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Greenhouse gases and its adverse effect on-environment

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Abstract

The accumulation of so-called "greenhouse gases" in the atmosphere – particularly CO_2 is adversely affecting the global climate. This paper briefly reviews current expectations regarding physical and biological impacts, their potential costs to society, and the potential costs of mitigation. For the "worst case" scenario, it is impossible, from an economic point of view, to assess the full range of possible non-linear synergistic effects. In the "most favorable" (though not necessarily "likely") case (of slow climate change), however, it seems that the impacts are within the "affordable" range, at least in the world's industrialized countries. In the "Third World" the notion of affordability is of questionable relevance, making the problem of quantitative assessment almost impossible.

Keywords: Greenhouse Gases, Climate Impacts, Mitigation Costs, Affordability Assessment

Introduction

Climate scientists believe that increasing atmospheric concentrations of carbon dioxide and other "greenhouse gases" released by human activities such as deforestation and burning fossil fuels are warming the Earth's crust. This mechanism is commonly known as the "greenhouse effect" which makes the Earth fit for human habitation. These gases in the atmosphere act like the glass of a greenhouse, letting sunlight in and preventing heat from avoiding. But human actions have changed the chemical composition of the atmosphere through the creation of greenhouse gases—primarily CO_2, CH_4, and NO_x.

Increases in environmental temperatures and changes in associated processes are directly linked to increasing anthropogenic greenhouse gas (GHG) emissions into the atmosphere. This increase in temperature was generally argued to be due to emissions of carbon-based compounds from the consumption of fossil fuels for electricity generation. Recent years have seen increases in the concentrations of carbon dioxide, methane and nitrous oxide, so their greenhouse gases, primarily chlorofluorocarbons (CFCs), have been added to the atmosphere in significant quantities.

History of Green House Gases

The survival of the greenhouse effect was arguing for by Joseph Fourier in 1824. This argument and evidence were further strengthened by Claude Pouillet in 1827 and 1838, and say from experimental observations by John Tyndall in 1859. The effect was fully determined by Svante Arrhenius in 1896. However, the term "greenhouse" was not used by any of these scientists to describe the effect. The term was first used by Nils Gustaf Ekholm in 1901. Alexander Graham Bell wrote in 1917. The uncontrolled burning of fossil fuels would cause a kind of greenhouse effect", and "the net result is that the greenhouse becomes a kind of hot-house." Bell also advocated the use of alternative energy sources such as solar power.

Literature Review

Ulstermann et al., (2007), have published papers on modeling the carbon cycle and estimate greenhouse gas emissions from organic and conventional agricultural systems. It gives information about carbon (C) and nitrogen (N) flows in the soil-plant-animal-environment system. The model links the balance of C, N and energy flows with the goal of estimating climate-relevant CO_2, CH_4 and N_2O sources and sinks of agricultural systems. To determine the net greenhouse effect, C sequestration in soils, CO_2 emissions from fossil energy use,

CH_4 emissions from livestock keeping and N_2O emissions from soils have been calculated. The results were converted to CO_2 equivalents using its specific global warming potential.

Mohammed, et al., (2012) has published paper on (A Synopsis on the Effects of Anthropogenic Greenhouse Gases Emissions from Power Generation and Energy Consumption).It gives information about Despite the looming difficult energy context in the majority of countries in the world, global change in environmental dignity resulting from power generation and energy consumption scenario is rapidly becoming a globally disturbing phenomenon. consequences. Therefore, this article presents an overview of the effects of anthropogenic energy generation and consumption practices capable of eject emissions of greenhouse gases into the atmosphere. It also endeavors to identify some greenhouse gas emission reduction and control measures.

Marco et al. 2004 have published a paper on (Gross greenhouse gas fluxes from hydro-power reservoirs compared to thermo-power plants). This paper presents findings from gross carbon dioxide and methane emissions measurements in several Brazilian water reservoirs compared to thermopower production. The term 'gross emissions' means gas flux measurements from the surface of the reservoir without natural pre-impoundment emissions by natural bodies such as river channels, seasonal floods and terrestrial ecosystems. Net emissions result from reductions in already existing emissions by the reservoir. A power dam emits biogenic gases like CO_2 and CH_4. However, studies comparing gas emissions from the reservoir surface (gross emissions) with emissions by thermo-power generation technologies show that the hydro-based option presents better results in most of the cases analyzed. In this study, measurements were carried out in the Miranda, Barra Bonita, Sagredo, Tres Marías, Xingo and Samuel and Tucuruí reservoirs, located in two different climatic regimes. Additional data from measurements taken in the Itaipú and Serrada Mesa reservoirs were used here.

Canonico, et al. (2009) have published a paper on reducing greenhouse gas emissions of commercial print with digital technologies.This highlights that paper is an excellent technology that provides durable, high contrast, high resolution and low power color display surfaces at a very low cost. In spite of low costs and low ecological impact during use, paper still produces significant greenhouse gas emissions as a result of other stages of the paper life cycle. In fact, in most print applications, including those described above, paper is the major contributor to greenhouse gas emissions. Although alternatives to paper such as e-books, e-paper and erasable ink have been proposed, it is not clear whether these will be successful or whether they will reduce emissions; It would certainly be foolish to rely on them as the only route to relief. This article quantifies greenhouse gas emissions caused by inefficiencies in current commercial and office print applications and describes improved business models built on digital print and distribution technologies to enable paper conservation and greenhouse gas reductions.

Sources of Green House Gases

The most plentiful greenhouse gases in Earth's environment are:

- Ozone (O_3),
- Water vapor (H_2O),
- Carbon dioxide (CO_2),
- Methane (CH_4),
- Nitrous oxide (N_2O),
- Chlorofluorocarbons (CFCs).

Atmospheric concentrations of greenhouse gases are determined by the balance between sources (emissions of the gas from human activities and natural systems) and sinks (the removal of the gas from the atmosphere by conversion to a different chemical compound). The proportion of an emission remaining in the atmosphere after a specified time is the airborne fraction. More precisely, the annual airborne fraction is the ratio of the atmospheric increase in a given year to that year's total emissions. For CO2 the airborne fraction over the last 50 years (1957– 2007) has been increasing at 0.26 ± 0.23%/year.

By their percentage contribution to the greenhouse effect on Earth the four major gases are: water vapor, 35–70% carbon dioxide, 8–25% methane, 5–9%ozone, 4–7% It is not actually practical to assign a specific percentage to each gas because the absorption and emission band of the gases overlap (ranges given above). The major nonages contributors to the Earth’s greenhouse effect, clouds, also absorbs and emit infrared radiation and thus have an effect on radioactive properties of the atmosphere.

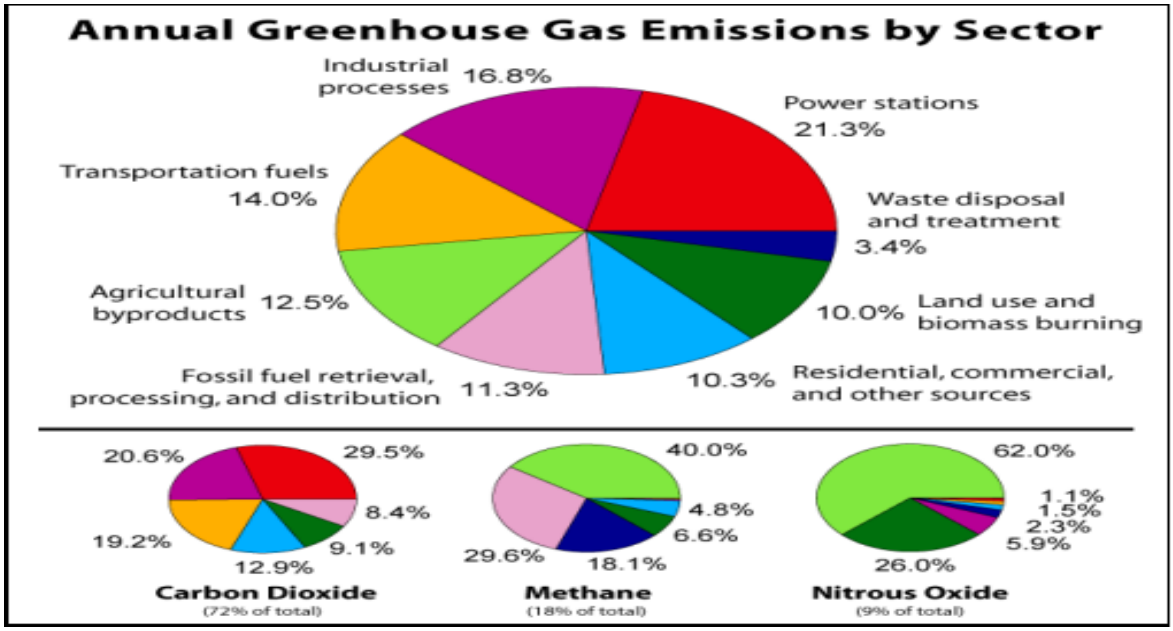

Fig. 1 Emission of greenhouse gases

In studies of the net greenhouse effect of agricultural systems, not only CO_2 and CH_4 emissions are important, but, because of their high specific greenhouse potential, site- and management-related N_2O emissions are also important. Model approaches for emissions inventories at the farm level have been elaborated, which consider all relevant outputs2, 9; However, based on partially simplified model algorithms. In addition to biological C fluxes, a holistic view of the net greenhouse effect of agricultural systems should also take into account technological C fluxes, i.e., all CO_2 emissions associated with the input of fossil energy.

N_2O emission

N_2O emissions were estimated during agriculture and industrial activities, as well as during combustion of solid waste and fossil fuels. It was assumed, albeit very simplified, that 1.25% of the nitrogen supplied to the soils by organic and mineral fertilization, N2 fixation and N deposition is emitted in the form of N_2O–N. Alternatively, a N_2O–N emission factor of 2.53% of the total N input as obtained in numerous measurements at the experimental farm8 was applied. The indirect N20 emissions from gaseous NH_3 and NOx losses as well as from N losses via reaching were quantified using emission factors.

CH_4 Emissions

Methane is emitted from the production and transportation of coal, natural gas, and oil. Methane emissions also occur from the decomposition of organic waste in agriculture, municipal solid waste, landfills, and in livestock raising. Metabolic methane emissions from livestock keeping were estimated in relation to animal species, performance and diet. Methane release was estimated through conversion factors, based on feed gross energy.To determine the amount of methane released from organic fertilizer during storage, excreta production (volume, chemical components, degradation) was chosen as the basis for calculating methane formation potential; The amount of methane produced was then determined in relation to the storage system.

Carbon dioxide (CO_2)

Carbon dioxide enters the atmosphere through burning fossil fuels (coal, natural gas and oil), solid waste, trees and wood products, and also as a result of certain chemical reactions (e.g., manufacture of cement). Carbon dioxide is removed from the atmosphere when it is absorbed by plants as part of the biological carbon cycle

Fig. 2The Greenhouse Effect

Definition Radiation: energy that is propagated in the form of electromagnetic waves.

- Incoming solar energy is called solar radiation
- Solar radiation warms the earth
- The warmed earth radiates heat. However, this is not called 'heat', but rather in scientific terms it is energy. The correct term is infrared radiation
- The atmospheric 'blanket' is gas molecules in the atmosphere.
- Solar energy reaches the Earth's surface. The earth surface absorbs the energy and warms up
- The warm earth surface radiates infrared radiation (IR), Greenhouse gases absorb IR leaving the surface
- Gases are energized, then emit more radiation (IR)
- Some of this IR returns to the earth surface, warming it further,
- This process is what we call the "GREENHOUSE EFFECT"

Impact on Environment of Green House Effect

1- Global Warming

Increasing concentrations of greenhouse gases reduces outgoing infrared radiation, so Earth's climate must change in some way to restore the balance between incoming and outgoing radiation. This "climate change" will include "global warming" of the Earth's surface and lower atmosphere because warming is the easiest way for the climate to get rid of excess energy. However, a small increase in temperature will induce many other changes, for example, cloud cover and wind patterns. Some of these changes may act to increase warming (positive feedback), others to counteract it (negative feedback). Using complex climate models, the "Intergovernmental Panel on Climate Change" in its Third Assessment Report estimates that the global average surface temperature will increase by 1.5℃ to 5.7℃ by the end of 2098. This projection takes into account the effects of aerosols that cool the climate as well as the oceans' large heat capacity to delay the effects. However, there are many uncertainties associated with this projection such as future emission rates of greenhouse gases, climate responses, and the size of the ocean delay.

2- Sea Level Rise

If global warming occurs, sea levels will rise due to two different processes. First, sea levels rise due to thermal expansion of seawater due to warmer temperatures. Secondly, water from the melting glaciers and ice sheets of Greenland and Antarctica will also add water to the ocean. It is estimated that Earth's average sea level will rise by 0.08 to 0.89 m between 1992 and 2098.

Potential Impact on human life

1- Economic Impact

Over half of the human population lives within 100 kilometers of the sea. Most of this population lives in urban areas that serve as seaports. A measurable rise in sea level will have a severe economic impact on low lying coastal areas and islands, for examples, increasing the beach erosion rates along coastlines, rising sea level displacing fresh groundwater for a substantial distance inland.

2- Agricultural Impact

Experiments have shown that with higher concentrations of CO_2, plants can grow bigger and faster. However, the effect of global warming may affect the atmospheric general circulation and thus altering the global precipitation pattern as well as changing the soil moisture contents over various continents. Since it is unclear how global warming will affect climate on a regional or local scale, the probable effects on the biosphere remains uncertain.

3- Effects on Aquatic systems

The loss of coastal wetlands could certainly reduce fish populations, especially shellfish. Increased salinity in estuaries could reduce the abundance of freshwater species but could increase the presence of marine species. However, the full impact on marine species is not known.

4- Effects on Hydrological Cycle

Global precipitation is likely to increase. However, it is not known how regional rainfall patterns will change. Some regions may have more rainfall, while others may have less. Furthermore, higher temperatures would probably increase evaporation. These changes would probably create new stresses for many water management systems.

Reduction and Control Measures of Green House Gases

Reduction of greenhouse gases is central to all countries because the problem is global and no one country or group of countries can provide the solution on its own. This is why international and regional cooperation is more demanded and well advocated in the context of global atmospheric conscience. In relation to this conflict, the United Nations Framework Convention on Climate Change (UNFCCC) recently came into force to deal with the global climate problem. It was implemented as an international agreement involving different countries from different regions to reduce dangerous concentrations of anthropogenic greenhouse gases in the atmosphere

1- Clean development mechanism(CDM)

The clean development mechanism involves large-scale deployment of renewable energy technologies for power generation and carbon dioxide sequestration to promote the concept of sustainable development. In addition to greenhouse gases reducing the potential of renewable energy resources, energy security guarantees are increasingly becoming a reality with the exploitation of various renewable energy resources. The Clean Development Mechanism is a fundamental idea of Kyoto Protocol under the umbrella of the United Nations Framework Convention on Climate Change (UNFCCC). In line with the proposed CDM, developing countries are more actively involved in the development of renewable energy production. In 2008, developing countries achieved 52% of global renewable energy electricity production. The initial idea behind the establishment of CDM is to strategically reduce the level of emissions due to energy production and consumption to a sustainable intensity. However, it was envisaged that the emissions reduction mechanism would be financed by industrialized countries, with funds going to developing countries in the form of sponsorship of renewable energy programme. After a decade and more, a good implementation outcome is yet to be seen and the global pace of renewable energy exploitation is not commensurate with realistic and expected levels of growth

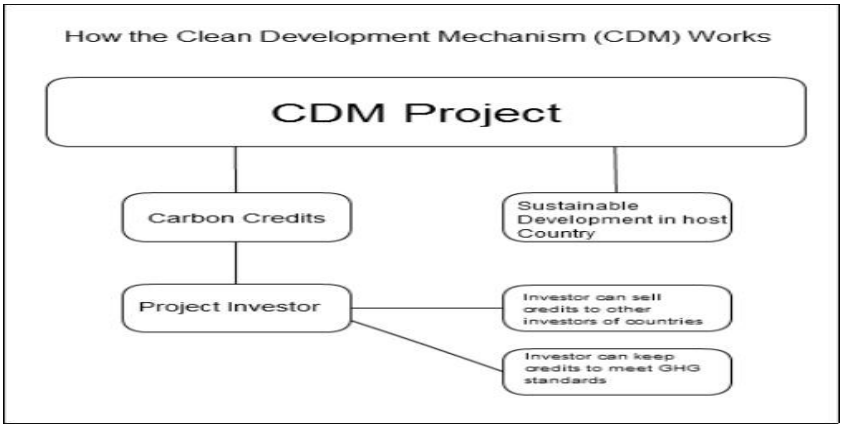

Fig. 3 Clean Developmental Mechanism

2- Green energy portfolio standard

Green energy is a type of energy produce conventionally with a reduced amount of negative environmental impact. Green energy is sometimes called renewable energy. Renewable energy application has become an essential ingredient with significant role in the expedition for greenhouse gases reduction and increasing the chance for sustainable development. Many countries have introduced and finance green energy programs to generate and consume power with minimum pollution. Green energy portfolio standard (GEPS) involves the uses of regulation to boost generation and consumption of energy from greener sources with the minimum rank of pollution propensity.

In some countries where green energy portfolio standard is strongly advocated, compulsions are placed on electric power generation companies to provide certain percentage of the national electricity demand from renewable sources as a strategic measure to lower emissions. Intergovernmental Panel on Climate Change (IPCC) direct countries to communicate their emissions from all sorts of energy related activities. Advocates of GEPS listed the benefits among which are innovation, pollution control and competition can eventually lower the per unit price of renewable power. Sustainable development of green energy can provide numerous environmental benefits alongside fossil resources conservation for far future generations.

3- Financing low carbon energy

CO_2 emission resulting from the combustion of petroleum products contributes substantial quantity of greenhouse gas to the atmosphere. As a critical factor towards development, a secure access to modern energy is essential for development. With the current global acknowledgement on the need to reduce emissions from energy, financing low carbon energy can be used as a strategy to reduce greenhouse gas emissions. Many financing initiatives exist for funding energy projects but financing low carbon projects is indispensable especially in countries where oils are the major source of income and energy production. Driven an economy by a low-polluting energy technologies reduces the vulnerability of the human environmental sustainability. This envisioned low carbon economy can be harnessed by unlocking the untapped renewable energy resources potential. Optimization of renewable sources for energy application provides noteworthy opportunities to spread out and upgrade the energy infrastructure especially in the rural communities due to their diverseness. Via this strategic measure, the solution to energy poverty in developing regions can be provided by decentralization of the renewable energy systems. In some countries, emissions trading scheme (ETS) through carbon taxation is already implemented to control and monitor emissions.

- How to reduce greenhouse effect:
- Energy conservation
- Rising the cost of fuels
- Developing new energy production
- Forest protection/ Reforestation
- Recovery of methane from garbage
- Banning of CFC production
- International conferences
- National Standards of pollutants
- Anti-pollution measures

Conclusion

This study showed that activities related to power generation and energy consumption have added emissions with the potential to influence greenhouse gas emissions which are the main source of imminent global warming. In fact, anthropogenic greenhouse gas emissions from energy activities exceed greenhouse gas emissions from other human activities. Essentially, the study also advocated the need to strategically deal with GHG reductions to prevent the sanctity of the global environmental divide for sustainable development and biodiversity connectivity. Ultimately, it supported the need to increase renewable energy consumption to help address energy security, energy control, and health issues.

A greenhouse is made from any material that allows sunlight to pass through, usually glass or plastic. It is heated primarily because the sun heats the ground and the materials inside it, which then heats the air in the greenhouse. The air continues to warm because it is confined within the greenhouse, as opposed to the atmosphere outside.

Greenhouse where warm air near the surface rises and mixes with cooler air above. This can be demonstrated by opening a small window near the roof of the greenhouse: the temperature will drop significantly. It was demonstrated experimentally (R.W. Wood, 1909) that a "greenhouse" with a covering of rock salt (which is transparent to infra-red) heats a container in the same way as a glass container. Thus greenhouses work primarily by preventing circulate cooling.

Recent quantitative studies show that the effect of infrared radiate cooling is not negligibly small, and may have an economic impact in heated greenhouses. An analysis of near-infrared radiation issues in greenhouses with high reflectance coefficient screens concluded that installation of such screens reduced heat demand by approximately 8%, and suggested the application of shades on transparent surfaces. Composite low-reflective glass, or less effective but cheaper anti reflective coated ordinary glass, also produced savings.

References

dos Santos, M. A., Rosa, L. P., Sikar, B., Sikar, E., & dos Santos, E. O. (2006). Gross greenhouse gas fluxes from hydro-power reservoir compared to thermo-power plants. *Energy Policy*, *34*(4), 481–488. https://doi.org/10.1016/j.enpol.2004.06.015

Küstermann, B., Kainz, M., & Hülsbergen, K. J. (2008). Modeling carbon cycles and estimation of greenhouse gas emissions from organic and conventional farming systems. *Renewable Agriculture and Food Systems*, *23*(1), 38–52. https://doi.org/10.1017/s1742170507002062

Martin, J. A. (1997). A total fuel cycle approach to reducing greenhouse gas emissions: Solar generation technologies as greenhouse gas offsets in U.S. utility systems. *Solar Energy*, *59*(4–6), 195–203. https://doi.org/10.1016/s0038-092x(96)00150-8

Mitchell, J. F. B. (1989). The “Greenhouse” effect and climate change. *Reviews of Geophysics*, *27*(1), 115–139. https://doi.org/10.1029/rg027i001p00115

Mwamba, R., Guo, R., & Kuch, S. G. (2020). Zambia’s Energy Consumption and Related Carbon Emissions. *International Journal of Scientific and Research Publications (IJSRP)*, *10*(3), p9938. https://doi.org/10.29322/ijsrp.10.03.2020.p9938

Nandanwade, B. C., & P. I, K. (2017). Voice Controlled Home Automation Using Zigbee. *IARJSET*, *4*(2), 70–72. https://doi.org/10.17148/iarjset/ncetete.2017.22

Raul, V., Leifsson, L., & Kaleita, A. (2020). System Modeling and Sensitivity Analysis of the Iowa Food-Water-Energy Nexus. *Journal of Environmental Informatics Letters*. https://doi.org/10.3808/jeil.202000044

Shehabi, A., Walker, B., & Masanet, E. (2014). The energy and greenhouse-gas implications of internet video streaming in the United States. *Environmental Research Letters*, *9*(5), 054007. https://doi.org/10.1088/1748-9326/9/5/054007

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