

Climate Change: Causes and Implications for Developing Economies

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Abstract

Climate change refers to a change in weather trends, which includes rising temperatures, lowering temperature, and changes in precipitation. These changes are caused mainly by anthropogenic and sometimes natural factors. Climate change impact can be harmful both on the environment and human. Several studies have identified the developing countries of the world as extremely vulnerable to climate change due to the fact that economies of these countries depend largely on climate-sensitive sectors e.g. agriculture, fisheries, and pastoralism. Furthermore, these countries are at the center of development and any negative phenomenon like climate change can hamper their development. To this end, this paper takes a look at the causes of climate change and its implications on fragile cum developing economies of the world. Solutions such as adaptation and mitigation measures are however suggested to arrest this phenomenon.

Keywords: Climate change, environment, developing countries, adaptation, mitigation

Introduction

Rising fossil fuel burning and land use changes have emitted, and are continuing to emit increasing quantities of greenhouse gases into the Earth's atmosphere. These greenhouse gases include carbon dioxide (CO₂), methane (CH₄) and nitrogen dioxide (N₂O), and a rise in these gases has caused a rise in the amount of heat from the sun withheld in the Earth's atmosphere, heat that would normally be

radiated back into space. This increase in heat has led to the greenhouse effect, resulting in climate change (UNFCCC, 2017) and hence global warming. As a result of global warming, the type, frequency and intensity of extreme events, such as tropical cyclones (including hurricanes and typhoons), floods, droughts and heavy precipitation events, are expected to rise even with relatively small average temperature increases. Changes in some types of extreme events

have already been observed, for example, increases in the frequency and intensity of heat waves and heavy precipitation events (Meehl et al. 2007). Cognizant of these potential adverse impacts, the global community signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. Ratified by 195 countries (UNFCCC, 2013), the UNFCCC is primarily aimed to stabilize greenhouse gas (GHG) concentrations at safe levels.

Developing countries are the most vulnerable to climate change impacts because they have fewer resources to adapt: socially, technologically and financially. Climate change is anticipated to have far reaching effects on the sustainable development of developing countries including their ability to attain the United Nations Millennium Development Goals by 2015 (UN, 2007).

Even with a temperature rise of 1– 2.5°C the IPCC predict serious effects including reduced crop yields in tropical areas leading to increased risk of hunger, spread of climate sensitive diseases such as malaria, and an increased risk of extinction of 20 – 30 per cent of all plant and animal species. By 2020, up to 250 million people in Africa could be exposed to greater risk of water stress (UNFCCC,2017)

Global Emissions by Gas

At the global scale, the key greenhouse gases emitted by human activities are:

- **Carbon dioxide (CO₂):** Fossil fuel use is the primary source of CO₂. CO₂ can also be emitted from direct human-induced impacts on forestry and other land use, such as through deforestation, land clearing for agriculture, and degradation of soils. Likewise, land can also remove CO₂ from the atmosphere through reforestation, improvement of soils, and other activities.
- **Methane (CH₄):** Agricultural activities, waste management, energy use, and biomass burning all contribute to CH₄ emissions.
- **Nitrous oxide (N₂O):** Agricultural activities, such as fertilizer use, are the primary source of N₂O emissions. Fossil fuel combustion also generates N₂O.
- **Fluorinated gases (F-gases):** Industrial processes, refrigeration, and the use of a variety of consumer products contribute to emissions of F-gases, which include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).

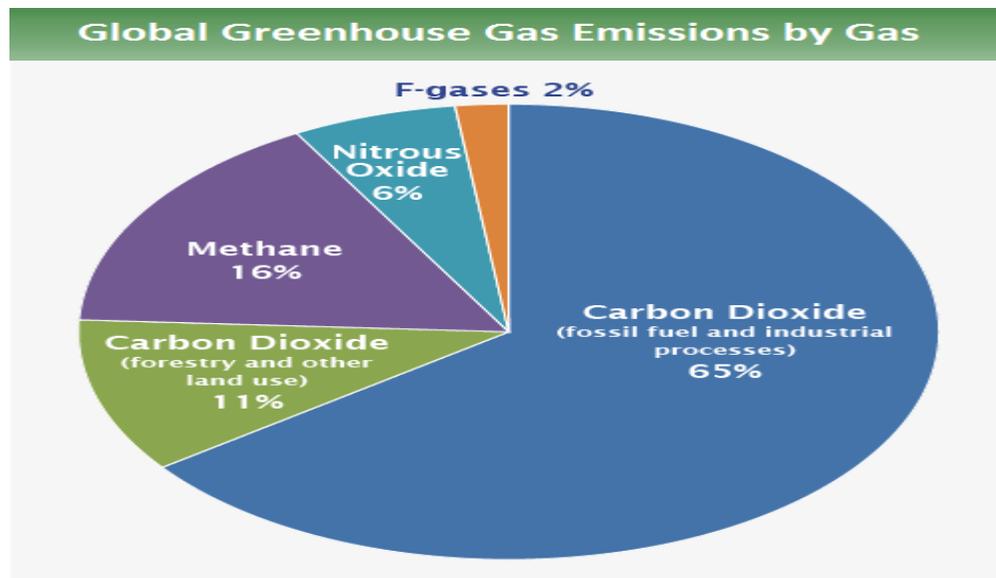


Fig 1: Global Greenhouse Gas Emission in percentages

Source: IPCC (2014)

World Major Emitters

In 2014, the top carbon dioxide (CO₂) emitters were China, the United States, the European Union, India, the Russian Federation, and Japan. These data include CO₂ emissions from fossil fuel combustion, as well as cement manufacturing and gas flaring. Together, these sources represent a large proportion of total global CO₂ emissions. Emissions and sinks related to changes in land use are not included in these estimates. However, changes in land use can be

important: estimates indicate that net global greenhouse gas emissions from agriculture, forestry, and other land use were over 8 billion metric tons of CO₂ equivalent, or about 24% of total global greenhouse gas emissions. In areas such as the United States and Europe, change in land use associated with human activities have the net effect of absorbing CO₂, partially offsetting the emissions from deforestation in other regions (Boden et al., 2017).

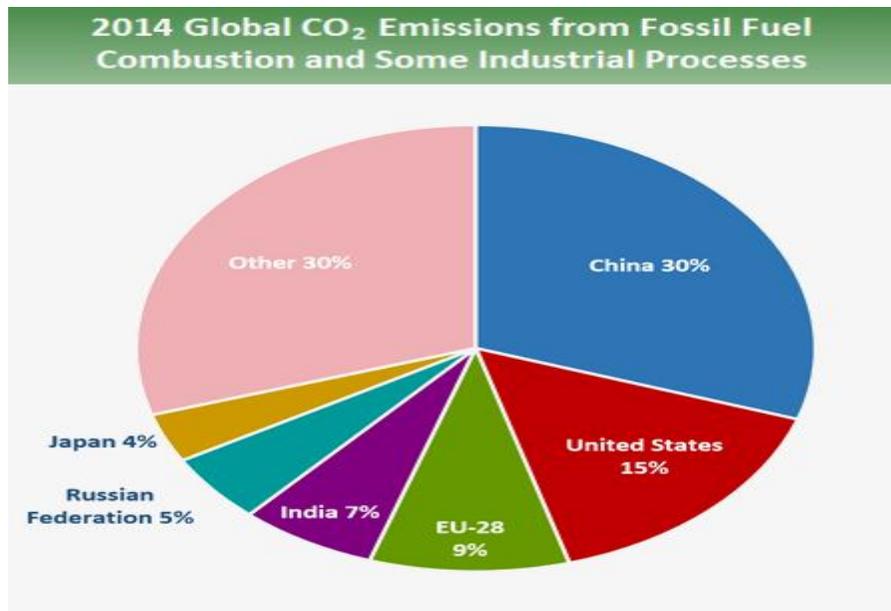


Fig 2: Carbon dioxide Emission by Countries

Source: Boden, T.A., Marland, G., and Andres, R.J. (2017)

Global Emissions by Economic Sector

Global greenhouse gas emissions can also be broken down by the economic activities that lead to their production.

Electricity and Heat Production (25% of 2010 global greenhouse gas emissions): The burning of coal, natural gas, and oil for electricity and heat is the largest single source of global greenhouse gas emissions.

Industry (21% of 2010 global greenhouse gas emissions): Greenhouse gas emissions from industry primarily involve fossil fuels burnt on site at facilities for energy. This sector also includes emissions from chemical, metallurgical, and mineral transformation

processes not associated with energy consumption and emissions from waste management activities.

Agriculture, Forestry, and Other Land Use (24% of 2010 global greenhouse gas emissions): Greenhouse gas emissions from this sector come mostly from agriculture (cultivation of crops and livestock) and deforestation. This estimate does not include the CO₂ that ecosystems remove from the atmosphere by sequestering carbon in biomass, dead organic matter, and soils, which offset approximately 20% of emissions from this sector.

Transportation (14% of 2010 global greenhouse gas emissions): Greenhouse gas emissions from this sector primarily involve fossil fuels burned for road,

rail, air, and marine transportation. Almost all (95%) of the world's transportation energy comes from petroleum-based fuels, largely gasoline and diesel.

Buildings (6% of 2010 global greenhouse gas emissions): Greenhouse gas emissions from this sector arise from onsite energy generation and burning fuels for heat in buildings or cooking in homes.

Other Energy (10% of 2010 global greenhouse gas emissions): This source of greenhouse gas emissions refers to all emissions from the Energy sector which is not directly associated with electricity or heat production, such as fuel extraction, refining, processing, and transportation.

Climate change will affect many sectors, including water resources, agriculture and food security, ecosystems and biodiversity, human health and coastal zones.

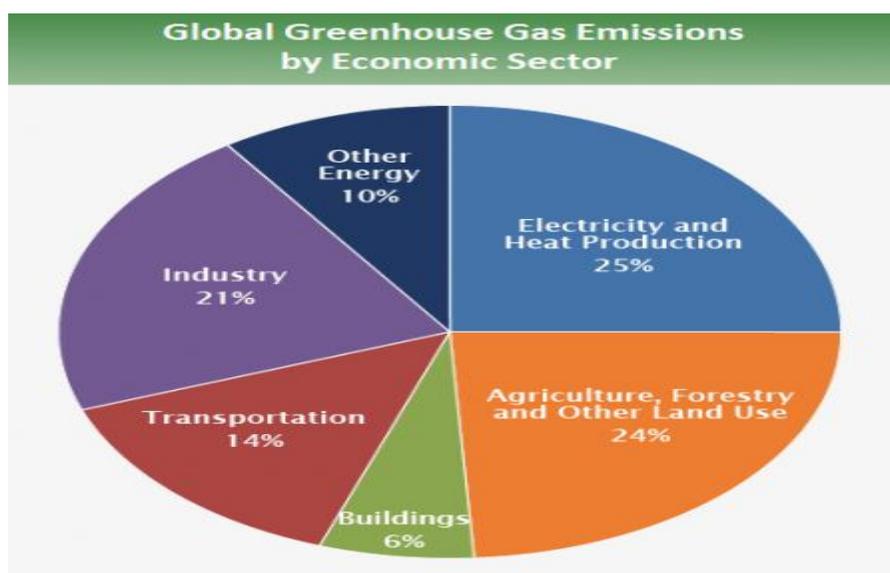


Fig 3: Global Greenhouse Gas Emission by Economic Sectors

Source: IPCC (2014)

The Way Forward

There are basically two types of measures when it comes to tackling climate change to in order to prevent the impacts it causes in the different systems of the planet. These include **mitigation** and **adaptation** measures.

Mitigation measures are those actions that are taken to reduce and curb greenhouse gas emissions, while adaptation measures are based on reducing vulnerability to the effects of climate change. In other words, mitigation attends to the causes of climate change, while adaptation addresses its impact.

Adapting to Climate change

Human beings have been adapting to the variable climate around them for centuries. Adaptation is a process through which societies make themselves better able to cope with an uncertain future. Adapting to climate change entails taking the right measures to reduce the negative effects of climate change (or exploit the positive ones) by making the appropriate adjustments and changes. There are many options and opportunities to adapt. These range from technological options such as increased sea defenses or flood-proof houses on stilts, to behavioural change at the individual level, such as reducing water use in times of drought and using insecticide-sprayed mosquito nets. Other strategies include early warning systems for extreme events, better water management, improve risk management, various insurance options and biodiversity conservation (UNFCCC, 2006c).

Developing countries have very different individual circumstances and the specific impacts of climate change on a country depend on the climate it experiences as well as its geographical, social, cultural, economic and political situations. As a result, countries require a diversity of adaptation measures very much depending on individual circumstances. However there are cross cutting issues which apply across countries and regions. The same sectors are affected by climate change, albeit to differing degrees. These main sectors include: agriculture, water resources, human health, terrestrial

ecosystems, biodiversity and coastal zones (UNFCCC, 2017)

Adaptation measures implemented in the Sahel for instance include crop-livestock integration, soil fertility management, planting of drought-resistant crops, water harvesting, dug ponds for watering animals, livelihood diversification, and seasonal or permanent migration. A number of these methods have been practiced for generations and are the norm for semi-arid regions. However, in a changing climate such practices will have to be scaled up and new methods developed, as adaptation has not been sufficient to prevent losses. New methods may include breeding of more drought-resistant crops (Schafer et al., 2018).

Mitigating Climate change

Several measures have been identified to curb the effect of greenhouse gases globally. However, the peculiarity of economies in developing countries has made some of these measures not to be one size fits all. Below are a few mitigation measures that could be adopted by developing countries.

- Increasing energy efficiency and replacing fossil fuels with biofuels or other methods with low carbon footprints will reduce emissions per unit of food produced.
- Minimal soil disturbance (minimum and zero tillage) and improved grazing management (e.g. stocking rate management, rotational grazing, and enclosure of grassland from livestock

grazing) can reduce emissions from volatilization of organic soil Carbon. Integrated nutrient management can reduce emissions by reducing leaching and volatile losses, improving nitrogen use efficiency through precision farming and improving fertilizer application timing.

- Reducing emissions from deforestation and forest degradation (REDD) and adopting sustainable management of existing forests can reduce emissions.
- Agro-forestry, afforestation/reforestation, forest restoration: Carbon storage can be increased through: combining crops with trees for timber and fodder; establishing shelter belts and riparian zones/buffer strips with woody species systems; and conversion from non-forest to forest land use and from degraded forests to fully carbon stocked forests.

Conclusion

In conclusion, developing countries especially sub-Saharan Africa need international assistance to support adaptation in the context of national planning for sustainable development, more capacity-building and transfer of technology and funds. Systematic planning and capacity-building are also needed to reduce the risk of disasters and raise the resilience of communities to increasing extreme events such as droughts, floods and

tropical cyclones. Funding for adaptation in developing countries must be sufficient and sustained. Least developed countries (LDCs) and small Island developing States (SIDS) in particular need special consideration due to their extreme vulnerability (UNFCCC, 2017).

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