

# “An Empirical Study on Impact of Greenhouse Gas Emissions in Indian Economy”

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## ABSTRACT

India is the world's fifth-largest emitter of greenhouse gases, ranking behind China, the United States, the European Union, and Russia. Gases that trap heat in the atmosphere are called greenhouse gases. Natural events and human activities contribute to an increase in average global temperature. This is caused mainly by increase in “Greenhouse Gases” such as Carbon dioxide (CO<sub>2</sub>). The six main GHGs are, Carbon dioxide (CO<sub>2</sub>), Methane (CH<sub>4</sub>) (which is 20 times as a potent a GHG as CO<sub>2</sub>), Nitrous oxide (N<sub>2</sub>O), and the other three are fluorinated industrial gases such as Hydrofluoric Carbons (HFCs), Per fluorocarbons (PFCs), Sculpture Hexafluoride (SF<sub>6</sub>). Water Vapor is also considered as a greenhouse gas. The Club of Rome Report 1972 officially raised global warming as an international issue and, in 1985, World Meteorological Organization (WMO) and United Nations Environment Programme (UNEP) officially declared carbon dioxide as the principal cause of global warming. Greenhouse gas concentrations are measured in parts per million, parts per billion, and even parts per trillion. One part per million is equivalent to one drop of water diluted into about 13 gallons of liquid (roughly the fuel tank of a compact car). The air pollutants responsible for the greenhouse effect are known as the greenhouse gases. Almost 100 percent of the observed temperature increase over the last 50 years has been due to the increase in the atmosphere of greenhouse gas concentration like water vapour, carbon dioxide (CO<sub>2</sub>), methane and ozone. Greenhouse gases are those gases that contribute to the greenhouse effect. The largest contributing source of greenhouse gas is the burning of fossil fuels leading to the emission of carbon dioxide. Greenhouse gases in the atmosphere act like a mirror and reflect back to the earth. A part of the heat radiation, which would otherwise be lost to space. The higher the concentration of greenhouse gases like carbon dioxide in the atmosphere, the more heat energy is being reflected back to the earth. The emission of carbon dioxide into the environment mainly from burning of fossil fuels like oil, gas, petrol, kerosene, etc., has been increased dramatically over the past 50 years.

**Keyword:** - HydrofluoroCarbons, Perfluorocarbons, World Meteorological Organization..

## 1. INTRODUCTION

Earth's temperature depends on the balance between **leaving the planet's** system. When incoming energy from the sun is absorbed by the Earth system, Earth warms. When the sun's energy is reflected back into space, Earth avoids warming. When absorbed energy is released back into space, Earth cools. When sunlight reaches Earth's surface, it can either be reflected back into space or absorbed by Earth. Once absorbed, the planet releases some of the energy back into the atmosphere as heat (also called infrared radiation). Greenhouse gases (GHGs) like water vapor (H<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>), and methane (CH<sub>4</sub>) absorb energy, slowing or preventing the loss of heat to space. In this way, GHGs act like a blanket,

making Earth warmer than it would otherwise be. This process is commonly known as the “greenhouse effect.” The recent role of the greenhouse effect, since the Industrial Revolution began around 1750, human activities have contributed substantially to climate change by adding CO<sub>2</sub> and other heat-trapping gases to the atmosphere. These greenhouse gas emissions have increased the greenhouse effect and caused Earth’s surface temperature to rise. The primary human activity affecting the amount and rate of climate change is greenhouse gas emissions from the burning of fossil fuels. The most important GHGs directly emitted by humans include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and several others.

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Greenhouse gas concentrations are measured in parts per million, parts per billion, and even parts per trillion. One part per million is equivalent to one drop of water diluted into about 13 gallons of liquid (roughly the fuel tank of a compact car). The air pollutants responsible for the greenhouse effect are known as the greenhouse gases. Almost 100 percent of the observed temperature increase over the last 50 years has been due to the increase in the atmosphere of greenhouse gas concentration like water vapour, carbon dioxide (CO<sub>2</sub>), methane and ozone. Greenhouse gases are those gases that contribute to the greenhouse effect. The largest contributing source of greenhouse gas is the burning of fossil fuels leading to the emission of carbon dioxide. Greenhouse gases in the atmosphere act like a mirror and reflect back to the earth. A part of the heat radiation, which would otherwise be lost to space. The higher the concentration of greenhouse gases like carbon dioxide in the atmosphere, the more heat energy is being reflected back to the earth. The emission of carbon dioxide into the environment mainly from burning of fossil fuels like oil, gas, petrol, kerosene, etc., has been increased dramatically over the past 50 years.

Since the industrial revolution, economic development has been accompanied by growth in the consumption of fossil fuels, with more and more coal, oil, and natural gas being burned by factories and electric power plants, motor vehicles and households. The resulting carbon dioxide (CO<sub>2</sub>) emissions have turned into the largest source of greenhouse gases that trap the infrared radiation from the earth within its atmosphere and create the risk of global warming.

### **1.1 Sources of Greenhouse Gases:**

Carbon dioxide is the main anthropogenic greenhouse gas. The global atmospheric concentration of carbon dioxide has increased from a pre-industrial value of about 280 ppm (parts per million) to 379 ppm in 2005. The atmospheric concentration of carbon dioxide in 2005 exceeded by far the natural range over many thousands of years. The annual carbon dioxide concentration growth rate was larger during the last 10 years. The primary source of the increased atmospheric concentration of carbon dioxide since pre industrial period results from the fossil fuel use.

### **1.2 Emissions of GHG in India:**

It is estimated that India emitted 908 million tons of CO<sub>2</sub> in 1998, four percent of the world’s total. The per capita emissions of CO<sub>2</sub> are 0.93 million tons per annum. In 2004, the per capita emission of CO<sub>2</sub> is 1.02 million tons per annum were well below the world average of 4.2 percent million tons per annum. Since GHG emissions were directly linked to economic growth, India’s economic activities would necessarily involve increased emissions.<sup>[2]</sup>

### **1.3 Impact on Climate Change:**

The impact of climate change on the economy’s performance has become an important issue for all the countries. It is more acute in case of developing countries which are in high growth trajectories. The emissions of GHGs have increased over time. It is well established fact that climate change is largely due to manmade causes and only partly due to natural causes. The human causes are the releases of what are called Greenhouse Gases (GHGs), notably Carbon dioxide emitted by power stations burning coal and automobiles run on petroleum and diesel and nitrogen oxides from vehicular exhausts. There other factors responsible for GHG are paddy cultivation and cattle. Deforestation and forest degradation is a major contributor to climate change, accounting nearly 20 percent of total greenhouse gas emissions. The IPCC in its fourth assessment report mentioned the changes in atmospheric concentration of GHGs and aerosols, land cover and solar radiation alter the energy balance of the climate system and become drivers of climate

change. According to this report, the annual CO<sub>2</sub> concentration growth rate has been larger during the last 10 years. However the continued increase in concentration of GHGs in the atmosphere is likely to lead to climate change resulting in large changes in ecosystems, leading to possible catastrophic disruptions of livelihoods, economic activity, living conditions and human health.

Historically the industrialized countries have been the primary contributors to GHG emissions. High population and economic growth rates, fossil fuel use led CO<sub>2</sub> emissions from developing countries are likely to soon match or exceed those from the industrialized countries. Therefore, if the responsibility for emissions increase in the past lies largely with the industrialized world, then the late-industrializing countries are likely to be the source of an increasing proportion of future increase of GHGs.

#### 1.4 Climate change and Economic growth:

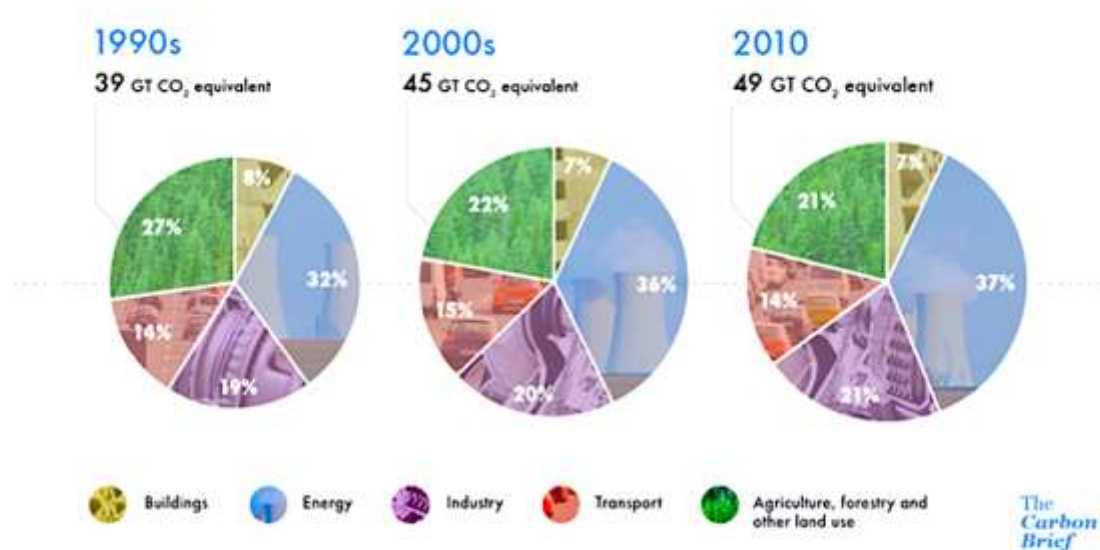
Indian economy is highly vulnerable to global warming caused by GHG emissions. The Indian Network for climate change Assessment report indicates that the average annual surface air temperature in India is increasing by 0.40 degree Celsius without much variation in absolute rainfall. The sea level has increased at a rate of 1.06 – 1.25mm/year during the last four decades across the coastal India. The same report has predicted that the temperature in India will be increased by 2 – 4<sup>0</sup> C by 2050s. The climate sensitive sectors such as agriculture, forestry, coastal and water resources will be adversely affected because of climate change. The economies of country are more vulnerable to climate change than those of other country because of varying share of these sectors in economic growth. In general in India, larger share economic activity is from agriculture and forestry. They also tend to be in the lower latitudes where the impacts of these sectors will be most severe. The low latitudes tend to be too hot for reasonably profitable agricultural activities and any further warming will further reduce agricultural productivity and thereby agricultural profitability here. A divesting impact of climate change in India will be the rise in sea level, resulting in the inundation of coastal areas.

**GHG emissions by sector and estimated projections in India (%)**

GHG	Sector	1995	2005*	2015*	2025*	2035*
CO <sub>2</sub>	Power	44	45	44	45	47
	Industry	35	34	31	29	28
	Transport	14	16	20	22	21
	Methane	39	39	39	38	37
	Livestock					
	Paddy	23	21	19	17	15
	Biomass	16	15	14	13	12
	MSW*	8	11	14	17	21
N <sub>2</sub> O	N-fertilizer	65	70	74	75	74
CO <sub>2</sub> equivalents	Power	28	31	32	34	36
	Industry	22	23	23	22	21
	Agriculture	25	21	18	16	15
	Transport	9	11	15	17	16

\*Estimated, \* Municipal solid waste. Source: Shukla et al. 2003.

## Greenhouse gas emissions by sector



**Greenhouse gas emissions by sector for the 1990s, 2000s, and then 2010. Credit: Rosamund Pearce, Carbon Brief. Figures taken from Tuiello et al. (2015) using the FAOSTAT dataset only.**

According to India's second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) (MoEF, 2012), total GHG emissions in 2007 (latest year available) were 1,772 million tonnes of CO<sub>2</sub>-equivalent (MtCO<sub>2</sub>-eq), including emissions from the land use, land-use change, and forestry (LULUCF) sector. This represents a 44 percent increase over total reported emissions in 1994 and a 36 percent increase in total GHG emissions since 2000.

Emissions per capita (including LULUCF) declined slightly between 1994 and 2000, but they have increased since then, reaching approximately 1.5 metric tons per person in 2007. Between 2000 and 2007 emissions per capita increased approximately 22 percent, while the total population increased approximately 11 percent. As India's total gross domestic product (GDP) continues to grow—increasing 140 percent between 1994 and 2007—GHG emissions intensity (emissions per GDP) has steadily declined, by nearly 20 percent between 1994 and 2007, a reversal of an earlier trend. The absolute amount of energy generated from hydropower, solar, wind, and other renewable energy sources increased by 30 percent between 1990 and 2010. However, according to International Energy Agency (IEA) statistics, consumption of fossil fuels has increased significantly, with coal, oil, and natural gas use rising approximately 180, 164, and 400 percent, respectively, during the same time period.<sup>[3]</sup> As a result, fossil fuels currently comprise nearly 75 percent of India's overall energy fuel mix, with coal representing approximately 40 percent.

### 1.5 Policy Implications:

India signed the United Nations Framework Convention on Climate Change (UNFCCC) on June 10, 1992 and ratified it on November 1, 1993. It ratified the Kyoto Protocol on August 26, 2002 and hosted the Eighth Conference of the Parties (COP 8) in October 2002 in Delhi. There are number of projects underway directly aimed at reducing GHG emissions funded by the Global Environment Facility (GEF). Most of these projects are on renewable energy sources and biomass. On the otherhand, government of India has submitted its First National communication (NATCOM I) to the UNFCCC in June 2004 and second National Communication report (NATCOM II) in May 2010. This report, being brought out by INCCA, provides updated information on India's GHG emissions.

In July 2007, Prime Minister Manmohan Singh publicly committed to ensuring that "India's per capita emissions never exceed the per capita emissions of the industrialized countries" (GOI 2008). While

an important statement of intent, without a legal basis either domestically or internationally to motivate compliance it is at this stage largely symbolic.<sup>[4][5]</sup>

India's strategy for tackling climate change while pursuing development is set out in its National Action Plan on Climate Change (NAPCC), released in 2008. It includes a target to reduce the emissions intensity of India's economy (per unit of GDP) by 20 per cent between 2007/08 and 2016/17, also articulated in the Eleventh Five Year Plan (2007-2012).

#### **1.6 The NAPCC has eight National Missions at its core:**

- National Solar Mission;
- National Mission on Enhanced Energy Efficiency;
- National Mission on Sustainable Habitat;
- National Water Mission;
- National Mission for Sustaining the Himalayan Eco-system;
- National Mission for a Green India;
- National Mission for Sustainable Agriculture;
- National Mission on Strategic Knowledge for Climate Change.

#### **2. Conclusion:**

The study concluded that increase in GHG emissions does lead economic growth. The growth of industries and weak implementation of environment law has raised the level of GHG emissions paving the way for global warming in significantly. Hence it is necessary to reduce the level of gas emission with the adoption of new technology and clean development mechanism so that India can save itself from becoming heaven for pollution industry.

#### **References:**

1. IPCC (2013). *Climate Change 2013: The Physical Science Basis . Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
2. Shukla, P. R., D. Ghosh, and A. Garg. 2003. Climate change economics and policy: Indian perspectives. Resource for the Future. In Future energy trends and GHG emissions for India., Washington DC.
3. Agarwal.P.K., Sivskumar.M.V.K.(2010), "Global climate change and Food Security in South Asia: An Adaptation and Mitigation Framework, Springer Science& Business Media(Eds)
4. CSO (2011). National Accounts Statistics. Central Statistics Organisation. Ministry of Statistics and Programme Implementation. <http://mospi.nic.in> [ 12.10.2011]
5. Government of India. Agricultural Statistics at a Glance. Various Issues, Ministry of Agriculture. New Delhi.
6. <http://www.gcrio.org/consequences/summer95/agriculture.html>.