Anthropogenic Contributions to the Atmospheric CO₂ Levels and Annual Share of CO₂ Emissions by Afghanistan

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Green house gases are derived from both natural systems and human activities. The emitted gases retained in the atmosphere represent the main cause of global climate change. Rising anthropogenic CO₂ emissions are anticipated to drive change to ecosystems. This rise in emissions was largely driven by affluence (consumption per capita) and population growth, aided by changes in production structure of industries, consumption baskets of households and shifts in the consumption vs. investment balance. Anthropogenic CO₂ emissions are known to alter hydrological cycles, disrupt marine ecosystems and species lifecycles, and cause global habitat loss. To achieve significant emission savings, there is a need to address the issue of affluence. One of the major initiatives is to actively intervene in non-sustainable lifestyles to achieve emission reductions. The findings of this review are vital for a comprehensive and integrated approach for mitigating climate change and to reduce the impacts of CO₂ emissions.

Keywords: Green house gases, green house effect, CO₂ emission, anthropogenic, global warming

INTRODUCTION

Greenhouse gases create the ‘greenhouse effect’ which warms the earth’s climate. These gases – carbon dioxide (CO₂), nitrous oxide, methane, and others – are important in sustaining a habitable temperature for the planet. Anthropogenic greenhouse gases and aerosols are associated with climate change and human health risks. Air pollution makes a major contribution to excess mortality from cardiovascular, respiratory, and other diseases (WHO, 2016; GBD 2015; Landrigan et al., 2018). Significant excess death rates are related to fossil energy use, as combustion emissions from traffic, power generation, and industry typically occur in densely populated regions (Leitveeld et al., 2015; Brauer et al., 2016). The anticipated impacts of climate change have led to a number of initiatives globally and regionally to reduce the emission of carbon dioxide (CO₂) and other greenhouse gases.

Humans have the capability of warming the Earth’s climate by causing an up- surge of greenhouse gases in the atmosphere. The most important human-produced greenhouse gas is carbon dioxide (CO₂). The atmospheric concentration of CO₂ has been steadily increasing since the eighteenth century (Keeling et al., 1989; Watson et al., 1990; IPCC, 2001; Quay, 2002). It is anticipated that atmospheric CO₂ concentrations will double by the end of the 21st century and bump up the earth’s mean temperature by as much as 1.0–4.5°C through the trapping of infrared radiation near the earth’s surface (Houghton et al., 1990; Krauchi, 1994). It is vitally important to recognize that global social life has greatly augmented the atmospheric CO₂ concentrations. The balance of evidence suggests that human activities are affecting many aspects of global ecosystems. The modern increase in CO₂ emissions represents the clearest and best-documented signal of change in ecosystems because of human activities.

CO₂ is an abundant gas and its variations have had a large climatic impact over all time scales (Ruddiman, 2003). Global climate change induced by anthropogenic release of CO₂ is perceived by some as one of the greatest environmental challenges the world faces today. Although scientific evidence suggests some positive effects of increased atmospheric CO₂ such as improved plant productivity (Schaffer et al., 1997; Pan et al., 1998; Centritto et al., 1999a, b; Idso and Kimball, 2001; Keutgen and Chen, 2001), negative changes in the global climate...
Humans modify the environment through their activities. As the human population increases and the power of technology is enhanced, the nature and scope of this modification changes. According to the GHG inventory data for global human activity compiled by the UN (GCP, 2017), CO₂ emissions from global fossil fuel usage and cement production have risen from 22.3 Gt in 1990 to 36.2 Gt in 2016, which represents a growth rate of approximately 70%. Fossil fuel energy consumption remains the primary source of GHG emissions. Emissions from coal, oil, natural gas, and cement production in 2016 were 14.5, 12.5, 7.0, and 2.0 Gt, respectively, accounting for respectively 40.3%, 34.7%, 19.4%, and 5.6% of the total. Anthropogenic GHG emissions account for approximately 47.9%–66.6% of the total global GHG emissions, with a most likely value of 55.4% (Yue and Gao, 2018).

**Combustion of fossil fuels**

The global increase in atmospheric CO₂ comes mainly from combustion of fossil fuels. On average, about half of the CO₂ emissions caused by fossil fuels have remained in the atmosphere, the rest have been absorbed by the ocean and by land ecosystems (Bousquet et al., 2000). The rapid increase in CO₂ emissions in developing countries can be traced to the process of development itself resulting in a shift away from the use of traditional fuel to the use of commercial fuels, increase in personal income and thus increase in purchasing power of consumer items such as cars that boost energy consumption, and the expansion of energy-intensive industries as economies shift from an agrarian to a manufacturing and industrial base.

**Terrestrial ecosystem strength**

Terrestrial ecosystems contributed greatly to atmospheric CO₂ concentration during both the preindustrial and industrial eras (Lal, 2004). Carbon emissions per year from terrestrial ecosystems was about 0.04 Gt C yr⁻¹ for 7800 years during the preindustrial era and about 0.8 Gt C yr⁻¹ for 200 years during the industrial era (Ruddiman, 2003). Above ground plants and ecosystems influence atmospheric CO₂ concentrations (Koch and Mooney, 1996). They contribute about one-fifth of global emissions when cleared (FAO, 2003). A broad array of evidence indicates early and pervasive deforestation of naturally forested regions. The terrestrial ecosystem plays an important role in global carbon sequestration. It is estimated that the peak of CO₂ concentration could be reduced by as much as factor two by preserving existing forests, or replanting new ones provided CO₂ fertilization is effective and soil carbon storage does not decrease as the climate warms (Kasting and Walker, 1993).
Land use change and population pressure

The global soil carbon pool of 2500 Gt is 3.3 times the size of the atmospheric pool (760 Gt) and 4.5 times the size of the biotic pool (560 Gt) (Lal, 2004). The soil organic carbon pool represents a dynamic equilibrium of gains and loss of carbon due to land use change. Transformation of land for goods and services is one of the most substantial human activities that affect soil organic carbon. Human use of land changes the structure and functioning of the ecosystem. Conversion of natural to agricultural ecosystems causes depletion of the soil organic carbon pool by as much as 60% in soils of temperate regions and 75% or more in cultivated soils of the tropics. The depletion is exacerbated when the output of carbon exceeds the inputs and when soil degradation is severe. It is estimated that some soils have lost as much as 20 to 80 tons of carbon per ha mostly emitted into the atmosphere and building up higher concentrations of CO₂.

CONCLUSION

It is clear from the above discussions that the global consequences of human activities on the environment are not something to be faced in the future, but that we are already living with the problems. Human activities are working more speedily in changing global ecosystems than we are in understanding it. Atmospheric CO₂ concentrations are rising because humans are adding CO₂ to the atmosphere 50–100 times faster than the natural rate of input. The momentum of human population growth, the necessity of further economic development in most of the world in order to meet their needs and aspirations and the increase use of commercial energy, ensures that human activities on ecosystems will increase in future and consequently will further deteriorate the environment. Reducing fossil-fuel consumption by conserving energy and switching to alternative cleaner energy sources such as solar energy, or electricity can reduce the rate of CO₂ buildup. Preserving existing forests, planting trees on abandoned and degraded forest lands, or planting trees by social /participatory/agroforestry forestry involving communities of people could reduce CO₂ emissions. It is clear that human activity-related GHG emissions exert extra pressure on the Earth system.

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