



Global warming: Its causes and effects on human health

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Tropical country like India global warming would adversely affect the human health. Moreover, the incidence of mosquito borne infectious diseases like malaria, Japanese encephalitis, filaria, dengue fever, chikungunya and West Nile fever would increase. Whereas, the scourges of sexually transmitted diseases like AIDS, hepatitis B, gonorrhoea and syphilis would also increase 7 fold. There would also be raise the incidence of non-infectious diseases like night blindness, rickets, anaemia, marasmus, beriberi, kwashiorkor and pellagra.

The long-term good health of populations depends on the continued stability and functioning of the biosphere's ecological and physical systems, often referred to as life-support systems. We ignore this long-established historical truth at our peril: yet it is all too easy to overlook this dependency, particularly at a time when the human species is becoming increasingly urbanized and distanced from these natural systems (Fagan, 1999). The world's climate system is an integral part of this complex of life-supporting processes, one of many large natural systems that are now coming under pressure from the increasing weight of human numbers and economic activities. By inadvertently increasing the concentration of energy-trapping gases in the lower atmosphere, human actions have begun to amplify Earth's natural greenhouse effect. The primary challenge facing the world community is to achieve sufficient reduction in greenhouse gas emissions so as to avoid dangerous interference in the climate system. National governments, via the UN Framework Convention on Climate Change (UNFCCC), are committed in principle to seeking this outcome. In practice, it is proving difficult to find a politically acceptable course of action—often because of apprehensions about possible short-term economic consequences (McMichael, 2001). This volume seeks to describe the context and process of global climate change, its actual or likely impacts on health, and how human societies should respond, via both adaptation strategies to lessen impacts and collective action to reduce greenhouse gas emissions. As shown later, much of the resultant risk to human populations and the ecosystems upon which they depend comes from the projected extremely rapid rate of change in climatic conditions. Indeed, the prospect of such change has stimulated a great

deal of new scientific research over the past decade, much of which is elucidating the complex ecological disturbances that can impact on human well-being and health (IPCC, 2013).

What is global warming? : Atmosphere is well structured and dynamic in nature. These become more complex near the earth's surface where changes take place both temporally and spatially. These changes may be induced either internally within the earth's atmospheric system or externally by extra-terrestrial factors. The global warming is one of the changes caused by the activity of human beings. Global warming is responsible for increase the average temperature of earth near surface air and ocean owing to build up of green house gases in the atmosphere. This increase has been between 0.3^o C and 0.8^o C over the 20th century. The chief cause of global warming is the phenomenon 'green house effect'.

What is green house effect? : Joseph Fourier (1824) was discovered green house effect and quantitatively investigated by Svante Arrhenius (1896). It is the process by which absorption and emission of infrared radiation by atmospheric gases warms the planet's atmosphere and surface or in another words green house effect is the phenomenon in which some atmospheric gases are transparent to incoming short-wave solar radiation but are opaque to outgoing long-wave terrestrial radiation, consequently leading to rise in earth's temperature. The natural green house effect is essential for life on the earth as it is responsible for maintaining the earth at a salubrious +15°C on the average than dead frozen -19°C that would have been the case in absence of green house gases. The gases responsible for the green house effect are known as green house gases.

Agent responsible to green house gases :

Carbon dioxide: Carbon dioxide (CO_2) is one of the main green house gas which is emitted due to the combustion of fossil fuels (coal, petrol, diesel etc.). The CO_2 is rising at rate of 0.5 per cent per annum and its warming capacity is 1. The burning of fossil fuels adds more than 5 billion tonnes of CO_2 to the atmosphere every year. Carbon dioxide increases the earth temperature by 55.3 per cent. According to an estimate CO_2 in air may have risen by 25 per cent in the middle of the 19th century. It may even be doubled upto 2030.

Methane: Methane (CH_4) which is twenty times more effective than carbon dioxide is another green house gas increasing at the rate of 1 per cent per annum. Its warming capacity is 36. Paddy fields, swamps and marshes are the principal source of methane to the atmosphere. In addition to these, enteric fermentation in cattle and insects is also the source of methane to the atmosphere. Methane concentration in the atmosphere has increased 150 per cent since 1750 and contributes a fifth of the warming effect (20%). By about 2050, methane will become a principal green house gas.

Chlorofluorocarbons (CFCs): Chlorofluorocarbons (CFCs) are the chemicals used as refrigerants, propellants and solid plastic foams. These chemicals are also released as aerosol by jet flying at high altitudes. These groups of chemicals are highly stable and non-destructive. These are generally of two types namely hydrofluorocarbon and perfluorocarbon. Both are increasing in atmosphere at the rate of 0.4 per cent per annum. However, the warming capacity of hydrofluorocarbon is 14,600 while that of perfluorocarbon is 17,000. The contribution to global warming of hydrofluorocarbon is 6 per cent while the same for perfluorocarbon is 12 per cent.

Nitrous oxide: Nitrous oxide (N_2O) is increasing at the rate of 0.3 per cent per annum and its warming capacity is 140.00. The sources of this gas to atmosphere are fossil fuel combustion, biomass burning and changing pattern of land use even released in the atmosphere by microbial action on inorganic nitrogenous fertilizers in the soil. Moreover, chemical fertilizers and other natural processes account for 70-80 per cent, fossil fuel combustion for 20-30 per cent of the N_2O in the atmosphere. Its contribution to global warming is 5 per cent.

Ozone (O_3): Troposphere ozone (O_3) is another green house gas increasing at the rate 0.5 per cent per annum in the atmosphere. While, its warming capacity is 430.0. O_3 is formed by light dependent reaction between nitrogen dioxide (NO_2) and hydrocarbons. Nitrogen dioxide is

released in the atmosphere by the combustion of fossil fuels. O_3 is also formed by NO_2 under the effect of Ultra Violatic radiations. Its contribution to global warming is 2.0 per cent.

Causes for emission of green house gases : Industrialization, urbanization, revolution in transport sectors, technological changes, thermal power plants, change in life style of human beings due to rapidly use of air conditioners, refrigerators and perfumes, indiscriminate use of nitrogenous fertilizers. Moreover, in modern agricultural, increased area of paddy cultivation and increase in livestock population and volcanic eruptions are the chief causes behind the emission of green house gases which are also responsible for the global heat consequently leading to the problem of global climate change.

Effect of global warming on human health : Scientists predict that by 2020 A.D. temperature all over the world would be higher than ever during the last 1000 years. The analysis of the temperature data in India for last 50 years reveals that there is an increase of 0.7°C in winter and 1.4°C in summer. Scientists have predicted a $1.4^\circ\text{C} - 5.8^\circ\text{C}$ rise in global temperature by 2100. This incline in globe temperature will change the global climate. Due to the global warming the climate of India would become warmer which may adversely affect the human health. Furthermore, owing to global warming there may be an increased incidence of diseases relating to heart and respiratory system. Moreover, due to warm climate there would be an increase in the frequency of non-infectious diseases like epilepsy, migraine, hypertension, depression and schizophrenia. There would be increased number of deaths owing to heat stroke in summer season. Besides, global warming may lead to emergence of new strains and species of pathogens consequently the present day antibiotics could lose their effect. In addition to these, the morality rate would increase several fold due to increased incidence of the infectious diseases like dysentery, diarrhoea, cholera, typhoid and jaundice. Since temperature and moisture play important role in multiplication and dissemination of disease causing vectors hence the rise in temperature would boost their population consequently there would be an increase in incidence of mosquito borne diseases like malaria, filaria, dengue fever, chikungunya, japanese encephalitis and West Nile fever in India. Since last few years there has been increased incidence of mosquito borne diseases like dengue fever, chikungunya and japanese encephalitis in India. Dengue fever has become major health problem in urban areas of Northern India while japanese encephalitis has emerged

as a serious health problem in Uttar Pradesh. Japanese encephalitis has spread to 40 districts of Uttar Pradesh. However, the Gorakhpur district of eastern Uttar Pradesh is the epicentre of this disease. The mosquito borne diseases would spread to hilly states of India like Jammu & Kashmir, Himachal Pradesh and Uttarakhand. In addition to mosquito borne diseases, there may also be increased frequency of the occurrence of the diseases caused by other vectors like *sand fly* and *tsetse fly*. Sand fly spreads Kala-Azar (Leishmaniasis) which is major health problem in the states of West Bengal and Bihar while tsetse fly spreads sleeping sickness which is major health problem in the states of Assam, Bihar and West Bengal. Due to rise in temperature the Kala-Azar and sleeping sickness would spread to several other states of the country.

pathways by which climate change affects health are the subjects of much of the remainder of this volume.

Global warming may also lead to a substantial decline in agricultural production as a result of which the poverty rate may also exceed several fold. Escalation in poverty may lead to the rise in social evils like prostitution. Consequently there would be an increased incidence of sexually transmitted fatal disease like Acquired Immune Deficiency Syndrome (AIDS). Besides AIDS, the scourge of other sexually transmitted diseases like hepatitis B, gonorrhoea and syphilis would also increase. However, decline in food grain production would also lead to the problem of malnutrition. This may result in increased frequency of deficiency diseases like anaemia, night blindness, rickets, beri-beri, marasmus, kwashiorkor and pellagra. Due to malnutrition in adults, the susceptibility to tuberculosis may also increase consequently the scourge of tuberculosis would increase. Presently India has more than 15 millions of tuberculosis patient which retain more than one-third patient of the world. Every year 20,000-25,000 individuals are infected from this disease and more than 1,500 people die from the disease (World Bank, 2014).

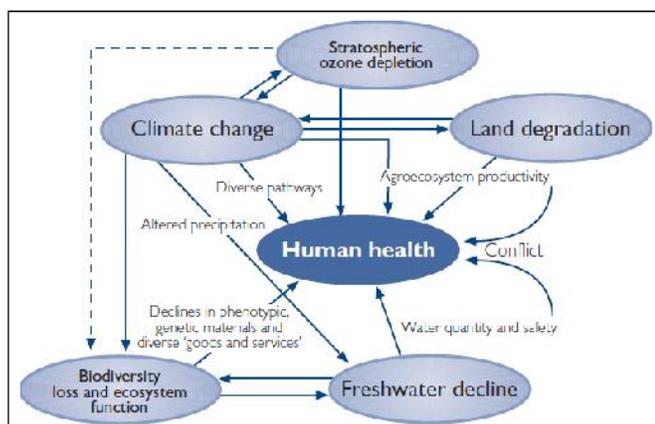


Fig. 1 : Interrelationships between major types of global environmental change, including climate change

Note that all impinge on human health and-though not shown here explicitly-there are various interactive effects between jointly acting environmental stresses. The diverse

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Received : 14.12.2017

Revised : 28.04.2018

Accepted : 11.05.2018

RN : UPENG/2006/17696 **An International Research Journal** ISSN: 0973-4791

Accredited By NAAS : NAAS Rating : 4.29 ONLINE ISSN: 0976-8963



THE ASIAN JOURNAL OF ANIMAL SCIENCE

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