

A Review on Vulnerability of Climate Change on Livelihood System in Ethiopia

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ABSTRACT

Now a day's issue of climate change gained a global concern among different development agents and natural resource practitioners. Global climate is varied temporarily and spatially due to different human activities like population growth, over utilizations, degradation of natural resources, urbanizations, technological advancement etc. these activities are leads human life endanger and prone to different social, economical and environmental crises. Therefore the intention of this seminar paper is to review the vulnerability of climate change up on the livelihoods of society in Ethiopia. Developing countries are more susceptible to climate change than developed ones due to their high dependency on agriculture and other natural resource products as well as their low coping and adaptation strategies. This is particular to our country. So, climate variability highly inter linked with livelihoods certain societies and affects the economy poor nations like Ethiopia. Thus, to evaluate climate change impact in the context of multiple stressors that reduce adaptive capacity, many of which are not related to climate or climate change; vulnerability assessment is most helpful. Crop losses may increase if climate change increases climate variability. Major floods which caused loss of life and property occurred in different parts of the country. Understanding how social systems respond to climate change and variability requires knowledge of how they are affected by those conditions today and how they might respond in the future if those conditions change.

Keywords: Agriculture, Coping mechanisms, Drought, Greenhouse & Population.

I. INTRODUCTION

Ethiopia is found in the horn of Africa covering an area is greater than 1.2 million square kilometers. The country is also endowed with rich water resources compared to most African countries. Though the economic reform made after the political change in 1991 brought improvement in the economy of Ethiopia, but it is still one of the least developed countries (LDC) in the World. This development status makes the country more vulnerable to climate variability and change. (Abebe Tadege et al., 2007).

Agriculture is the most susceptible sector to climate change. This is attributed to the fact that climate change affects the important direct agricultural

production inputs, precipitation and temperature. Climate change also indirectly affects agriculture by influencing emergence and distribution of crop pests and livestock diseases, exacerbating the frequency and distribution of adverse weather conditions, reducing water supplies and irrigation; and enhancing severity of soil erosion. (Abate Feyissa, 2009).

Despite worldwide coverage of climate change impact, there is vulnerability depending on location, adaptive capacity and other socioeconomic and environmental factors. For instance, agricultural sector is believed to benefit from gradual climate change due to the carbon effect and the warming climate. (Abate Feyissa, 2009).

The negative consequences of climate change in Africa are already happening as prevalent from frequent floods, droughts and shift in marginal agricultural systems. The climate change impact on agriculture is believed to be stronger in Sub-Saharan Africa. (Abate Feyissa, 2009).

In Ethiopia, it is assumed that the temperature has been increasing annually at the rate of 0.2°C over the 21 century. This has already led to a decline in agricultural production, and cereal production is expected to decline still further (by 12%) under moderate global warming (Yohannes Gebre, 2009).

II. CAUSES OF CLIMATE CHANGE

At global scale, the main cause of greenhouse gas (GHG) emissions is from carbon dioxide (70%), primarily from burning of fossil fuel (petroleum) imported from industrialized countries, while the other sources for GHG are methane and nitrous oxide caused by deforestation and agricultural activities, particularly the use of pesticides. There are historical accounts of many centuries ago indicating that climate variability and change are not recent phenomena in Ethiopia. (Yohannes Gebre Michael, 2009).

In the arid and semi-arid areas, drought is part of a normal cycle, and pastoralists have developed some strategies to cope with it, such as mobility, livestock species diversity, reciprocity in use of resources, territorial fluidity and social safety nets. However, according to many applied research findings, the vulnerability of pastoralists to drought is very complex and diverse. It is claimed that drought as such is not making pastoralists vulnerable but rather the increasing marginalization of their drought response mechanisms. Restriction on mobility of people and animals, intensification of conflicts and stricter control of cross-border trade and defective tenure policy are some of the threats. Some authors underlined that the prolonged droughts, combined with environmental degradation and increasing sedentarisation, have led to

deterioration of pastoral livelihoods (Yohannes Gebre, 2009)

1.1. Status of Climate Change Ethiopia

The GHG emissions per capita in 1998 totaled to 900 kg CO₂ equivalent per capita and year. Compared to other countries, Ethiopia's emissions are very low (e.g. the U.S. emissions amount to 23.7 tones CO₂ equivalent per capita and year in 1998). Sector wise, Ethiopia's GHG emissions are dominated by agriculture, which contributes 80% of the total GHG emissions. This reflects the fact that livestock farming goes together with high methane emissions. The dominant position of livestock farming in Ethiopia's economy also influences the relative contribution of GHG to the total emissions. These are dominated by methane emissions, which account for 80% of the warming potential. In addition to agriculture, the energy sector (heating, cooking, and trans-port) contributes to the total GHG emissions with 15%. 95% of the energy consumption is satisfied by bio-mass sources (mainly wood); petroleum and electricity are of minor importance. Ethiopia's GHG emissions are closely linked to basic needs of the population: Food production (through livestock farming) and heating. Therefore, the future GHG emissions will likely increase with the projected increase in population. (Keller M, 2009).

2.2. Vulnerability Assessment in livelihood

"Vulnerability" is defined as the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate change and variation to which a system is exposed, its sensitivity and its adaptive capacity. (Yohannes Gebre, 2009)

An impact study is most helpful when focusing on a single stressor, in this case climate Change. Thus, impact alone is subtle and may not be sufficient to

show the consequences of climate impact on different members of the same or different community (Abate Feyissa, 2009).

Thus, to evaluate climate change impact in the context of multiple stressors that reduce adaptive capacity, many of which are not related to climate or climate change; vulnerability assessment is most helpful. Vulnerability assessment also “helps to inform decision makers to facilitate decision-making process of specific stakeholders of a sector about their options for adapting to the effects of climate change within the scope of their resources” (Abate Feyissa, 2009).

Vulnerability in this study is, thus, defined as the livelihood of households and communities in the, Ethiopia, to suffer from climatic adverse impacts on their livelihood and their inability to respond to stresses resulting from the impacts. (Abate Feyissa, 2009).

2.3. Causes of Vulnerability to Climate Conditions in Ethiopia

Causes for vulnerability of Ethiopia to climate variability and change include very high dependence on rain fed agriculture which is very sensitive to climate variability and change, under-development of water resources, low health service coverage, high population growth rate, low economic development level, low adaptive capacity, inadequate road infrastructure in drought prone areas, weak institutions, lack of awareness, etc. (Abebe Tadege et al., 2007).

Vulnerability assessment based on existing information and rapid assessments carried out under NAPA has indicated that the most vulnerable sectors to climate variability and change are agriculture, water and human health. In terms of livelihood approach, smallholder rain-fed farmers and pastoralists are found to be the most vulnerable. The arid, semiarid and the

dry sub-humid parts of the country are affected most by drought. (Abebe Tadege et al., 2007).

III. IMPACT OF CLIMATE CHANGE IN ETHIOPIA

In the last decade, the country has been subjected to drought, floods, new insect, pests, new vector-borne diseases and other problems made worse by climate change. According to the mean annual temperature in Ethiopia has increased by 1.3C between 1960 and 2006, at an average rate of 0.28°C per decade. The temperature increase has been most rapid from July to September (0.32°C per decade). It is reported that the average number of hot days per year has increased by 73 (additional 20% of days) and the number of hot nights has increased by 137 (additional 37.5% of nights) between 1960 and 2006. The rate of increase is seen most strongly in June, July and August. Over the same period, the average number of cold days and nights decreased by 21 (5.8% of days) and by 41 (11.2% of nights), respectively. These reductions have mainly occurred in the months of September to November (Keller M, 2009).

It is very difficult to detect long-term rainfall trends in Ethiopia, due to the high inter-annual and inter-decadal rainfall variability. Between 1960 and 2006, no statistically significant trend in mean rainfall was observed in any season. The decrease in rainfall observed in July to September in the 1980’s recovered in the 1990s and 2000s. In addition, there are insufficient daily rainfall records to identify trends in daily rainfall variability and changes in rainfall intensity (Keller M, 2009).

Although all pastoral regions in Ethiopia are highly prone to the adverse impacts of climate change, the problem is more prevalent in the north eastern lowlands of the country.

Afar, Somali, Tigray and Oromiya regions are more vulnerable to climate change than other regions of the

country. This corresponds with results from that the arid, semi-arid and sub-humid lowlands are more vulnerable than the highland areas. Vulnerability of Afar and Somali can be attributed to their low level of rural service and infrastructural development higher frequency of drought and floods, lower access to technology (Somali regional state, 2011)

3.1. Impact of Climate Change on Livelihood production

While the zone specific exact value of damages caused on livelihood by past climate-related events is scarce due to the recent establishment of the zone and poor maintenance of data, the subjective evidences gathered during respondent interview with the available agricultural production data suggests climatic change has been frequently imposing challenge on their livelihood and consequently affecting the societies socio-economic activity (Abate Feyissa, 2009).

Climate related hazards in Ethiopia include drought, floods, heavy rains, strong winds, frost, heat waves (high temperatures), lightning, etc. Though the historical social and economic impacts of all of these hazards are not systematically well documented, the impacts of the most important ones; namely, droughts and floods are discussed. Understanding how social systems respond to climate change and variability requires knowledge of how they are affected by those conditions today and how they might respond in the future if those conditions change. Historical analogs give us some insight into climate changes and corresponding social responses. The major adverse impacts of climate variability in Ethiopia include:-

- ✓ Food insecurity arising from occurrences of droughts and floods;
- ✓ Outbreak of diseases such as malaria, dengue fever, water borne diseases (such as cholera, dysentery) associated with floods and respiratory diseases associated with droughts;
- ✓ Land degradation due to heavy rainfall;

- ✓ Damage to communication, road and other infrastructure by floods. (Abebe Tadege et al., 2007).

2.4. Climate Change on Farming Livelihood

Livelihood - is broadly defined as “comprising people, their capabilities and means of living, including food, income and assets. Livelihood comprises the capabilities, assets (including both material and social resources), and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base. The livelihood system could be categorized in broad five types: pastoralist, agro-pastoralist, farming, hunting & gathering and urban livelihoods, although poor people have limited income, they have assets and capabilities that can be strengthened to reduce their vulnerability to climate change. These assets or “capital” can be grouped into social capital, natural capital, physical capital, human capital, and financial capital. Adaptation policies should focus on providing stable conditions and support for making the livelihood assets of the poor more resilient to climate change through resource accessibility and the reforming of policies, institutions, and processes. It is important to ensure that sectoral and other policies do not undermine, but rather reinforce, the opportunities of the poor to access resources, build assets, and diversify their economic activities to increase their adaptive capacity to climate change. (Dawit Kebede et al., 2011)

The livelihood assets determine how livelihoods work and in particular are the basis for understanding how people will respond to climate induced vulnerabilities. They are the basis for the development of adaptation strategies. Natural resources are among the most significant means of livelihoods for the poorest and most vulnerable of the world especially for the rural community. The rural communities depend directly on natural resources, through cultivation, livestock

breeding, collecting or hunting for their livelihoods. As it has been changes in temperature and rainfall patterns are widely predicted, with many semi-arid parts of the developing country to become even hotter and dryer with even less predictable rainfall. These changes will both directly affect crop yields and will produce changes to ecosystem distributions and species ranges. This affects the livelihood of many communities, particularly through declining of food security and constraints with variability of many livelihood activities, including livestock rising and use of forest products as well as agricultural production (Dawit Kebede et al., 2011).

2.5. Climate Change Effects on Agricultural Production

Since many rural poor people in developing countries depend on agriculture, it is one of the central arenas in which the threat posed. By climate change must institutions and implementing agencies or bodies, be it nongovernment or government. The recurrent droughts and floods threaten the livelihood of billions of rural people who depend on agriculture for most of their needs. Agriculture is not only sensitive to climate change but it is also one of the major drivers of climate change. (Ranganathan, C et al., 2010).

The climate sensitivity of agriculture is uncertain, as there is regional variation in rainfall, temperature, crops and cropping systems, soils, and management practices. Understanding the weather changes over a period of time and adjusting management practices towards achieving better yields is a challenge to the growth of the agriculture sector as a whole. Crop losses may increase if climate change increases climate variability. Different crops respond differently, and so global warming will have a complex impact. The impact of such climate change on agriculture will be one of the major deciding factors influencing future food security. (Ranganathan, C et al., 2010).

2.6. Droughts and Floods

Ethiopia is highly vulnerable to drought. Drought is the single most important climate related natural hazard impacting the country from time to time. Drought occurs anywhere in the world but its damage is not as severe as in Africa in general and in Ethiopia in particular due to low adaptive capacity. Recurrent drought events in the past have resulted in huge loss of life and property as well as migration of people.

The other climate related hazards that affect Ethiopia from time to time are flash and seasonal river floods. Areas in the Afar Region along the Awash River, in the Somali Region along the WabiShebele River and in the Gambela Region along the Baro-Akobo River, in the Southern Region along the Omo-Gibe River, Bahirdar Zuria and Fogera areas along the Abbay River in the Amhara Region are prone to seasonal river flood. (Abebe Tadege et al., 2007).

Major floods which caused loss of life and property occurred in different parts of the country in 1988, 1993, 1994, 1995, 1996 and 2006. For example in the 2006 main rainy season (June-September), flood caused the following disasters:

- More than 250 people died, about 250 people were unaccounted for and more than 10,000 people became homeless Due to the Diredawa flood. (Abebe Tadege et al., 2007).

IV. COPING MECHANISMS

International conventions such as the United Nations Framework Convention on Climate Change (UNFCCC) assumes that developing countries are the victims of climate change and need external solutions in a top-down approach. Moreover, little is known about the rationality of local adaptation mechanisms because of insufficient documentation and awareness. (Yohannes Gebre, 2009).

However, there is slowly growing recognition of local adaptation to the changing environment (both environmental and policy changes) in terms of efficiency, effectiveness and sustainability. Recognition of local adaptation is seen as an entry point to strengthen the resilience of local people to climate change. Similarly, the concept of community-based adaptation (CBA) is based on recognition of the competence of grassroots communities to solve their own problems. At global level, different strategies had been suggested to overcome the challenges of climate change. These include reduction in use of fossil fuels and increased use of other energy sources such as atomic power. (Yohannes Gebre, 2009).

4.2 Coping Strategies to Adverse Climatic Impacts

Societies are dynamic and they use all possible strategies to reduce the vulnerability to climatic impacts. There are two kinds of responses to crisis that overlaps across the temporal scale, coping mechanisms and adaptive capacity. Coping mechanisms are the actual responses to crisis on livelihood systems in the face of unwelcome situations, and are considered as short-term responses. Adaptive strategies are the strategies in which a region or a sector responds to changes in their livelihood through either autonomous or planned adaptation (Abate Feyissa Senbeta, 2009).

Coping mechanisms may develop into adaptive strategies through times. However, it is difficult to make a clear distinction between coping mechanisms and adaptations. This study considers both schemes as coping strategies. The resilience or the robustness of coping mechanisms differ depending on the availability and access to resources and technology (Abate Feyissa, 2009).

4.3 Coping Mechanisms to Climate Variability

Experience with how society copes with current climate variability and extreme events provides a valuable foundation for longer-term adaptation, as it

offers familiarity with climate and its socioeconomic impacts. Decision support tools and methods that are used for addressing today's challenges could also be used under a changing climate. In this regard strengthening capacity in terms of developing methods, tools, institutions and individuals to produce, disseminate and apply climate information is highly essential. (Abebe Tadege et al., 2007)

Traditional and contemporary coping mechanisms to climate variability and extreme in Ethiopia include changes in cropping and planting practices, reduction of consumption levels, collection of wild foods, use of inter-household transfers and loans, increased petty commodity production, temporary and permanent migration in search of employment, grain storage, sale of assets such as livestock and agricultural tools, mortgaging of land, credit from merchants and money lenders, use of early warning system, food appeal/aid, etc. (Abebe Tadege et al., 2007)

V. CONCLUSION AND FUTURE LINE OF WORK

5.1 Conclusions

Climate change is currently one of the top agenda of every country in general, developing countries particularly in Ethiopia is among countries which are more vulnerable to climate variability and change. Because of high reliance agricultural activities and low coping strategies in ecosystem approaches. Agriculture is the most susceptible sector to climate change. This is attributed to the fact that climate change affects agriculture directly as well as indirectly. In the last decade, the country has been subjected to drought, floods, new insect, pests, new vector-borne diseases and other problems made worse by climate change. Population growth, emission of green house gases (GHG), deforestation and agricultural expansion are the main causes for climate change.

5.2 Future Line of Work

In order to overcome the vulnerability of adverse climate change certain activities should be there.

These are;

- ✓ There must be appropriate institutional arrangement and policy setting regarding to resource governance
- ✓ There should be participatory efforts among the concerned parties to bring integrated resource management
- ✓ Encourage and developing coping strategies by using locally available material and resources

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