

Changes in Climate Impact on the Forest: Review

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Abstract

As a result of man's contribution to the natural environment, global warming which is a natural phenomenon has given rise to changes in climate. Human contributions to global warming are twofold: First, by human practices that have triggered a rise in CO₂ production and second is green-house gases, thus taking the level of global warming to dangerously high levels. The second concern is the denuding of the Earth's forest; thereby reducing the potential of the Earth to withstand the rise in CO₂. Such effects include biodiversity loss, desertification, environmental erosion, loss in fertility of soil and flooding. Way out of the challenge is basically through conversion and alleviation. Changes in climate effects are now unavoidable therefore there is a need to develop species/varieties tolerance for stress and drought. Forestation projects, community forestry, agro forestry activities will serve as approaches to counter this detrimental global phenomenon. According to this review paper, some negative effects of changes in climate on food safety, health, biodiversity and the threats they pose to world. It also explored likely causes of changes in climate and the forest trees which play a role in mitigating the effects of changes in climate.

Key words: Changes in climate, Forest, Global Warming, Greenhouse Gases

Introduction

Changes in climate is seen as a consequence of the contribution man has made to global warming and has been described as a global threat. Activities of industries have caused an increase in carbon dioxide and other greenhouse gases, exacerbating to dangerous levels of the extent of global warming of the Earth. The second concern is denuding the forests of the Planet, reducing the potential of the Earth to withstand the increased CO₂ emissions [1].

Most vulnerable continent is Africa to climate by 2020, water shortages can be faced by around seventy-five to two hundred and fifty million people. In many African countries, agricultural production will reduce and there will be little access to food, people will lose agricultural land, and growing seasons and yields will reduce. Production due to crops dependent on rain will be half in certain countries in 2020. Increasing temperatures of water will lower stocks of fish in bigger lakes which are already reduced by overfishing [2].

Shifting temperature and precipitation patterns, and continuing to increase atmospheric CO₂ concentrations, are likely to drive significant changes in natural and modified forests. The present review reflects on recent publications covering developments in commercial forestry, excluding the roles of forest ecosystems and non-timber forest products. They focus on the

direct and indirect impacts of changes in climate on forest production, predictions of future trends in commercial forestry, the potential role of bio fuels, and supply and demand shifts.

Overall forests occupy about four billion hectares of land, which is also thirty percent of the surface of the land. In 2016, around four billion m³ wood of four hundred thirty-four billion m³ of fresh stock was taken from the forests; about 60 per cent constituted industrial wood and left wood of fuel. Most of the forest land is filled with natural forests main (36 percent) or adjusted (53 percent). Since the 1990s, the forest area of primary has gradually decreased by approximately six million in a year, and this trend is particularly more in Brazil as well as Indonesia; thus two countries are accountable for the loss of five million hectare of forest. Countries with low income have more forest loss, majority in tropics, but those with higher income are having forest expansion since they have revered this process for themselves.. A map of the world forest area has been shown in the Fig.1 [3].

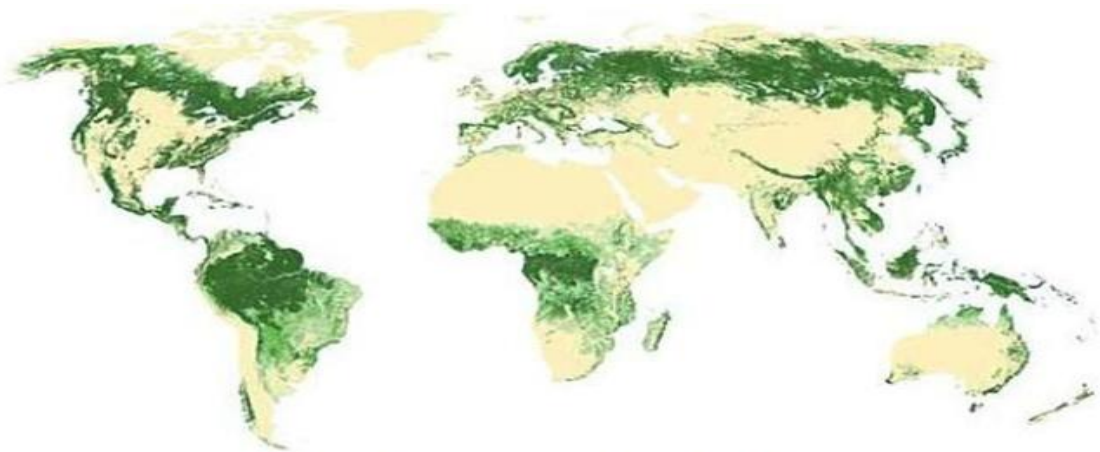


Fig. 1 Forest Covers Of the World

The sectors of land use, forestry and agriculture account for on fourth of overall emissions from greenhouse gas and are the biggest source after combining cars, trains ,trucks, aircraft and ships. They will reduce carbon emissions and combat changes in climate by reducing the forest decline. That is so easy [4].

Cause of changes in climate

- **Influences of Human Activities on Climate:**

Human activities which lead to changes in environment and have influence on the climate are anthropogenic factors. In few situations, causality continuity is clear and unclear (e.g., through the influence on temperature of irrigation), but in others, not so evident. Numerous theories for human-created changes in climate are debated since a number of years, although it is evident that the debate has gone above from skepticism, but still it is under doubt that the change in climate is occurring due to activities of humans. The primary interpretation for the current fast changes in the world climate, the debate on the present rapid changes has primarily shifted to ways of reducing the impact of humans and adapting to the changes that are still in the system. The broad services range offered in forests includes un-timber products

such as mushrooms and berries, giving habitats of wildlife, water and soil protection, sustenance of biodiversity, tourism, leisure opportunities, plants for medicinal purposes, etc. For people who are dependent on forest, these services are especially important since these people are leaving under poverty. [5].

- **Fossil Fuel:**

The most important reason of concern at the moment is the increase of carbon dioxide level because of fossils fuel's combustion emissions then comes aerosols having an effect of cooling. Such considerations include land use, loss of ozone, livestock farming and deforestation.

The levels of CO₂ are significantly more than as compared since 750,000 years.

- **Cement Manufacture:**

The manufacture of cement adds CO₂ when heating calcium carbonate, which creates carbon dioxide and lime. The industry of cement produces 5 percent of all anthropogenic CO₂ emissions, half of it is due to chemical process and forty percent due to fuel burning. If one thousand kg of cement is made, around nine hundred kg of carbon dioxide is released. *Land Use:*

Tropical deforestation accounts for almost one fourth of the global annual carbon dioxide emissions. Forest degradation and deforestation contribute about 24% of human made carbon emissions and 18 percent of all combined greenhouse gas emissions.

Since extensive use of fossil fuel, the greatest effect mankind has on local climate is likely to have been due to land use. Irrigation, deforestation, and forestry dramatically change the environment. They change, for example, the amount of water coming into and out of a given location. They may also change the local albedo by influencing the ground cover and by changing the amount of sunlight absorbed.

- **Livestock:**

According to a researcher, livestock is accountable for eighteen percent of emission of greenhouse gas, globally as expressed in equivalents of CO₂. This involves changes in use of land, having deforestation to establish land for grazing, and emissions of natural gas from livestock. 70 percent of deforestation of Rainforest of Amazon is to make way for land for grazing, so it is a major factor of UNFAO report of 2006, it was first agricultural study to add improvements in land use.

In addition to CO₂ emissions, livestock produces 65% of human induced nitrous oxide (which has 296 times the CO₂ potential for global warming) and 37% of human induced ethane (which has 23 times the CO₂ potential for global warming) [7].

Consequently, the proportion with which major greenhouse gasses cause global warming is given as carbon dioxide (CO₂) causes about 9-26%, methane (CH₄) causes about 4-9%, ozone causes about 3-7% and water vapor causes about 36-70%. Such gasses serve as a kind of isolating shield, shielding heat from the sun and preserving the average Earth's surface temperature. But it's not only the presence of greenhouse gases that is critical, it's the amount as well.

- **Evidence of climate:**

The system of climate warming is unambiguous, and is apparent from measurements of rising average global air and temperature of ocean, widespread snow and melting of ice, and increase in average sea level. The average temperature of surface Earth rose since 1850 of 0.76 ° C. the warming that has taken place in the past 50 years will most likely have been effect of activities of human. In worst case scenario, the average temperature of surface is expected to rise by another 1.8-4.0 ° C in this century, and go to 6.4 ° C.

effects of change in climate

- **Effects of changes in climate on food security:**

Changes in climate poses a serious threat to tropical poor farmer livelihoods and food security. Scientists recently predicted the impacts of changes in climate on maize yields in Africa and Latin America five decades from now. This evaluation, performed with high resolution to expose household-level impacts, suggests profound changes for tens of millions of smallholder farmers who rely on rain-fed maize production to feed their families and livestock. Changes in climate will interfere with availability of food, reduced access to food and effect the food quality. For example, increases in temperature, pattern changes in precipitation, variations in weather events and unavailability in water can will lead to reduction in productivity of agriculture [8].

- **Effects of changes in climate on biodiversity:**

The cycles of life of a number of wild plants and wild animals are linked closely to the passage of the climatic; changes in climate will lead to dependent pairs of organisms (e.g. a wild flora and its pollinating insect) losing equilibrium if, for example, one cycle depends on the duration of the day and the other on temperature or precipitation. This could at least result in extinction or changes in species distribution and abundance [9].

- **Effects of changes in climate on health:**

Transmission of infectious disease to human occurs when humans enter the process of the disease or when an environment disturbance including ecological and meteorological influences is present. Changes in climate impacts health factors in social terms—cleaner air, safer drinking water, adequate food and safer shelter. It is expected that changes in climate

will cause about 250 000 more deaths each year from 2030 to 2050, due to malnutrition, malaria, diarrhea and stress of heat.

Table.1 Vector –Borne Diseases Considered to Be Sensitive To Climate Change

Cause	Disease
Mosquitoes	Malaria, Filariasis, dengue fever, Yellow fever
Sand flies	Nile fever
Triatomines	Leishmaniasis
Ixodes ticks	Chagas disease
Tsetse flies	Lyme disease
Black flies	encephalitis

Adaptation To Changes In Climate

Changes in climate is forcing plant scientists to rethink priorities and focus on stress-tolerant species instead of just crops with high yielding varieties. Scientists of International Crop Research Institutes of Semi-Arid Tropics (ICRISAT) are working to develop pearl millet, sorghum, chickpea, pigeon pea and ground nut for growing in a warmer world. Until now, they have developed heat tolerant varieties, high soil temperatures, low and variable rainfall and diseases.

Scientists make significant progress in providing varieties which can withstand drought and salinity. They made a breakthrough finding a gene that enables rice to survive floods for up to 2 weeks. Genetic modification is therefore assumed to be the secrets to the creation of changes in climate in forest ecosystems.

The planet is already experiencing changes in average temperature, seasonal shifts and a rising occurrence of extreme weather events and other impacts of changes in climate and slow onset events. The quicker changes in climate and the longer reform steps are put off, the tougher and more expensive it may be. Adaptation means that changes in environmental, social, or profitable systems as a response to current as well as predicted climatic incitement and their effects. This applies to improvements in procedures, strategies and systems to minimize potential damage or to take advantage of opportunities linked to change in climate. Simply put, countries and regions should build adaptation plans and take action in order to give to the already occurring impacts of changes in climate and prepare for impacts in future. Solutions to adapt will have forms and shapes, depending on the particular background of a culture, company, organization, region or country. One solution cannot be applied to all the types of region; it will change for different areas such as some might need immediate response but some might work with a larger time gap. Various steps are being taken by nations and organizations in order to make a dependable and economies, thus a better action need to be taken to build a cost-effective and lesser risk prone option [9] [10].

Successful adaptation is a function of governments, also on mobile and sustained stakeholder engagement, which include national, worldwide, multilateral and worldwide organizations, common and private sectors, civil organization and other stakeholders, as well as effective

management of knowledge. Change in climate's effects will be modified over different markets and regions, and also at different levels.

UNFCCC parties and their Paris- agreement agree that adaptation is one of the global challenge facing with local, regional and international boundaries. To protect people and their livelihood and habitats, it is major component of the change in climate's response globally in long term. In Fig.2, adaptation for the climate has been shown with its key factor.

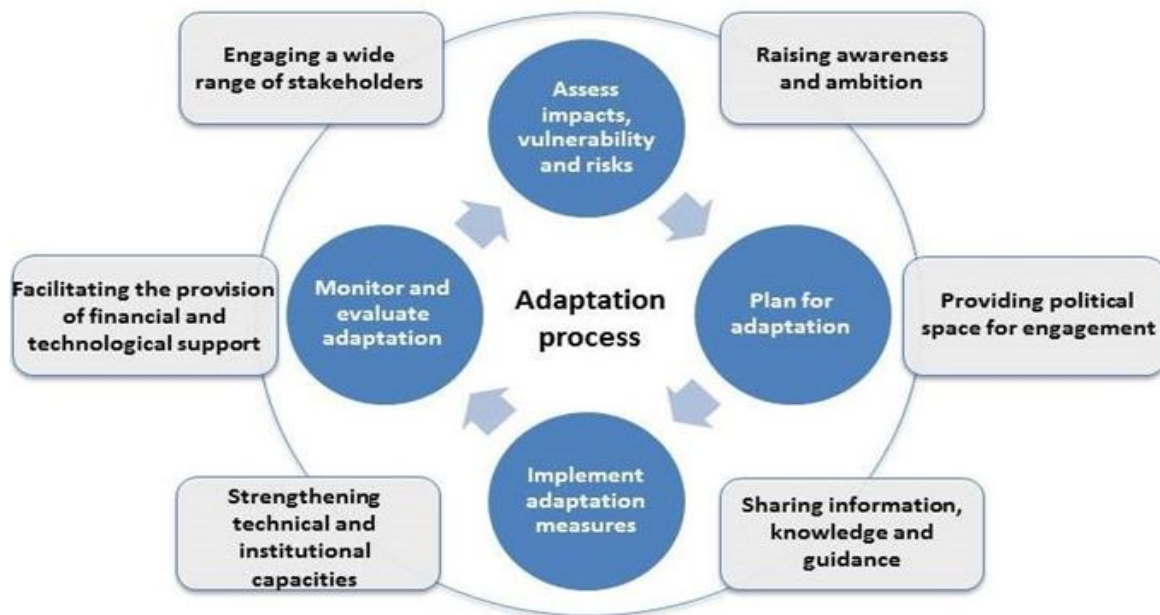


Fig.2 Adaptation Policy and Its Key Factor

Conclusion

Tropical deforestation accounts for nearly one-fourth of global carbon dioxide emissions a year. Obviously, Trees will not solve all of our changes in climate issues, but they are a step in the right direction that the researchers can all take as a rescue to our environment. Remember, the tree you planted to help reduce global warming can clean the air, filter storm water, lower energy cost, provide protection for local wildlife, and beautify your neighborhoods-that's a promise that no compact fluorescent light bulb can create.

Both the United Nations Framework Convention on Changes in climate (UNFCCC) and the Kyoto Protocol acknowledging importance of forests in mitigating changes in climate listed general forest responsibilities common to all member states. The following recommendations are therefore made to member countries that they should encourage sustainable forest management, promote and collaborate in the protection and enhancement of forests as greenhouse gas sinks and reservoirs. The researchers should also promote forestation, reforestation, and renewable energy. Forest should be considered as part of the national greenhouse gas emission reduction inventories as well as regional climate mitigation programs.

References

1. C. C. Impact, "Changes in climate in the Eastern Himalayas : Observed Trends and Model Projections," *Icimod*, 2010.
2. J. T. Abatzoglou and A. P. Williams, "Impact of anthropogenic changes in climate on wildfire across western US forests," *Proc. Natl. Acad. Sci. U. S. A.*, 2016.
3. R. N. Sturrock *et al.*, "Changes in climate and forest diseases," *Plant Pathology*. 2011.
4. M. C. Hansen *et al.*, "High-resolution global maps of 21st-century forest cover change," *Science* (80-.), 2013.
5. F. R. Scarano and P. Ceotto, "Brazilian Atlantic forest: impact, vulnerability, and adaptation to changes in climate," *Biodivers. Conserv.*, 2015.
6. R. Seidl *et al.*, "Forest disturbances under changes in climate," *Nature Changes in climate*. 2017.
7. W. R. L. Anderegg, J. M. Kane, and L. D. L. Anderegg, "Consequences of widespread tree mortality triggered by drought and temperature stress," *Nature Changes in climate*. 2013.
8. B. M. Wotton, C. A. Nock, and M. D. Flannigan, "Forest fire occurrence and changes in climate in Canada," *Int. J. Wildl. Fire*, 2010.
9. E. A. G. Schuur *et al.*, "Changes in climate and the permafrost carbon feedback," *Nature*. 2015.
10. K. H. Erb *et al.*, "Unexpectedly large impact of forest management and grazing on global vegetation biomass," *Nature*, 2018.