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Effect of Climatic Change on Agricultural Production and Food Security

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ARTICLE ID: 17

Introduction:

According to the Inter-Government Panel on Climate Change (IPCC), the three main causes of the increase in greenhouse gases observed over the past 250 years have been fossil fuels, land use, and agriculture. The increase in greenhouse gases from the late nineteenth century to the present time has resulted in global warming of 1 to 3°c to the planet. The warming for the next 20 years is projected to be about 0.2°c per decade. Environment is the most important agenda of the international community due to its far reaching consequences on the survival of human being and other forms of biodiversity on the earth. Climate change is the most important indicator of environment degradation. Climate change is occurring due to increase in the level of greenhouse gases (GHG).In greenhouse gases, carbon dioxide, methane, nitrous oxide and fluorinated gases are the main contributors. GHG emissions have had a significant impact on the climate, particularly in recent times, with the global-average surface temperature rising structure rising studies have revealed that the warming of the planet is closely linked with the build-up in the atmospheric concentrations of carbon dioxide (Co_2), methane (CH_4), and some other greenhouse gases (GHG).China is the major contributor of green gouse gases with 19.5 per cent followed by USA (19.2%), India (5.3%), Japan (3.6%) and Germany (2.6%). Climate change many natural and human systems. According to the Inter-Government Panel on Climate Change (IPCC), the three main causes of the increase in greenhouse gases observed over the past 250 years have been fossil fuils, land use, and agriculture. The increase in greenhouse gases from the late nineteenth century to the present time has resulted in global warming of 1 to 3°c to the planet. The warming for the next 20 years is projected to be about 0.2°c per decade. Studies indicate that global warming increase the risk for species extinction, especially in bio diverse ecosystems,

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because extreme weather conditions like hurricanes, droughts and torrential downpours become more frequent. Flora and fauna become extinct at a rate 100-1000 times higher than normal. Climate change is one of the main causes of species depletion. According to a recent study of Stockholm Environment Institute, greenhouse gases can inflicting costs of nearly 2 trillion annually in damage to the oceans by 2100. The estimate is based on the assumption that climate-altering carbon emissions continue their upward spiral without a pause. This study indicates that warmer seas will lead to greater acidification and oxygen loss, hitting fisheries and coral reefs. Rising sea levels and storms will boost the risk of flood damage, especially around the coastlines of Africa and Asia.

Warmest Decade:

According to the UN weather agency (World Meterological Organization), Climate change has accelerated in the past decades (2001 to 2010) and it was the warmest decades on record since records began in 1850. This period was marked by extreme levels of rain or snowfall, leading to significant flooding on all continent, while droughts effected parts of East Africa and Nourth America. The Global land and sea surface temperature estimated at 0.46 degrees Celsius above the long term average of 14°c. The UN weather agency notted that the world is warming because of human activities and this is resulting in far reaching and potentially irreversible impacts on over earth, atmosphere and oceans. According to a Government statement in the Parliament, there is 1.29 millimetre rise in sea level along the Indian coastline.

Atmospheric Pollution: Atmospheric pollution include:

1. smog caused by chemical reactions between pollutants derived from different soursces, mainly automobile exhaust and industrial emissions, and rain occurs when pollutant like sulphuric acid combines with droplets of water in the air, the water becomes acidified.
2. Acid rain kills trees and harms animals, fishes and other wild life, green house effect or global warming is a common fact of atmospheric pollution.
3. Global warming is increase due to increase in carbon dioxide content in the air. This carbon dioxide builds up a blanket and traps the heat in the earth's surface.
4. Ozone depletion is the major trouble of the development rather industrial development. Our earth is surrounded by layers of atmosphere, ozone gas which

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protects harmful ultra violet rays from coming in the earth's surface is found in the stratosphere. The release of chlorofluorocarbons (CFC) from aerosol cans, refrigerators, air conditioners etc. are continuously harming ozone layer causing holes and allowing the radiation to reach the earth. Air pollution effects health in many ways, may be short or long term short term effects include irritation of eyes, nose, throat such as bronchitis, pneumonia.

Marine Pollution:

Oceans are the largest ecosystem on earth. Seventy five percent of sea pollution is based on land activity. Some major types of contamination are:

1. Oil spills which primarily effects marine mammals and reptiles like turtles that need surface to breathe and breed. Adult fishes living near shore waters and juveniles in shallow water nursery and birds who live near shorelines are vulnerable to adverse effects of oil pollution.
2. Sewage adds to suspended particles in the water column. This sewage is hard to detect in open coast but in semi-enclosed areas, their effects are devastating.
3. Garbage has huge effect on ocean life. Litters on land find their way to the oceans being carried by the wind; as a result tons of plastic bags, cigarette buds, bottles etc. are always floating in the sea. Sea turtles often mistake plastic bags with jelly fish which blocks their digestive system and finally leads to death.
4. Radioactive wastes- the world's oceans have been dumping ground for radioactive wastes since 1944. Dumping of high radioactive wastes in the ocean is no longer permitted but low level wastes are still dumped in deep sea. May be in near future its devastating effect will be seen by our coming generations.
5. Thermal pollution only affects the communities adjacent to the discharge. Electrical generating plants along the coastlines use marine waters for cooling purposes which leads to heated water being expelled in the marine environment, tropical areas are affected by thermal discharge. For e.g. mangrove trees in a heated bay will not reproduce.
6. Eutrophication means release of extra nutrients into coastal waters. Fertilizers used on land are washed into the ocean through rivers; streams etc. which may lead to the birth of phytoplankton blooms as red tides, yellow or green foams, a higher frequency

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of the occurrence of algae blooms also indicate unhealthy eco system. Toxicity of the recent blooms are increasing which has direct effect on the organisms that feed upon them.

Deforestation:

Means permanent destruction of indigenous forests and wood lands. Forests are home for many important species, they also play a major role in ecosystem. Forests produce huge amount of oxygen, tend to help replenish nutrients in land and prevent desertification. Forests are also a main source of timber. If people exhaust their supply of forests, they will no longer be able to continue using them as the source of building materials, heating fuels and paper (Bragaw, 1999).

Desertification:

"Land degradation means reduction or loss, in arid, semi-arid and dry sub-humid areas, of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, pasture, range, forests and woodlands resulting from land uses or from a process or combination of processes. These processes include soil erosion caused by wind or water, deterioration of the physical, chemical and biological or economic properties of soil, and long term loss of natural vegetation." Soil degradation, is defined as human -induced phenomenon, which lower the current or future capacity of the soil to support human life. In drylands, soils are especially vulnerable to degradation due to the slowness of their recovery from a disturbance ("Desertification", 2001).

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Hazardous Wastes:

The generation of hazardous wastes is one of the major consequences of development. As defined by the High Powered Committee Report, hazardous wastes refer to "any substance, whether solid, liquid or gaseous form, which has no foreseeable use and which by reasons of any physical, chemical, reactive, toxic, flammable, explosive, corrosive, radioactive or infectious characteristics causes danger or is likely to cause danger to health or environment, whether alone or when in contact with other wastes or environment, and should be considered as such when generated, handled, stored transported, treated and disposed of." Hazardous wastes are generally a by-product of the industrial operations which involve the use of heavy metals such as arsenic, cadmium, lead, mercury and processes which utilize different categories of oil and petrochemicals. The main difficulty is, recycling of hazardous waste is itself very hazardous and is more toxic in concentration that the material recycled.

Climate Change:

"lf temperatures rise by almost 6°C over the next 100 years, then the rising sea levels, shifting weather patterns and an increase in the frequency of extreme weather events could cause massive traumas both for human populations and for nature" says Intergovernmental Panel on Climate Change (IPCC). A blanket of water vapour and other green house gases (carbon dioxide, methane, nitrous oxide) traps some of the sun's radiation from going back causing warming of the atmosphere. The main cause of this global warming is carbon dioxide which is produced by burning of fossil fuels and another is methane which traps heat 30 times more than carbon dioxide. Methane emissions come from cultivation of rice, pipeline leaks, the flatulence of cattle and forest fires. It is predicted that if global warming keeps on following the same pattern then a day will come when the glaciers and ice-caps will melt and cause the sea level to rise and tropical diseases like malaria will spread in the tropical climates.

Decline in the Biodiversity:

The variety of life on Earth, its biological diversity is commonly referred to as biodiversity. The number of species of plants, animals, and microorganisms, the enormous diversity of genes in these species, the different ecosystems on the planet, such as deserts, rainforests and coral reefs are all part of a biologically diverse Earth. Appropriate conservation and sustainable development strategies attempt to recognize this as being

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integral to any approach. Almost all cultures have in some way or form recognized the importance that nature, and its biological diversity has had upon them and the need to maintain it. Yet, power, greed and politics have affected the precarious balance. A more fruitful analysis of the relationship between economic development and environmental impact depends upon several factors as:

Specific Effects:

There are large differences in state level per capita emissions due to the enforcement of pollution laws and the use of outdated industrial technology. Low income states are still sources of emissions because of land conversion through burning and replanting of tree crops while high income states are emitting increasing emissions because of industrial and municipal wastes. Improved technology not only significantly increases productivity in the manufacture of old products but also the development of new products. There is a growing trend among industries to reconsider their production processes and thereby take environmental consequences of production into account. This concerns not only traditional technological aspects but also the organization of production as well as the design of products. Technological changes associated with the production process that may also result in changes in the input mix of materials and fuels (Lindmark, 2002).The economy-wide reforms often contribute simultaneously to the economic, social and environmental gains (Anderson and Cavandish, 2001; Pasche, 2002). Developing countries could learn from the experiences of industrialized nations, and restructure growth and development (Munasinghe, 1999) - thereby avoiding going through the same stages of growth that involve relatively high (and even irreversible) levels of environmental harm.