

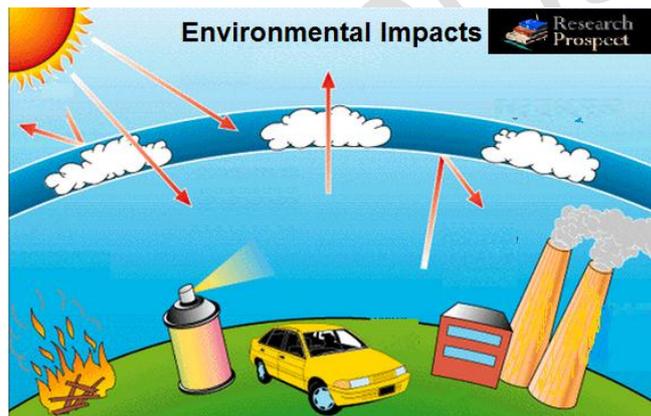
## Literature Review

Sample Literature Review



# The Global Warming

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## 1. Introduction

Global warming has not only become one of the biggest environmental challenges globally but has sparked such an interest amongst nations that there seems to be dire need to address its causes and subsequent consequences. This article aims to highlight various causes that have attributed towards global warming.

Inter governmental Panel for Climate Change (IPCC) produced reports which have been substantiated through the works of various scientists that state that through observation over the last fifty years the increase in temperature can be attributed to the increase in the green house gases which were a subsequent result of human related or anthropogenic activities which include deforestation, burning of fossil fuels, agriculture, mining etc, amongst other factors. Since the atmosphere of earth comprises of heat absorbing gases, which inherently keep the temperature of the earth comfortable so that it can support life, the aforementioned activities result in the heat to be absorbed by the gases in a higher quantity, resulting in the subsequent increase in temperature (Intergovernmental Panel on Climate Change, 2001).

## 2. Literature Review

The continuous increase in the temperatures of the Earth is a result of the imbalanced composition of the green house gases which are posing a threat to the atmosphere of the Earth and this gradual increase in the average temperature is referred to as global warming. Various other factors such as volcanic eruptions and solar variations are also contributing to the increase in temperature. According to the reports published by Inter governmental Panel for Climate Change, the temperature of the atmosphere has risen from 0.18 to 0.74 degrees Celsius and it is estimated by various scientists that this temperature is expected to rise up to between 1.5 to 4.0 degrees over the next century (Houghton , 2009).

Jean-Baptiste Fourier was the first scientist to discover the effect of greenhouse gas emissions and the subsequent warming effect in 1827, and his work led to this effect being widely known as the greenhouse effect. Subsequently in 1896, a Swedish scientist Saveno Arrhenius investigated the effect of greenhouse emissions and the concentration of gases in these emissions. Furthermore Roger Revelle and Hans Suess were the first scientists who expressed concern over the climatic change in the atmosphere in 1957.

Invariably, global warming is the subsequent effect of the greenhouse gas emissions. The atmosphere of the Earth comprises of various gases, out of which, oxygen and nitrogen form the bulk, but various other gases such as carbon dioxide and methane, all present in smaller quantities, absorb heat and subsequently emit thermal radiation which heat up the surface of the earth. Houghton, 2009, describes the natural greenhouse effect whereby, these gases act as a partial blanket for the aforementioned thermal radiation and the gases involved in this process are commonly known as the greenhouse gases.

Distinction is drawn between the natural greenhouse effect and the enhanced greenhouse effect, whereby the former constitute of gases that have been present before the advent of human activities, and the latter constitutes the addition of various gases as a subsequent result of human activities. In this era of industrialization, the quantity of carbon dioxide has substantially increased, along with other greenhouse gases, and following the enhanced greenhouse effect the atmosphere of the Earth is seen to thicken because of the composition of these additional gases.

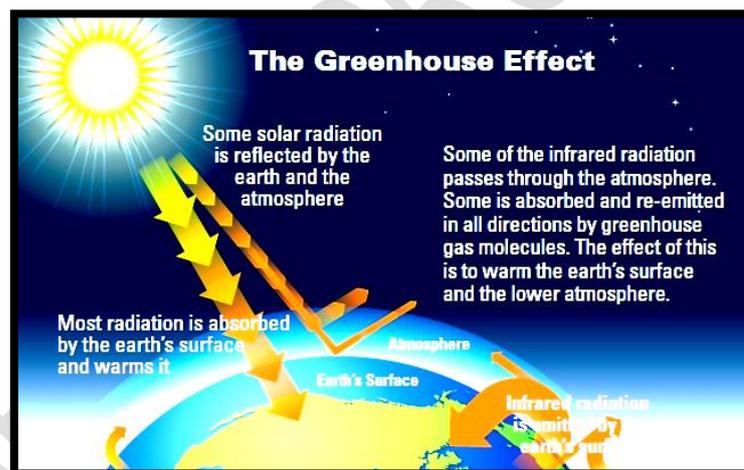


Figure-1: The Green-house Effect (Source: Climate change, 2007)

## 2.1. Type of Greenhouse Emissions and Environmental Impact

Enhanced concentration of gases within the greenhouse emissions are the major cause of global warming. Apart from naturally occurring disasters such as volcanic eruptions that contribute to the increase in the gaseous emissions, human related activities have their own impact on these emissions. There are various types of gaseous emission but they differ on the basis of their

concentration, rate of absorption, infra red radiation and strength. Following from this distinction, the dominant of these gaseous emissions are nitrogen dioxide, carbon dioxide, water vapour, methane, chloro flouro carbons and ozone amongst others.

### 2.1.1. Gaseous Carbon Emissions

Release of carbon and other related substances in the atmosphere through both natural and human related activities are referred to as carbon emissions. Over the last one hundred and fifty years with the onset and expansion of the industrial revolution, the carbon emissions, predominantly consisting of carbon dioxide have greatly increased in quantity. In comparison to the pre industrial revolution times, the carbon emissions have increased to over thirty one percent (Intergovernmental Panel on Climate Change, 2001). The carbon cycle, illustrated in figure two shows how these carbon emissions are regulated in the atmosphere. This is a completely natural process where respiration and decomposition both contribute to the carbon dioxide in the atmosphere, and photosynthesis uses up this carbon dioxide which in turn increases the levels of oxygen in the atmosphere, subsequently creating a balance within the natural environment.

In order for the carbon concentration to relatively constant, the carbon cycle ensures not the destruction but distribution of carbon amongst the carbon reservoirs. With the ever increasing expansion of our technological capabilities, along with the industrialization, the amount of carbon and various other green house gases has increased to an alarming degree, which is illustrated in Figure three (Drakes, 2000).

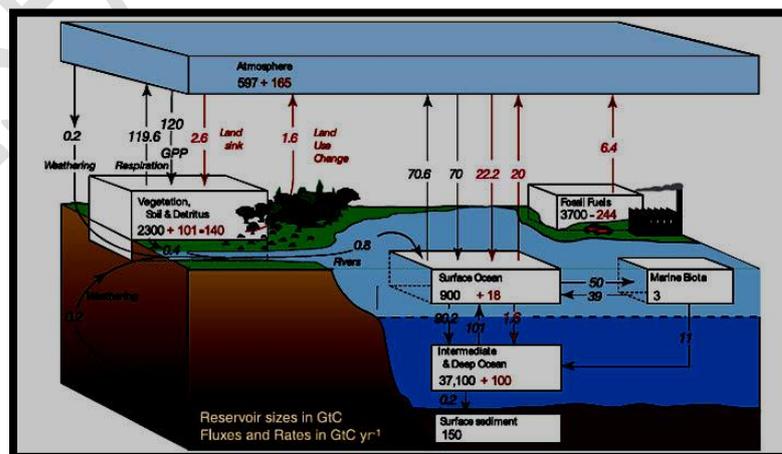
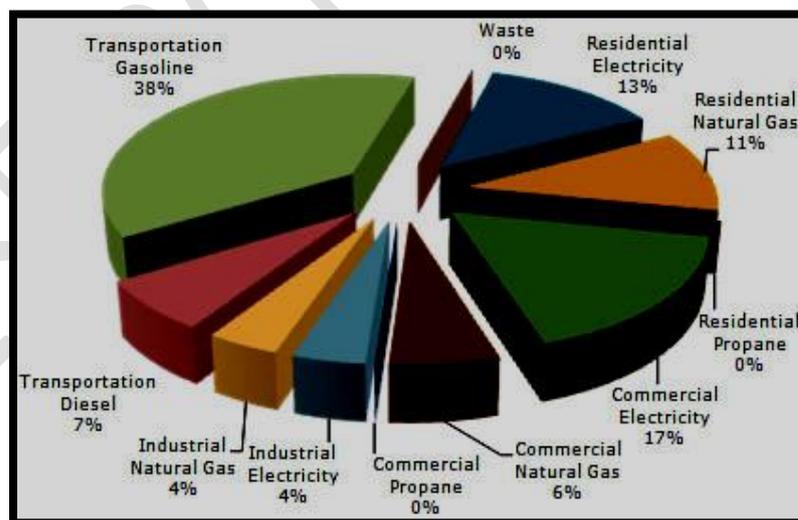


Figure 2: Global Carbon Cycle between various reservoirs (Source: Drakes, 2000)

Houghton, 2009, points out that this change in the level of atmospheric gases is attributed to the increase in carbon concentrations by about thirty six percent from two hundred and eighty ppm to three hundred eighty ppm. All emissions, since the industrialization have been released into the atmosphere as carbon dioxide, the primary source of which is the burning of fossil fuels, and these emissions seem to rise at a steady zero point seven percent per annum. The imbalance between deforestation and afforestation, a consequence of the human related activities has further contributed to this rise in the quantity of emissions. Figure two sets out these estimated contributions.

### 2.1.2. Impact Assessment

Following from the figure it can be seen that about seventy nine percent of these emissions result from the combustion of fossil fuels, furthermore, to quantify these contributions, they collectively resulted in eight point eight billion metric tonnes. Since, as per the scientific reports, the annual increase in the atmosphere is estimated to be about three point three billion metric tonnes, thirty seven point five percent of this was left to increase the concentration within the atmosphere, whereas the remaining percentage has been taken up by oceans or land biota. Vicuna et al in 2007 states that with this continuous increase in the global temperature, the amount of carbon dioxide that is used by both land and ocean biota is likely to reduce.



*Figure 3: Annual Green House Gas Emissions by Sector (Source: United States Environmental Protection Agency, 2009)*

### 2.1.3. Other greenhouse gaseous emissions

Various other gases, other than carbon dioxide play a potent role in global warming, because of their ability to be able to stay in the atmosphere for a much longer time than the carbon emissions. Methane is known to be one of dominant players in green house gaseous emissions and therefore contributing to the global warming predicament. Houghton 2009 points out that in comparison to the 1880's the presence of methane within the ice cores has increased to an alarming rate with a relatively sustainable increase of 10 ppb per annum. It has further been pointed out that where the quantity and concentration of methane in the atmosphere is lower to that of carbon dioxide, the effect that it has on the environment is twenty times more hazardous than that of carbon, since the carbon has a chemical lifetime of about hundred years where methane is only active for twelve years (United States Environmental Protection Agency, 2006).

Globally, the annual emission of methane comprises about eighteen percent, with carbon being seventy two percent, nitrous oxide being nine percent, with the rest of potent gases occupying the remaining one percent of the atmospheric emission content. Prominent sources include not only natural occurring activities or landscapes such as wetlands but also human related activities such as coal mining, petroleum fermentation, sinks, biomass remediation, waste treatment and landfills amongst other factors (Mohr, 2005).

Having an atmospheric lifetime of over one hundred and twenty years, nitrous oxide has more powerful effect on the atmosphere than carbon dioxide. Ever since the industrial revolution, since after 1998, the concentration of nitrous oxide has steadily increased from two hundred and seventy ppb to three hundred and fourteen ppb which depicts an increase of zero point two five percent per annum (United States Environmental Protection Agency, 2006).

Natural sources of nitrous oxide are derived from biological ecosystems on the land, ocean including water, soil and agricultural ecosystems. Human related activities that have contributed to the increase in nitrous oxide are predominant in the agricultural and soil management area, and may be associated with the increased use of fertilizers, biomass combustions, fossil fuels and animal waste management. Furthermore, industrial activities that include the production of nitric acid and nylon are also contributing factors to the nitrous oxide.

CFCs comprising of chlorine, fluorine and carbon are manmade chemicals used primarily as propellants and refrigerants owing to their non flammable nature. They exist in three main components: CFC 12, CFC 113, and CFC 11. According to Houghton, 2009, not only are these gases non reactive, but they have a chemical lifeline of hundred to two hundred years at an

average, with an atmospheric content of about 1ppb. International protocols such as the Montreal Protocol and various initiatives by London and Copenhagen aim to prevent the disastrous effects of CFCs which are the main source of ozone depletion.

Ozone on the other hand is a result of the nitrogen oxide emission from aircraft fumes and if present in high concentration in the form of compound zone can have harmful effects on the atmospheric environment.

Gases with a higher potential to cause global warming include sulphur hexa flouride (SH<sub>6</sub>), perfluorocarbons (PFCs) and hydroflouorocarbons (HFCs). In comparison to CFCs they are less destructive and have a lesser atmospheric lifeline, however, PFCs and SH<sub>6</sub> are able to live in the atmosphere for over a thousand years. Their GWP values range from 140 to 11700 for HFCs, 23900 for SH<sub>6</sub> and 5000 to 12000 for HFCs (United States Environmental Protection Agency, 2006).

Certain gases because of their reaction with the primary green house gaseous emissions have an effect on global warming; these include, nitrogen oxides, carbon mono oxide and sulphur dioxide. Major sources of these gases are aircraft fumes and vehicle emissions and react with GHGs to have a harmful effect on the atmosphere and become major contributors to global warming such as methane and carbon dioxide. Aerosols and water vapours may be less reactive and less harmful than other gases, however they may still be worth noting.

### **3. Discussion**

Various scientific sceptics have argued that global warming is in fact a political tool which has been developed and manipulated by the larger nations to impose taxation and benefit from trade fair. Within such an environment, such debates give rise to various questions on the reality of global warming, and whether human based activities are really responsible for contribution to global warming. In order to come up with a valid conclusion, all these complex questions have to be adequately answered.

Scientific evidence, reports by IPCC and observatory evidence points out strongly towards the existence of global warming. Extreme climatic changes and weather conditions point out to such an existence. In the predominantly tropical regions, such as West African region, there is strong evidence that the weather conditions with each passing year are becoming unbearable

which have led to the destruction of various ecosystems and marine habitats. Similarly, in the United Kingdom, where there is a temperate climate condition, the summers have over the last couple of years increased in intensity and days.

Globally, further changes observed are the changes in the rainfall pattern, increased periods of droughts, and variations of natural disasters such as hurricane and storms. Various other effects of these drastic climatic changes include soil degradation, degradation of agricultural practices, marine life and decrease in food supply.

Further evidence which attributed to the existence of global warming is the increase in the melting of polar ice sheets, warming of the Arctic region, cooling of the Antarctic region and disintegration of sea ice which is apparent from the measurements of ice water and the use of satellites. Moreover, an increase in the sea levels has also been observed by scientists over the past two decades.

The above argument has emphasized over and again that global warming does in fact exist and all the aforementioned gases have played their crucial part in the increase in the atmospheric temperatures. A large amount of blame is placed upon carbon dioxide as the sole contributor of global warming with an ignorance placed on the role of other gases such as methane, nitrous oxides and various other gases. Where it can be argued that carbon dioxide is a primary contributor to global warming, but other gases have more disastrous effects because they have the ability to stay in the atmosphere years after they had been released in the environment.

Even though human based activities are blamed for the steady increase in between the activity and the consequences. However, there is a general agreement that natural activities may have contributed to the rise of global warming while the impact of human activities may be stated in exaggeration. Also, where causes of global warming will be attributed to storms, hurricanes, heavy rain falls, such a connection has not been adequately established till yet. Another argument places sole blame on human activities with complete disregard to factors such as solar radiation which is normally known to substantially contribute towards global warming.

The essay has aimed to address the complex questions regarding the existence of global warming which will be summarised in a valid conclusion below.

#### **4. Conclusion**

From the aforementioned evidence, observations and arguments it can be concluded that global warming is in fact a reality. Furthermore, despite the general belief, not only do carbon emissions, but non carbon emissions play a role in global warming and also the latter have been known to be more potent and harmful because of their longer lifespan in the atmospheric environment. The effects and causes of global warming have been researched and analysed by various scientists throughout the globe, and even though they have given rise to complex questions, a conclusion can only be reached once these questions can be answered.

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