

## GREENHOUSE GASES: ITS SOURCES AND EMISSION FROM DIFFERENT COUNTRIES

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### ABSTRACT

In this research paper, researcher will heed the different sources of greenhouse gases (GHGs) and only on carbon dioxide (CO<sub>2</sub>) emission from different countries because among the GHGs, CO<sub>2</sub> is the most dominant gas causing global warming which accounts for nearly 77% of global total CO<sub>2</sub> equivalent GHG emissions (Intergovernmental Panel on Climate Change [IPCC], 2007c). The concentration of GHGs in the atmosphere has increased rapidly due to anthropogenic activities resulting in significant increase in the temperature of the earth. The increase in the concentration of these GHGs results in global warming. The increasing interest in quantification of GHS emissions comes as a result of growing public awareness of global warming. Many countries and organizations are estimating their GHS emissions and developing strategies to reduce their emissions. As per IPCC, CO<sub>2</sub>, methane, nitrous oxide, hydro fluorocarbons, per fluorocarbons, and sulfur hexafluoride are the major GHSs.

**Objectives:** To study the different sources of GHGs emission in % and to compare the CO<sub>2</sub> gas emission among the different countries.

**Methods:** Descriptive survey method was used for collecting the data.

**Result and Conclusion:** The result shows that the different sources of GHG's emission are natural and human sources, and the biggest CO<sub>2</sub> emitter was China in 2013.

**Keywords:** Greenhouse gases, Carbon dioxide emission, Sources of greenhouse gases.

### INTRODUCTION

Earth's temperature depends on the balance between energy entering and 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 energy is released back into space, Earth cools. Many factors, both natural and human, can cause changes in Earth's energy balance, including:

Changes in the greenhouse effect, which affects the amount of heat retained by Earth's atmosphere:

- Variations in the sun's energy reaching earth
- Changes in the reflectivity of Earth's atmosphere and surface.

These factors have caused Earth's climate to change many times.

Recent climate changes, however, cannot be explained by natural causes alone. Research indicates that natural causes are very unlikely to explain most observed warming, especially warming since the mid-20<sup>th</sup> century. Rather, human activities can very likely explain most of that warming. Since the Industrial Revolution began around 1750, human activities have contributed substantially to climate change by adding carbon dioxide (CO<sub>2</sub>) and other heat-trapping gases to the atmosphere. These greenhouse gas (GHG) emissions have increased the greenhouse effect and caused Earth's surface temperature to rise.

### METHODS

Descriptive survey method.

#### Objectives

1. To study the different sources of GHG's emission in %
2. To compare the CO<sub>2</sub> gas emission among the different countries.

### RESULTS AND DISCUSSIONS

There are two ways that GHSs enter our atmosphere. One of them is through natural processes and another is through human activities.

There are four main types of forcing GHSs: CO<sub>2</sub>, methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and fluorinated gases. Let's take a closer look at the sources of each type of GHS.

#### CO<sub>2</sub>

There are both natural and human sources of CO<sub>2</sub> emissions.

Table 1 shows that 42.8% of all naturally produced CO<sub>2</sub> emissions come from ocean-atmosphere exchange. Other important natural CO<sub>2</sub> sources include plant and animal respiration (28.56%) as well as soil respiration and decomposition (28.56%) A minor amount is also created by volcanic eruptions (0.03%).

Table 2 shows that 87% of all human CO<sub>2</sub> emissions come from the burning of fossil fuels such as coal, natural gas, and oil. Other sources include deforestation (9%), and industrial processes such as cement manufacturing (4%).

Before the influence of humans, CO<sub>2</sub> levels were quite steady because of this natural balance. Since the Industrial Revolution, human sources of CO<sub>2</sub> emissions have been growing. Activities such as the burning of fossil fuels as well as deforestation are the primary cause of the increased CO<sub>2</sub> concentrations in the atmosphere.

#### CH<sub>4</sub>

While there are both natural and human sources of CH<sub>4</sub>, but humans creating the majority of total emissions.

Table 3 shows that 78% of natural CH<sub>4</sub> emissions are produced by wetlands. Other natural CH<sub>4</sub> sources include termites (12%) and the oceans (10%).

Human-caused emissions have increased greatly since the Industrial Revolution. Activities, such as fossil fuel production and intensive livestock farming, are the primary cause of the increased CH<sub>4</sub> concentrations in the atmosphere. Table 4 shows that together these two sources are responsible for 60% of all human CH<sub>4</sub> emissions. Other

Table 1: Natural sources of CO<sub>2</sub> emission in %

Responsible natural sources	CO <sub>2</sub> emission in %
Ocean-atmosphere exchange	42.80
Plant and animal respiration	28.56
Soil respiration and decomposition	28.56
Volcanic eruptions	0.03

CO<sub>2</sub>: Carbon dioxideTable 2: Human sources of CO<sub>2</sub> emission in %

Responsible human sources	CO <sub>2</sub> emission in %
Burning of fossil fuels	87.00
Deforestation	9.00
Industrial processes	4.00

CO<sub>2</sub>: Carbon dioxideTable 3: Natural sources of CH<sub>4</sub> emission in %

Responsible natural sources	CH <sub>4</sub> emission in %
Wetlands	78.00
Termites	12.00
Oceans	10.00

CH<sub>4</sub>: MethaneTable 4: Human sources of CH<sub>4</sub> emission in %

Responsible human sources	CH <sub>4</sub> emission in %
Fossil fuel production, distribution, and use	39.00
Livestock farming	21.00
Landfills and waste	16.00
Biomass burning	11.00
Rice agriculture	9.00
Biofuels	4.00

CH<sub>4</sub>: Methane

sources include landfills and waste (16%), biomass burning (11%), rice agriculture (9%) as well as biofuels (4%).

For thousands of years, natural CH<sub>4</sub> sources have been closely balanced by natural sinks.

However today, human-related sources create the majority of total CH<sub>4</sub> emissions. This has upset the natural balance that existed before the Industrial Revolution and is increasing atmospheric levels.

### N<sub>2</sub>O

N<sub>2</sub>O emissions are also produced by both natural and human sources. The main natural sources are soils under natural vegetation and the oceans. Important human sources come from agriculture, fossil fuel combustion, and industrial processes.

Table 5 shows that 60% of natural N<sub>2</sub>O emissions are produced by soils under natural vegetation. Other natural sources include the oceans (35%) and atmospheric chemical reactions (5%).

Table 6 shows that human activities, such as agriculture, fossil fuel use, and industrial processes, are the primary cause of the increased N<sub>2</sub>O concentrations in the atmosphere. Together these sources are responsible for 77% of all human N<sub>2</sub>O emissions. Other sources include biomass burning (10%), atmospheric deposition (9%), and human sewage (3%).

Table 5: Natural sources of N<sub>2</sub>O emission in %

Responsible natural sources	N <sub>2</sub> O emission in %
Soils under natural vegetation	60.00
Oceans	35.00
Atmospheric chemical reactions	5.00

N<sub>2</sub>O: Nitrous oxideTable 6: Human sources of N<sub>2</sub>O emission in %

Responsible human sources	N <sub>2</sub> O emission in %
Agriculture	67.00
Fossil fuel use and Industrial processes	10.00
Biomass burning	10.00
Atmospheric deposition	9.00
Human sewage	3.00

N<sub>2</sub>O: Nitrous oxide

### Fluorinated gases

Emissions of the three main fluorinated gases (hydrofluorocarbons [HFCs], perfluorocarbons [PFCs], and sulfur hexafluoride [SF<sub>6</sub>]) are almost all created by humans and are used mainly in industrial processes. With the exception of PFC-14 (tetrafluoroethane [CF<sub>4</sub>]), fluorinated gases have no natural sources.

HFCs are the largest source of fluorinated gas emissions, accounting for 91%. HFCs are used inside of products such as refrigerators, air-conditioners, foams, and aerosol cans. Emissions from these products are caused by gas leakage during the manufacturing process as well as throughout the product's life. If disposal is not done properly, HFCs continue to leak out of the product until they are empty.

PFCs are responsible for 6% of fluorinated gas emissions. These gases are created during the production processes of aluminum and semiconductors. PFC-14 (CF<sub>4</sub>) and PFC-116 (hexafluoroethane [C<sub>2</sub>F<sub>6</sub>]) account for the majority of PFC emissions. <0.1% of PFC emissions is caused by natural sources. Small amounts of CF<sub>4</sub> are found in fluorite, granite, and natural gas deposits. Geochemical reactions in the lithosphere cause these emissions.

SF<sub>6</sub> creates 3% of fluorinated gas emissions. This gas is mainly used by the electric power industry as an insulator and is interrupted. The other important source of SF<sub>6</sub> emissions is from its use as a cover gas in magnesium production.

The increase in the atmospheric levels of fluorinated gases has been caused exclusively by human emissions. For a long time, now human sources of fluorinated gases have been creating emissions much more rapidly than the Earth can remove them.

CO<sub>2</sub> is the primary GHS emitted through human activities. In 2012, CO<sub>2</sub> accounted for about 82% of all U.S. GHS emissions from human activities.

Table 7 shows that, in 2013, China was the biggest CO<sub>2</sub> emitter in the world. CO<sub>2</sub> is naturally present in the atmosphere as part of the Earth's carbon cycle (the natural circulation of carbon among the atmosphere, oceans, soil, plants, and animals). Human activities are altering the carbon cycle - both by adding more CO<sub>2</sub> to the atmosphere and by influencing the ability of natural sinks, such as forests, to remove CO<sub>2</sub> from the atmosphere. While CO<sub>2</sub> emissions come from a variety of natural sources, human-related emissions are responsible for the increase that has occurred in the atmosphere since the industrial revolution.

Table 7: Top 5 emitters of CO<sub>2</sub> in 2013

Top 10 emitters of CO <sub>2</sub> in 2013	% of global total
China	29
USA	15
EU	10
India	7.1
Russian Federation	5.3

CO<sub>2</sub>: Carbon dioxide

#### CONCLUSION

1. The different sources of GHGs emission are natural and human sources.
2. The biggest CO<sub>2</sub> emitter was China in 2013.

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