

Global Warming and Climate Change: Impact on Biodiversity



Environment

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ABSTRACT

Global warming and climate change will trigger major changes in diversity and abundance of arthropods, geographical distribution of insect pests population dynamics' insect biotype, herbivore plant interactions, activity and abundance of natural enemies species extinction, and efficiency of crop protection technologies. Changes in geographical range and insect abundance will increase the extent of crop losses, and thus, will have a major bearing on crop production and food security. Distribution of insect will also be influenced by changes in the cropping patterns triggered by climate change. Major insect pests such as cereal stem borers, the pod borers and white flies may move to temperate regions, lading to greater damage in cereal, grain legumes, vegetables and fruit crops. Global Warming will also reduce the effectiveness of host plant resistance, transgenic plants, natural enemies, bio pesticides, and synthetic chemical for pest management. Therefore, there is a need to generate information on the likely effects of climate change on insect pests to develop technologies that will be effect you in future under Global warming and climate change.

Introduction:

Global Warming -- a gradual increase in planet-wide temperatures -- is now well documented and accepted by scientists as fact. A panel convened by the U.S National Research Council, the nation's premier science policy body, in June 2006 voiced a "high level of confidence" that Earth is the hottest it has been in at least 400 years, and possibly even the last 2,000 years. Studies indicate that the average global surface temperature has increased by approximately 0.5-1.0°F (0.3-0.6°C) over the last century. This is the largest increase in surface temperature in the last 1,000 years and scientists are predicting an even greater increase over this century. This warming is largely attributed to the increase of greenhouse gases (primarily carbon dioxide and methane) in the Earth's upper atmosphere caused by human burning of fossil fuels, industrial, farming, and deforestation activities.

Average global temperatures may increase by 1.4-5.8°C (that's 2.5 - 10.4°F) by the end of the 21st century. Although the numbers sound small, they can trigger significant changes in climate. (The difference between global temperatures during an Ice Age and an ice-free period is only about 5°C.) Besides resulting in more hot days, many scientists believe an increase in temperatures may lead to changes in precipitation and weather patterns. Warmer ocean water may result in more intense and frequent tropical storms and hurricanes. Sea levels are also expected to increase by 0.09 - 0.88 m. in the next century, mainly from melting glaciers and expanding seawater.

In recent usage, especially in the context of Environment Policy, the term Climate Change refers to changes in modern climate which have been caused by human action near about 90-95% according to IPCC [Intergovernmental Panel on Climate Change]. This phenomenon is also referred to in the mainstream media as Global Warming. In some cases, as in the United Nations Framework Convention on Climate change [UNFCCC], the term is also used with a presumption of human causation.

Climate Change refers to the variation in the Earth's global climate or in regional climates over time. It describes changes in the variability or average state of the atmosphere over time scales ranging from decades of millions of years. These changes can be caused by----

- Internal processes to the Earth
- External forces (e.g. variations in sunlight intensity)
- Human activities

In short, "Climate Change refers to a change of climate which is attributed directly or indirectly to human activity that alters

the composition of the global atmosphere and which is in addition to natural climate variability observed comparable time periods".

CLIMATE CHANGE FACTORS:

There are numerous factors which affect on climate and ultimately lead to Climate Change in present. The factors are categorized into 2 subheads, which are as follows:

1. Climate Factors
2. Non-climate Factors

Climate Change means increase in the average temperature of the Earth.

Climate is the average state of weather. It includes temperature, amount of rainfall, days of sunlight. Mainstream media refers this term as the "Global warming".

Glaciations, Volcanism, Deforestation, Fossil Fuels, Ozone Depletion etc. are the factors responsible for Climate Change. It is the possibility of "Dreary Future" and harmful to human beings.

India lies within the Indomalaya ecozone and contains three biodiversity hotspots. One of 17 mega diverse countries, it hosts 7.6% of all mammalian, 12.6% of all avian, 6.2% of all reptilian, 4.4% of all amphibian, 11.7% of all piscine, and 6.0% of all flowering plant species. Endemism is high among plants, 33%, and among ecoregions such as the shola forests. Habitat ranges from the tropical rainforest of the Andaman Islands, Western Ghats, and North-East India to the coniferous forest of the Himalaya. Between these extremes lie the moist deciduous sal forest of eastern India; the dry deciduous teak forest of central and southern India; and the babul-dominated thorn forest of the central Deccan and western Gangetic plain. Under 12% of India's landmass bears thick jungle.

Biodiversity is under threat worldwide. From a human perspective, the rapid climate change and accelerating biodiversity loss risks human security (e.g. a major change in the food chain upon which we depend, water sources may change, recede or disappear, medicines and other resources we rely on may be harder to obtain as the plants and fauna they are derived from may reduce or disappear, etc.).

New research led by the University of York has repeated the survey 42 years later; and found that, on average, species had moved uphill by about 67 metres over the intervening years to cope with changes in climate.

This is the first demonstration that climate change is affecting the distributions of tropical insects, the most numerous group of animals on Earth, thus representing a major threat to global biodiversity. *ScienceDaily (Jan. 21, 2009)*

Rapid environmental changes typically cause mass extinctions. One estimate is that less than 1% of the species that have existed on Earth are extant.

Since life began on Earth, five major mass extinctions and several minor events have led to large and sudden drops in biodiversity.

A 2007 study conducted by the National Science Foundation found that biodiversity and genetic diversity are codependent—that diversity among species requires diversity within a species, and vice versa. “If any one type is removed from the system, the cycle can break down, and the community becomes dominated by a single species.” At present, the most threatened ecosystems are found in fresh water, according to the Millennium Ecosystem Assessment 2005, which was confirmed by the “Freshwater Animal Diversity Assessment”, organized by the biodiversity platform, and the French Institut de recherche pour le developpement (MNHNP)

Crop plants used as a food by human beings are damaged by over 10,000 species of insects, and cause an estimated annual loss of 13.6% globally (Benedict 2003) and 23.3% in India (Dhaliwal et al. 2004). In India, the average annual losses have been estimated to be 17.5% valued at US\$17.28 billion in eight major field crops (cotton, rice, maize, sugarcane, rapeseed-mustard, groundnut, pulses, coarse cereals, and wheat) (Dhaliwal et al. 2010).

Discussion:

Environmental conditions play a key role in defining the function and distribution of plants, in combination with other factors. Changes in long term environmental conditions that can be collectively coined climate change are known to have had enormous impacts on plant diversity patterns in the past and are seen as having significant current impacts. It is predicted that climate change will remain one of the major drivers of biodiversity patterns in the future.

The insects have beneficial as well as negative effects on human population. They are essential for pollination etc but they are also responsible for large scale destruction of food crops as pests. They also act as vectors for some specific type of diseases. It is said that Global warming means more insects. Warmer climates seem to increase their reproductive rate and population growth, with widespread effects on agriculture. Insects adapt to the temperature of the environment gradually. This is bad as well as good news. The negative aspect of this is that the population growth of mosquitoes can spread various diseases which can be very harmful to the human beings e.g.: Dengue and malaria. This can even cause death. One can already observe the steady increase in the incidence of malaria, dengue and other such diseases in the third world countries and countries with tropical climate

India is among countries most threatened by climate change with experts warning that rising temperatures will lead to more floods, heatwaves, storms, rising sea levels and unpredictable farm yields.

Here are the main potential effects of climate change on a country which is the world's seventh largest in area and is home to 1.1 billion people, a sixth of humanity.

Various studies show that surface air temperatures in India are

going up at the rate of 0.4 degrees Celsius every 100 years, particularly during the post-monsoon and winter seasons. While mean winter temperatures could increase by as much as 3.2 degrees Celsius in the 2050s, summer temperatures could go up by 2.2 degrees Celsius in the 2050s, spurring climate variability.

Extreme temperatures and heat spells could alter patterns of monsoon rains, vital for India's agriculture and water needs. Scientists warn that India will experience a decline in summer rainfall by 2050. Soil erosion, increased numbers of pests and weeds brought by climate change will also affect agriculture in India. For instance, the amount of moisture in the soil will be affected by changes in factors such as rainfall, runoff and evaporation.

A 10-year study in and around the Bay of Bengal points to the sea rising 3.14 mm a year in the mangrove swamps of the Sunderbans delta against a global average of 2 mm, threatening the low-lying area which is home to about 4 million people. This will also be responsible for the submergence of the important and endemic floral and faunal species leading to abrupt changes in the prevailing ecosystems.

A trend of sea level rise of 1 cm per decade has been recorded along the Indian coast. The major delta area of the Ganga, Brahmaputra and Indus rivers, which have large populations reliant on riverine resources, will be affected by changes in water regimes, salt water intrusions and land loss.

All species are likely to be directly impacted by the changes in environmental conditions, but also indirectly through their interactions with other species. While direct impacts may be easier to predict and conceptualize, but indirect impacts are to be given equal importance in determining the response of plants to climate change.

A species whose distribution changes as a direct result of climate change may 'invade' the range of another species for example, introducing a new competitive relationship.

Energy in the ecosystem can be depicted in the form of a food pyramid or energy pyramid. The biogeochemical cycles are important for the life processes to work smoothly. The changing climate disturbs the proper working of the cycles triggering the loss of species sensitive to the changing climates, thereby erasing their total existence from the globe. The climate change and global warming are such phenomenon's which cannot be avoided or stopped but simple caries can help in inhibiting their boosting speed.

Conclusion:

Numerous studies have been carried out to examine the impacts of past climatic variations on agriculture using case studies, statistical analyses and simulation models (e.g. Nix 1985; Parry 1978; Thompson 1975; World Meteorological Organization 1979). These studies have clearly stated the sensitivity of both temperate and tropical agricultural systems and nations to climatic variations and changes. According to various studies at national and international level the need is felt to carry out thorough studies on the perfect impacts of the climatic changes and global warming to get adapted to the prevailing and forthcoming situations. There is a need to generate information on the likely effects of climate change on insect pests to develop technologies that will be effect you in future under Global warming and climate change. This will be more helpful to enhance and cope with future problems. One another way is to work for the conservation keeping in mind the strategy to increase the floral and faunal cover helpful in minimising and pushing the critical effects for some longer period.

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