Chapter 5
Green House Gases:
Challenges, Effect, and Climate Change

Kannadhasan S.
https://orcid.org/0000-0001-6443-9993
Study World College of Engineering, India

Nagarajan R.
https://orcid.org/0000-0002-4990-5869
Gnanamani College of Technology, India

ABSTRACT

Changes in weather patterns over decades or longer periods of time are referred to as climate change. Natural and human forces both contribute to climate change. Since the Industrial Revolution, humans have contributed to climate change through emitting greenhouse gases and aerosols, as well as changing land use, leading global temperatures to rise. More storms, floods, droughts, and rising sea levels may result from increasing global temperatures and the melting of ice sheets, sea ice, and glaciers. The sun's rays supply energy to the whole world. GHGs are required to trap heat and maintain a temperature that permits life to flourish on the planet. The greenhouse effect is a natural and necessary occurrence for life on Earth to survive. If the greenhouse effect did not exist, the world would be around 33°C cooler right now. Humans have contributed to the increase in atmospheric GHGs via rising fossil fuel usage and deforestation in recent decades. Increased GHG emissions have been the primary cause of global warming during the last century.

INTRODUCTION

Since 1850, three primary datasets have been used to calculate global surface temperatures. These figures indicate a warming of +0.8°C to +1.0°C since 1900. 4 Since 1950, land-only data has shown increasing trends of +1.1°C to +1.3°C, indicating that land temperatures respond to climate change quicker than ocean temperatures. While multi-decadal time periods (30 years or more) are often used to assess global warming, attribution of trends over shorter time periods may be problematic due to natural variability.

DOI: 10.4018/978-1-6684-5269-1.ch005

Natural climatic variability is caused by internal interactions between the atmosphere, ocean, land surface, and sea ice. These oscillations happen whether or not there is climate change, and are generally referred to as "noise" or natural changes around a "normal" figure. Temperature rises as GHG levels increase, which has a substantial indirect influence on water vapour. Due to the greenhouse effect of water vapour, greater global temperatures induced by GHGs increase the atmosphere's capacity to store water vapour, resulting in a positive feedback loop. The quantity of water vapour in the atmosphere increases by roughly 7% when the global temperature rises by 1°C. (Dones et al., 2016; Frischknecht et al., 2003; Inter-Governmental Panel on Climate Change (IPCC), 2001; Villigen & Swiss, 2003)

Water vapour is a potent and quick feedback that increases any initial force by two to three, despite the fact that CO2 is the most significant human control knob on climate. Water vapour is a large contribution to climate change, despite the fact that it is not a significant beginning force. By continuing to address criteria pollutant nonattainment issues, state and municipal governments may accomplish significant GHG emission reductions. The most efficient approach to accomplish this goal is to ensure that the techniques utilised to achieve emission reductions for criteria pollutant compliance also provide benefits in terms of GHG reduction, rather than ineffective or counterproductive GHG reduction efforts. Because strategies that reduce GHG emissions nearly invariably result in reduced emissions of other air pollutants, STAPPA and ALAPCO believe it is vital to focus on the link between GHG mitigation and conventional air pollution management. The most well-known harmonised procedures are used to address CO2, particle matter (PM), nitrogen oxides (NOx), sulphur dioxide (SO2), carbon monoxide (CO), and air toxics, all of which are important CO2 sources. The most harmful greenhouse gases include CO2, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride. Ozone precursors (NOx and NMVOCs) have an indirect greenhouse effect since they are also GHGs. The focus of this study is on CO2 for two reasons. To begin with, CO2 is thought to be responsible for more than half of the expected global warming consequences. In 1997, CO2 emissions accounted for almost 82 percent of total emissions in the United States. (Dones et al., n.d.; Hondo, 2003; Lee, 1997; Ozawa et al., 2003; Spath et al., 1999). GHG emissions refer to the amount of greenhouse gases released into the atmosphere. Second, the primary source of CO2 is fossil-fuel combustion, which is governed by state and local governments via emission categories. According to the Intergovernmental Panel on Climate Change (IPCC), the Earth's climate system is continually changing, both worldwide and locally, with some of the changes linked to human activity and resulting in greenhouse gas emissions. Energy delivery systems, especially fossil-fuel systems, are the principal contributors to these gas emissions. This article primarily leverages data from a recent Swiss study addressing Life-Cycle Assessment (LCA) issues based on environmental inventories of European-wide energy systems to provide GHG emission comparisons.

The ocean covers 71% of the Earth's surface and is home to 1.3 billion cubic kilometres of salty water. This enormous body of water has a huge influence on the global environment. It functions as a global thermostat, lowering heat gradients induced by differences in incoming solar radiation over time and space, controlling the composition of numerous trace chemicals in the atmosphere, and functioning as a dump for a range of manmade toxins. Climate fluctuations are often connected to changes in the atmosphere (Fraedrich, 2001; Fraedrich et al., 2005; Fraedrich & Lunkeit, 2008; Kunz et al., 2008; Lorenz, 1955). However, analysing the atmosphere on its own is challenging. The land, oceans, and ice-covered regions of the Earth's surface are all intricately tied to the atmosphere (known as the cryosphere). The biosphere, which comprises both terrestrial and marine biological systems, has a substantial relationship.