

AEFFECT OF GLOBAL WARMING ON ABIOTIC AND BIOTIC COMPONENT OF THE ENVIRONMENT

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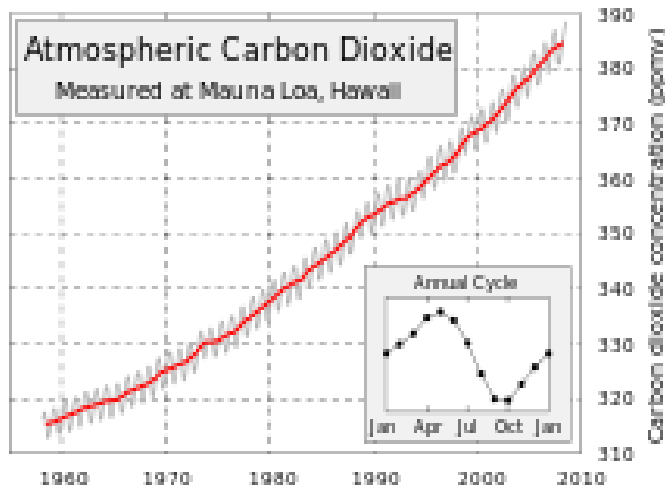
ABSTRACT

We, the inhabitants of earth are instinctively entering the phage of autogenic succession where we are amending our environment which consecutively will escort our extermination. Combustion sources (mobile and stationary) along with change in land use pattern emit a large amount of carbon dioxide (CO₂) with other green house gases. Carbon dioxide impersonates a glass panel of greenhouse, warming the earth atmosphere which successively will affect the abiotic and biotic components of the ecosystem. With this paper we are presenting the process by which this phenomenon is happening and its impact on abiotic and biotic components (plants and animals) of the globe.

Keywords: *Global warming, Greenhouse, Abiotic component, Biotic component, IPCC and Global dimming.*

INTRODUCTION

An undesirable change has occurred in our habitat. The gaseous raw material of photosynthesis, named carbon dioxide, being a boon for the producer community is slowly becoming a ban to the materialistic consumer community. The concentration of carbon dioxide (CO₂) in Earth's atmosphere is approximately 392 ppm (parts per million) by volume as of 2011 and rose by 2.0 ppm/yr during 2000-2009. 40 years earlier, the rise was only 0.9 ppm/yr, showing not only increasing concentrations, but also a rapid acceleration of concentration. The increase of concentration from preindustrial concentration of 280 ppm has again doubled in just last 33 years (http://em.wikipedia.org/wiki/Carbon_dioxide_in_Earth's_atmosphere). (CO₂) like green house (plants in cold countries grown in green house where outgoing solar radiation is trapped by soil and structure of green house) allows the short wavelength incoming solar radiation to come in, but does not allow the long wave outgoing terrestrial infrared radiation to escape and thus causing warming up of earth's atmosphere (Schneider, 1989). Measurement indicates that the global temperature has increased by about 1 degree Fahrenheit in the past century. Urban land cover was modeled over 20 years and found to increase global warming by 0.06-0.11 K and population-weighted warming by 0.16-0.31 K (Jacobson and Hovee, 2012). IPCC, 2007 observed that the average global air temperature near the Earth's surface increased $74 \pm 0.18^\circ\text{C}$ ($1.33 \pm 0.32^\circ\text{F}$) during the 100 years ending in 2005. This warming trend occurred due to increased human activities like fossil fuel combustion, industrialization, deforestation etc which affected the plants, animals and the environment or climate of the globe (<http://timeforchange.org/climate-change>).



Source: http://en.wikipedia.org/wiki/Carbon_dioxide_in_Earth%27s_atmosphere

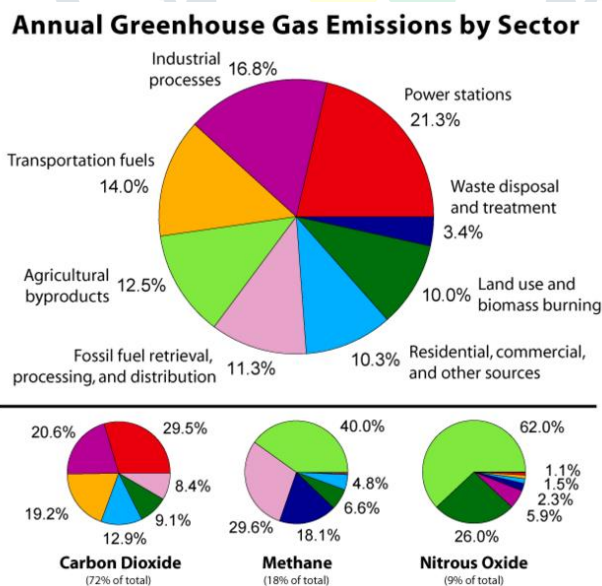
This graph shows the long-term increase of atmospheric carbon dioxide (CO₂) concentration from 1958-2008. Monthly CO₂ measurement display seasonal oscillations in an upward trend; each year maximum occurs during the Northern Hemisphere’s late spring, and declines during its growing season as plants remove some atmospheric CO₂.

Materials and Methods:

This paper reviews the consequences of global warming on abiotic and biotic component of ecosystem.

Green house gases:

Green house gases are emitted by both the natural and anthropogenic sources. The foremost green house gases are water vapor (H₂O) followed by carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and chlorofluorocarbons (CFCs) whereas sulphur dioxide (SO₂) and ozone are among the minor one. The major non-gas contributor for the Earth’s greenhouse effect, the clouds, also absorb and emit infrared radiation and thus have an effect on radiative properties of the atmosphere (Botkin and Keller, 2000).



Source: http://en.wikipedia.org/wiki/File:The_green_house_effect

Result:

Effect of Greenhouse Gases on Abiotic Component (World): Hegerl et al. (2007) concluded that greenhouse gas forcing had “very likely” caused most of the observed global warming since the mid-20th century. A report Published in 2009 by the U.S. Global Change Research Program Concluded that global

warming is unequivocal and primarily human-induced. Global warming affects the abiotic component in the subsequent way:

- (a) **Stress on Water Resources:** Scientist agree that global warming will result in milder winter and hotter summer. In winter it may rain more, but in summer, it may be dryer (Min et. al., 2011). In some areas of the world, water evaporation may exceed than rainfall. So water table may get decreased in some parts where some parts of the world may experience flood (Schiermeier, 2011). Water is essential for agriculture activities, hydroelectric power, domestic purpose, industrial activities and so on. If water availability is reduced then all of the above activities get influenced (Bates et. al., 2008).
- (b) **Melting Glaciers:** Rising temperature is believed to melt the glaciers. Melting of polar Ice may poured fresh water into the North Atlantic and interrupted the deep ocean circulation pattern, which may have sent the Northern Hemisphere into a 1000-year cold period, fresh water flow into the Arctic Ocean from Siberia's four great rivers has increased and oceanographers observe a slight decrease in the salinity of the North Atlantic (Tripathy and Nanda, 2008).
- (c) **Sea Level Rise:** Coastal zones are more prone to climate variability and change. The IPCC estimates that the global average sea level will rise between 0.6 and 2 feet in the next century (IPCC, 2007). Rising sea level will submerge wetlands, erode beaches, intensify flooding and amplify the salinity of rivers, bays and groundwater tables. Coastal wetland ecosystems, such as salt marshes and mangroves are particularly vulnerable to rising sea level because they are generally within a few feet of sea level (IPCC, 2007).
- (d) **Coastal Water Supplies:** Rising sea level increases the salinity of both surface water and ground water through salt water intrusion. If sea level rise pushes salty water upstream, then the existing water intakes might draw on salty water during dry periods. Salinity increases in estuaries also can harm aquatic plants and animals that do not tolerate high salinity (Tripathy and Nanda, 2008).
- (e) **Other effects:** Rise in wildfires and diseases in the world (Tripathy and Nanda, 2008).

Effect on Abiotic component in India (Jacob, 2010)

- Rajasthan-Drought
- Rann of Kutch- Sea Level rise
- Mumbai- Salt water intrusion
- Ganges- Sedimentation problem, Gangotari glacier is now receding at by 120 feet a year and could disappear by 2030.
- Sunderbans- Sea level raise
- Coastal Orissa: 2 villages, out of 7 of Satavaya region have been submerged due to cyclone, flood and sea ingression

Effect of Greenhouse Gases on Biotic Component (World)

- (a) From plankton to penguins to polar bears, the greenhouse effect is harming our animals by forever changing their natural habitats. A recent study says that scientists are now predicting that a quarter of the world's animal and plant life world face extinction by 2050 due to climate change (Hansen et. al. 2006).
- (b) Due to global warming mosses and other plants have appeared in the area of Antarctic that was preciously considered too cold them (Tripathy and Nanda, 2008).
- (c) Tree species in US have shown earlier flowering due to higher spring temperature (Tripathy and Nanda, 2008).

- (d) Coral reefs have undergone mass 'bleaching' on at least six occasions since 1979 (Tripathy and Nanda, 2008).
- (e) Scientists have found that as the globe warms species in North America extend their ranges up in elevation as habitats in these area have warmed up but due to human-made stress these animals have to navigate around the free ways, agriculture lands, industrial parks and cities. Arctic hare, Caribou, brown bear and golden eagle are facing these problems (Tripathy and Nanda, 2008).
- (f) In the Arctic, due melting of ice caps. Polar bear's health are adversely affected, reducing their population. The polar bear hunting season is being cut short due to warmer temperature, melting their sea-ice hunting ground at a faster rate. As a result, polar bears now have less food to gather at a faster rate. As a result, polar bears now have less food to eat and raise their young (Jacob, 2010).
- (g) In Antarctica, the Adelie penguin's numbers have also diminished because of rising temperature and loss of sea ice. Melting sea ice reduces the amount of algae which in turn reduce the krill shrimp, that feed on algae and so Adelie penguins will get reduced (Tripathy and Nanda, 2008).
- (h) Disruption of habits such as coral reefs and alpine meadows could drive many plant and animal species to extinction (Tripathy and Nanda, 2008).
- (i) Progressive acidification of ocean due to increasing carbon dioxide is expected to have negative impact on marine-shell forming organisms (Tripathy and Nanda, 2008).
- (j) Change in seasonality (Bradshaw, 2011) and in phenology is observed in many species across the continents such as frogs breeding earlier, cherry blossoms blooming earlier and leaves turning colour later.
- (k) Butterflies, dragonflies and other insects are now living in higher altitude and latitude where previously it was too cold for them to survive.
- (l) It is projected that forest, farm and cities will face troublesome new pests and more mosquito-borne diseases.
- (m) Global warming will have some psychological impact on human like increase in violence and displacement and relocation of humans will be there (Doherty and Clayton, 2011).

Effect on Biotic Component (India) (Jacob, 2010)

- Kerala- Productivity of Forest
- Tamil Nadu-Coral bleaching
- Northwest India-reduction In rice yield
- Kullu Valley, Himachal Pradesh: Apple cultivation was reduced

Discussion

Methodologies for skirmishing the Greenhouse effect- International communities through the Framework Convention Climate Change (1992) and the Kyoto Protocol (1997) have taken their steps to protect earth's climate from dangerous human interference. Now the nations have agreed to reduce the greenhouse emissions by an average of about 5% from 1990 levels by the period 2008 to 2012. The UK, through its Climate Change Programme, has committed itself to a 12.5% cut in greenhouse gas emissions. Existing and future targets can be achieved by embracing the concept of sustainable development. The following steps could be taken to minimize the greenhouse effect (Tripathy and Nanda, 2008).

Community Practices

- Control population growth
- Reduce, reuse and recycle wastes.

- Afforestation practices: Protect and conserve forest and wildlife as they will make the environment healthy.
- Alternative sources of energy: Reduce the use of fossil fuels and skip to alternative sources of energy such as solar power, wind power, geothermal energy etc.
- Use clean coal technologies
- Use carbon capture and storage to mitigate climate change by capturing CO₂ from large point source such as power plants and then storing it away safely instead of releasing it into the atmosphere.
- Mixed use zoning: Planners must keep industry and domestic settlement out of flood prone area.
- Environmental audits of the area should be done.
- Save energy in data centre (Uddin and Rahman, 2011)

Individual Practices

- Make saving energy a family affair
- USE CFL bulbs
- Use less heat and Air Conditioner
- Buy energy efficient products
- Save electricity
- Drive Less and Drive Smart
- Eat more vegetable and less meat: The average American diet causes the release of an extra 1.5 tones of greenhouse gases per year compared with a strict plant based diet.

India's Initiatives (Jacob, 2010)

- Signed UNFCCC on 10th June 1992
- India ratified the Kyoto protocol
- India has a National Action Plan on Climate Change
- India has a well developed policy, legislative regulatory & programmatic regime for promotion of Energy efficiency, renewable energy, nuclear power, fuel switching, energy pricing reform addressing CHG emission.

Conclusion

All the ecosystem and humans are not equally sensitive to the changes in climate. Result may vary from place to place and also within a same place. Global dimming is another side of the same coin as a result of which earth temperature is cooled down. That's why there is almost a balance in earth's temperature. Still we can't ignore the climate change and biotic disturbances in the ecosystem due to global warming. Concerted efforts need to be undertaken at local, regional, national and International levels to reduce the emission of greenhouse gases to save our planet from catastrophic effects of global warming.

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