

Climate Change in Ethiopia



What is climate change?

How does climate change affect us?

What can we do against climate change?

Bread for all

October 2009

Contents

Introduction.....	2
What is climate change?.....	3
Climate change in Ethiopia	5
Impacts of climate change in Ethiopia.....	6
Ethiopia’s contribution to climate change	7
How to deal with climate change?	8
Adaptation measures.....	9
Mitigation measures	9
Climate change politics.....	10
Bibliography	11

Introduction

Climate change is one of the largest problems humanity faces today. Communities in Ethiopia suffer now and in the future from the impacts of this global phenomenon, even though people in Ethiopia have contributed very little to causing climate change.

The first step in order to be able to cope with the adverse effects of climate change is to know about climate change and its impacts. Thus, this guide aims at providing basic information on climate change, its causes, and how it affects us. Furthermore, this guide can also be used to analyze the climate context with tools such as *CRiSTAL* or the *Climate Proofing Tool* developed by *HEKS* and *Bread for all*.

What is climate change?

Climate change refers to changes in the Earth's climate that are persistent and often large scale. These changes can be caused by either natural processes or they can be caused by human activities. In the remainder of this guide, climate change will refer to changes that are man-made unless noted otherwise.

Different human activities affect the climate including energy production from combustion of fossil fuel, coal, and wood and land-use changes. The mechanism by which these activities affect the global climate is called the greenhouse effect.

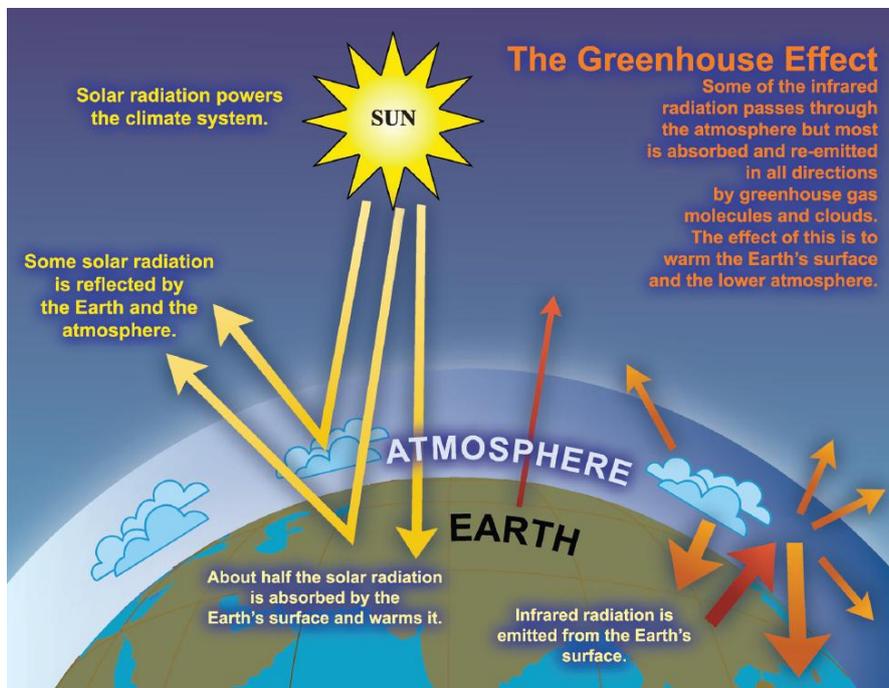


Figure 1: An idealized model of the greenhouse effect (IPCC, 2007)

The Earth receives energy from the Sun in form of visible light and loses energy in the form of invisible, thermal radiation (heat) to space (see Figure 1). Greenhouse gases block some of the infrared radiation from escaping to space, thus heating the atmosphere and the surface of the Earth. One can think of greenhouse gases as a blanket that you use during the night to keep the body from cooling. Adding greenhouse

gases to the atmosphere corresponds to using a thicker blanket, with the consequence that your body heats up.

The most important greenhouse gas is water vapour, which occurs naturally. Without water vapour in the atmosphere, the Earth would be completely frozen. Other important greenhouse gases are carbon dioxide, methane, and nitrous oxide. Human activities such as combustion of fossil fuels, deforestation (carbon dioxide), and agricultural activities (methane and nitrous oxide) add greenhouse gases to the atmosphere, where these gases spread out globally, accumulate, and warm the atmosphere and surface of the Earth.

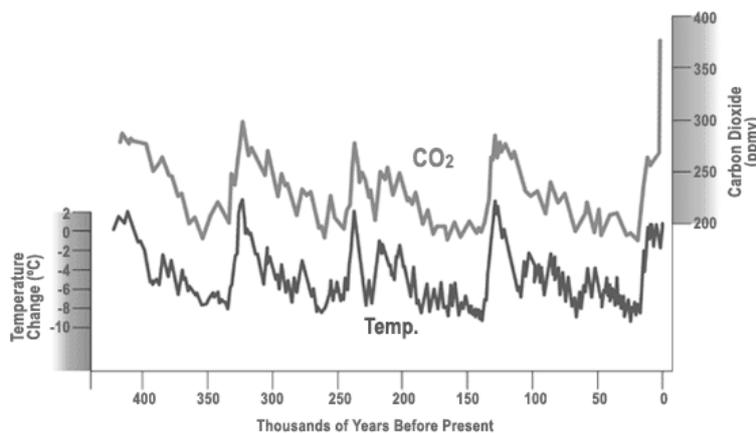


Figure 2: Carbon dioxide concentration and temperature anomalies during the past 400'000 years, source: www.architecture2030.org

When looking at the temperature evolution during the last 400'000 years, we find a strong correlation between the amount of carbon dioxide in the atmosphere and temperature. Carbon dioxide concentrations increased from 280 parts per million (ppm) in preindustrial times to 379 ppm in 2005. During the same period, the global temperatures have increased by 0.8° C. Most of the observed warming happened in the last 50 years.

If we further emit greenhouse gases at present rates, global warming continues at about 0.2° C per decade. If we stopped emitting greenhouse gases now, however, global temperatures would still continue to

rise by about 0.1° C per decade due to the inertia of the climate system. The world is warming now and it will keep warming in the future.

Global warming, however, is just the most obvious and best understood aspect of climate change. Many more aspects of global and regional climate have been found to change as well. As a direct consequence of the warming, the sea level rises and the snow and ice cover decreases. Furthermore, the weather patterns change with widespread changes in rainfall and increases in droughts and/or heavy rainfall events in some regions (IPCC, 2007).

These changes have severe socio-economic and environmental consequences. Hundreds of millions of people suffer from water shortage, floods in coastal low-land areas, heat waves, droughts, and increases in cardio-respiratory and infectious diseases due to climate change. Furthermore, thousands of species will die out and agricultural yields may severely decrease in some regions. The impacts of climate change already affect hundreds of millions of people today and in the next twenty years the number of people seriously affected by climate change will likely double (GHF, 2009).

These harmful effects of climate change cannot be avoided completely. Thus, we have to prepare to be able to cope with the changing climate. In the long run, global warming can be slowed down or maybe even stopped, if the international community manages to drastically reduce the emission of greenhouse gases.

Climate change in Ethiopia

Climate change is already taking place now, thus past and present changes help to indicate possible future changes. Over the last decades, the temperature in Ethiopia increased at about 0.2° C per decade. The increase in minimum temperatures is more pronounced with roughly 0.4° C per decade. Precipitation, on the other hand, remained fairly stable over the last 50 years when averaged over the country. However, the spatial and temporal variability of precipitation is high (see Figure 3), thus large-scale trends do not necessarily reflect local conditions.

The future changes in precipitation and temperature as projected by various global climate models are summarized in Figure 3. Most of the global climate models project an increase in precipitation in both the dry and wet seasons. Studies with more detailed regional climate models, however, indicate that the sign of the expected precipitation change is uncertain. The temperature will very likely continue to increase for the next few decades with the rate of change as observed (see Figure 3).

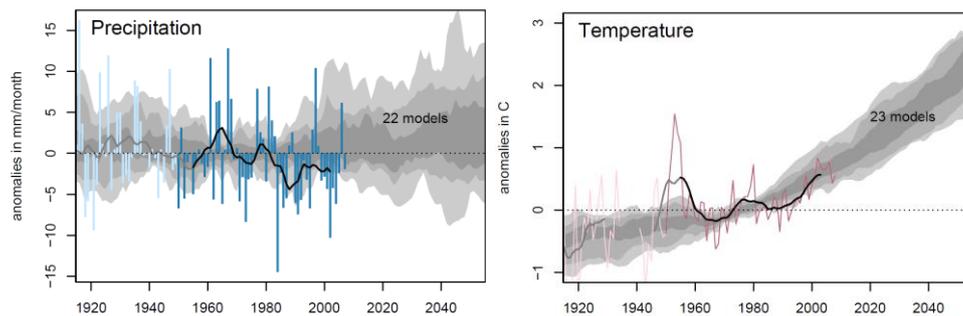


Figure 3 Observed precipitation (Schneider et al. 2008) and temperature (Brohan et al. 2006) changes in Ethiopia (annual averages) along with simulated changes by 22/23 global climate models (IPCC, 2007). The observed changes are likely flawed by network density changes and measurement errors in the first half of the 20th century (light colours).

The projected increases in the interannual variability of precipitation in combination with the warming will likely lead to increases in the occurrence of droughts. Furthermore, heavy rains and floods are projected to increase as well.

Impacts of climate change in Ethiopia

Detrimental and beneficial impacts of the ongoing and projected climate change and variability are widespread in both socio-economic and natural systems. These impacts include:

Agriculture, Food Security: The increasing year-to-year variability and increases in both droughts and heavy precipitation events lowers

agricultural production with corresponding negative effects on food security.

Water: The availability of clean drinking water is likely to decrease due to the increasing evaporation and the increasing variability of rainfall events.

Health: Incidences of malaria in areas of the highlands where malaria was previously not endemic. The warming is further expected to cause an increase in cardio-respiratory and infectious diseases.

Ecosystems, Biodiversity: Climate change but also human drivers such as forest fires threaten forest ecosystems. Furthermore, a large number of plant and animal species is threatened by extinction, as climate conditions are changing too quickly for them to adapt.

Infrastructure: Heavy rainfall events and floods cause damages to roads and buildings.

It is important to notice, however, that other factors threaten the livelihoods of Ethiopian communities as well. For example resource degradation and the overexploitation of natural resources such as fire wood is one of the key issues in association with the environmental decline.

Ethiopia's contribution to climate change

The GHG emissions per capita in 1994 totalled 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 tonnes CO₂ equivalent per capita and year in 1994).

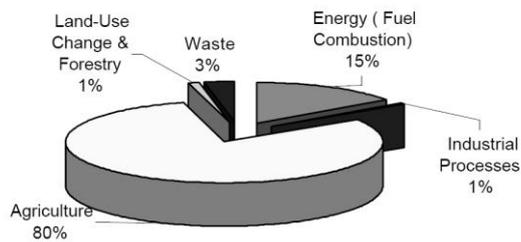


Figure 4: Total greenhouse gas emissions by sectors in 1994, (FIRST, 2001)

Sectorwise, 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 (see Figure 5). These are dominated by methane emissions, which account for 80% of the warming potential.

In addition to agriculture, the energy sector (heating, cooking, and transport) contributes to the total GHG emissions with 15%. 95% of the energy consumption is satisfied by biomass sources (mainly wood); petroleum and electricity are of minor importance.

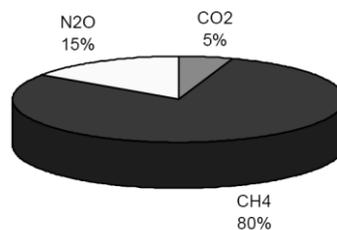


Figure 5: Relative contribution of individual greenhouse gases to aggregated emissions, (FIRST, 2001)

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.

How to deal with climate change?

Two possible coping strategies can be distinguished: adaptation to the impacts of climate change and mitigation of the causes (mainly greenhouse gas emissions) of climate change. Adaptation seeks to reduce

vulnerabilities both in the short and long term. Mitigation aims at slowing down and eventually stopping or even reversing the global warming. Adaptation measures will have to be implemented regardless of the mitigation measures taken, as the climate system will keep changing for the coming decades due to its inertia.

Adaptation measures

Contemporary strategies to deal with climate risks include (NAPA, 2007):

- changes in cropping and planting practices and grain storage
- use of inter-household transfers and loans
- temporary and permanent migration in search of employment
- sale of assets such as livestock and agricultural tools, mortgaging of land, credit from merchants and money lenders
- food appeal/aid

Future adaptation measures might focus on (NAPA, 2007):

- Water storage and conservation; water use and irrigation efficiency
- Drought/crop insurance programmes
- Improved land management through erosion control, soil protection and reforestation

Mitigation measures

Agriculture and Energy are the sectors with the largest mitigation potential in Ethiopia. As Ethiopian agriculture is dominated by livestock farming, mainly methane is emitted. Mixed crop/livestock farming could increase agricultural productivity while decreasing methane emissions. Further mitigation potential in the agricultural sector is found with forage treatment in order to increase the efficiency of the fermentative digestion.

The major mitigation potential in the energy sector is found in improved, energy efficient stoves for cooking and improved charcoal kilns (FIRST, 2001).

Protection of existing carbon reservoirs can prevent GHG emissions related to deforestation and land degradation.

Climate change policy

The international framework to tackle the challenge posed by climate change is specified in two Conventions of the United Nations: the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The Convention intends to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The Kyoto Protocol sets binding GHG emission reduction targets for the industrialized countries that ratified the Protocol.

In December 2009, Copenhagen will host the next international climate conference of the United Nations. At this conference, the international community has to work out an overall agreement for the follow-up to the Kyoto Protocol. Hopefully, the new agreement will contain much stronger emission reduction targets and significant international adaptation funds.

Ethiopia has ratified the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The ministry of water resources and more specifically, the National Meteorological Agency deals with climate change in Ethiopia. All parties of the Convention are obliged to report on the steps taken to implement the Convention, and so is Ethiopia. To this end, a series of national communications containing the national greenhouse gas inventory and planned and implemented adaptation and mitigation programmes have to be elaborated and published. Ethiopia issued its initial national communication in 2001 (FIRST, 2001).

Furthermore, the National Meteorological Agency has elaborated the National Adaptation programme of Action (NAPA, 2007) which identifies 20 priority project ideas that address the immediate climate change adaptation needs of the country.

Under the Kyoto Protocol, developing countries are encouraged to contribute to emission reductions through trading of emissions rights. The Clean Development Mechanism (CDM) allows mitigation projects

in developing countries to earn certified emission reduction (CER) credits, which can be sold to industrialized countries to help them meet their emission targets. This mechanism aims at stimulating sustainable development and emission reductions in developing countries. At the moment, Ethiopia has not yet registered a CDM project.

In addition to the NAPA, Climate Change and Air Pollution are among the ten sectoral environmental policies. The overall objectives of this policy are to promote climate monitoring, to implement a firm and demonstrable containment policy with respect to GHG emissions, and to foster the use of hydro, geothermal and solar energy.

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