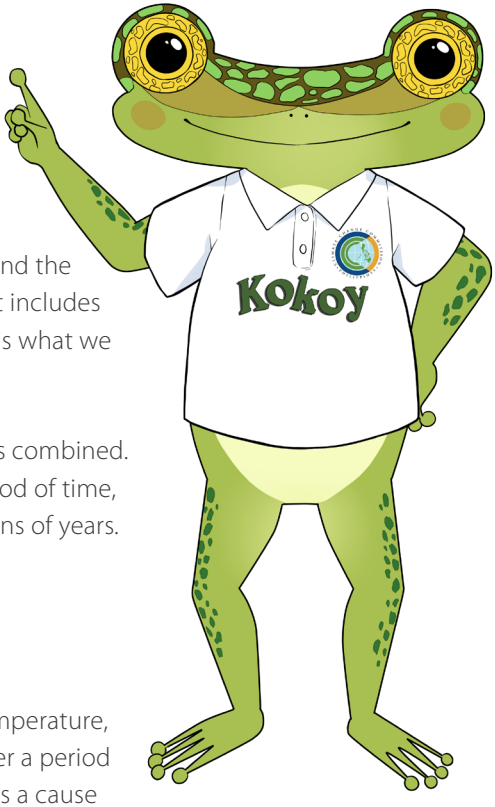
CLIMATE CHANGE

A PRIMER FOR LOCAL GOVERNMENT

Table of Contents

Weather vs Climate



Weather and climate are not the same, although they are related.

Weather is the present condition of the air and the atmosphere at a particular place and time. It includes temperature, rainfall, wind, and humidity. It is what we experience every day.

Climate on the other hand is many weathers combined. It is the average weather over a specific period of time, ranging from months to thousands or millions of years.

Climate Change

Climate change is the general change in temperature, rainfall, wind, and other climate patterns over a period of time. We consider the actions of people as a cause of this change. Thus we say that climate change is a direct or indirect result of human activity.

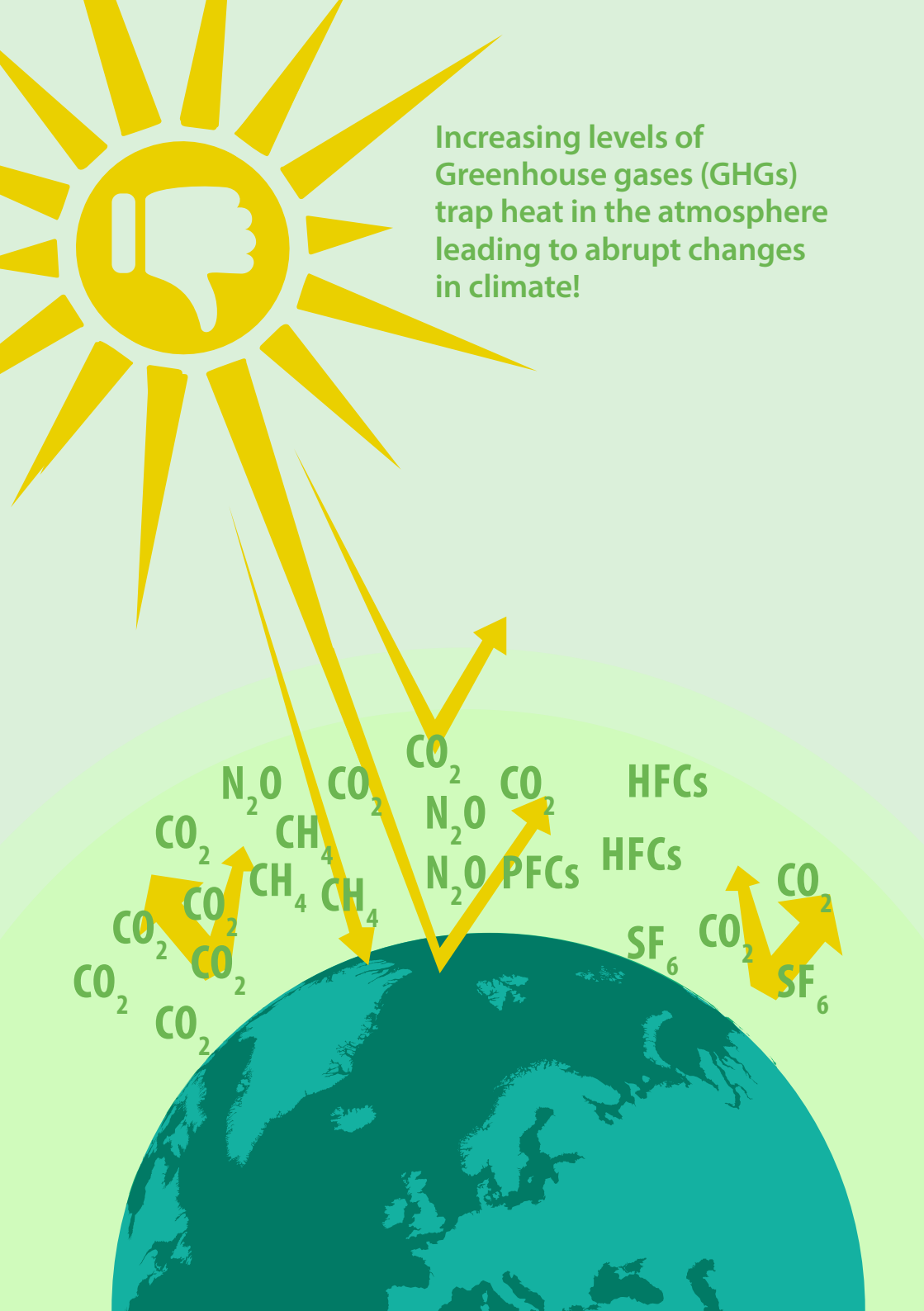
The United Nations Intergovernmental Panel on Climate Change (2014) defines climate change as a change in the state of the climate that can be identified (e.g., using statistical tests) by changes in the mean or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use.

(CCC)

The Greenhouse Effect

While other planets of our solar system are not livable because they are too hot or too cold, Earth has the right temperature to sustain life. Earth enjoys these temperatures because of its atmosphere, which is the thin layer of gases that surrounds the planet.

Some sunlight that hits the earth is reflected. Some becomes heat.


Increasing levels of Greenhouse gases (GHGs) trap heat in the atmosphere leading to abrupt changes in climate!
N_2O
CO_2
CO_2
N_2O
CO_2
HFCs
CO_2
CH_4
CH_4
CH_4
N_2O
PFCs
HFCs
CO_2
CO_2
CO_2
CO_2
CO_2
CO_2
SF_6
SF_6

Greenhouse Effect

Climate change is caused primarily by the increasing level of greenhouse gases or GHGs in the atmosphere. The GHGs trap the sun's heat, and this is known as the "greenhouse effect".

The greenhouse effect, a natural phenomenon which makes the earth a liveable planet, is the warming that happens when certain gases in the earth's atmosphere trap heat. These gases let in sunlight but keep heat from escaping, like the glass walls of a greenhouse.

Sunlight shines onto the earth's surface, where it is absorbed. Sunlight then radiates back into the atmosphere as heat. In the atmosphere, GHGs trap some of this heat, and the rest escapes into space. The more GHGs in the atmosphere, the more heat gets trapped.

As people burn fossil fuels and cause the emission of GHGs, the greenhouse effect becomes more pronounced, causing the earth to become warmer.

Had these GHGs been able to escape back into space, the earth's average temperature would have been colder by about 15 ºC.

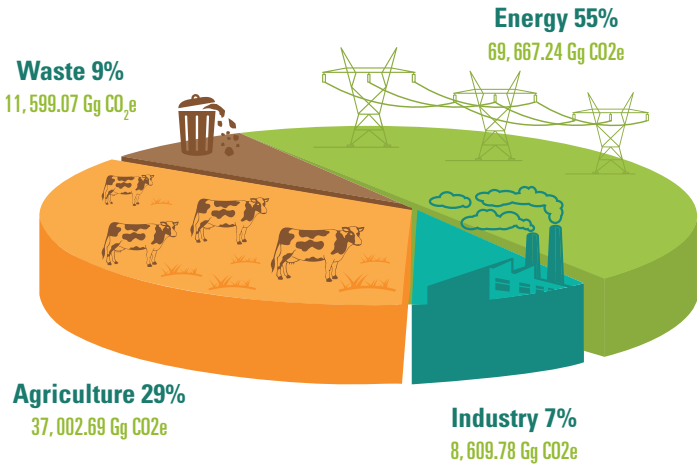
As it is, increasing levels of GHGs make the earth unusually warm, leading to global warming and climate change.

(CCC, DENR)

Common sources of GHGs

- Carbon dioxide (CO2) from burning of fossil fuels such as coal, oil, and gas from industries and cars.
- Methane (CH4) from natural sources such as wetlands and from man-made sources such as agriculture and, landfills and waste from homes and business establishments. Domestic livestock such as cattle, sheep, and goats produce large amounts of CH4 as part of their normal digestive process.
- Nitrous oxide (NO2) from automobile exhaust, industrial activities, biomass burning, and synthetic fertilizer used in agriculture.
- Hydro fluorocarbons (HFCs), Per fluorocarbons (PFCs), Sulfur hexafluoride (SF6) from aerosols and industrial coolants. These gases have a strong resistance to radiation, and stay in the atmosphere for a long period of time.

Greenhouse Gas Sources in the Philippines

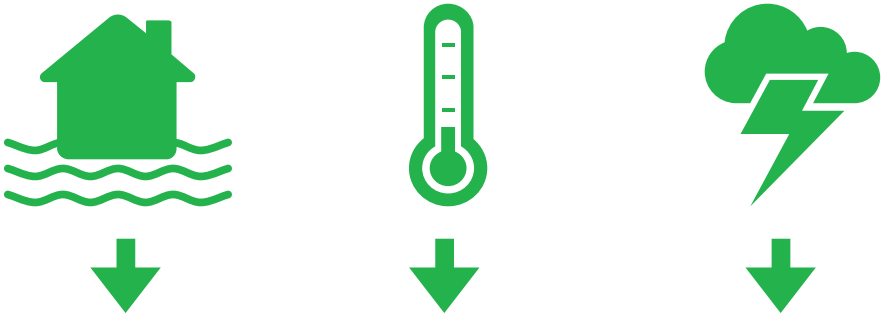


Total: 21,767.41 Gg CO2e

Source: 2000 Philippine GHG Inventory

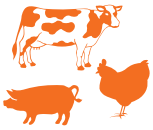
Impact of climate change

The world is already feeling the impact of climate change, with the planet only 0.8 ºC warmer than in pre-Industrial times. Many of us could experience the harsher impact of a 2 ºC warmer world within our lifetime, that is, 20 to 30 years from now. And 4 ºC is likely by the end of the century, if the world does not act now.



Health Impacts

- Weather-related mortality infectious diseases
- Air quality respiratory illnesses



Agricultural Impacts

- Crop yields
- Drought

Forest Impacts

- Change in forest composition
- Shift geographic range of forests

Species & Natural Areas

- Shift on ecological zones
- Loss of habitat and species

Impact on Coastal Areas

- Erosion of beaches
- Cost to defend coastal communities

Water Resources Impacts

- Change in water supply
- Water quality
- Increased composition for water

Impact on Settlements

- Flooding

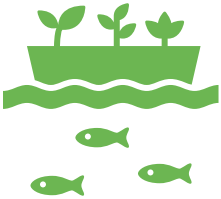
Philippines' vulnerability to climate change

The Philippines is the world's 3rd country that's most vulnerable to climate change.

- The Philippines has no land barrier to protect against climate impact.
- Its 16 provinces are among 50 in the Asian region that are most vulnerable to weather-related risks.
- It has accelerating environmental deterioration, unsustainable development practices, and population growth.

The urban poor and coastal communities are particularly vulnerable.

- The Philippines has the 10 cities of the world that are most vulnerable to sea level rise and intensifying storm surges.
- Informal settlements, which account for 45% of the Philippines' urban population, are particularly vulnerable to floods due to less secure infrastructure, reduced access to clean water, and lack of health insurance.
- Sea level rise will increase by 50 cms by 2060, and by 100 cms by 2090. A storm surge of 100 cm sea level rise will affect 14% of the total population and 42% of the coastal population.
- Wind intensity and maximum wind speed will increase by the end of the century, worsening coastal erosion.



Agriculture and fisheries will be hard hit.

- Climate-related impact is expected to reduce agricultural productivity in the Philippines.
- Warming oceans and ocean acidification affect coral reefs, which serve as feeding and spawning grounds for many fish species that support the livelihoods of fisher folk.
- Extreme heat during the summer months will affect 90% of the land.
- Global warming can reduce rice yield by 75% by the end of this century.
- Coral bleaching and reef degradation will lead to loss of fisheries.
- A climate that is 4 ºC warmer will decrease catch potential by 50% in southern Philippines and increase by 6-16% in northern Philippines.

(World Bank, 2012)

Climate change and disasters

Climate change affects disaster risks in two ways. First, through the likely increase in weather and climate hazards. Second, through increases in the vulnerability of communities to natural hazards, particularly through ecosystem degradation, reductions in water and food availability, and changes to livelihood.

Climate change will add yet another stress to those of environmental degradation and rapid unplanned urban growth, further reducing communities' abilities to cope with even the existing levels of weather hazards.

(UNISDR, 2008)

There are three integrated approaches to climate change and disaster risks.

1. Adaptation
2. Mitigation
3. Disaster risk reduction

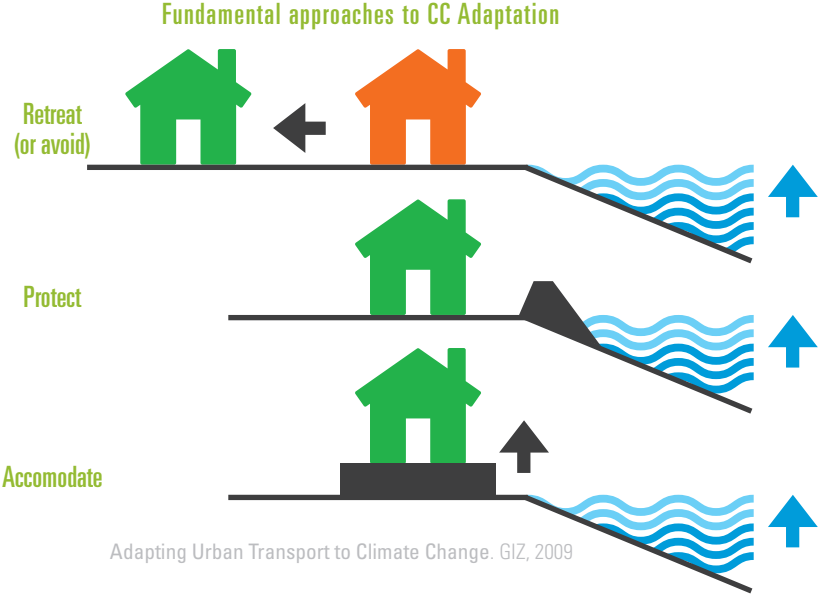
Adaptation

Adaptation is action that helps people cope with the effects of climate change. For example, construction of barriers to protect against rising sea levels, or conversion to crops capable of surviving high temperatures and drought. (BBC, 2014)

IPCC (2014) defines it as the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.

Adaptation includes:

- Responses or measures that address drivers of vulnerability, such as crop insurance for farmers
- Responses or measures that directly confront climate change impact, such as flood control that incorporates climate change and climate variability in design
- Reponses or measures that build resilience to current and future climate risks (i.e. Introduce climate-resilient rice varieties), such as climate-resilient rice varieties



Adapting Urban Transport to Climate Change. GIZ, 2009

Avoid high risk areas, such as those prone to flooding and exposed to sea level rise. Consider this in planning infrastructure and other development programs. Doing so may well be the most cost-effective and safest option.

Protect the community from sea level rise and river flooding. Install seawalls and plant mangroves that act as buffers during storm surges. Build green spaces with many trees to provide shade, wind fences, and drainage.

Accommodate adjustments in the design of roads, buildings, transport system, and other infrastructure. Accommodation means changing design standards and construction materials so that they withstand higher levels of flooding or temperature. It means installing air conditioning in cars. Accommodation also includes designating emergency bus routes and strengthening public transport networks to increase resilience. In agriculture, shifting to crops that can withstand floods and droughts is an adaptation measure.

Mitigation

Mitigation is action that will reduce man-made climate change. This includes action to reduce GHGs or absorb GHGs in the atmosphere. (BBC, 2014)

IPCC (2014) defines mitigation as human intervention to reduce the sources or enhance the sinks of GHGs.

Examples of mitigation measures:

- Reducing GHG emissions by constructing bike lanes and green buildings
- Increasing GHG sequestration through reforestation
- Protecting carbon sinks, for example, through Bantay Gubat (forest watch) or Bantay Bakawan (mangrove watch)

3

Disaster risk reduction

Disaster risk reduction is an action taken to reduce the risk of disasters and the adverse impact of natural hazards, through systematic efforts to analyze and manage the causes of disasters, including through avoidance of hazards, reduced social and economic vulnerability to hazards, and improved preparedness for adverse events. It is tailor-made to help counteract the added risks arising from climate change. (UNISDR, 2008)

Examples of disaster risk reduction measures

- Risk assessment in development plans
- Risk reduction in land use planning
- Early warning systems
- Evacuation procedures and communication protocols
- Hazard-awareness trainings

Putting it all together: an approach to risk resiliency

Risk resiliency is a measure to ensure that programs, projects, and activities target the communities and areas that are most vulnerable to climate change and disaster risks.

It requires that government and citizens make risk resiliency a priority, set up the policies and mechanisms needed to make it happen, and integrate it in planning and budgeting.

National Climate Change Action Plan

The National Climate Change Action Plan (NCCAP) guides the programs and initiatives of government for adaptation, mitigation, and risk resiliency.

NCCAP outlines the specific programs and strategies for adaptation and mitigation for 2011 to 2028. It has seven strategic priorities: water sufficiency, food security, ecological and environmental stability, sustainable energy, climate-smart industries and services, human security, knowledge and capacity development.

Water Sufficiency

Food Security

Ecological and Environmental Stability

Sustainable Energy

Climate-smart Industries and Services

Human Security

Knowledge and Capacity Development

What can be done: more examples of adaptation, mitigation, and risk reduction measures

Water

- Water conservation
- Water harvesting and storage
- Better management of water supply systems

Agriculture: crop production

- Forecasts and early warning
- Diversification of herds, crops and livelihood
- More resistant crop varieties
- Irrigation solutions
- Soil conservation
- Changes in timing of farming activities, in land use and in farm location
- Use of early maturing rice varieties in the face of climatic variability
- Rice ratooning to increase rice production
- Rainwater conservation to support the cropping period
- Simple measures for handling rapid harvesting and post harvesting

Agriculture: fish production

- Changes in fish stocking and harvesting
- Improving fish cage management

Health

- Improving access to health care
- Disease monitoring and emergency responses

Ecosystems

- Rehabilitation of habitats
- Creating protected areas and migration corridors
- Tree planting along highways, forest reserve areas, water shed areas and mountains

Coasts

- Integrated coastal resource management
- Integration of adaptation in planning
- Construction of sea walls
- Elevating houses
- Conservation of ecosystems
- Elevating major thoroughfare
- Modifying existing drainage systems
- "Flood-proofing" buildings
- Flood hazard mapping and floor warnings
- Temporary shelter for affected communities
- Relocation of affected communities should sea water level rise
- Empowering community institutions

Sources

Department of Environment and Natural Resources - Environmental Management Bureau. Various publications and presentation slides.

Climate Change Commission. Various publications, videos and presentation slides.

Intergovernmental Panel on ***Climate Change. (2014). Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the IPCC***. Cambridge, UK: Cambridge University Press.

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