

Global Warming and Its Effects on India

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The Earth's temperature is maintained at a level where it can sustain life by a balance between heat from the sun, and cooling form reflecting some of the hear by the Earth's warm surface and atmosphere back to space.

But atmospheric gases such as carbon dioxide, methane, nitrous oxide and halocarbons absorb some of the rays reflected back from the Earth's surface. These are 'greenhouse gases' (GHGs). They act like a blanket, preventing much of the hear reflected by the earth's surface escaping directly to space. By slowing the release of cooling radiation, these gases warm the Earth's surface. While this is a natural process that is essential to life on Earth, the trouble starts when the concentration of these GHGs in the Earth's atmosphere increases. The result is an increase in the Earth's temperature, or global warming. Global warming in turn interferes with the earth's climatic systems, resulting in climate change of all GHGs, carbon dioxide in single responsible for over half the effect of global warming. Though the gas is naturally present in the Earth's atmosphere and in oceanic and terrestrial 'sinks' (Such as forests), the trouble starts when carbon concentrations increases beyond limits that can be absorbed by the Earth's natural cycle.

Carbon dioxide concentrations have been increasing rapidly in the atmosphere since that start of the industrial revolution, when the world became heavily dependent on carbon based fossil fuels for economic growth. Ever since then, human beings have been emitting carbon dioxide into the atmosphere in their pursuit for industrialization, economic growth and better lifestyles.

What are the effects of global warming and climate change?

Global warming could have many disastrous effects on the society directly (water, food, habitat, health, economic infrastructure such as energy, transport and industry) and also through the environment (rainfall, sea level rise, extreme events such as hurricanes and typhoons, floods and droughts).

Polar ice melts as a result of the rising temperature and, combined with the thermal expansion of seawater, causes oceans to slowly creep up and swallow low-lying islands. According to a panel of international experts studying climate change, entire forests may disappear and biological diversity may reduce because of the disappearance of habitat or reduced migration potential.

Climate systems, such as the Indian subcontinent's monsoon system, could be dramatically affected. This will have a direct impact on the economy of nations. For instance, both brought and floods caused by interference in India's climatic systems could result in crop failure, affecting both the economy and the food security in the country. Dealing with the natural disasters also imposes a huge cost on the country's economy, as is evident from the droughts and floods India has suffered over the last year.

What will be the effects of global warming on India

India's economy is largely dependent on agriculture and is already under stress due to its increasing population, and the resulting increase in demand for energy, fresh water and food. This situation will worsen with the effects of global warming. Some of the most obvious effects are listed below.

Increased temperature :

Scientists from the Indian Institute of Technology (IIT), New Delhi, already report that surface air temperatures over India are going up at the rate of 0.4°C per hundred years, particularly during the post-monsoon and winter season. Using models, they predict that mean winter temperatures will increase by as much as 3.2°C in the 2050s, and 4.5°C by the 2080s, due to GHGs. Summer temperatures will increase by 2.2°C in the 2050s and 3.2°C in the 2080s.

Extreme temperatures and heat spells have already become common over Northern India, often causing loss of human life. In 1998 alone, 650 deaths occurred in Orissa due to heat waves.

Effect on monsoon :

India is heavily dependent on the monsoon to meet its agricultural and water needs, and also for protecting and propagating its rich biodiversity. Subtle changes have already been noted in the monsoon rain patterns by the IIT, Delhi, despite the 11 near normal monsoons in a row. IIT scientists warn that India will experience a decline in summer rainfall by the 2050s. Since summer rainfall accounts for almost 70 percent of the total annual rainfall over India and is crucial for Indian agriculture, this could have a devastating effect on the Indian economy, and on food security.

Effects on water resources :

Relatively small climatic changes can cause large water resource problems. Particularly in arid and semi-arid regions such as northwest India. This will have an impact on agriculture, drinking water, and on generation of hydroelectric power, resulting in limited water supply and land degradation.

Apart from monsoon rains, India uses perennial rivers, which originate and depend on glacial melt-waters in the Hindukush and Himalayan ranges, Since the melting season coincides with the summer monsoon season, any intensification of the monsoon is likely to contribute to flood disasters in the Himalayan catchment. Rising temperatures will also contribute to the raising of the snowline, reducing the capacity of this natural reservoir, and increasing the risk of flash floods during the wet season.

Increase in temperatures can lead to increased eutrophication in wetlands and fresh water supplies.

Effect on agriculture :

Increased temperatures will impact agricultural production. Higher temperatures reduce the total duration of a crop cycle by inducing early flowering, thus shortening the 'grain fill' period. The shorter the crop cycle, the lower the yield per unit area.

Increased temperature also mean increased evaporation and transpiration rates. Even a small increase of 1°C could increase the rate of evaporation/transpiration by 5-15 per cent. With no rain fall to compensate, yields will be reduced. In north India, for instance, a temperature rise of 0.5°C could reduce wheat yields due to heat stress by about 10 per cent if rainfall does not increase. IIT scientists predict that a temperature increase of 3°C will result in a 15-20 per cent decrease in wheat yields, and also a decrease in rice yields.

Rise in surface temperature will create more conducive conditions for pest infection, which is already a major constraint in achieving higher crop production in India, and hence loss of crop.

Human health :

Modeling suggests that the rise in temperature and change in humidity will adversely affect human health in India. Heat stress could result in heat cramps, heat exhaustion, heat stroke, and damage physiological functions, metabolic processes and immune systems. Increased temperatures (particularly minimum temperatures) can increase the range of vector borne diseases such as malaria, particularly in regions where minimum temperatures currently limit pathogen and vector development.

Stress on food supply, water availability, sea level rise and changes in ecosystems is likely to have additional effects on human health in India. Water borne diseases, natural disasters, environmental migration, nutritional deficiency could be other major risk factors.

Effect on forests :

Increase in temperatures will result in shifts of lower altitude tropical and subtropical forests to higher altitude temperate forest regions, resulting in the extinction of some temperate vegetation types. Decrease in rainfall and the resultant soil moisture stress could result in drier teak dominated forests replacing sal trees in central India. "In any case an increased turnover of forest species is indicated," says M Lal from IIT Delhi. This could potentially result in species extinction and decline in biodiversity.

Increased dry spells could also place dry and moist deciduous forests at increased risk from forest fires.

Effect on coastal low lands and deltas:

A trend of sea level rise of 1 cm per decade has been recorded along the Indian coast. Sea level rise due to thermal expansion of seawater in the Indian Ocean is expected to be about 25-40 cm by 2050. This could inundate low lying areas, drown coastal marshes and wetlands, erode beaches, exacerbate flooding and increase the salinity of rivers, bays and aquifers.

Deltas will be threatened by flooding, erosion and salt intrusion. Loss of coastal mangroves will have an impact on fisheries, 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 intrusion and land loss.

In addition to dealing with its own problems, India will not be able to ignore its neighbors, whose citizens are also likely to be very badly affected and seek refuge in India. For instance, Bangladesh will not only lose land to sea level rise, it will also become more vulnerable to many environmental hazards, including frequent floods, droughts, cyclones and storm surges that damage life, property and agricultural production.

Who is responsible for global warming :

Developed countries have had a head start on developing countries in the industrialization process. They have been emitting carbon dioxide in the Earth's atmosphere for years before developing countries, at the time when the harmful effects of these emissions were not known, and hence there were no restrictions on emissions.

Since carbon dioxide accumulates in the atmosphere for hundreds of years, the emissions by developed countries are still present in the Earth's atmosphere, and are still causing global warming.

Therefore, and are still causing global warming. Therefore developed countries are responsible for increasing the carbon dioxide concentrations in the atmosphere through their historical emissions.

Carbon dioxide emissions of developing countries like India have now grown as they follow the fossil fuel-intensive economic growth model set out by the rich countries, and try to achieve better standards to living. But even to this day, many industrialized countries emit more carbon dioxide than many developing countries.

The differences in developed and developing country emission are even more apparent when per capita emissions of carbon dioxide are concerned, In 1996, the emissions of one US citizen were equal to 19 Indians, 30 Pakistanis, 17 Maldivians, 19 Sri Lankans, 107 Bangladeshis, 134 Bhutanese or 269 Nepali. This is because of the energy intensive lifestyles of industrialized countries. Many of the uses of energy in the richer countries are for purposes of luxury, and the emissions caused from such uses may be termed luxury emissions.

But the lower per capita emissions of developing countries are because a large number of poor people do not even have access to basic amenities such as electricity. They will need their share of ecological space to increase what could be termed survival emissions. Citizens of richer countries will have to decrease their per capita emissions in order to allow these poor people to increase theirs, and to allow them to improve their living standards.

What can you do:

- a. Recognize that global warming will have economic, as well as health and environmental impacts of your constituency.
- b. Initiate a parliamentary debate on the impacts of global warming on the country's economy, and also on the impacts of the current international negotiations.
- c. Ensure that India accepts no less than per capita entitlements, and the best and most effective renewable energy technology under the Kyoto Protocol.
- d. Insist that Indian scientific institutions generate detailed studies listing these impacts, and that this information is made available to the people.

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