

Climate Change in Philippines



Climate Change Guide

What is climate change?

How does climate change affect us?

What can we do against climate change?

Marion Künzler

Bread for all

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BROT FÜR ALLE
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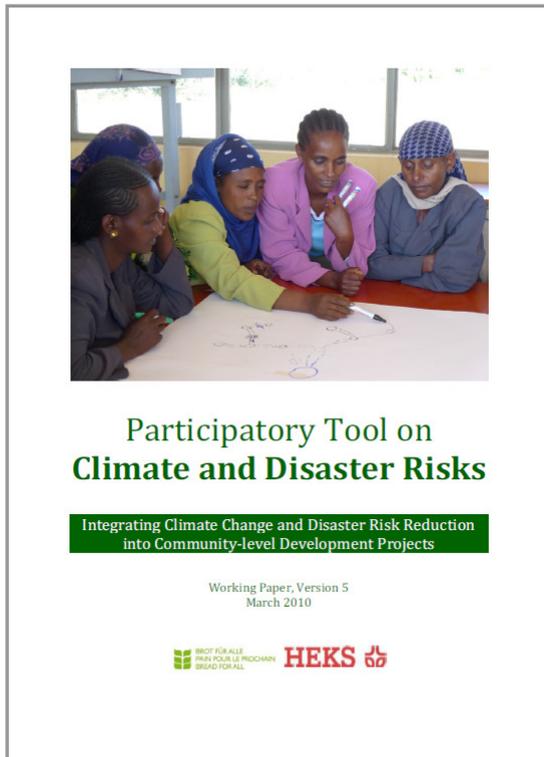
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1 Introduction

Climate change is one of the largest problems humanity faces today. Communities in Philippines suffer now and in the future from the impacts of this global phenomenon, even though people in Philippines 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 and Disaster Risk Tool (CLiDR)* developed by *HEKS* and *Bread for all*.

2 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.

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.

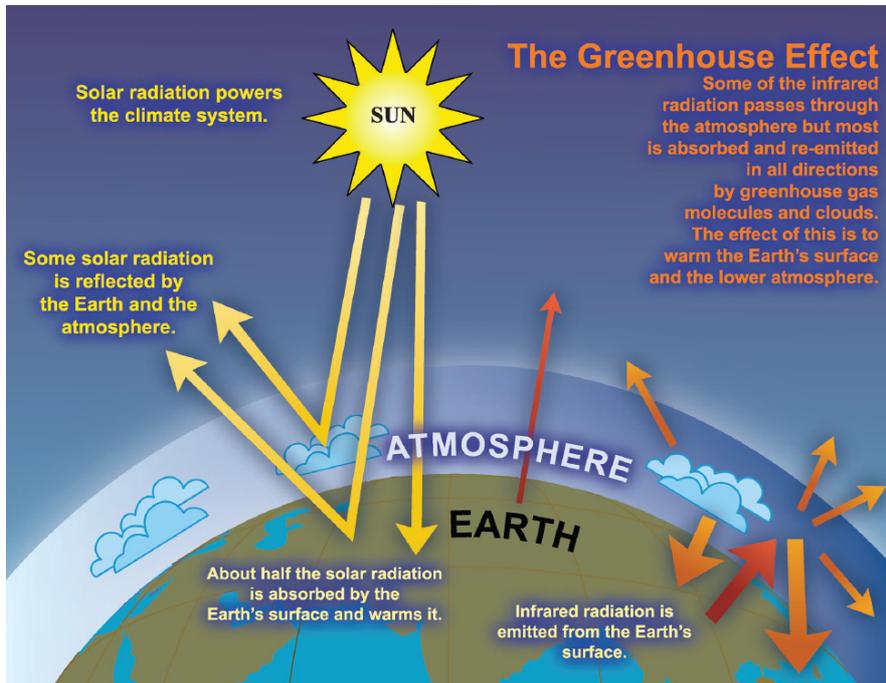


Figure 1: An idealized model of the greenhouse effect (IPCC, 2007)

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.

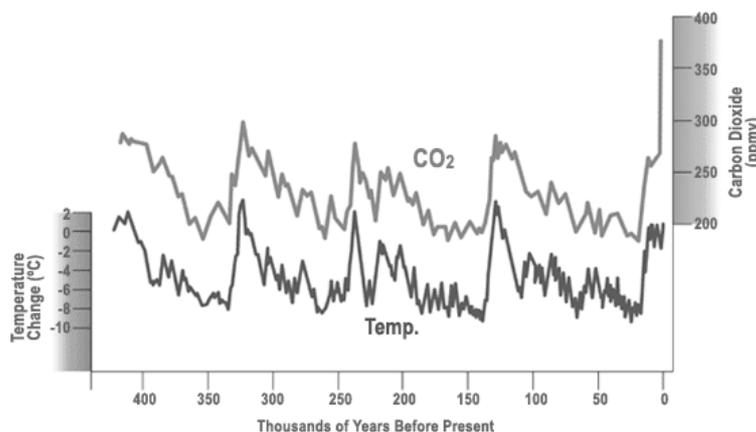


Figure 2: Carbon dioxide concentration and temperature anomalies during the past 400'000 years

(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.

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.

3 Climate Change in Philippines

3.1 Trends, Risk Analysis and Impacts

3.1.1 Past Trends of Climate Change

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 the Philippines increased at about 0.6° C (1951-2006). Annual rainfall amounts and number of rainy days during the wettest and driest years per decade increased as well. And sea level rise began in 1970, thereby Manila and Davao showed an increase of nearly 15 cm.

The El Nino-Southern Oscillation (ENSO), is a large-scale phenomenon associated with a major warming (El Nino)/ cooling (La Nina) of the surface layer of the central eastern equatorial Pacific Ocean. The observations indicate that there have been more ENSO events, especially of El Nino that were more frequent, persistent and intense since early 1970.

No trend has the total number of annual tropical cyclones. In contrast increasing tropical cyclones in Visayas and decreasing ones in Mindanao were observed (1951-2000).

3.1.2 Projected Trends of Climate Change

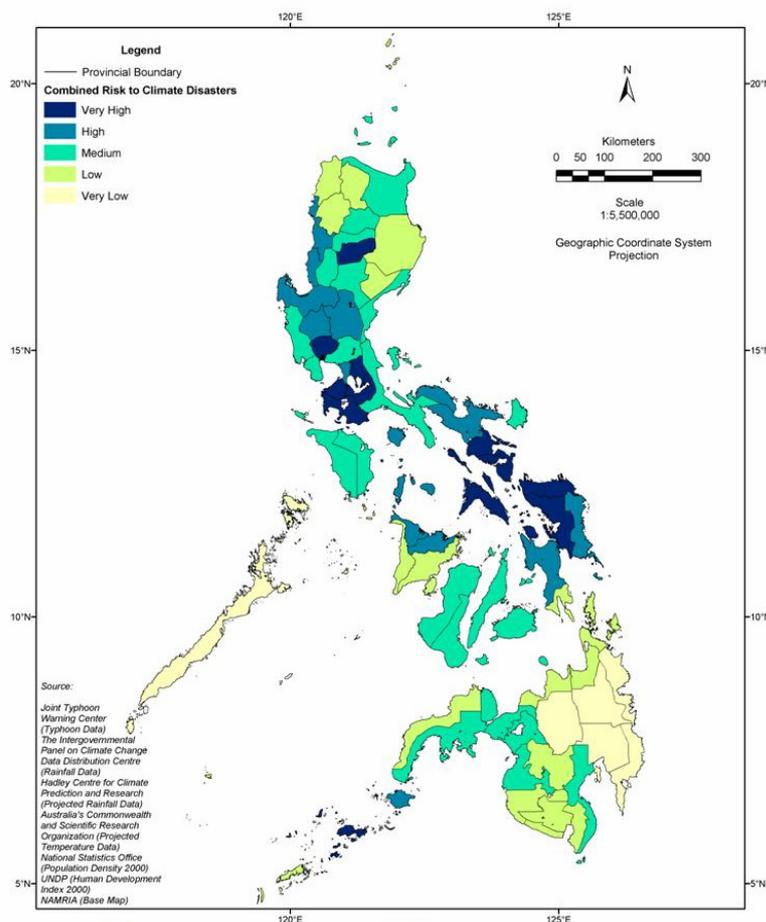
The projected climate change scenarios based on the downscaling made by the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) are:

- **Temperature:** Significant warming will occur in the Philippines by middle of the current century, especially a significant increase in the frequency of hot days and warm nights: The average annual mean temperature is projected to increase by 0.9°C -1.2°C by 2020 and 1.7°C-3.0°C by 2050. Warming will be worst in Mindanao.
- **Precipitation:** Changes in annual mean precipitation are varying largely. Increase in rainfall are particularly evident in most areas of Luzon and Visayas (2 to 17% by 2020 and 1 to 16% by 2050), while Mindanao is projected to undergo a drying trend (0.5 to 11% by 2020 and 2 to 11% in 2050). Projections of seasonal temporal rainfalls show that the dryer season (March to May) will become drier, while the wet season (June to August and September to November) will become wetter. Reduction of rainfall is seen in most areas for all seasons of Mindanao by 2050. Mainly a much active and stronger southwest monsoon season is projected as significant increases in rainfall in July to August.
- **Sea level** rise will increase the risk of flooding, storm damage, erosion of beaches and cliffs as well as changes in tides of rivers and bays. Projected impacts of one meter sea level rise show that a land loss of 129,144 ha could be expected and approximately 2 million people affected.
- **Extreme events:** there is no clear trend for extreme events e.g. typhoons.

3.1.3 Regional Climate and Weather Risks Analysis

The combined risk to climate disasters map represents the sum of the normalized, provincialized risks to typhoon (super typhoons, typhoons, tropical storms and tropical depressions), drought caused by El Niño, projected rainfall change and projected temperature increase. The top ten provinces are: Albay, Pampanga, Ifugao, Sorsogon, Biliran, Rizal, Northern Samar, Cavite, Masbate, and Laguna. In general, Central Luzon and the Bicol regions rank high to very-high on the risk scale. This is due to the fact that the risk to typhoons and risk to projected rainfall change dominate. Mindanao has higher risk to temperature increase and El Niño-induced drought compared to other areas.

Figure 3: Combined Risk to Climate Disasters (Manila Observatory 2010)



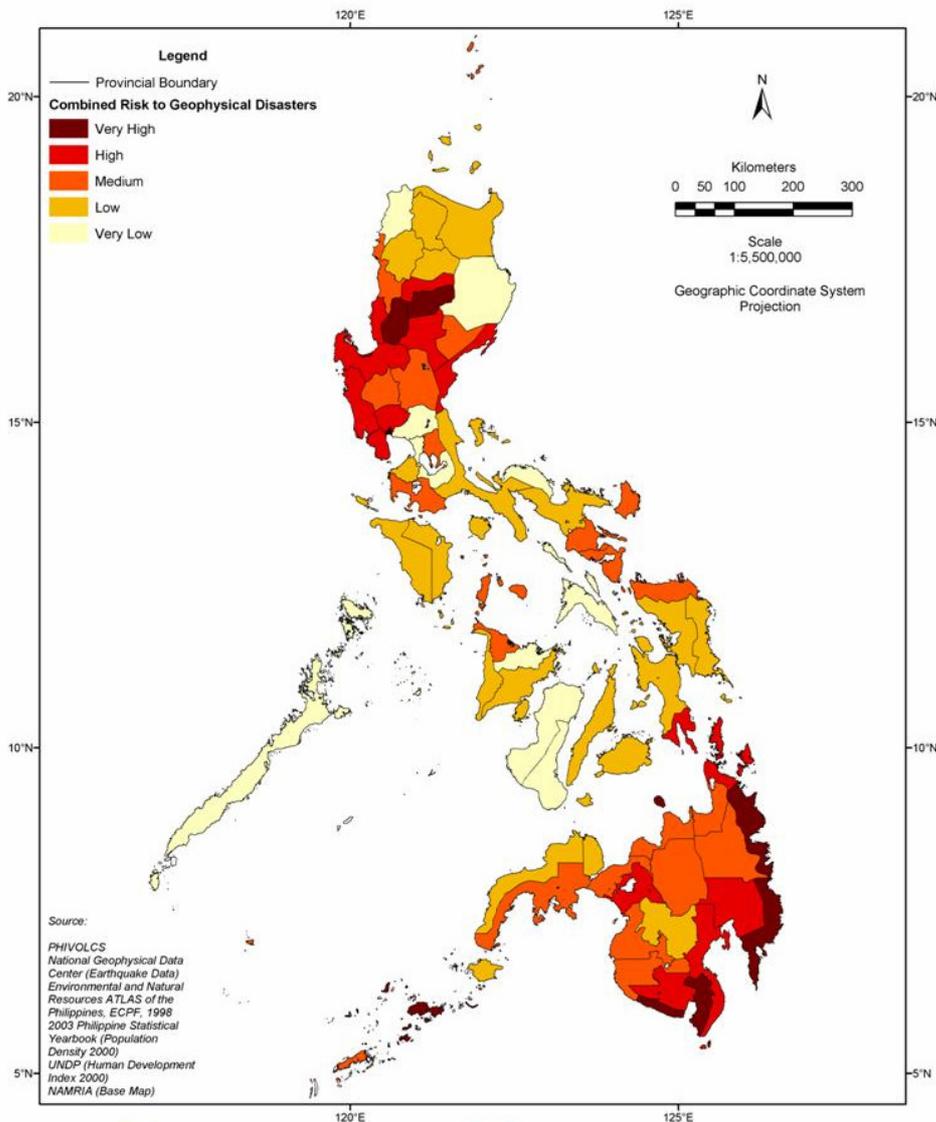
Having a more differentiated look shows that the areas most at risk :

- to **temperature** increase during the projected 2080 climatology are Mindanao and Central Visayas.
- to projected **rainfall changes** are Central, South and Southeast Luzon and Eastern Visayas
- to the occurrence of **tropical depressions**, tropical storms, typhoons and super typhoons are Northern Luzon, South-eastern Luzon and Eastern Visayas.
- to **El Niño**-induced drought are Central and West Mindanao.

3.1.4 Regional Geophysical Risk Analysis

Geophysical factors are not climate change related but natural hazards and can cause disasters. The Geophysical Disaster Risk Map represents the sum of the normalized, provincialized risks to earthquakes, earthquake-induced shallow landslides, tsunamis and volcanoes. The top ten provinces include: Sulu, Camiguin, Ifugao, Davao Oriental, Sarangani, Benguet, Surigao del Sur, La Union, Lanao del Sur, and Zambales. In general, Central Luzon and Eastern Mindanao are the high-ranking areas.

Figure 4: Combined Risk to Geophysical Disasters (Manila Observatory 2010)



The maps of areas at risk to earthquakes and earthquake-induced landslides have certain areas of Central to Northern Luzon and Eastern Mindanao in common. However, there are areas like Bukidnon and Lanao that have a high risk to landslides but a low risk to earthquakes, indicating that there must be other factors contributing to the occurrence of landslides in these areas. Areas at risk to both tsunamis and volcanic eruptions include the northwest to southeast diagonal across RP.

Having a more differentiated look shows that the areas most at risk

- to **earthquakes** are Union and Pangasinan, due to the Manila Trench. While Surigao del Sur and Davao Oriental have earthquake hazards due to Philippine Trench and nearby active faults. Frequency of shallow and left-lateral strike-slip earthquakes in Nueva Vizcaya, Nueva Ecija, Eastern Pangasinan, Benguet and La Union can be attributed to its location along the Philippine Fault Zone.
- to earthquake induced **landslides** are the provinces, especially Ifugao, Lanao del Sur and Sarangani rank high because of their high vulnerability to disasters.
- to **volcanic eruptions** is Camiguin because the land area is so small that a volcanic eruption can affect the whole province.
- to **tsunamis** are Sulu and Tawi-tawi because of their location between two nearby trenches namely, Sulu Trench and Cotabato Trench. Moreover, both provinces are also densely populated and have very high vulnerability. Similarly, most areas in Basilan and Romblon are at high risk.

3.1.5 Impacts of Climate Change in Philippines

Detrimental and beneficial impacts of the ongoing and projected climate change and variability are widespread in both socio-economic and natural systems. The Philippines has identified four priority areas for vulnerability and adaptation assessment: agriculture and food security; watershed (forestry and biodiversity); coastal zones, and human health. There impacts include:

Agriculture, Food Security: Agriculture represents 1/5 of the total economy and generates 1/3 of the country's total employment. Agricultural productivity will be constrained by the increasing temperatures, particularly by those in nighttime, changes in rainfall patterns and the projected changes in frequency and intensity of tropical cyclones causing wind damages and yield losses. Simulation models have shown that rice yields vary from – 14% to 6.6% for every 1°C rise in temperature. Outbreak and spread pest and diseases in plants, crops and animals is mostly uncertain. Climate Change will weaken national food security and self-sufficiency and intensify problems of water allocation.

Forestry and Biodiversity: The Philippines is one of the critical biodiversity hotspots with more than 65% of the species found nowhere else. Thereof more than 800 of its plant and animal species are threatened with extinction of great concern. Increases in temperature will affect the survival of plants and animals. Changes in precipitation may also cause a re-composition and re-distribution of forest types: A decrease in soil moisture in drier areas may accelerate forest loss while increase in precipitation could increase run-off resulting in soil erosion and flooding.

Water resources: Changes in rainfall and temperature will be critical to future inflow in two major reservoirs: Angat and Lake Lanao. Runoff is likely to decrease and be insufficient to meet future water demands. Other factors deemed as contributing to the impacts of climate change on water resources include degradation of water areas, unchecked extraction of groundwater, pollution due to industrialization, saltwater intrusion and sedimentation of reservoirs. Saltwater intrusion has been reported to be evident in nearly 28 percent of coastal municipalities in Luzon, 20 percent in the Visayas, and almost 29 percent in Mindanao.

Coastal zones: Extreme weather events (e.g. typhoons/storm surges), sea level rise and increased temperatures will lead to increased flooding of low-lying coastal areas, enhanced coastal erosion and negative agricultural impacts (e.g. loss of yield and employment)

resulting from inundation, salinization and land loss. Besides that negative impacts are expected on coastal aquaculture and tourism because of coral bleaching and ocean acidification.

Human health: Frequency and severity of extreme weather events such as heat strokes and dehydration from increasing temperatures, heat waves and drought will increase. Indirect causes of climate sensitive infections diseases such as vector or water borne will also increase: Diarrhoea and malaria are the two main diseases affected by climate change, especially temperature raise, in the region. Consequently the number of deaths will also increase.

Infrastructure: Frequent rainfall, strong winds, higher waves and temperatures variations will lead to accelerated structural fatigue and materials failure (e.g. power transmission structure, road pavements etc.)

It is important to notice, however, that other factors threaten the livelihoods of Philippines communities as well. For example resource degradation and the overexploitation of natural resources such as unsustainable fishing practices in association with the environmental decline.

3.2 Philippines's Contribution to Climate Change

The total GHG emissions with Land use Change and Forestry (LUCF) are 19,491 GGt of carbon dioxide equivalents (CO₂e) in the year 2000. Overall GHG emissions from non LUCF sectors amounted to 126,878.78 Ggt CO₂e.

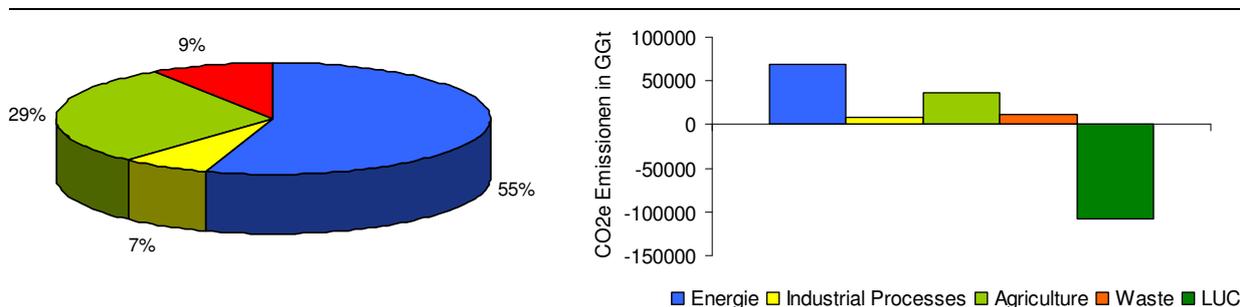


Figure 6/7: Overall 2000 GHG emissions from Non-LUCF sectors (left) and all sectors (right), (UNDP 2009)

Sector wise, Philippines' GHG emissions are dominated by energy and agriculture, which contribute 55% (69,667.24 Ggt Co₂e) or 29% (37,002.69 Ggt CO₂e) of the total GHG emissions (refer to figure 6 and 7).

The energy sector contributes mainly with crude oil (76%) and coal (24%) as energy consumption to the GHG emissions, biomass sources; kerosene and different gases are of minor importance.

The Land use and forestry sector reduces greenhouse gas emissions with 107,387.67 Ggt CO₂e. Thus it is a significant carbon sink. This sink is mainly attributed to a low deforestation rate from 1990 to 2000 as well as an increasing carbon sequestration of various terrestrial ecosystems in the country (refer to figure 7).

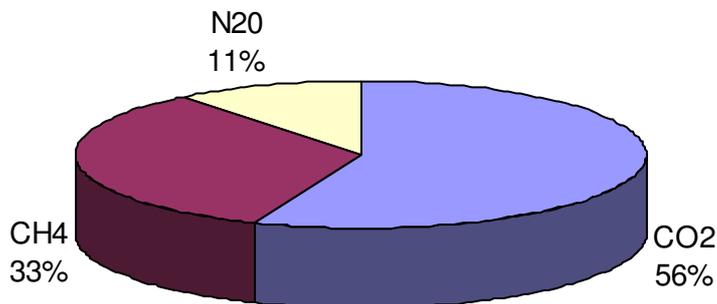


Figure 8: Relative contribution of individual greenhouse gases to aggregated emissions in 2000 (UNDP 2009)

Philippines Agriculture sectors ghg emission contribution is high mainly because of methane from rice cultivation (44%) and enteric fermentation in domestic livestock (18%), followed by nitrous oxide emission from agricultural soils (24%). The Agricultural sector contributed 14% of the country's GDP in 2000 and 34% are working in agricultural sector

4 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.

4.1 Adaptation Measures in Philippines

Strategies to deal with climate risks could include:

Coastal zones

- Conduct research studies on salt water intrusion, fisheries and aqua culture
- Monitoring sea level rise and climatologically data
- Strengthening of the Disaster Management Program, e.g. typhoon warning system
- Flood prevention/protection, e.g. stop conversion of mangroves into fishpond development or upland and coastal reforestation of mangroves

Human health sector

- National Disease specific program responses for e.g. dengue, malaria or cholera
- National health advisory and alerts

Agricultural sector

- Cropping pattern adjustments using climate information, e.g. of rainy season or frequency of tropical cyclones
- Redesigning/diversify cultivation mixes to ensure a guaranteed minimum yield e.g. high variety of crops, trees, livestock

- Soil conservation (i.e., management of crop residues with a balanced use of organic and inorganic fertilizers, erosion control)
- Improved farm management and production (i.e., diversified farming, use of farm weather advisories, post harvest facilities, regulated land-use conversion)
- Efficient water use i.e. natural rainfall management, building terraces or water retention systems
- Set up a drought management which includes an early warning system

Generally

- Prepare hazard and vulnerability maps to e.g. floods and to probable sea level rise
- Information, education and communication, awareness raising program

4.1.1 Multi-/Bilateral Adaptation Projects in Philippines (incomplete list):

Philippine Climate Change Adaptation Program (PhilCCAP), World Bank funded: to develop and demonstrate the systematic diagnosis of climate related problems and the climate-design and implementation of cost effective cost- adaptation measures in agriculture and natural resources management to integrate climate change risk awareness and responsiveness in economic and operational planning

Enabling Activities for the Preparation of the 2nd National Communication on Climate Change, GEF/UNDP funded: GHG inventories, climate change scenarios for climate risk assessment, vulnerability and adaptation assessment, etc.

Strengthening the Philippines' Institutional Capacities to Adapt to Climate Change, funded by UNDP/Spanish Grant: to enhance the national and local capacity to develop, manage and

4.2 Mitigation Measures in Philippines

Agriculture and Energy including transport are the sectors with the largest mitigation potential in the Philippines. In the National Framework Strategy on Climate Change 2010-2012 the Philippines identified therefore also energy efficiency, renewable energy, transport and deforestation as priorities:

- Enhance energy efficiency towards a low carbon economy.
- Boost renewable energies to diversify the energy mix.
- Improve the transport efficiency through increased use of alternative fuels and expansion of mass transport systems
- Reduce emissions from deforestation and forest degradation through the sustainable management of forests and the protection and enhancement of carbon stocks in watersheds, forests and other terrestrial ecosystems, effective implementation of waste management laws.

4.2.1 Multi- /Bilateral Mitigation Projects in Philippines (incomplete list):

Capacity Building to Remove Barriers to Renewable Energy Development in the Philippines (CBRED) Project: The CBRED Project aims to reduce the annual growth rate of GHG emissions from activities using fossil fuels through the removal of the major barriers to the development and widespread implementation of renewable energy applications to replace part of the current fossil fuel use in the Philippines.

Philippine Efficient Lighting Market Transformation Project (PELMATP), funded by GEF through UNDP: The project addresses the barriers to widespread utilization of energy efficient lighting systems (EELs) in the Philippines and will accelerate integration of EEL programs to the planned activities of the Department of Energy, enhance private sector's involvement and appreciation of the benefits of EEL and ensure that environmental impacts associated with the use of EELs are mitigated.

Integrated Capacity Strengthening for CDM (ICS-CDM) Program, financed by Ministry of the Environment Japan: The capacity building programme for developing countries in Asia enhances institutional and human capacity to fully engage in and benefit from Clean Development Mechanism (CDM). The Institute for Global Environmental Strategies (IGES) has been the implementing institute for the programme and conducted various activities through workshops and trainings for both the government and private sector in the host countries

JICA Study on Capacity Building to Promote CDM Projects in the Republic of the Philippines: The objective of the JICA Study is to assist the EMB-DENR to enhance its capacity to promote CDM projects in the Philippines.

5 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 2010, Cancun will host the next international climate conference of the United Nations. In Copenhagen 2009, the international communities agreed on a non binding Copenhagen Accord with disappointing results: No specific aims and measures were mentioned, only the agreement of a maximum 2°C global warming was reached. Therefore, the international community needs to work hard in Cancun to work out an overall agreement for the follow-up to the Kyoto Protocol.

In 1991, the Philippines began to address the issue of climate change in its thrust to achieve sustainable development with the formulation of the Philippine Strategy for Sustainable Development (PSSD). Immediately, thereafter, the country officially adopted the Agenda 21 by formulating the Philippine Agenda 21. This document serves as the overarching framework to lay down the national agenda for sustainable development for the 21st century geared towards having a "harmonious integration of a sound and viable economy, responsible governance, social cohesion and harmony and ecological integrity to ensure that development is a life-enhancing process.

In 1991, the Philippine Government established the Inter-Agency Committee on Climate Change (IACCC), comprising 15 government agencies and representatives of NGOs, to provide technical support on matters concerning climate change.

The Philippine was one of the first countries to set up a national committee to discuss and develop positions on climate change prior to the establishment of the Intergovernmental Negotiating Committee, which then negotiated the United Nations Framework Convention on Climate Change (UNFCCC). The Philippines ratified both the UNFCCC in 1998 and the

Kyoto Protocol already in 2003. The Philippines as a Non-Annex 1 Party do not have any responsibility or commitment to reduce or limit its anthropogenic emissions of greenhouse gases.

The Department of Environment and Natural Resources (DENR) is the technical focal point recognized by the UNFCCC and international community while the Department of Foreign Affairs (DFA) serves as the political focal point. One of the commitments of the Parties to the UNFCCC is to incorporate climate change consideration, when feasible, in relevant social, economic and environmental policies and actions. The following laws explicitly address climate change:

The following laws explicitly address climate change:

- Agriculture and Fisheries Modernization Act (1997) establishes that the Department of Agriculture together with other appropriate agencies, should take into account climate change, weather disturbances and annual productivity cycles in order to forecast and formulate appropriate agricultural and fisheries programs.
- The Clean Air Act of 1999 provides the Department of Environment and Natural Resources (DENR) together with concerned agencies and local government units prepare and implement national plans that are in accordance with UNFCC and other international agreements, conventions and protocols on reducing greenhouse emissions. In addition it establishes that meteorological factors affecting ozone depletion and GHGs should be monitored and standards set.
- Reinforcing the country's drive towards a healthier environment was the enactment of the Solid Waste Management Act of 2000 that aimed at providing a comprehensive solution to the country's garbage problem.
- The Philippines climate change act of 2008 integrates disaster risk reduction measures into climate change adaptation plans, development and poverty reduction programmes.
- The Philippine Disaster Risk Management Act of 2009 is intended to strengthen Philippine disaster management capability by institutionalizing the national disaster risk management framework to decrease disaster vulnerability, increase capability for recovery, and enhance over-all resilience to disasters.

In 1990 and 1994, the Philippines conducted a national greenhouse gas emissions inventory and submitted in 2000 the First National Communication on Climate Change to UNFCCC. Currently the Second National Communication is elaborated.

The Presidential Task Force on Climate Change Adaptation and Mitigation (PTFCC) and the Advisory Council on Climate Change (ACCC) were formed in 2003. The Presidential Task Force on Climate Change promotes national projects, programs and actions on climate change.

The following national development plans integrate climate change:

- *Medium Term Philippine Development Plan (MTDP)* integrates "Green Philippines", as a chapter in the Updated 2004-2010 MTDP as one of the "8 in 8" priorities. MTDP underscores the need to manage the environment more effectively in order to address the problem of poverty particularly in the rural areas.
- *Philippine Energy Plan (PEP)* boosts major programs on energy efficiency as well as promotion and use of new and renewable energy (NRE) sources. Furthermore, the Biofuels Act (2007), which was designed to pursue energy sufficiency and security, in a way helps reduce the emission of greenhouse gases.

- *Midterm Progress Report on the Millennium Development Goals (MDGs)* suggests that climate change creates an opportunity for the Philippines' to channel large-scale debit-for-equity programs to reforestation, clean water, irrigation and food production programs. In other words, climate change is seen to have a devastating impact on the attainment of the MDGs mostly through a series of natural disasters, and, therefore, the report highlights the importance of climate change adaptation and long-term disaster risk management.

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.

The DENR was set up as the designated national authority (DNA) for CDM, the executive order in 2005. In the middle of June 2010, 41 CDM projects were registered and 34 at validation in the Philippines. There of are 48 methane avoidance projects, 12 biomass energy, 6 landfill and 5 hydro projects. For more information about CDM in Philippines, please view <http://cdmdna.emb.gov.ph/>

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