyangatom and the Turkana, and examines the effectiveness of the dispute resolution approaches tried so far. Both groups belong to the Karamojong Cluster (also Ateker), an ethno-geographic designation of numerous ethnic groups living in Uganda, Kenya, South Sudan, and Ethiopia. The relationship between the Nyangatom and the Turkana began to deteriorate after the former lost control over their grazing land in the Kibish area during the colonial period. Over the years, the steady increase in herd size, exceeding carrying capacity; the changes in climatic patterns that led to frequent drought; the cultural values that incite violence; and the participation of non-pastoral groups in raids, made the conflict complex and complicated. In recent years, the Nyangatom-Turkana discord increased in frequency and intensity largely due to competition over scarce resources. The major consequences of this rather protracted inter-ethnic conflict include loss of precious life, permanent injuries, loss of access to pasture and water, and failing livelihoods. Thus far, the governments of Ethiopia and Kenya failed to stop the cross-border inter-ethnic conflicts in the Ilemi Triangle - a disputed territory. It is high time to devise a comprehensive program intervention in the border area to attain lasting peace.

1. Introduction

This paper explores the relationship between two ethnic groups: the Nyangatom of Ethiopia and the Turkana of Kenya. Both groups are members of the Ateker or the Karamojong (also Karimojong) Cluster, an ethno-geographic designation of numerous ethnic groups living in northeastern Uganda, northwestern Kenya, southeastern South Sudan, and southwestern Ethiopia.[2] It seems that there is no

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[2]Terrence McCabe (1996), in Encyclopedia of World Cultures, wrote, "Oral history and archaeological evidence suggest that, prior to A.D. 1500, the ancestors of the Ateker Language Group lived somewhere in southern Sudan and most likely subsisted as hunter and gatherer peoples. After beginning their southern migration, these ancestral peoples incorporated both agricultural and pastoral

clear consensus on which ethnic groups belong or do not belong to the Karamojong Cluster. Based on the works of previous researchers, Michael Quam (1999, p. 2) identified the Dodoth, Jie, Karimojong (which is further divided into Bokora, Matheniko, and Pian sub-groups), Teso, Turkana (Kenya), and one or two groups in Sudan, as the core groups of the Karamojong Cluster. The Jiye and the Toposa of South Sudan and the Nyangatom in Ethiopia are widely recognized as members of the Ateker group. In different online sources, the Chekwi, Kumam, Labwor, and Tepes are also reported to belong to the Karamojong Cluster.

Most members of the Karamojong Cluster speak mutually intelligible languages, share certain cultural values and practices and common religious traditions, and pursue similar livelihood strategies (agro-pastoralism—although the level of dependence on livestock or crop production varies from one group to another). The relationship between the various members of the Ateker is characterized by both hostility and solidarity. For example, the Nyangatom maintain friendly relations with the Toposa and frequently fight with the Turkana. If they all belong to the same geographic, socio-economic, and ethnic cluster, what is the reason that they maintain solidarity with some and are hostile with others?

Based on information obtained from the Nyangatom people in the South Omo Zone (Ethiopia) and a review of documents, this paper attempts to identify the factors that contributed to inter-ethnic discord. There will also be discussions about the social organisations of the Nyangatom and the effectiveness of customary and official dispute resolution mechanisms. It is important to understand the factors which divide the two groups, their historical and cultural relationship, and their existing conflict resolution methods, in order to identify the connectors (peace potentials) that could be used to revitalise solidarity between the Nyangatom and the Turkana.

The study, which started in 2010 in Nyangatom and continued in Jinka (the capital of the South Omo Zone) and Addis Ababa until September 2011, employed qualitative research methods (interviews, focus group discussions, and observations) and document reviews. The local residents of the Nyangatom (men, women, young, and old), government officials at different administrative levels, and relevant experts were interviewed at different times. The limitation of this paper is the absence of the Turkana perspective on the pertinent issues discussed.

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pursuits, and eventually split into groups that emphasised one subsistence strategy or another." According to another online source (http://www.littlestar.com/karamojong/karmjong/migrate.htm), "The Karamojong originated … in what is now southern Ethiopia and Sudan. Traditions of the Karamojong group hold that the land they came from was mountainous and blessed with abundant rainfall.… Others have pointed to the Omo river valley, a tributary of Lake Turkana, as their point of origin. Several hundred years ago, somewhere between the eleventh and sixteenth centuries, a large migration of the original people (usually called the Plains Nilotes) began…. These Plains Nilotic peoples fanned out heading to west, south, …. The Toposa, the Jiye, and the Nyangatom seemed to retrace their steps to the northeast, almost returning to the point from which they began."

However, attempts have been made to review relevant studies, which focus on insight and experience in Turkana.

Conceptually, this paper follows certain lines of argument to provide a context for broader understanding of the complexity of conflict in the area. Given the fragile nature of the physical environment, the variability and unpredictability of rainfall, the scarcity of vital resources (water and pasture), the increased human and livestock population pressure, and the absence of alternative livelihood strategies, conflict is expected. Moreover, given the diversity of the actors (for example, the pastoral communities, state players, livestock traders, commercial raiders, arms dealers, armed gangsters), it would be naïve to assume that everyone values peace or strives to attain it. There might be individuals and/or groups whose interests are better served only when conflict prevails. Therefore, both conceptually and practically, it is important to recognise the complexity of conflict and the need for comprehensive intervention.

In the context of this paper, inter-ethnic pastoral conflict is conceptualised as a confrontation that prevails between groups of people who have or perceive to have competing interests to resources (in this case, pasture and water points), power, and opportunities. In the context of pastoral conflict, due to certain trigger factors, the prevailing confrontational situations often manifest themselves in violence that involves the killing and maiming people, livestock raids, property destruction, and the creation of widespread insecurity. Not all confrontations culminate in violence, as the opponents often have the opportunity to resolve differences peacefully. Violence could be averted by addressing the root causes of conflict and by preventing the trigger factors. Both strategies require the creation of the conditions necessary for the opponents to feel safe and united, and able to benefit from the mutual connection. In this regard, at the intervention level, attempts need to be made to identify the commonalities that could serve as connectors. Moreover, it is necessary to devise new strategies (such as border area joint projects) that promote cultural and socio-economic integration.

The paper is divided into five parts. This introduction is followed by the second part, which provides a brief ethnographic account of the Nyangatom people—background information, for example, on location, environment, history, economy, internal division, external relations, and development. In part three, the major factors that contributed to and escalated the inter-ethnic conflict between the Nyangatom and the Turkana are analytically discussed. The social organisations of the Nyangatom, and the various conflict resolution approaches attempted thus far, are discussed in part four. Knowledge of social organisations helps to enhance our understanding of the identity, role, power, and legitimacy of decision-makers. The concluding remarks and the recommendations represent the last part of the paper.

2. The study area

2.1 Overview of the Nyangatom world

The Nyangatom (also known as Gnangatom) people, who belong to the Nilo-Saharan language family, live in Southwestern Ethiopia, in the border region between Ethiopia, Kenya, and Sudan. Kangaten, the capital of Nyangatom *Woreda*, is located some 848 km southwest of Addis Ababa. According to the latest national census, the population of the Nyangatom ethnic group is 25,252 (Central Statistics Authority (CSA), 2007, p. 85), and the land area inhabited by the group is estimated to be 2,183.6 sq km.[3] The official territory of the Nyangatom stretches from the Omo river in the east to the Kibish river in the west.[4] While those who live in the west and central parts of the territory rely heavily on livestock production, those in the east largely depend on flood retreat cultivation of sorghum, some maize, cowpeas, and tobacco along the Omo River. The Nyangatom send their livestock (especially cattle) to cattle camps, located far away from permanent residential areas, where only milking cows and small stocks are kept. Those taking care of the animals in the cattle camp rely heavily on blood and milk for their subsistence.

The Nyangatom people have different social organisations: territorial sections (*ngiteala*, sing. *ekitala*), generation-sets (*ngikasa*, sing. *ekas*), age-sets (*ngigerea*, sing *ajere*), and clans (*ngitekerea*, sing. *ateker*). These institutions play different roles in the secular and sacred lives of the people. The Nyangatom *Woreda*, which was established only in 2006, consists of three ethnic groups (Nyangatom, Kwegu or Muguji, and Murle) and 20 *Kebele* (local administrative tier). In the last five years, the new *Woreda* has taken encouraging steps in the area of office organisation, health provision, school enrolment, agricultural extension, gender participation, transportation and communication, and investment attraction. Regarding inter-ethnic conflict, the officials worked hard to convince local people to refrain from engaging in raids and revenge actions. Moreover, in collaboration with NGOs, they organised a series of peace initiatives and motivated people to focus on development activities. These efforts are reported to have significantly contributed to the reduction in the number of counter attacks from the Nyangatom side (CEWARN, 2010a). In the Nyangatom area, modernity is still far from a reality. The people continue to lead a traditional life, heavily reliant on their rich knowledge to exploit their natural environment.

Protestant Christianity was introduced in the Nyangatom territory in the early 1970s by the Swedish Philadelphia Church Mission (SPCM). The Mission made a modest contribution, in terms of providing modern education, healthcare, and irrigated agriculture. Most of the educated Nyangatom, currently serving or representing their people in different capacities, attended the mission school.

[3] The figure for land area was obtained from the South Omo Zone Administration.
[4] The local people claim that the Kibish area (both sides of the Kibish River) was their traditional homeland with its western border further west from the river.

Although the Church existed for a long time, it was only from the second half of the 1980s that teachings of the Bible spread in the society.

The Nyangatom people are surrounded by eight ethnic groups, namely, the Surma (Suri), Mursi, Kwegu (Muguji), Kara, Murle, Dassanech, Toposa, and Turkana. While the first seven reside in Ethiopia, the last two live outside of Ethiopia. Historically, the Nyangatom maintained peaceful relationships with the Toposa and the two small groups, the Muguji and Murle.[5] On the other hand, they had a history of conflict with the Surma to the northwest, the Mursi to the north, the Kara and the Hamar to the east, and the Dassanech and the Turkana to the south. The Nyangatom, who were feared because of their reputation as ferocious warriors in the 1970s and 1980s, have now became a calm people—in the face of repetitive attacks from their neighbours. The decline in the motivation for aggression and the number of revenge killings was partly explained, by Christian informants in Nyangatom, in terms of religious teachings about sin and forgiveness. Many others attributed the reduction in the incidents of fighting to a lack of weapons, especially bullets, which ran out when the Sudanese civil war ended. There are still others (notably *woreda* government officials and development experts) who strongly believe that the recent development initiatives launched by the government significantly diverted the attention of people away from war. For a combination of reasons, the Nyangatom people were prepared and committed to lasting peace with their neighbours, especially the Turkana. This is an important peace opportunity on which to build.

2.2 Nyangatom migration and inter-Ateker relations

According to oral history, the Nyangatom migrated perhaps some 200 years ago from the Karamoja area, northeast Uganda, together with the Toposa–because of drought that caused the deaths of humans and livestock. Gulliver, (1968) (in Tornay, 1979, p. 98), considered the Nyangatom as a splinter group of the Toposa, who, in turn, originated from the Jie of Uganda. However, Serge Tornay (1979, p. 98) noted that the separation of the Nyangatom from the related Paranilotes might have occurred around 1800, at least concomitant with that of the Toposa. Upon arrival, while some of the Nyangatom settled west of the Kibish River, others moved further east and settled at Lere, near the Omo River. Informants noted that the Arbore[6] and the Dassanech were the original inhabitants of the Kibish and Omo areas respectively. The Nyangatom were already in the lower Omo valley by the time Count Samuel Teleki and Ludwig von Höhnel (travellers) visited the area in 1888. Tornay (1979, p. 98) wrote:

[5] The Murle were called Narich and treated as one of the seven territorial sections of the Nyangatom until recently. At the moment, the Murle are officially registered as constituting an independent ethnic group.

[6] It appears that there was some kind of Nyangatom-Arbore integration or assimilation. One of the territorial sections of the Nyangatom called *Ngilingaqol* is believed to be related to the Arbore, who later migrated east.

> At the time of the first explorations of the Lake Turkana area (by Höhnel and Teleki in 1888) two groups of Nyangatom, one at Kibish who were mainly cattle herders (the Dongiro), and the other at the Omo itself who lived mainly by cultivation and fishing (the Puma), were already settled in the Lower Omo Valley.

The Nyangatom people recognise the Karamojong as the earliest tribe, from which all Ateker members originated. According to one resourceful informant, the word Karamojong is made up of two terms: *ngikaru* (year) and *mojong* (old). Thus, the Nyangatom define Karamojong as their ancestors who had lived for many years before their migration to their current location. All ethnic groups that originated from the earliest tribe (Karamojong) are collectively called Ateker. The Ateker members commonly known to the Nyangatom include the Matheniko, Pian, Bokora, Dodoth, Jie, Kumam, Tepeth, Toposa, Jiye, Turkana, and Teso. When asked what they have in common, many informants listed the following communalities: origin, geographic location (Karamoja), language, religion,[7] age-system, dances, and songs.

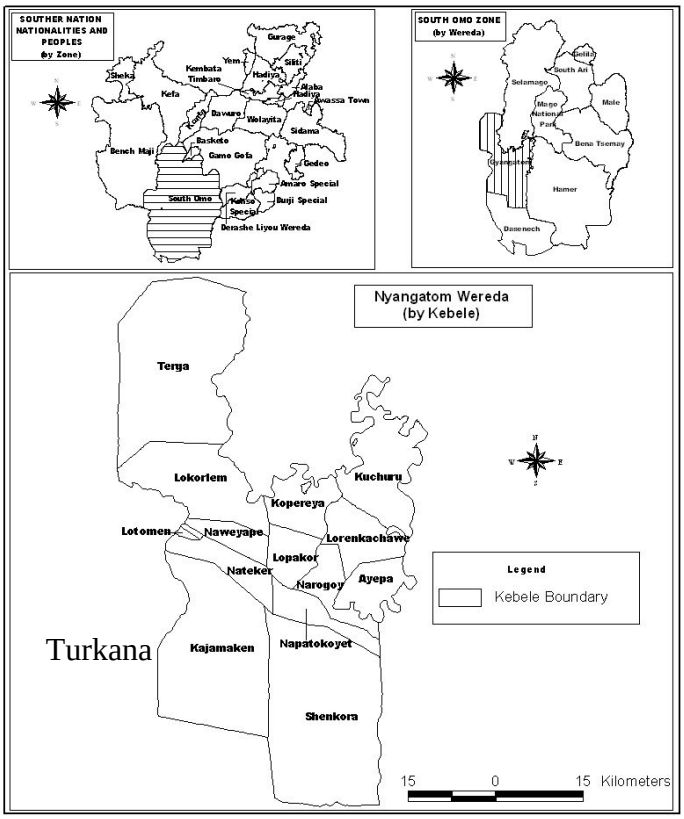

Figure 1: Map of Nyangatom Woreda
Source: Adapted from CSA map

[7] The common religious beliefs include: Akuj (Sky God), ngikaram (ancestors), and ngipyan (spirits).

The Nyangatom and the Toposa are close associates and they consider one another *amuro-katta* (grand-mother's thigh), an expression that symbolises common ancestry. It is believed that they have descended from the same ancestor, lived in the same neighbourhood in the Karamoja area, migrated together, and split away only later. Cultural expectations exist between the two groups that stress sharing and mutual assistance. For instance, when a Nyangatom slaughters an animal, any Toposa (old or young) present is entitled to the hindquarter, as a matter of cultural right. Any Nyangatom would expect the same when his Toposa neighbour kills an animal. Failure to live up to this expectation is considered mystically dangerous and culturally unacceptable. The depth of the relationship between the two goes beyond sharing food, pasture, water, and residential areas. They often form alliances in fights against common enemies (e.g., Surma and Turkana) or each other's enemies (e.g., Dassanech are considered as Nyangatom's enemy, while Jiye are Toposa's).

The Nyangatom fully recognise that the Turkana are also their Ateker-mates. Apart from the recognition of common origin, the Nyangatom and the Turkana do not seem to have accounts of historical cooperation and cultural responsibilities for one another. Some writers noted that the Nyangatom people might have migrated from Uganda due to Turkana pressure (Mburu, 2001, p. 150; Tornay, 1979, p. 98), and this suggests that the two groups may have been early rivals. However, there exists no historical memory, or even folktale, that points to Nyangatom-Turkana conflict in olden days. What informants stressed was that the two groups lived together in peace when the Turkana moved to Kibish from the Lodwar area, located further south. The local people's remarks about the northward expansion of the Turkana is consistent with the reports of Alexander De Waal (1991) and Nene Mburu (2003) that the boundary of Turkana grazing, and the limits of Kenyan administration, moved north over the years. Terrence J. MacCabe (1996) presented the early migration and later expansion of the Turkana people as follows:

> The period from 1500 to 1800 appears to have been characterized by frequent splitting and fusing of ethnic groups, and shifting alliances among the groups…. The Turkana people emerged as a distinct ethnic group sometime during the early to middle decades of the nineteenth century…. Oral histories suggest that the Jie seceded from the Karamojong, and that a group split off from the Jie established themselves in the region near the headwaters of the Tarach River, in what is now Turkana District, sometime during the early part of the eighteenth century. By the beginning of the nineteenth century, Turkana cattle camps began to push down the Tarach in search of new pastures…. They first pushed to the north and east to Lake Turkana, and then to the south, crossing the Turkwell River.

During the early contact period, the Turkana and the Nyangatom were good friends, cherished their common identity as Ateker, and experienced intermarriage (although mutual raids occurred sporadically). Traditionally, pastoral territorial boundaries are flexible, to allow free movement and grant access to pasture and water resources. Prior to the colonial period, the Nyangatom and the Turkana exploited the rich pasture and water in the Kibish River valley. During the dry seasons, they migrated further north and west to share resources with the Surma and the Toposa people. Some 60-70 years ago, however, the relationship between the Nyangatom and the Turkana began to deteriorate fast. The Nyangatom informants firmly believed that external agents (the British colonial administration, the Kenyan government, and later commercial raiders) created and perpetuated animosity between them and the Turkana. There is a strong feeling among the Nyangatom that lasting peace with the Turkana could be attained if the external agents could stop interfering.

3. Factors responsible for Nyangatom-Turkana discord

The 2002 USAID report identified three major causes of conflict in the Karamojong Cluster. These include structural or root causes, proximate causes, and triggering factors.

> Structural causes of conflict in the Cluster include competition for scarce resources, traditional pastoral cultural values, increasing frequency of drought since about 1980, and the general poverty of the cluster. Proximate causes of conflict in the KC include systematic neglect by government of pastoral areas, politicization of conflict, the enormous increase in modern weapons, inappropriate government responses to conflict, provision of food aid without developing suitable livelihood opportunities for the recipients, interference by political leaders, weakened traditional authority systems, increased levels and non-traditional nature of violence, inflammatory media, and the introduction of commercial raiding…. Several factors can trigger immediate violent conflict between groups in the Cluster and surrounding areas, including a specific violent incident, a series of livestock theft, a raid, a government operation, traditional taunting by girls and women, a seer's prophecy, an inflammatory media article or a politician's speech (USAID, 2002, p. 8).

These characterizations of the causes of conflict in the Karamojong Cluster adequately capture the nature of the Nyangatom-Turkana conflict. With the intention of providing a deeper context and appreciation of the details of individual cases, the major factors that contributed to and exacerbated the Nyangatom-Turkana conflict are discussed below.

3.1 Colonial land alienation and movement restriction

The northward expansion of the Turkana became evident during the colonial period. In the early 20th century, certain Turkana sections are reported to have migrated to Ethiopia to avoid surrender to the British colonial army. According to Mburu (2001, p. 154), "Resistance to British military conquest was weak as some Turkana sections collaborated with the colonizers whereas those defiant evaded confrontation by simply relocating north to sanctuaries in Ethiopia."

At this stage, the Turkana did not pose a real threat to Nyangatom interests. Probably the most serious blow to pastoral economy in the Nyangatom area was the movement restriction that followed the colonial demarcation of boundaries. The British colonial administration in Kenya imposed several measures that restricted free movement and denied access to traditional pastures and water points. In the 1920s and 1930s, the Ilemi Triangle was created and patrolled by the King's African Rifles (KAR), in the name of protecting the Turkana against the Nyangatom and the Dassanech.[8] In July 1939, according to Mburu (2003), "Britain conducted a punitive raid with the King's African Rifles (KAR), supported by the Royal Air Force who dropped 250-pound bombs north of Ilemi."

The British troops of the KAR occupied Ilemi in 1941 and consolidated control over the area when the British entered Ethiopia to fight the Italians during World War II. In the 1940s, the British colonial administration in Kenya established "a series of police posts along the Ethiopian border at Kokuru, Liwan, Lokomarinyang, Kaiemothia and Kibish" (Almagor, 1986, p. 98), thereby effectively curtailing the movement of the Nyangatom and the Dassanech to their traditional grazing lands. This was a time when Ethiopia was deeply indebted to Britain for the help in expelling the Italians, after five years of occupation. Although the Turkana, who were perceived as enemies of the British, had to be brutally pacified,[9] the colonial boundary demarcation obviously expanded their grazing territory further north. The Nyangatom-Turkana relationship worsened after the enclosure of the Ilemi Triangle.[10]

[8] Paradoxically, during the same period the Turkana needed protection. The British military was responsible for the protection of the Karamoja of Uganda from Turkana aggressors (USAID, 2002, p. 23).

[9] However, the establishment of the colonial rule involved brutal military expeditions against the Turkana and the consequent disarmament, which made them vulnerable to attacks and raids by their northern neighbours (Mburu, 2001).

[10] Nyangatom and Turkana were not the only to experience hostility partly due to the colonial legacy. More than half of what became Turkana District was transferred from Uganda to Kenya in 1926 (USAID, 2002, p. 24), thereby exacerbating conflict between the Turkana and those who had lost their land. The report further noted that during the punitive military expeditions in Turkana, the British seized a large number of livestock, which were passed on to members of the Pokot ethnic group as reward for taking part in the campaign on the side of the colonial power, and this increased the animosity of the Turkana towards the Pokot.

3.2 The Ilemi Triangle

The Ilemi Triangle is a disputed territory claimed by Ethiopia, Kenya, and Sudan for more than a century now. From the turn of the 20th Century to the 1970s, numerous meetings were held to determine the status of this area. Since the meetings were held without involving all disputants, the agreements failed to prove binding. Temporary maps drawn during the colonial period, place the triangle under Sudan's control. Sudan and Kenya made arrangements for the latter to administer the area. Hence, Kenya has *de facto* control over the triangle today. Charles Haskins reported that the inter-ethnic conflicts in the Ilemi Triangle is considered as proxy wars to maintain claims to the disputed territory, and he warned that the problem was a time-bomb.

> The problems facing people who live in the Ilemi Triangle…have up to now remain largely ignored by the outside world.... Ethiopia, Kenya and Sudan have each been accused by international observers of using the ethnic groups to fight low-level proxy wars as a means of maintaining their claims to the disputed territory…. Inter-ethnic conflict, competition over dwindling natural resources, state neglect, a lack of adequate health care and, more recently, the discovery of oil, all make the Ilemi Triangle a time-bomb which is ticking inexorably towards disaster (Haskins[11]).

For the Nyangatom, the disaster is not in the future—it is an ongoing and lived experience. The lack of demarcation meant underdevelopment of the area due to state neglect, prolonged hopes that land could be reclaimed, and protracted conflict to realize this hope. After 100 years, unfortunately, there seems to be no solution in sight. In the past the three countries seemed to have chosen to avoid conflict over this remote and inaccessible location, which is perceived to be of marginal economic importance. With the Ilemi Triangle now described as potentially rich in unexplored oil reserves the prospect for peace in the area remains bleak. Therefore, it is high time for the three countries (Ethiopia, Kenya, and South Sudan) to peacefully resolve the age-old and silent dispute over the triangle in a manner that respects the inalienable rights of the original inhabitants of the disputed area.

3.3 Later and recent Turkana expansion

The ordeals of the Nyangatom did not end with the end of British colonial rule in Africa. Reports and informants revealed that afterwards they continued to lose more land and more lives. In July 1988, the Kenyan government, which was planning to annex the Ilemi Triangle earlier in that year, massacred an estimated 700 Nyangatom and displaced the rest from the Kibish river valley (De Waal, 1991; Matsuda, 1994). De Waal (1991, Pp. 345-6) wrote:

[11] Charles Haskins, in a report titled, "The Ilemi Tirangle: A forgotten conflict" noted that the size of the area is between 10,000 to 14,000 sq km.
http://shalomconflictcenter.org/images/THE_ILEMI_TRIANGLE.pdf

> [In] July 1988, the Kenyan police clashed with a group of Toposa or Nyangatom raiders who had previously attacked the Dassanech, and came of worst. Fifteen [Kenyan] policemen were killed, and some taken hostage. The Kenyan government responded the following day with an attack using helicopter gunships and paramilitary forces on the Nyangatom area of Kibish, which straddles Ethiopia, Kenya and Sudan. About 200 Nyangatom raiders and a minimum of 500 civilians were killed by the Kenyan forces over the following 18 days. In the attack, at least five villages in Ethiopia were partly destroyed, the Swedish Philadelphia Mission at Kibish was burned.

The 1988 Kibish massacre is locally known as the *dio* incident, after the District Office of Kenya at Kibish from which the attack was launched. The *dio* incident led to the forced relocation of some Nyangatom eastward as far as the Omo River, while others fled further north to Mount Naita. On the very day the Kenyans bombed the Nyangatom positions, the survivors fled the area in disarray, abandoning their chief, called Loguti Lobotol, who died shortly after the *dio* incident. The Nyangatom, believe that the disappointed and humiliated chief cursed the people and the land, and the curse is now manifested through natural disasters and man-made adversities.

Soon after the Kibish massacre, the Kenyan government is reported to have strengthened its presence by increasing the Police Force, establishing a military camp, and reinforcing the district administrative post. Since the 1988 incident, the grazing area that stretches from the Kibish River to the Tepeth Mountain has been under Turkana control. The Turkana continued to attack and raid the Nyangatom by crossing the Kibish River, deep into Ethiopian territory. A large-scale attack in December 2008 on the Lebere, Kajamakin and Natikar villages caused property destruction and a massive displacement eastwards of the Nyangatom people. In June 2011, the Turkana occupied Lobere for weeks and then withdrew; reportedly after high-level government officials of the two countries were alerted.

3.4 Livestock raids: traditional and transformed

Among most pastoral groups, raiding is widely practiced to replenish lost stock or build new herds. A USAID (2002, p. 5) report stated, "In some respects, this raiding can be seen as a quasi-legitimate sharing of resources, permitting groups on the verge of economic ruin and even starvation to re-establish their systems of food production and natural resource management." Legitimate or otherwise, raiding and livestock theft remain the hallmark of Nyangatom-Turkana relations. Raiding led to the cycle of retribution and violent conflict in the Ilemi Triangle. From the Nyangatom perspective, Turkana raiding has increased in frequency and intensity. A high-profile raid took place in August 2009, when the Turkana allegedly raided more than 13,316 livestock from the Nyangatom (Gebre, 2011).

The practice of raiding is reported to have transformed because of the alleged involvement of some elements of the Kenyan security forces, livestock traders, arms dealers, and jobless armed gangsters. The alleged non-pastoral actors behind cattle rustling are reported to be employing sophisticated strategies to ensure success in raiding. These include meticulous planning and execution of raids, the use of advance automatic weapons (e.g., G3), the use of trucks to load and drive the animals away, and the immediate selling of animals. Teshome Mekonnen (2010, Pp. 206-7) wrote, "When the commercial raiders sold cattle in distant markets, the ability to locate and restore these cattle to rightful owners becomes impossible." Regarding commercial raiding, Nancy Omolo (2011, p. 88) wrote, "The challenging problem is the way in which livestock raiding has been transformed over the years, from a cultural practice/redistributive raiding into a more predatory activity/commercial activity…. In Turkana, the increase in 'commercial' raiding includes cases of 'sponsored' raiding where guns are provided to young men by wealthy people who wish to acquire livestock for sale." Cathy Watson (2003, p. 9) states, "Commercial raids are defined as an aspect of the wider integration of pastoralists within a market economy, and as such includes both raids in which the promoters are not pastoralists themselves, but also those involving pastoralists or ex-pastoralists who raid then sell the stolen livestock immediately afterwards."

The USAID (2002, p. 6) report also highlighted a new conflict trend, as follows:

> One newer phenomenon in the KC [Karamojong Cluster] is roadside banditry, which is often blamed on young men living in the towns and centers. They are part of a growing reservoir of impoverished and uneducated young men, many of whose families have been forced out of pastoralism by circumstances beyond their control or who have dropped out of pastoralist way of life while their families struggle on. All these young men have limited opportunities to earn income so they end up preying on their fellow citizens.

3.5 Other indirect factors

While some factors directly contributed to the Nyangatom-Turkana conflict, others failed to play preventive roles or even exacerbated cross-border pastoral conflict. For example, there is lax security on the Ethiopian side of the Ethio-Kenyan border. In Nyangatom, there are only two police posts (Kibish and Kakuta) located around the border area. They represent a symbolic presence rather than an actual force capable of monitoring the long, porous border and protecting the people from Turkana attacks. According to the study, Kakuta, Lebere, Lokorlam, and Natikar are Nyangatom villages repeatedly attacked by the Turkana. When the fighters/raiders from Kenya perpetrate attacks on Ethiopian soil, the border police, or special security force, rarely come to the rescue of the Nyangatom. The Kenyan side of the border seems to be better protected by the General Service Unit (GSU),

the regular police, and the Kenyan Police Reservist (KPR). According to Nyangatom informants, the Kenyan forces have the capacity to monitor movement on the Ethiopian side of the border, alert the Turkana through by radio, and provide cover when the Turkana attackers/raiders are pursued by the Nyangatom. Some Nyangatom informants reported to have witnessed the involvement of elements of the Kenyan security force in the raids and sharing out of raided animals. It is equally important to acknowledge the brave acts of the responsible Kenyan security forces, in helping the Nyangatom recover raided/stolen livestock. Sammy Ekal (2008), Secretary of Riam Riam (an NGO operating in Turkana), reported,

> On 7th February 2008, the Ngisiger clan of the Turkana from Lapur division… raided the Nyangatom…386 herds of cattle and during this incident six Nyangatom were gunned down…. On 8th February 2008…a violent armed clash occurred between the Turkana of Ngisiger clan and the General Service Unit based at Kibish when the security force was pursuing the Turkana raiders to recover the stolen Nyangatom cattle….the armed raiders opened fire at the security force injuring three…

The Nyangatom-Turkana conflict may have been complicated and exacerbated by human, cultural and natural factors. Within 23 years, the population of the Nyangatom increased fourfold: from 6,087 in 1984 (CSA, 1984, p. 45) to 25,252 in 2007 (CSA, 2007, p. 85). Given the population growth trend in developing countries, it would be safe to assume that the Turkana, the population of which is estimated at 497,770 (Omolo, 2011), have also been expanding demographically. The rapid population growth, and the high social values attached to cattle, may have contributed to the steady increase in the number of livestock being kept. On the other hand, climate change, which is evidenced by frequent drought, has caused scarcity of water and pasture. In recent periods, the Nyangatom experienced severe drought incidences in 2000, 2003, 2005 and 2008. Therefore, environmental change, population growth, and increased herd size, combined with a host of other factors, have exacerbated competition over vital resources–leading to the escalation of inter-ethnic conflict in the hotspot Ilemi Triangle.

A number of cultural values and practices seem to have had a triggering effect on pastoral conflict. In Nyangatom, traditionally participation in offensive/defensive action is important, in order to demonstrate masculinity and fitness. Killing members of ethnic groups considered your enemy does not necessarily subject the killer(s) to negative sanction. The culture allows killers to perform rituals that earn them greater reputation, bestows them with killer names, and changes their social status. Women, in particular, are reported to be playing a significant role in driving men into violence by challenging docility and encouraging/praising aggressiveness. When an individual from a group kills a member of another group, the blame is laid on his group and any member of that group will be targeted for revenge. According to Nyangatom informants, the traditions related to warrior ethos, hero

cults, and the cycle of retribution are not different in the Turkana. It is also important to underline that guns entered the highly valued cultural repertoire and the use of automatic guns since the 1980s has increased pastoral fatality.

3.6 Environmental and climatic factors

Some reports, based on insight from the Turkana area, explain the escalation of conflict between the Turkana and their neighbours, such as the Nyangatom, primarily in terms of how climate change contributed to resource scarcity. Sammy Ekal (2008) attributes the increase in conflict incidences between the Turkana and all their neighbours as the scramble for available natural resources, following the failure of rain. Integrated Regional Information Network (Integrated Regional Information Networks (IRIN), 2011) reported, "Cross-border armed conflict over resources among Turkana pastoralists in northeastern Kenya has increased following the severe drought ravaging parts of the Horn of Africa." Thijs Berman (2011), a Dutch politician and Member of the European Parliament, wrote,

> Last May I visited Kenya's Turkana province, on the border with Uganda, Sudan and Ethiopia…. I had read about the killings of twenty people the week before; it seemed a revenge for a cattle raid by an Ethiopian tribe. The government downplayed the news somewhat, but during my visit it appeared this was not an isolated incident. The struggle for water, for viable land and cattle makes the situation very tense.

Information from the local people also reveal that, over the last few decades, temperatures have increased, rainfall decreased, and droughts occurred with a frequency and intensity never seen before. Informants stressed that they experienced prolonged dry spells and significant seasonal and annual variability of rainfall. Although there are indications that climate change does contribute to or worsen conflict, it is not easy to link specific meteorological factors to a specific conflict. This is partly because conflict occurs due to a number of factors other than climate related ones. When the dry spells intensify, people and livestock concentrate in resource-rich areas, and it is at this time that resource-related conflict surfaces. Yet, a single-year dry season may not lead to conflict, as water and grass do not disappear completely within a short period of time. Moreover, violent conflict is not considered as the only option to address scarcity. People tend to exhibit tolerance in the face of threats and provocations from enemies, in order to save human and animal lives.

4. Social organizations and conflict resolution approaches

4.1 Social organisations[12]

Territorial organisation: There are seven named territorial sections (sing. *ekitala*, pl. *ngiteala*) in Nyangatom. These include Ngilingaqol, Ngkapung, Ngsaqol, Ngutokoraman, Ngukumama, Nubune, Ngarich.[13] An individual (male or female) is born into a given territorial section through his/her father. Section names are not place names, rather the collective names of people occupying a given place. Hence, sections can best be described as political units where important decisions are made. In other words, a territorial section serves as a social identity and fundamental organising principle. Individuals and communities participate in public life through their territorial sections. As Tornay (1981, p. 160) noted, "Members of the sections have rights to settlement, grazing and watering, cultivation, and transhumance within their territory."

Generation-set: The generation-set (*ekas*) is another very important social organisation in Nyangatom. It operates side-by-side and in total harmony with the territorial section. The men of one generation-set father the men of the next generation-set. Hence, each individual belongs to the generation junior to his father. At any given time, two generation-sets with living members are recognised as major and dominant, and they are called the 'Fathers of the Country' and the 'Sons of the Country.' During the research period, the *Gnytome* (Elephants) and the Gnyorukopi (Ostriches) represented the Fathers of the Country and the Sons of the Country respectively. Junior to the Ostriches, are three generation-sets: Gnugoleteng (Antelopes), Gnykosowa (Buffalos), and the youngest generation (not yet formally named, but temporarily called the Gnykinyaga (Crocodiles), ranked in order of seniority.

Traditionally, secular (administrative, judicial, etc.) and ritual powers are vested in the hands of the Fathers of the Country. Serious matters of public concern are brought to their attention for deliberation. Since the entire Nyangatom society is organised according to the principle of generation-sets, every territorial section has the same generation-sets. Hence, in all territorial sections of Nyangatom it is the Elephants who are responsible for the management of public affairs. Theoretically, the Elephants are the sole decision-makers. Practically, however, they invite a certain number of members of the sets called Ostriches, Antelopes, and sometimes Buffalos, to attend crucial meetings. The Elephants could delegate power to the Ostriches to handle certain issues on their behalf. The Sons of the Country are responsible for ensuring the implementation of the decisions made by the

[12] In order to adequately grasp the customary dispute resolution mechanisms, it is necessary to understand social organisations. Deeper knowledge of the social organisations of conflicting groups would enable us to understand the decision-making processes and the power and legitimacy of local actors in pastoral conflict. This, in turn, may serve as an entry point for planned intervention or further and detailed research.

[13] The Ngarich section consists of the Murle, an independent ethnic group assimilated into the Nyangatom. In recent years, the independence of the Murle has been recognised.

Elephants and giving orders to the junior sets, who are responsible for the actual implementation of decisions. Despite the introduction of modern administrative and justice systems, the Nyangatom prefer to resolve intra-and inter-ethnic conflict through traditional mechanisms. In recent years, however, people have realized that only bilateral government meetings would resolve the cross-border conflict with the Turkana.

Age-sets: Generation-sets are further divided into a number of age-sets. Age-sets consist of age-mates, i.e., males of a similar biological age through an initiation ritual called *apeyo*. Except for the most senior generation-set (which loses most members due to aging) and the most junior generation-set (which recruits new members), generation-sets in the middle hierarchy have several age-sets. Neville Dyson-Hudson (1963, p. 358-9) explained the age system among the Karimojong cluster as follows:

> Adult male Karimojong are recruited into named corporate groups of coevals, termed *ngasapaneta or ngasapanisia*, and here are spoken of as age-sets. Each age-set comprises all those men who have performed the initiation ceremonies within (ideally) a single five-to-six years period throughout the entire tribe. Five age-sets amalgamate into a named corporate group of wider time span and larger membership, termed *anyamet*, to which I give the name generation-set. Each generation-set thus comprises all men of the tribe who have performed initiation within the period of 25 to 30 years ideally covered by its constituent age-sets.

Likewise, the generation-sets of the Nyangatom are divided into age-sets, which are formed in different localities and with different names. Age-mates, willing to be initiated into a new age-set, have to demonstrate their readiness by participating in some offensive/defensive action. Moreover, they are expected to offer animals (e.g. goats) to members of the senior age-sets within the same generation. As Tornay (1981, p. 162) noted, the senior age-sets '…in return allow the initiands to wear the adult mauve plastered head-dress and to adopt the new age-set name,…' The name could be chosen by the new initiates or imposed on them by the elder age-mates. The youths continue to join the newly initiated age-set until the group becomes numerous and strong enough to declare its autonomy. Although the dates of age-set formation and the names given to individual sets vary from place to place, the ranks of the sets and the structural equivalence is widely understood.

Clan: The Nyangatom are divided into 14 (there may be more) named patrilineal exogamous clans (*ngitekerea*, sing. *ateker*). These include Ngimuyoko, Ngitoroy, Ngukuko, Ngikuakurecha, Ngidhocha, Ngikor, Nginyanga, Ngipucho, Ngiribo,

Ngithiger, Ngiraputa, Ngilopol, Ngimeturuaba, and Ngikuren.[14] The clans of Murle (Yirmach) and Muguji (Numuchu) are not treated as Nyangatom clans.[15] An individual becomes a member of his/her father's clan at birth. Unlike in other cultures, such as Somalia, clans do not serve as organising foundations for the formation of a political entity. According to Tornay (1981, p. 153), 'clans should be viewed as emblematic entities rather than descent units.' Most clans are not territorial and thus do not claim resources in their names. Clans do not have publicly recognized roles in major decision-making processes. However, certain clans are believed to have the power to make/stop rain, deceive/trick enemies, cure snake/scorpion bites, and control disease. For instance, the Ngikuren are reported to be responsible for fire and war.

4.2 Conflict resolution approaches

Resolving intra-ethnic conflicts: In Nyangatom, there exits an elaborate customary law for resolving intra-ethnic conflicts. The common types of internal conflict that are often resolved using customary mechanisms include homicide, adultery, impregnating girls, disputes over resources (water and pasture), theft, failure to pay debt, and betrayal. When disputes arise, attempts are made to resolve them at the family, friends, or neighbourhood level, with or without involving elders. Sometimes individuals may agree to resolve their problems within the presence of few witnesses. If the matter turns out to be difficult to handle then more elders may be invited to participate, while the matter is still kept low key. The arbitrators/elders would normally ask the disputants to explain the causes of their conflict, before advising them to reconcile rather than hurt each other and their loved ones. When such initial efforts fail, the matter is taken to members of the senior generation-set (Gnytome) and/or a senior member of the Ngukumama territorial section. The Ngukumama are considered as ritual experts, peace symbols, and masters of blessing/cursing. The presentation of a case to the Gnytome or the Ngukumama is followed by various procedures of hearing, evidence verification, deliberation, ritual performance, and provision of compensation.

Resolving inter-ethnic conflicts: After a major conflict, or a series of repeated small clashes, inter-ethnic disputes were resolved by traditional mechanisms. In most cases, elders from one or more groups expressed the need to initiate a peace process through peace messengers, who carried peace symbols—white ostrich feathers tied to a tree branch. Following approval of both parties meetings will be held in each group to discuss possible reconciliation. Then delegates will be identified to attend the peace ceremony. On a date fixed in advance, the guests from one group travel to the village of the other group, often to their common border area. The Nyangatom are represented by senior members of the Elephants,

[14] Serge Tornay (1981, Pp. 153-4) counted 20 clans in Nyangatom and noted that some of the clans have wives acquired from the Dodoth, Lotuko, and Turkana peoples. The reduction in the list of Nyangatom clans today may partly be explained in terms of the death of these women.

[15] Further research may reveal that the Murle and the Muguji have more clans than only one each.

senior members of the Ostriches, at least one Ngukumama, and other wise elders and young men as deemed necessary.

Upon their arrival, the guests will be given warm hospitality, including the slaughtering of small animals in their honour. The same day, or often the next day, the peace negotiations would resume and continue for at least a day. In order to develop trust and confidence, the deliberations would be held in a manner that is open/free and based on telling the truth. Terms of compensation and retrieval of animals would be agreed, to the satisfaction of both parties, and implemented without any delay. Rituals will be performed to validate and enforce the agreements. Since the Nyangatom and the Turkana share the same religious traditions and cultural values and practices, the reconciliation rituals are taken seriously. Common ritual practices include splashing milk and water on participants, placing the belly fat of a sacrificial goat on their necks, rubbing hands/body with stomach discharges, holding fresh green grass/leaves, breaking and burying spears or guns, cursing evil deeds, and blessing peaceful activities. The participants would then return to their respective groups to spread the peacemaking news and urge their people to refrain from engaging in any conflict. In the past, conflict was intermittent and peace deals lasted for several years. Today, peace efforts fail immediately, or last only a very short.

Community level peace initiatives: The community-based conflict resolution mechanisms discussed above worked well prior to the 1970s but not in recent years. After the 1988 Kibish massacre, the relationship between the Nyangatom and the Turkana further deteriorated. Ten years later, the Nyangatom and the Turkana elders met and performed reconciliation rituals at Lokiriyama (Kenya). To the embarrassment of the Nyangatom elders involved and the people they represented, the Turkana launched an organized attack on the very day the Lokiriyama meeting was held. In 2004, elders from the two ethnic groups met at Kibish (Kenya) and swore through acts of rituals, not to attack and raid each other. Once again, according to Nyangatom informants, the Turkana violated the deal by launching an attack shortly after the meeting. However, the Nyangatom explain the failure of peace deals in terms certain agents in Kenya who benefit from destabilization. One elder noted:

> We know the ordinary Turkana, we know their elders. They are our neighbours, our cousins. They want to live in peace with us. When we meet, we say: what went wrong? Aren't we Ateker? Why are we killing each other? The ordinary Turkana could not understand why the peace agreements are violated…. Of course, there are some Turkana who come from distant locations to raid. That happens rarely. They come for animals, not for land…. The real enemy is the father of Turkana [the Kenyan government] who spoiled some of his children. He sends them to kill us, to evict us from home… Our father [the Ethiopian government] does not protect us.

It appears that the traditional methods of resolving conflict are not taken seriously by the Turkana, as evidenced by their failure to honour agreements. Some Nyangatom informants unequivocally expressed their conviction that elements of the Kenyan security forces, local officials, and NGOs operating on the Kenyan side of the border, are not interested in ending the raiding. Others felt that the younger generation and the educated Turkana do not respect their elders or honour their decisions. This may have to do with the dismantling of the traditional dispute resolution institutions by the colonial administration.

> Colonial boundaries were introduced that put restriction on transhumant migrations and imposed an alien system of resolving community disputes, which usurped the gerontocratic authority previously vested with community elders…. It is notable that before colonialism, chiefly authority constrained unnecessary conflicts and when they occurred, it regulated bloodletting and devastation. For example, there existed a poly-tribal council of elders known as Lukiko, which settled inter-community disputes over water, grazing or livestock thefts between the Nyangatom, Turkana, Dassanetch and Toposa without recourse to war…. However, this traditional institution was destroyed by the British system of colonial administration that was backed by the force of modern weapon (Mburu, 2001, p. 155).

District level peace initiatives: The second conflict resolution approach relates to peace initiatives taken by authorities of adjacent border districts. The Nyangatom *Woreda* administration, on its own and sometimes in collaboration with other agencies, worked to organise or facilitate a series of peace meetings/events. In 2006, the administration sent a delegate to Loktank (Kenya) to initiate peace talks, and this initiative led to the January 2007 initial meeting at Kangaten (Ethiopia) and the March 2007 peace conference at Kibish (Kenya). During this conference, elders of the Nyangatom and the Turkana signed a comprehensive peace agreement, in the presence of district officials from both countries. In October 2007, a peace festival was organized by a local NGO called Atowokis Ekisil Pastoralist Development Association (AEPDA) at Kangaten, with the objective of promoting and strengthening the peace effort. People from 18 different ethnic groups in Ethiopia, Sudan, and Kenya participated. In January 2008, the Turkana violated the 2007 Kibish peace deal and since then have intensified their assaults with impunity. The 2008 Turmi Accord was also reportedly broken by the Turkana. On the other hand, Riam Riam (2008, online), the Kenyan NGO operating in Turkana, claimed that the Nyangatom were in breach of the Turmi agreement, as follows:

> From Turmi - Ethiopian meeting communities agreed as a resolution that a 10 km buffer zone be created within the communities for purposes of managing the conflict in the area but

> … we found Nyangatom livestock [grazing] within the fence of the Kenya GSU camp, an issue that had contravened the Turmi resolutions. Therefore, we attribute that as a problem caused by lack of following the laid down agreement by either communities, governments and the civil societies.

The 2010 CEWARN Country Updates from Ethiopia (for the period of September-December 2009) recognises the efforts made by the Ethiopian local authorities to minimise cross-border counter raids and revenge killings in the face of repetitive attacks from the Kenyan side, as follows:

> The active engagement of local authorities in positive peace activities was one of the key reasons for keeping the peace initiatives…. The Dassanech and Nyangatom administrations had worked relentlessly in convincing the communities to refrain from launching counter raids in the face of repetitive attacks from Turkana. They were tirelessly moving from settlements to settlements in an attempt to convince the communities to show restraints. This has hugely contributed to the lessening of cross-border attacks from the Ethiopian side (CEWARN, 2010a, p. 9).

Regional level peace initiatives: Bilateral border commission meetings represent the third peace-making approach. When local peace initiatives failed and the conflict escalated unabated, the Governments of Ethiopia and Kenya once in a while organise high-level meetings through their border commissions. The latest such meeting was held in October 2009 at Nakuru (Kenya) and November 2009 at Hawassa (Ethiopia). The Nakuru and Hawassa meetings were led by the Provincial Commissioner of the Rift Valley Province and the President of the Southern Nations, Nationalities, and Peoples Region (SNNPR) (Ethiopia). Both meetings focused on improving relations between the Nyangatom, Turkana, and Dassanech, and an agreement was reached on the retrieval of livestock (CEWARN, 2010a). However, this decision was not implemented because the "Turkana insisted that they cannot return the livestock because they had died since then due to disease or had been raided by other communities" (CEWARN, 2010b, p. 9). Local authorities in Ethiopia noted that the Turkana not only refused to honour the Joint Border Commission's decision but also derailed the peace process by launching new attacks on the Nyangatom shortly after the Hawassa meeting.

During the research period, the local people and *Woreda* officials were frustrated by the behaviour of the Turkana, who became unpredictable, untrustworthy, and increasingly violent. There was a sense of bitterness, on the part of local people, who felt that the Ethiopian government did not come to their rescue when they were massacred, displaced, and robbed of their lifeline (livestock) repeatedly by the Turkana–who, allegedly, enjoy protection and support from the Kenyan police and army stationed at Kibish.

5. Conclusion and recommendations

5.1 Conclusion

Based on a study conducted in 2010 in Nyangatom (South Omo Zone, SNNPR, Ethiopia), attempts are made in this paper to explain the longstanding inter-ethnic conflict between the Nyangatom and the Turkana. The relationship between the two groups began to deteriorate after the Nyangatom lost control over their grazing land in the Kibish area—the heart of the contested Ilemi Triangle. The British colonial administration planted the seeds of animosity by creating the Triangle to restrict free movement of pastoralists. The worst conflict happened in 1988 when the Kenyan government controlled the land west of the Kibish River, after expelling the Nyangatom at gunpoint. The steady increase in herd size, exceeding carrying capacity; the changes in climatic patterns that led to frequent drought; the cultural values that incite violence; and the participation of non-pastoral groups in raids, made the conflict complex and complicated.

The consequences of this rather protracted inter-ethnic conflict include loss of precious life, permanent injuries, loss of access of pasture and water, and failing livelihoods. Large tracts of land in Kibish area have been abandoned and wasted because of security concerns. Many households displaced by the conflict are on emergency aid. The conflict zones in the border areas lack meaningful development projects, infrastructure, social services, trade activities, and security. The increased attacks perpetrated by both parties over the years with impunity, using newly acquired deadly automatic weapons, have exacerbated animosity and the cycle of violence. Unfortunately, the governments of Ethiopia and Kenya did not pay sufficient attention to the cross-border inter-ethnic conflict in the Ilemi Triangle. The Nyangatom-Turkana conflict is far from over and it is high time for a lasting solution to be found.

There exist a number of peace capacities (connectors) to build on. The Nyangatom and the Turkana have a lot in common: identity as members of the Ateker, similar religious traditions, common language, common cultural values and practices, intermarriage, and the culture of sharing. Apart from these historical and cultural bases of connectors, it is important to develop the current perception, among the Nyangatom, that the Turkana are a friendly people. The existing sense of friendship/companionship could be further enhanced through social and cultural events (e.g., music and dance festivals, sports events, and religious/ritual activities). In the last five years, the Nyangatom have expressed, and demonstrated time and again, their readiness for lasting peace with the Turkana. Since it takes two to cut a peace deal, genuine commitment on the part of the Turkana side is also necessary. The steady decline in resources due to environmental factors contributed to the escalation of conflict. This warrants the need to devise joint or separate program intervention in the border area.

Traditionally, the Nyangatom migrated from the Kibish area to the Omo River bank to avoid more loss of human life and livestock through Turkana attack and drought. The Ethiopian Government plans to develop 150,000 hectares of land to grow sugarcane, which will be processed in six factories to be established in the lower Omo valley. Although the Ethiopian authorities claim to have consulted local people about this, the ordinary pastoralists in Nyangatom do not seem to have adequate and clear information about the project and the way it will affect their future. Some people had heard about the construction of a dam (Gibe III) upstream and the planned diversion of water to irrigate the sugarcane plantation. It is feared that these projects would reduce the flow of the river, thereby threatening livelihoods and exacerbating inter-ethnic conflict—as a large number of people may be forced to return to Kibish. The Ethiopian government plans to resettle the pastoralists and provide access to irrigated agriculture, infrastructure development, social services, and agricultural extension services. It is difficult to speculate what will exactly happen down the road. After taking their land away, if the Nyangatom are left to fend for themselves with minimum support from the government, the concerns that the projects may threaten livelihoods and exacerbate inter-ethnic conflict will become a reality. On the other hand, if the planned interventions are based on proper understanding of the cultures and life choices of the people in the area, the projects would mark the end of all social evils—that is, conflict, poverty, disease, and underdevelopment.

5.2 Recommendations

Conflict prevention: Strengthen police posts, local militia, peace communities, community vigilance, and early warning systems, to prevent conflict

Inter-community contact: Launch regular dialogue, review of peace progress, cultural events/festivals, to foster mutual understanding and solidarity

Joint projects: In the border areas, launch common social services (schools, clinics), veterinary services, water/grazing schemes, local market/trade, infrastructure, to create and promote socio-economic and cultural integration

Improving livelihoods: Diversify livelihoods, improve livestock quality, promote milk/butter production, promote agriculture (where possible), create outside market opportunities for pastoral products, to reduce reliance on raising animals.

Enforce peace accords: Involve major actors in peacemaking, reduce commitment to acts of violence through awareness raising schemes, devise mechanisms to enforce peace accords.

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New Regionalism as a Response to Environmental Conflicts among Pastoralists of the Horn of Africa: The Case of IGAD/CEWARN

Yonas Ashine

Abstract

Environmental problems and their severe impact are nowhere as noticeable and felt as much as they are in the Horn of Africa (HoA). Among other things, the nexus between environmental degradation and conflict is becoming multifaceted and complex in the region. Pastoralist areas are archetypal stages for this kind of depressing tragedy. These problems are not limited to the boundary of a state, rather they appear to be trans-boundary and collective regional problems, making regionalism indispensable. This trend has attracted the attention of states since the late 1980s and urged them to collude. It was this incentive that gave birth to the Intergovernmental Authority on Drought and Development (IGADD, later to cancel one of the Ds (Drought) and become IGAD). This study has two separate but interrelated objectives. On the one hand, it examines not only the presence but also the viability of new regionalism in the Horn. On the other, it explores the evolution as well as effectiveness of IGAD and the Conflict Early Warning and Response Mechanism (CEWARN) in addressing pastoralist conflict in the region. The study uses both primary and secondary data. To substantiate the analysis, theories such as new regionalism and new functionalism were utilized. As a final point, the study concludes that the regional process in the HoA is incrementally and functionally becoming more in line with new regionalism. However, it asserts, for example, that the problematic state-civil society relationship, donor fatigue among partners of IGAD, negative impact of foreign forces, and the incapability and reluctance of members to contribute membership fees are barriers to new regionalism in the Horn of Africa. The study reveals the gap in the response side of the CEWARN system, which failed to integrate the issues of environment and development and provide a permanent way of addressing pastoralist conflict in the region.

1. Introduction

The Horn of Africa (HoA) is a region that is often associated with famine, poverty, instability and conflict. Many scholars (Markakis, 1998; Medhane, 2004; Mesfin, 1999; Woodward, 1996) describe it as one of the most unstable and crisis-prone areas of the world. As history witnesses, the region was previously an area of confrontation between colonial powers, and between the super powers during the cold war. It is also a region that defies the anticipation that peace and stability would follow the end of the cold war. Since the end of cold war, in spite of regime change and the emergence of new states, the HoA has not been free of conflict and tension between member states and other sub-national groups (Belay, 1996; Medhane, 2004).

The other gloomy aspect of the HoA is the magnitude of environmental degradation, which has been linked to long years of instability in the region. Environmental degradation, such as soil erosion, deforestation, loss of biodiversity, and desertification, has been the norm rather than the exception in the region (Economic Commission for Africa (ECA), 2004; Markakis, 1998; Yohannes, 2003). In addition, global environmental change, coupled with the above local and regional environmental problems, as well as socio economic and political dynamics of the region created huge potential for additional sources of conflict (Gedion, 2003; Hutchison, 1991). This is because the above-mentioned environmental problems create, for example, scarcity of water, land and other renewable resources. Therefore, there is a clear link between environmental problems and conflict, with actors, mainly pastoralists, competing for scarce resources to ensure their survival. This is one of the causes of conflict in the HoA (Homer-Dixon, 1992, 2004; Hutchison, 1991; Markakis, 1998).

Hence, when discussing conflict between pastoral communities, the inclusion of the environmental factor as a cause, catalyst and consequence is essential. This study attempts to determine the nexus between environmental scarcity and conflict among pastoral communities, who often try to negate the impact of the harsh environment though various strategies, mainly mobility (Markakis, 1998). This strategy fails to respect international borders and, hence, pastoral issues are common in all countries of the region.[1] Because of this trend the study commences by hypothesizing that regional co-operation is necessary to address environmental conflicts in the HoA. In order to explore attempts to achieve regional cooperation the study focuses on the role of Intergovernmental Authority on Development/Conflict Early Warning and Response Mechanism (IGAD/CEWARN) in pastoralist areas such as the Karamoja, Somali and Dikhil clusters. It also anticipates the challenges to and prospects for new regionalism in the Horn.

2. Regionalism: Old or New?

Regionalism[2] is the formation of regional cooperation in a certain distinct area. It is synonymous with terms such as regional integration and regime formation. Soderbaum (2003, p. 7) defines regionalism as "…the ideas of identities and ideologies related to a regional project." In this sense it denotes a condition of collective management of regional issues. For Nye (1968, p. vii) regionalism in the "……descriptive sense [is] the formation of interstate associations or groupings on the basis of regions; and in the doctrinal sense, the advocacy of such formation." Based on these two definitions, it is

[1] States of the HoA–Sudan, Somalia, Ethiopia and Kenya–rank first, third, fifth and sixth respectively in the world in terms of pastoralist population size and hold considerable size of pastoral population ranging from 6 percent in Kenya to 60 percent in Somalia. Pastoral rangelands cover vast sizes of each country—52 percent in Ethiopia, 66 percent in Sudan, 70 percent in Eritrea, 72 percent in Kenya, 75 percent in Somalia and 100 percent in Djibouti (see Markakis, 2009)

[2] Macro-regions (world regions) are larger territorial (in contrast to non-territorial) units or sub system between the state and the global system. Africa, Europe, Asia and other continents could be regarded as macro-regions, and meso-regions describe mid-range states or non-state arrangements and processes. Regions such as the Horn of Africa and Southern Africa are considered meso-regions.

possible to conceptualise regionalism as a collective action and the promotion of the collective action as the proper way of dealing with regional problems.

In the 1980s states in the HoA began to practice regional cooperation, in order "…to tackle collectively the recurrent drought and desertification in the sub region." (Kinfe, 2007, p. 22). They chose to engage in regional cooperation because they recognised their interdependence. There are two forms of regionalism: old or first wave regionalism and new or second wave regionalism.

According to Hettene (2003, Pp. 23-4), old regionalism is the form of regional integration which is formed in the bipolar, cold war context. Created from above by elites and heads of state towards protecting the state security, it is very specific with regard to its objectives (i.e. security or economy) and only involved state actors. This approach is directly linked to the sphere of influence during the bi-polar world. Moreover, it is dominated by state actors only, therefore often described as "the old boys club" (Soderbaum, 2007, p. 187). New regionalism or second wave regionalism takes place in the multi-polar order and in the context of globalisation, or "in a post-hegemonic era" (Soderbaum, 2007, p. 187), on a voluntary basis, among state and non-state actors, who have an understanding of the value of greater interdependence in multi-dimensional and comprehensive areas, such as the environment, transport, and ethnicity. In general, the latter is a response to new global and regional challenges (Hettene, 2003, Pp. 23-4). Similarly, Shaw (1995, p. 251) explains new regionalism to be "… distinguished by their purpose (i.e. less economic or strategic); participant (i.e. non-state as well as official actors) and structures (i.e. less centralized, bureaucratized and politicized)." Such an approach is promoted by, theory of neo-functionalism. Neo-functionalism promotes gradual and incremental cooperation between actors to manage collective problems. Terms such as 'spill over effect', 'incremental integration' and 'ramification' are important in explaining new regionalism (See Hass, 1958, 1968). Hence, both neo-regionalism and neo-functionalism appear complementary and essential to substantiate the analysis in this study.

The study views the regional response to pastoralist conflicts from the aforementioned key characteristics of new regionalism. The justification for the selection of new regionalism as a tool is premised on the needs of the environment and political economy. Cooperation is mandatory for dealing with environmental problems and conflict, owing to their regional character, the nature of shared resources, and common problems. The states of the HoA are poor, unstable, conflict-prone as well as lack expertise and institutional capacity (Kinfe, 2007; Shaw, 1995; Terlinden, 2004) as a result of which they cannot initiate meaningful arrangements for cooperation by themselves. Hence, it is necessary for external actors and civil society organizations (CSOs) to fill the gap created by the frail and problematic political economy of the states. New regionalism promotes the role of CSOs and external actors in regional cooperation on functional issues such as the environment (see Figure 1).

To clearly depict the new regionalism, a conceptual map has been developed. The map indicates the state actors, the CSOs, the general population of the region, and the

external actors (light gray colour box) interacting and converging (arrows) in certain functional areas of cooperation (white colour box), such as in relation to environmental problems (see Figure 1 below). The double arrow lines depict the relationship between actors and their responses to specific problems.

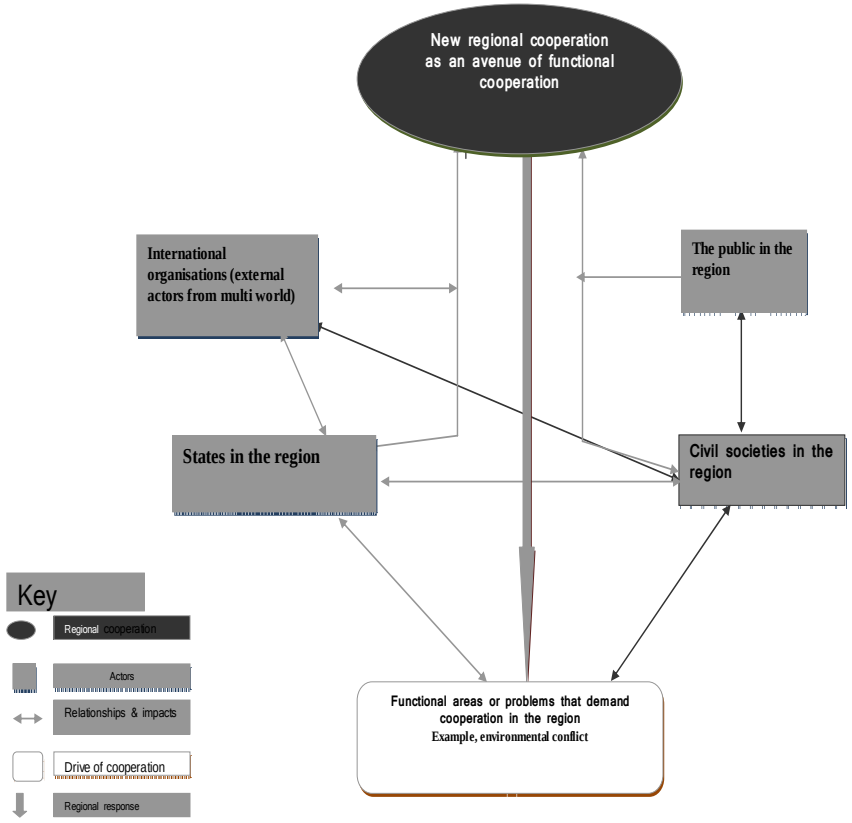

Figure 1: Model for schematic explanation of new regional cooperation

3. Pastoralists of the HoA

Pastoral areas cover about one third of the earth's surface and nearly two thirds of the African continent (Meier & Doug, 2005). In the HoA, 12-20 million pastoralists live in seven countries. These people constitute a substantial population and represent a huge land size and considerable resources in their respective countries. For example, in Ethiopia 10-12% of the total population are pastoralist; 40% of the cattle, 75% of the goats, 25% of the sheep and 100% of the camels as well as most national parks are found in pastoralist areas of the country (Yacob, 2001). However, in Ethiopia and elsewhere in the Horn, pastoralists are the most marginalized and peripheral people, in terms of socio-economic indicators and political participation.

Researchers have identified the link between the marginalized status of pastoral communities and the socio-political economic as well as ecological crises, which severely challenges the survival of these communities. For example, Helland's (2006, p. 1), research on the Afar pastoralists indicates that "…resource poverty [as result of degradation and encroachment by other actors] is..... becoming a major aspect of poverty in pastoral areas." Although the appropriateness of mainstream poverty indicators to pastoral conditions is debatable, in Karamoja (Uganda), the proportion of population who live in poverty is 82%, which is the highest in Uganda (Chapman and Alexander, 2009). Comparatively, pastoral lowlands of the HoA and pastoralists inhabiting these lowlands face a myriad of challenges among which conflict is a major one (Chapman and Alexander, 2009; Mwaura, 2005).

4. Pastoral conflict and environmental change

Pastoral areas are increasingly becoming a textbook case of conflict in Africa. In the HoA, the boarders of Ethiopia, Somalia, Sudan and Kenya are very insecure because of ongoing pastoral conflict. For this reason it is named with various deprecating epithets; for example, Bekele (2010, p. 13) addressed the region as a "…[pastoral] conflict hotspot." The numerical data also supports this gloomy picture. According to IGAD/CEWARN about 2,653 human lives were lost between 2003 and 2006 in pilot areas of the Karamoja Cluster. In addition, during the same period 116,426 cattle were raided. During one particular clash in May 2007 over 50 people were reported killed—almost all of them women and children—after Toposa pastoral groups attacked Dindinga villages in South Sudan (Sudan Human Security Baseline Assessment (HSBA), 2007).

In February 2010, 17 violent incidents were recorded in the Karamoja, Somali and Dikhil Clusters, causing 14 deaths and the raiding of 129 animals (CEWARN, 2010a). In December 2010 a total of 71 violent incidents were recorded in the Karamoja Cluster, causing 103 deaths and raiding of 6,290 livestock, and there were four violent incidents causing the death of two people and raiding of 157 animals in the Somali Cluster. In January 2011, 41 violent incidents were recorded in Karamoja Cluster, causing 33 deaths and the raiding of 3,690 livestock. Uganda recorded the highest number of incidents yet, at 37 violent incidents, which resulted in the death of 13 individuals and the raiding of 3,333 livestock (CEWARN, 2010b).

Environmental scarcity has been identified, by a number of academics, as one of the major causes of violent conflict (Cramer, 2008). Homer-Dixon (1992, 2004) explains conflict mainly from the context of environmental scarcity. Competition for scarce resources, particularly water and pasture, is one of the major causes of pastoral conflict (Bekele, 2010; Ethiopian Pastoralist Research and Development Association (EPaRDA), 2010; USAID/REDSO quoted in Meier & Dough, 2005).

Pastoral conflict is not a new phenomenon in the Horn, however in recent decades the frequency and severity of pastoral conflicts is increasing: partly as resource scarcity increased, population significantly increased and the environment is more degraded. In the past there were fewer injuries and deaths resulting from violent conflict and attacks on women and children were nonexistent. Moreover, the impact of the conflict was less in the past because of the use of traditional weapons, rather than the modern automatic weapons used today (EPaRDA, 2010). The major changes in the pastoral way of life result from changes to the environment, the proliferation of small arms, and the increase in size of both the human and livestock population. Moreover, the legacy of colonialism and the civil wars in the region contributed significantly for intensification of conflict in the region (Umar, 1997). Thus, the breaking down of traditional institutions, the worsening poverty and increasing competition for dwindling resources have created fertile ground for conflict.

Regarding the impact of the environmental variable, climate change is becoming the prominent factor in increasing pastoral conflict[3] in the HoA. For example, in 2009 "…close to ten million pastoralists were at risk of starvation due to drought" (UNEP, 2010a). Recent research in the Karamoja area, which assessed the correlation between environmental variables, such as precipitation and forage, with human behaviour concluded that "…the violence in the Karamoja Cluster is clearly linked to environmental scarcity." In other words "…low forage availability during the dry season prompts pastoralists to migrate in search of productive patches of land and water resources…… [Conflict] soared during this time period just before the onset of the rainy season." (Meier & Dough, 2005, p. 25). Bekele (2010, p. 145) considers "…recurrent droughts [to be] the major factor contributing to resource scarcity" and that "…resource scarcity is an important challenge ...to recurrent clashes". UNEP (2010a) argues that "…climate change is resulting in unpredictable and extreme weather patterns and influencing mobility patterns amongst pastoral communities" and that this inevitably "…increases levels of migration and conflict over often scarcer resources" in the HoA.

The natural environment of the pastoral areas of the Horn is degraded and becoming unable to accommodate the pastoral communities and their livestock. And migratory routes are blocked by international boundaries and encroachment of land by different land users. This has a clear and direct implication for traditional survival mechanisms. The desire for peace has been lost and recurrent conflict has become the norm, not the exception. Survival becomes a challenge, and in that situation the last resort is conflict. The opportunity cost of choosing to fight becomes zero (Hisheliefer quoted in Cramer, 2008). In general, pastoralists are becoming too poor and impoverished to be able to choose peace.

[3] There are literatures which question the correlations between environmental degradation and pastoral conflicts. This view is called cornucopian. They recognize that natural resources are theoretically limited, but they stress that natural resources are more abundant than realized by the neo-Malthusians and do not consider scarcity of resources as cause of conflict (see Nils Petter Gleditsch & Ole Magnus Theisen, n.d.). Neo-malthusians as opposed to the cornucopians emphasize the role of environmental variable in conflict dynamics (Markakis 1998; Home –Dixon, 1992).

Although the role of environmental factors in causing pastoral conflicts is undeniable, to fully comprehend the nature of other casual variables connected to the localities their specific historical, social, geographical and economic make-up needs to be considered. This is because pastoral conflict can be explained by other variables, such as poverty, the culture of raiding, arms proliferation, land encroachment, ethnicity, external intervention, and wider regional and global dynamics (Bekele, 2010; Cramer, 2008; Ludi & Tobias, 2004; Meier & Dough, 2005; Mwaura, 2005).

5. Response to pastoral conflict: Peace, environment or the development pillar?

There are various debates among scholars on the ways of managing or resolving pastoral conflicts. The available literature frames the response to pastoral conflict in the Horn, and elsewhere, by three different pillars: environmental, peace and development (Bekele, 2010; UNEP, 1999; 2010a; 2010b).[4]

The peace pillar focuses on operational prevention—short-term efforts using political or military means to prevent a conflict or forestall escalating violence (the “fire brigade approach”) (Rubin & Jones quoted in Wulf & Tobias, 2009). In this pillar the utilization of traditional conflict resolution, and peace conferences for the conflicting parties, are examples of the chosen mechanisms. The development pillar focuses on structural prevention—efforts through developmental or economic tools to address the root causes of conflict, aimed at risk reduction and formulation of better regulatory frameworks (Ibid). Creating better accesses to markets and know-how, developing economic interdependence and exchange between communities, and improving livelihoods and survival mechanisms should also be considered. For example, Bekele (2010) recommended that "…conflict management should be recognized as part and parcel of development policies, because development efforts [alone] cannot produce the anticipated impacts on the livelihoods of pastoralist."

The environmental pillar focuses on the rehabilitation of the degraded environment and the creation of opportunities and mechanisms which mitigate and help to adapt to the changing environment. As UNEP (1999, p. 36) put it "…environmental condition and reuse should be the focal point for conflict resolution and conflict prevention… [in pastoral areas]." A more practical recommendation is put forward by UNEP (2010a): "…urgent action is needed to help pastoralists cope with the rising impacts of climatic change including strategies by government to facilitate safe passage across borders in the Horn and East African region." The aim is to improve the opportunity for pastoral communities to move across international borders in search of pasture and water points.

Given the complex socio-political, economic, geopolitical and environmental context of the pastoral areas in the Horn, the three pillars appear complementary. Addressing the

[4] In some literature the latter two pillars are considered to be structural prevention.

crisis in pastoral areas demands the consideration of all the pillars, without compromising any of them. The regional response appears worthwhile, given that the pastoral issues, in particular, and environment and peace issues, in general, are beyond the jurisdiction of any individual state in the region. Therefore the involvement of regional organisations and non- state actors, such as CSOs, is critical. With this in mind the study will explore the response of the IGAD system, through CEWARN, to the pastoral conflict.

6. Historical view on the evolution of IGAD

When one imagines regional cooperation in the Horn, IGAD inevitably and predominantly springs to mind. IGAD provides an avenue for the countries of the Horn to cooperate on various issues. IGAD was conceived from the understanding that tackling environmental problems required regional cooperation (Kinfe, 2007; Saleem, 1992, p. 114; Shaw, 1995). After its conception, IGAD passed through various restructuring steps, aimed at better addressing the multifarious challenges of the region.

Regional inter-governmental organizations encouraging cooperation emerged in the HoA, in the form of Intergovernmental Authority on Drought and Development (IGADD), in 1986. "The [root cause for the] genesis of IGADD is environmental issues".[5] This is true because the *raison d'être* of IGADD was environmental factors such as drought, desertification and famine (Kinfe, 2007, p. 7; Saleem, 1992, p. 114). Although it visualized the optimal use of the region's environmental resources, its action plan did not address trans-boundary resource utilization and environmental conflict (see IGADD Plan of Action (IGADD), 1986).

During its first decade, IGADD successfully brought the leaders of the Horn to the negotiation table, using their common problems to prioritise the agenda. Hence, the primary success of IGADD was its attempt to encourage good relations between the members and its survival for such a long time as a regional organisation. It must, however, be noted that drought and environmental degradation issues could not be resolved within this timeframe.[6] Shaw (1995, p. 257) described IGADD as "... the only regional institution which has brought major contenders together, especially in its instrumental mediation/negotiation in the late 1980's." This indicates that IGADD, even before the expansion of its mandate, was already established as an avenue of peace and security (Ibid). However, the states were not in a position to start the peace process in the 1980's as there was much antagonism in the region. IGADD was able, slowly and incrementally, to build confidence, in order to achieve region-wide cooperation on drought and desertification—which, in turn, led to cooperation in peace and security issues.

[5] Ngeno, Gilbert, Economic Affairs Attaché, Embassy of the Republic of Kenya, Addis Ababa, April 29, 2010.
[6] Ibid

This seems to demonstrate that neo-regional and new-functional paradigms, which promote indirect, incremental and gradual penetration of the political sphere, through economic, social and environmental decisions, always have political significance (Hass, 1958, p. 152). The achievement of IGADD in bringing together leaders of countries of the Horn, who had been mutually suspicious and distrustful of each other,[7] is politically significant and this was achieved thorough indirect penetration of the politics of the Horn through environmental decision-making.

It is not possible to claim that the mistrust and suspicion has been totally eradicated. But by breaking the political deadlock the continuance of IGADD as a regional vehicle is guaranteed. Moreover, crucial lessons were learnt about how peace and security could facilitate and strengthen the effort to terminate the drought and desertification process.[8] As result the lesson is reflected in the new IGAD—as its objective states that it will "…promote a policy of peace and stability in the region in order to attain food security, sustainable environmental management and sustainable development" (African Union (AU), n.d., p. 2). Peace and security are perceived as a means to an end. It was an understanding by decision-makers of the dialectical connection between the environment and peace and security that give birth to IGAD.

Then IGADD, which was solely an environmental organization, expanded its mandate to encompass peace and security and economic aspects of cooperation—giving it three identities (El-Affendi, 2009, p. 8; Kinfe, 2007). According to IGAD's profile document, "…one of the principal motivations for the revitalization of IGADD was the existence of many organizational and structural problems that made the implementation of its goals and principles ineffective" (AU, n.d, p. 2). With the identification of various bottlenecks in 1996, the heads of state and government of the Second Extraordinary Summit in Nairobi approved and adopted an agreement establishing the IGAD. The expansion of the mandate of the organisation has been both praised and criticised.

The critics highlight the poor record of IGADD in achieving its goals and objectives, and claim the decision to expand the mandate was ambitious: in that it did not take into consideration the problems it would face as a young organisation. They argue IGADD was not well established to expand its mandate. Moreover, they stipulate that had it focused on narrow, functional areas, it would have been more successful.[9]

In contrast, many see the expansion of IGADD's role as success story (Kinfe, 2007; Shaw, 1995). They argue that peace and security is necessary for both development and protection of the environment. They praised the revitalisation of IGADD and said it's new "… political and humanitarian mandate was a…crucial addition…" (Kinfe, 2007, p. 7). But this addition was not a particular goal; rather it was the result of circumstances.

[7] Bashir, H. Attalla (Ambassador), former Executive Secretary of IGAD (2000-2008), Addis Ababa, April 16, 2010.
[8] Ngeno, Gilbert, Economic Affair, Embassy the Republic of Kenya, Addis Ababa, April 29, 2010.
[9] Bashir, H. Attalla (Ambassador), former Executive Secretary of IGAD (2000-2008), Addis Ababa, April 16, 2010

Member states felt a "common agenda" had to reflect their interests in the conflict in Somalia and the Sudan.[10]

Despite its revitalization, IGAD continues to recognise that the environment remains an important motivation for regional cooperation. Thus, the issue of the environment is still one of IGAD's three programme areas, offering the organization an eco-regional picture where actors converge. In spite of this, and IGAD's best efforts, the issue of environmental resources and their degradation remains a challenge yet to be effectively tackled. But these two issues are central in the discourse of both development and security in the region. They are linked to the boundary issues, which form one of the critical problems in the Horn—as elsewhere in Africa where boundaries have colonial genesis. Because the boundaries were conceived this way, member states have not dared to discuss problems related to them.[11] And this has led to conflict and unhelpful competition. One exception to this is IGAD's new initiative for managing both local and trans-boundary pastoralist conflicts in the region—CEWARN. This opens the third period in the evolution of IGAD, when it began to address trans-boundary environmental conflict.

7. IGAD/CEWARN: Regional response to pastoralist conflict

CEWARN[12] is IGAD's response to severe pastoral conflict in different areas of the region, such as Karamoja, Borena, and Somalia—which tend to produce a sort of "domino effect". CEWARN is not an independent or separate organization but rather an organ or a "special agency"[13] of IGAD. The emergence of CEWARN as an organ of IGAD is considered to be a significant juncture in the evolution of the organisation.

CEWARN is structurally part of the Peace and Security Division of IGAD,[14] which is mandated to deal with conflict in the region. The system has its own legal and institutional basis within the framework of IGAD. It also constitutes an open model that involves non-state actors in information-gathering and organisation of their response. Hence, IGAD exists to facilitate the gathering and analysis of information, and the co-ordination of the response to conflict situations (IGAD, 2002).

Functionally, CEWARN has two wings, the early warning system and the early response system. These systems operate in the three clusters (the Karamoja Cluster—border areas of Ethiopia, Kenya, South Sudan and Uganda; the Somali Cluster—border areas of Ethiopia, Somalia and Kenya as well as the Dikhil Cluster—border areas of Djibouti and

[10] Mulegeta Gebrehiwot, Director of the Institute for Peace and Security Studies, AAU, Addis Ababa, May 11, 2010.
[11] Ibid
[12] An application of early warning system (a process of collecting, verifying, and analyzing information and communicating the result to decision makers) to prevent and mange pastoral conflicts in the Horn.
[13] Ngeno, Gilbert, Economic Affairs Attaché, Embassy the Republic of Kenya, Addis Ababa, April 29, 2010.
[14] Bizusew Mersha, Country Coordinator, Ethiopia IGAD/CEWARN, Addis Ababa, April 28, 2010.

Ethiopia) at local, national and regional levels and involve both state and non-state actors.

7.1 The early warning wing of CEWARN

Within the CEWARN Unit, which is the main link between CEWARN and IGAD's Peace and Security Division, there are two functional wings. The first is the Early Warning System, involving the National Research Institute (NRI) and a CEWARN country coordinator for each member state. This body is responsible for coding and analyzing information from early warning reports, based on data collected by field monitors (FMs) in each locality (CEWARN, 2006). This network makes visible the local, national and the regional network of the system.

The NRIs in each country ensure collection of field data; provide preliminary analysis, to Conflict Early Warning and Response Units (CEWERUs). The analysis is based on two types of information collected—quantitative and qualitative time series data. The qualitative data monitors both peace and conflict dynamics collected on a weekly basis. The reliability of these data depends not only on "…the collection but on the verification of the information by our institute [NRI]" (Teemt, April 14, 2010). This open system of information exchange is not intended to replace the existing information collection mechanisms, but compliment them. Firstly, they created a new more proactive analytical approach, methodology and framework to assist and transform the traditional systems. Above all, it was designed to foster collective responsibility of state and non-state actors on security. Secondly, the new information network, unlike the traditional system, has been able to explore trends and patterns of behaviour at the local, national and regional levels for a decade or more. This has assisted analysis and understanding of the current situation, enabled prediction and prevention of future similar negative scenarios, as well as clearly shown the need for a holistic approach. Thirdly, the data-gathering systems created a regional link, in which information exchange becomes easier and including in trans-boundary conflict.[15]

The NRI in each country disseminates information to the respective CEWERUs of its base country and the CEWARN unit, which in turn disseminates the information to relevant stakeholders.[16]

The early warning wing of the CEWARN system has been very successful. However, this does not mean it is without its weakness and shortcomings. Firstly, and most importantly, the biggest challenge for the early warning wing is the "deficit of infrastructure" in the Horn.[17] Secondly, the system has not been linked directly to other IGAD organs (mainly Environment and Economic Development organs), although, in principle, the system promotes the linkage with other organs of IGAD.[18]

[15] Ibid
[16] Ibid.
[17] Teemt Bekele, Assistant Country Coordinator, Ethiopia CEWARN/IGAD, Addis Ababa, April 14, 2010.
[18] Bizusew Mersha, Country Coordinator, Ethiopia CEWARN/IGAD, Addis Ababa, April 28, 2010.

7.2 The early response wing of CEWARN

This wing has structures at the local, national and regional level (IGAD, 2002). The early response wing encompasses the CEWARN response section and the national CEWERUs. The national CEWERU in each country consists of a Steering Committee at the national level and local peace committees at the local level. The Committee is composed of, representatives of, central government, parliament, the provincial administration, police, militia, civil society, and academic and research institutions (CEWARN, 2006a; IGAD, 2002).

The CEWERUs are the central unit for analysis and formulating response strategy. They, in principle, base their response on the information originated from the NRI. The local border committees have a very significant role in the facilitation of this communication in cross-border areas of, for example, Ethiopia and Kenya.[19] CEWARN's principle of integrating with the existing structures is visible at various levels in different countries. For example in Kenya and South Sudan—the National Steering Committee for Peace and Reconciliation (NSC) and South Sudan Peace Commission—which are the main institutions tasked by their respective government with early warning and response issues of their countries and CEWARN structures are one and the same. In Uganda even though there is no early warning mechanism, it has incorporated and institutionalized the District Peace Committees that CEWARN has helped to establish to do early warning (EW) and early response (ER). In addition, CEWARN calls on the existing structures, both government and non-government, to do its response including in peace dialogues, and the existing traditional systems are employed in all countries.

Locally, at the root of the response measures are the peace committees. These committees involve elders, young people, and administration and CSOs. These structures again make the principles of integrating with the existing local structures, and the involvement of CSOs a reality. All CEWARN's Rapid Response projects are implemented by CSOs. CEWARN as a system encourages working with grassroots' method of peace building (IGAD, 2002). Through facilitating grassroots state and non-state structures, IGAD, the regional organization is linked, with the local community. This link helps IGAD to overcome the common criticism of African regional organisations that they are "old boys' clubs".

Regionally, there are two structures: the Technical Committee for Early Warning (TCEW) and the Committee of Permanent Secretaries (CPS). The TCEW is the technical arm of the CPS. CPS is the highest policy-making organ of CEWARN and also CEWARN's link to the Council of Ministers of IGAD (CEWARN, 2006a), to which it reports.

[19] Tesfasilase Mezigebe, Director, Conflict Early Warning Response Directorate, Ministry of Federal Affairs, Bizusew Mersha, Country Coordinator, Ethiopia, CEWARN/IGAD, April 28, 2010

With regard to the response approach, so far the CEWARN system has focused on two areas: putting response structures at the national and local level and facilitating improving relations between communities through information sharing, peace meetings, and communal agreements which create community harmony. The peace meetings especially help to air grievances and enable local actors to come together to find solutions.[20] The Rapid Response Fund (RRF) is providing funds to facilitate some of these peace meetings. Funds can be provided, based on a proposal from the local level through the local peace committee. The proposal at the national level is reviewed by the Technical Support Unit that advises the CEWERU Committee on the relevance of the project to the problem. Following the approval of the CEWERU Committee depending on the nature of the request for support—urgent or regular projects—it would be presented to the RRF Steering Committee. This is applied to regular projects while urgent projects that needed to be responded immediately are approved by the CEWARN Director once the CEWERU approves.

CEWARN response correlates with the unique nature of the mechanism that reaches and coordinates its work from regional up to the local level. Thus it has taken a three tier approach where at the regional level it has established forum of discussion to member states where CSOs are integral part of decision making process. At the national level it facilitates both formal and informal bilateral communication, and established and institutionalized EW and ER structures on national and local levels that are now used as part of response structures in most countries. It also made sure that CSOs are part of the process and structures at all level that are institutionalized.

On a micro/local level, CEWARN has pursued only the peace pillar as a major strategy— to show this trend the type of response taken to manage pastoral conflicts in the Karamoja and Somali Clusters is used as example. In 2009/2010 the total budget approved for various intervention proposals was about 591,130 USD for Ethiopia, Kenya and Uganda. The money was used to prevent conflict by improving relations between communities. The proposals included facilitating communal agreements that includes resource sharing and promoting indigenous resilience mechanisms, intercommunity peace building, capacity building, peace meetings, and cross-border peace dialogue. Other activities include using events such as youth tournaments and cultural shows to promote peace. In addition, proposals that focused on the developmental pillars that were approved and will be implemented in 2012 include establishment of markets designed to benefit cross-border communities and support for cross border livestock trade. Almost all the budgets approved came under the umbrella of the peace pillar, to the exclusion of the environmental and development pillars. However, the objectives of the RRF seem to exceed those of the peace pillar. The business of the development and environment pillars is mainly left to national governmental or non-governmental actors, who do not provide a regional response. Nonetheless, the peace pillar is only really available in the short or medium term, unless it can be integrated with the development or environment pillar, for programmes which

[20] Teemt Bekele, Assistant Country Coordinator, Ethiopia CEWARN/IGAD in Addis Ababa, April 14, 2010

are feasible on a regional basis. If this is not possible the peace pillar will remain a "fire brigade" to the problems.[21] In short, although IGAD, through CEWARN, attempts to respond to pastoral conflict via its early warning and response system, it does not seem to be able to address these conflicts in a sustainable manner.

Hence, this indicates that, to date CEWARN is only warning and intervening before or while the pastoralists fight through strategies which are limited to the peace pillar. The root cause of the conflict, chiefly the degradation of the shared environment and resources, remains untouched by the system, or is left to the states to deal with, or is considered as a national issue. Moreover, development has still not been integrated into peace intervention; although it is an area of focus for the IGAD system. Hence, although the pastoral issues are considered to be very complex—involving environmental change, poverty and conflict—and these are all common issues for the Horn countries, IGAD/CEWARN has only dared to tackle conflict resolution, while ignoring the environment and development concerns.

7.3 The role of other (external) actors

In the IGAD system there has been a continuous increase in the role of other actors, and since 1996 it has focused on establishing permanent institutional links with external agents and CSOs. The role of other actors or partners such as the AU, the UN, the USA and the EU, in regional cooperation has been vital. And the role of these actors in stimulating, funding and assisting the regional cooperation in the Horn has dominated IGAD's strategies and literature. The protocol on the establishment of CEWARN, for example, states that," CEWARN [doesn't] exist in a vacuum. It will need to cooperate with international, regional and sub-regional organizations." The mechanism for this co-operation was set up by the system and a notable example is the IGAD Partners Forum (IPF). Despite this effort, the organization has been suffering from donors fatigue[22] and the negative impact of these actors on regional cooperation. For instance, the role of the super powers in the 1998-2000 Ethio-Eritrea war has been questioned.[23] The presence of foreign forces in the region enables foreign actors to impact negatively on regional cooperation. All the above trends indicate that the international environment is not ideal for regional cooperation in the Horn.

7.4 The role of CSOs

CEWARN's vision is embodied in the basic philosophical underpinning of "stakeholders empowered to prevent violent conflict" and the resolution of pastoral conflict in a peaceful, sustainable manner (CEWARN, 2006a, p. 14). To this end, IGAD has taken various measures to increase the diversity and number of stakeholders in the regional cooperation arrangement. The most important measures to mention are the successive IGAD-NGO forums over the last decade, the IGAD-business community

[21] Bizusew Mersha Country Coordinator, Ethiopia CEWARN/IGAD, Addis Ababa, April 28, 2010
[22] Bashir, H. Attalla (Ambassador), former Executive Secretary of IGAD (2000-2008), Addis Ababa, April 16, 2010.
[23] Mulegeta Gebrehiwot, Director of the Institute for Peace and Security Studies, AAU, Addis Ababa, May 11, 2010.

forum, and the IGAD inter-parliamentary union forum (Karuuombe, 2008, p. 7; Terlinden**,** 2004, p. 4).

CSOs are part and parcel of the IGAD/CEWARN system, at the strategic and policy as well as operational levels. CSO representatives of each country are part of the technical arm of CPS (TCEW), CSOs are part of the RRF Steering Committee, information analysis is done by research institutes and responses are implemented through local partners including CSOs. The rationale for this is that "…civil society organizations are close to the grassroots where the most effective early warning conflict can be discerned" (IGAD, 2002). The role of CSOs has become more visible in global governance since the 1990s (Charnovitz quoted in Germmil & Abimbola, 1997). It was very important to focus on the spirit of the CEWARN protocol and the role of governments, communities and CSOs when addressing pastoral conflicts.[24] All are represented in the structure of CEWARN.

CSOs are represented in each NRI, CEWRU and Peace Committees. Taking one example from Ethiopia, the Inter Africa Group (IAG) acts on behalf of Ethiopia as an NRI, while the Ethiopian Pastoralist Research and Development Association (EPaRDA) is involved in CEWRU and another local response organs (peace committees) in the Dassanech *Woreda*. Riam Riam Turkana, a network of local CSOs from Kenya, also plays a similar role. There are many grassroots organizations assisting the peace committees and serving in the steering committees.[25] CSOs are an integral part of the CEWARN and are considered as part of the regional cooperation process.[26]

In addition to their proximity to the grassroots, CSOs are important sources of new initiatives to address conflict; they empower local knowledge and experience through capacity-building programmes; they appear flexible and responsive to change; and they also share their expertise to the state structure, mainly at local level. Therefore, they are significant contributors to regional cooperation. This role of CSOs is acknowledged in the IGAD/CEWARN system. And this means "IGAD fills an important niche, promoting a two way communication between governments and CSOs in the IGAD region by formalizing the right of civil societies to have access to information and analysis" (IGAD, 2002). This is significant as it puts regional cooperation on the track of new regionalism.

However, the nature and role of CSOs, in particular, and their relationship with the state is not free from problems. To begin with the nature of CSOs in the Horn is problematic because they are either external or depend on external donors, hence exhibit little organisational freedom. And some, which claim to be indigenous, are not free because they are usually linked to the governments of the countries in the region.

[24] Bizusew Mersha, Country Coordinator, Ethiopia, CEWARN/IGAD, Addis Ababa, April 28, 2010.
[25] Ibid.
[26] Teemt Bekele, Assistant Country Coordinator, Ethiopia CEWARN/IGAD in Addis Ababa, April 14, 2010.

Concerning the role of CSOs, Ethiopian government officials state they do not prioritize the interests and needs of the society, and they do not often align themselves with the policies of the state for addressing various problems. They try to squeeze the hands of government to dictate policy, and they tend to be radical, especially in relation to the environment. The similarity of the data gathered from various Ethiopian government offices indicates that there is a CSO phobia in the government system. As a result since the ratification of the new Civil Society and Charity Organization Law (Proclamation No 00/2008) [27] various NGOs have withdrawn from their activities, especially in the peace and conflict sector. This reflects the problematic state-civil society relationship in Ethiopia, in particular, and in the Horn in general. The region is characterized by suspicion and mistrust between states and CSOs.[28] Here, it is very important to note that this phobia is not only because of the problem associated with CSOs; rather it has much to do with the issues of democracy and the nature of the regimes in the Horn.

An additional dimension of this relationship is the status of CSOs in the Horn is not in a similar condition in all states of the region. Moreover, CSOs operating in Kenya and Uganda have a more harmonious relationship with their governments than elsewhere in the region (IGAD, 2002). In Kenya, there is a better understanding of the role of NGOs and the government often listens to what they say, and considers their voices as an important signal/indicator about how critical the local agenda is. If there is much voice from NGOs the government tries to address the crisis at local level to which the NGOs have proximity.[29]

8. IGAD/CEWARN: Towards new regional cooperation in the Horn of Africa

Looking at it through the conceptual tool of new regionalism, IGADD appears to have the characteristics of semi-new regionalism. Firstly, the role of other external actors has been crucial. IGADD's conception is the result of actors such as the UN, the OAU and funding by external partners. The significant role played by the international community in the formation of IGADD gives the cooperation the feature of new regionalism despite the fact that "…it lacks an agreed, transparent mechanism for dealing with crucial donor community" (Shaw, 1995, p. 261). Secondly, the main reason for the cooperation was the environment, namely drought and desertification. Thirdly, the progress of cooperation was gradual and incremental. In general both the casual factor and the strategy of cooperation wss new regional one. However, CSOs were not involved. In the region, they were weak and linked to the government. As an informant put it, some of the NGOs were more of governmental organisations than CSOs.[30] Fourth, IGADD was

[27] The option to work in the peace and security sector is restricted by the proclamation, which allows CSOs to participate in peace and security only if there is a bilateral agreement with the government.
[28] Bashir, H. Attalla (Ambassador), former Executive Secretary of IGAD (2000-2008), Addis Ababa, April 16, 2010
[29] Ngeno, Gilbert, Economic Affairs Attaché, Embassy the Republic of Kenya, Addis Ababa, April 29, 2010.
[30] Bashir, H. Attalla (Ambassador) former Executive Secretary of IGAD, Addis Ababa, April 16, 2010

conceived and evolved in the era of cold war, or bipolar world,[31] where traditional forms of regionalism were more likely to be successful than new regional cooperation (Soderbaum, 2007, p. 187). Hence, with regard to the first two features, IGADD can be seen as being a semi-new regional organisation from its conception.

Coming to IGAD, the picture entails a better new regional cooperation in various dimensions than that of IGADD. The global environment that IGAD started operations in was during a time when the world was not as polarised as the 1980s. IGAD attempts to involve itself in regional functional areas through which it attempts to step into regional politics, where, historically, there has been a considerable deficit of stability and good relationships. Hence, this means IGAD meets one of the variables of new regional cooperation, where politics is accessed slowly, gradually and incrementally.

In addition, unlike its predecessor, IGAD has agreed and established transparent structures to deal with external actors, mainly bilateral and multilateral donors. One of these structures is the Joint IGAD Partners Forum (IPF or JIPF), which is the forum for the organisation's numerous partners, the friends of IGAD and the IGAD member states (El-Affendi, 2009, p. 8; Kinfe 2007, p. 17; Terlinden, 2004, p. 4). The IPF holds regular international consultative meetings internally and with partner organizations (Kinfe, 2007, p. 17). The forum includes the UN, the AU, the Arab League, the USA, the EU and other non-EU member states of Europe, such as Norway (Ibid; Terlinden**,** 2004, p. 4). Including these significant actors as partners in the regionalism process entails that IGAD is pursuing the new regional line.

IGAD also opens its doors, to some extent, to CSOs through the IGAD-Civil Society Forum.[32] In 2003, the founding assembly of the IGAD-Civil Society Forum, which was designated to improve cooperation with CSOs in the region, was held. A similar forum was held with the business community, with the aim of increasing IGAD's links with the wider community. In addition, an inter-parliamentary union (IGAD-Parliamentary Unit) was created—which is a very significant move (Terlinden**,** 2004, p. 4). However, the interaction of IGAD with CSOs is limited to the ad-hoc level and annual meetings and the participation of CSOs in IGAD programmes in the region has not been significant (IGAD, 2002, p. 9).

Viewing the IGAD/CEWARN system through the new regional framework, it is clear to see that the CEWARN system elevates the regional cooperation in the Horn more to the new regional line. Firstly, this is because of the integration of the non-state regional actors in the system. Contrary to the tradition in the IGAD system, the CEWARN system has created a structural and strategy-based opportunity for CSOs to take part in the regional cooperation. The role of IAG, EPaRDA and Riam Riam Turkana in the NRI and in the local peace committees is a good example of this. Secondly, the increment of

[31] Mulegeta Gebrehiwot, Director of the Institute for Peace and Security Studies, AAU, Addis Ababa, May 11, 2010

[32] Bashir, H. Attalla (Ambassador), former Executive Secretary of IGAD (2000-2008), Addis Ababa, April 16, 2010.

the proximity of the external actors, such as donors community to the CEWARN system, through the peace and security advisors (from the donors such as GIZ and USAID), add a new regional picture to the system.

Finally, IGAD/CEWARN has emerged as an actor in its own right in the multi-polar world, with CSOs and external actors participating only in a very narrow functional area of its work, i.e. prevention and resolution of pastoralist conflict. The overall picture indicates that regional cooperation in the HoA is evolving, functionally, incrementally and gradually and that, with IGAD's help, it is taking on more of a new regional appearance (see the table below).

Table 1: Summary of the evolution of IGAD towards New Regional Cooperation

Regional Organization	External (global) environment	Role of CSOs	Role of other actors (partners)	Functional issues
IGADD 1986-1996	Bi-polar	non-existent	significant but lacks transparent linkage	drought and desertification (specific)
IGAD 1996-	multi-polar	ad-hoc level	transparent linkage through IPF; donor fatigue	environment; security; economy
IGAD/ CEWARN 2002-	More multi-polar	embedded in system but facing a problem	transparent linkage through IPF; donor fatigue	human security (focus on pastoral conflicts)

9. Deadlock of new regionalism in the Horn

IGAD as a new regional organization has faced multiple challenges. To begin with, the problematic civil-society relationship in the region (with the exception of Kenya and Uganda) became a challenge to IGAD. However, the situation differs throughout the region. Suspicious of their intentions, states often belittle the role of CSOs. Additionally, they are insignificant in number, and those operating on the ground tend to lack autonomy, because of their reliance on states or external actors for funding. Moreover, while there is a general belief that CSOs are close to the grassroots population this is untrue in the HoA, as they are dependent on external actors and somehow guided by these actors. The problematic state-CSO relationship forms the first area of deadlock in the new regionalism in the HoA.

The second deadlock for new regional cooperation is the lack of commitment in the region to the project. The international community, as external actors, tend to be concerned only with their own interests, even to the extent of compromising the regional cooperation. For instance, during the 1998-2000 Ethio-Eritrea war, external forces such as the USA wanted alliance from both parties and hence, they were more divisive than unifying for regional politics. Although its relationship with the donor community

improved through the IPF, IGAD suffers from donor fatigue.[33] The existence of foreign military forces (e.g. the USA, Iran, and France), with their specific interests in the region has had negative implications. States in the Horn align themselves more with external forces, mainly their former colonial masters, rather than their immediate neighbours.[34] In general, although there is general agreement about the suitability of the multi-polar world order to new regional cooperation, various bottlenecks have materialised to achieving an effective regional process in the HoA.

The third deadlock has appeared because of the reluctance of IGAD member states to contribute their membership fees. This has already created a financial challenge for the regional organisation. This demonstrates both the incapacity and the lack of commitment by member states. This funding gap could have been filled by empowering CSOs and acquiring considerable finance from external partners. However, in the HoA both CSOs and IGAD are weak and are not in a position to play their expected role independently.

10. Conclusion

Environmental change is becoming a critical issue in the discourse of development and security in the HoA. This is most relevant to the pastoralist community of the region. Moreover, environmental issues and the impact of environmental change on pastoralist communities are regional issues, which one state cannot address unilaterally. Owing to the dependency of the pastoral communities on the natural environment for their survival and economic wellbeing, problems associated with cross-boundary mobility and conflict among the pastoral communities will likely persist in the future. Hence, the environment appears to be among the central, if not the dominant, issues of security in the region. Addressing security problems demands inclusion of environmental and developmental issues, and vice versa.

Actors' understanding of the juxtaposition of the environment, development and the security issue in the IGAD region is undeniable; however every attempt to solve regional problems fails to be integrative. For example, IGADD began as an environmental organization with no focus on security, while CEWARN failed to include both environmental and development aspects when addressing pastoralist conflict. Hence, this is a critical gap which has undermined the efforts of CEWARN/IGAD, both in early warning and early response.

To continue as an energetic regional organization and be able to solve the pastoralist conflict, IGAD has to comprehensively integrate these three complex and interrelated dynamics: the environment, security and development. To this end, the role of CSOs and external partners is significant. States must act as key players; their political commitment is indispensable to regional transformation. And commitment is needed at

[33] Bashir, H. Attalla (Ambassador) former Executive Secretary of IGAD (2000-2008), Addis Ababa, April 16, 2010
[34] Ibid

both the local and national levels, since local political dynamics has implications for regional politics. For example, empowering CSOs at the local level enhances its role in achieving regional cooperation in the Horn. This in turn minimises the gap created by the incapacity of the states and significantly increases local-regional links. All this is dependent on the progress of the democratisation process in each region. The success of new regional cooperation in the HoA also depends on the existence of a smooth and harmonious state-CSO relationship, which is unlikely to appear without stronger democratic institutions and culture in member states.

Regional cooperation is, with no exaggeration, a panacea to the hitherto unresolved environmental, political, economic and social crises of the HoA. It can be achieved through incremental, functional, and all-inclusive engagement when states of the region, CSOs, and the international community converge for the common cause. Regional cooperation, as a response to pastoralist conflict in the region, has to go far beyond early warning and policy harmonisation to a more concrete and integrative, project-based response system, which involves the three pillars and all interested parties.

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Preparing for adverse impacts of climate change in pastoral areas: The way forward

Jean-Bosco Butera and Mulugeta Gebrehiwot Berhe

Pastoralists in the Horn of Africa will certainly experience climate extremes at a higher frequency and severity in coming decades. This will have serious socio-economic and political ramifications for the communities under discussion, the states, and the region as a whole. It is therefore necessary to pursue reflections and engagements at various levels in order to find ways of addressing the issues at hand. The findings of the articles presented in this volume and discussions during the conference brought about a good number of recommendations. The following five policy relevant recommendations were highlighted:

Inter-disciplinary research-guided solutions: Some papers provided empirical evidence against popularly-held convictions, for instance that a decline in rainfall causes pastoral conflicts. Furthermore, what was recognised as traditional wisdom to cope with climate variability and change by some researchers was re-examined by another and found to be a maladaptive approach. Furthermore, the diversity of the methodologies followed in collecting and analysing data help to achieve a robust and whole-rounded outlook on the situation. However, all the papers pose more questions than answers: from the lack of understanding of the paleoclimatic history of the pastoral lowlands to the need to investigate the potential of wild edible plants for domestication and the causation of pastoral conflicts by climate extremes.

Pastoralists have witnessed the kick-off programmes of a number of ill-suited development projects in the past and seen them fail. These projects were designed with little understanding of local ecological and socio-cultural realities. Efforts to augment the adaptive capacities of pastoralists should not repeat this mistake; detailed research in the exact sciences as well as the human sciences should precede the prescription of methods for alleviating the problems of pastoralists.

Recognize the experiences and traditional coping mechanisms of pastoral communities: There seems to be limited or no consideration of the cultural knowledge and adaptation practices of pastoralist communities in the design and implementation of responses by administrative authorities at different levels. While times have changed and it is in the great interest of pastoralist communities to take cognizance of such changes and adapt in ways that best respond to their needs, it is also important for governments at all levels to recognize the traditional adaptation mechanisms of these communities and adopt a participatory approach in developing new adaptation strategies. Indeed, the issue of the survival of pastoralist communities need to be tabled and analysed in a candid and sober way. Can their

traditional *modus vivendi* be upheld for time immemorial? Should they evolve towards agro-pastoral communities? Should their traditional lands be left out of the drive by many governments in the Horn of Africa to develop? The question would be to define and implement a development approach that upholds the dignity and rights of the communities concerned and guarantees their useful and effective participation.

These questions could constitute the subject of another research programme to investigate further those aspects of the new development initiatives that are taking place in the pastoralist zones, the stake of pastoralist communities or their absence in these initiatives as well as the arguments of the developers. It would also be necessary to investigate further the role of different constituencies within pastoralists communities like women and young adults to try and understand how an increasing number of educated women and youths versus the traditional elders may impact on the long term perspectives and survival of the pastoralist communities in the Horn of Africa.

Work towards strengthening customary governance institutions: While the possibility that climate change-induced scarcity plays a major role in causing pastoral conflicts is high, it would be simplistic to limit the causal relationship to a single source. Governance also constitutes a major factor in the dynamics of the region, both to increase adaptive capacities and decrease risk of (violent) conflict. Indeed, government policies and interventions at various levels of authority – local, national and regional – do impact both the capacity of the communities to adapt and their relationships. We would actually argue that governance is the single most important determinant that will have a durable impact on how pastoralist communities evolve.

Long-term development-centred solutions: Quick fixes for climate change-induced environmental disasters and/or pastoral conflicts, such as food aid, mediation and medical aid, only deal with the contemporary situation and work towards alleviating the hardship pastoral communities experience. Economic development in pastoral areas, preferably with a cross-border nature, will create interdependence between communities and increase the opportunity cost of violent conflict. Thus, development should be seen as a deterrent to conflict and the respective states, regional bodies and NGOs should put more emphasis on creating the physical infrastructure that will enhance development opportunities.

Broader understanding of causation and integrated approaches to resolving pastoral conflicts: Pastoral conflicts are usually perceived as tribal, thus having their roots in local cultures and practices, or seasons of the year. As is the case under complex environmental and social phenomena, single-factor explanations do not do justice to reality. Conversely, it can be stated that poor understanding of the

causes of a given conflict will not help the efforts to deal with the conflict. Thus a better, broader understanding of the causes of pastoral conflicts should precede efforts geared towards conflict resolution. Moreover, the task of conflict prevention and resolution and of building durable stability in the pastoralist communities is too important to be left to a single level or authority – local, national, regional and international actors should work collaboratively.

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Addis Ababa University (AAU) established the Institute for Peace and Security Studies (IPSS) in March 2007. In 2010, IPSS was identified as one of five "Centers of Excellence" by AAU.

The Institute's mission is to promote peace and security in Ethiopia and Africa at large through education, research and professional development. IPSS produces skilled professionals in conflict prevention, management and resolution as well as in peacebuilding, and promotes the values of a democratic and peaceful society.

IPSS currently offers a two-year MA Program in Peace and Security Studies, a PhD Program in Peace and Security, Federalism and Human Rights, and — in collaboration with the African Union within the African Peace and Security Program — a one-year executive MA on "Managing Peace and Security in Africa". The collaborative program with the African Union further includes the establishment of a pan-African research network on peace and security issues.

In addition to these programs, IPSS holds conferences and panel discussions to disseminate research findings and expertise in the areas of conflict prevention, management and resolution, peace culture, peacebuilding, security and related issues.

The University for Peace (UPEACE) was established in Costa Rica in 1980 as the UN-mandated graduate school of peace and conflict studies. The mission of the University should be seen in the context of the worldwide peace and security objectives of the United Nations.

To ensure academic freedom, the University was established under its own Charter, approved by the United Nations General Assembly. The Charter calls for UPEACE to "contribute to the great universal task of educating for peace by engaging in teaching, research, post-graduate training and dissemination of knowledge fundamental to the full development of the human person and societies through the interdisciplinary study of all matters related to peace".

The Secretary-General of the United Nations, Ban Ki-Moon, is the Honorary President of the University.

The UPEACE Africa Programme was established in 2002 following extensive consultations on the continent. The Programme has focused on the need to strengthen African capacities to teach, train and conduct research in areas of peace and conflict studies. To this end, the Programme has been working with a number of Partner Universities and has reached out to a wide range of stakeholders including academics, policy makers and civil society organisations.