

Human Health Aspects in Relation to Climate Change

R. K. Prajapati

Department of Energy and Environment, Mahatma Gandhi Chittrakoot Gramodaya University Chittrakoot-485335 Satna (M.P.) INDIA

Abstract- Human beings are exposed to climate change through changing weather patterns (precipitation, sea-level rise, temperature, and more frequent extreme events) and indirectly through changes in air water, food quality, changes in ecosystems, agriculture industry, settlements and the economy. Global average temperatures are projected by The United Nations & World Health Organization to increase between 1.4 to 5.8°C by the end of this century: an associated rise in sea level is also expected. The number of people at risk from flooding by coastal storm surgery is projected to increase from the current 75 million to 200 million in a scenario of mid- range climate change, in which a rise in the sea level of 9-88 cm is envisaged by the 2100s. [3] The study based by NASA'S Goddard Institute 2005 was the warmest year since reliable data available in the late 1800 century. The Women's are expected to be affected more than Men from climate change due to they have to take over the biggest part of the additional work burden, specifically additional care work, and the burden of nurturing the family, as well as providing the daily essentials. The aims of this paper are to briefly summaries what are known about likely impacts of climate change on human health.

Index Terms- Precipitation, industrialization, urbanization and carbon emission

I. INTRODUCTION

Climate change is the result of the buildup of greenhouse gases in the atmosphere, primarily from the burning of fossil fuels for energy and other human activities. These gases, such as carbon dioxide and methane, warm and alter the global climate, which causes environmental changes to occur that can harm people's health and well-being. There is scientific evidenced show that the green house gases (GHG) concentration increasing in rapid rate in the atmosphere due to industrialization, urbanization, coal based power plants and increasing the living standards. The carbon dioxide levels are currently highest of the available data, the values is 345 ppm and 450 ppm is supposed to be very risky. These anthropogenic GHG were not present 50 years back. More than last four decades climate has been noticed to be hotter and hotter; even in the last fifteen years were recorded 10 hottest year globally whenever scientific data available from 1850, in these years temperatures recorded approximate 0.5°C more than the normal temperature. In 1988 established Intergovernmental penal on climate change (IPCC) which works on the current phenomenon like climate change. In Kyoto Protocol in 1997 commit to 5.2 % reduce carbon emission by the developed countries in 2008 to 2012.

Changes in climate, including changes in climate variability, would affect many vector-borne infections. Populations at the

margins of the current distribution of diseases might be particularly affected. Climate change represents an additional pressure on the world's food supply system and is expected to increase yields at higher latitudes and decrease yields at lower latitudes. This would increase the number of undernourished people in the low-income world, unless there was a major redistribution of food around the world. Assuming that current emission levels continue, air quality in many large urban areas will deteriorate. Increases in exposure to ozone and other air pollutants (e.g., particulates) could increase morbidity and mortality.

India is confronted with the challenges of sustaining rapid economic growth amidst the increasing global threat of climate change. Evidence has shown that climate change will affects the distribution and quality of India's natural resources, which will ultimately threaten the livelihoods of the most poor and sector of the population who are closely tied to India's natural resources base. More than 56% of workers are engaged in agriculture and allied sector, while many others earn their living in coastal areas through tourism or fishing; indeed most of the poorest people live in rural areas and are almost completely reliant on natural resources for their food and shelter. [12]

II. CLIMATE CHANGE SCENARIO

Climate change is a scientifically proven phenomenon that includes "any change in the climate, whether due to its natural variability or as a result of human activity"; [2] it is also a reminder of a sometimes forgotten fact: we are ecologically inter-dependent [15] Human activity takes place within ecological systems not bound by political frontiers and will have generally negative impacts on the environment and on people's well-being if not managed in a sustainable manner.

The latest scientific studies focus on the high atmospheric concentrations of carbon dioxide (CO₂), nitrous oxide (N₂O) and methane (CH₄). The gas with the highest emission volume is CO₂ and it is to a large extent associated with energy generation and productive processes. A third of N₂O emissions are of human origin, mainly due to some of the fertilizers used in agriculture. [2]

The average global surface temperature is projected to increase by 1.4-3°C from 1990-2100 for low emission scenarios and 2.5-5.8°C for higher emission scenarios of green house gases (under the new SRES 'marker' scenarios) in the atmosphere. Study conducted by NASA'S Goddard Institute for space studies 2005 was the warmest year since reliable data available in the late 1800s. The Indian meteorological Department assessed the eight warmest years which occurred in the decades 1997-2007. These warmest years were 2002, 2006, 2003, 2007, 1998, 2004, 1999, and 2001, in the order of warmness. The annual average air

temperature over India was 0.55oC above the averages the normal temperature in these warmest years.

Scientific studies indicate that saturating the sinks, as well as increasing the global temperature, will release additional CO₂ from the natural reserves; this could cause an increase of 200 parts per million (ppm) in the concentration of this GHG in the atmosphere in the next 100 years. This is a substantial increase, especially in view of the fact that the increase in the previous century was only 100 ppm, from 280 to 380 ppm.^[11]

III. IMPACTS OF CLIMATE CHANGE ON HUMAN HEALTH

Global climate change is thus a significant addition to the spectrum of environmental health hazards faced by humankind. The global scale makes for unfamiliarity— although most of its health impacts comprise increases (or decreases) in familiar effects of climatic variation on human biology and health. Health includes physical, social and psychological wellbeing. Population health is a primary goal of sustainable development. Human beings are exposed to climate change through changing weather patterns for example more intense and frequent extreme events) and indirectly through changes in water, air, food quality and quantity, ecosystems, agriculture, livelihoods and infrastructure (Figure 1). These direct and indirect exposures can cause death, disability and suffering. Ill health increases vulnerability and reduces the capacity of individuals and groups to adapt to climate change. Populations with high rates of disease and debility cope less successfully with stresses of all kinds, including those related to climate change. Categories of human health consequences of climate change directly or indirectly: Asthma,

respiratory Allergies, and Airway Diseases, Cancer, Cardiovascular Disease and Stroke, Foodborne Diseases and Nutrition, Heat-Related Morbidity and Mortality, Human Developmental Effects, Mental Health and Stress-Related Disorders, Neurological Diseases and Disorders, Vector-borne and Zoonotic Diseases, Waterborne Diseases and Weather-Related Morbidity and Mortality

Global warming is the increase in the average temperature of the earth’s near-surface air and oceans since the mid-20th century and it project continuation. Global warming is the current issues in front of the world, which cause millions of death, occurred in every year world wide. The global warming affects human health by both ways directly and indirectly. The global warming impacts directly to human as heat and cold waves, indeed extreme weather condition, sea level rise alter the life of humans. In the figure 1 illustrated the possible pathways of impacts of the climate change on human health. High temperatures also raise the levels of ozone and other pollutants in the air that exacerbate cardiovascular and respiratory disease. The known impacts of climate change on human health (table 1). The World Health Organization (WHO) has declared that most health consequences of climate change will be adverse. It is estimated that, in 2000 alone, climate change was responsible for 2.4% of diarrhea cases and 6% of malaria cases worldwide.

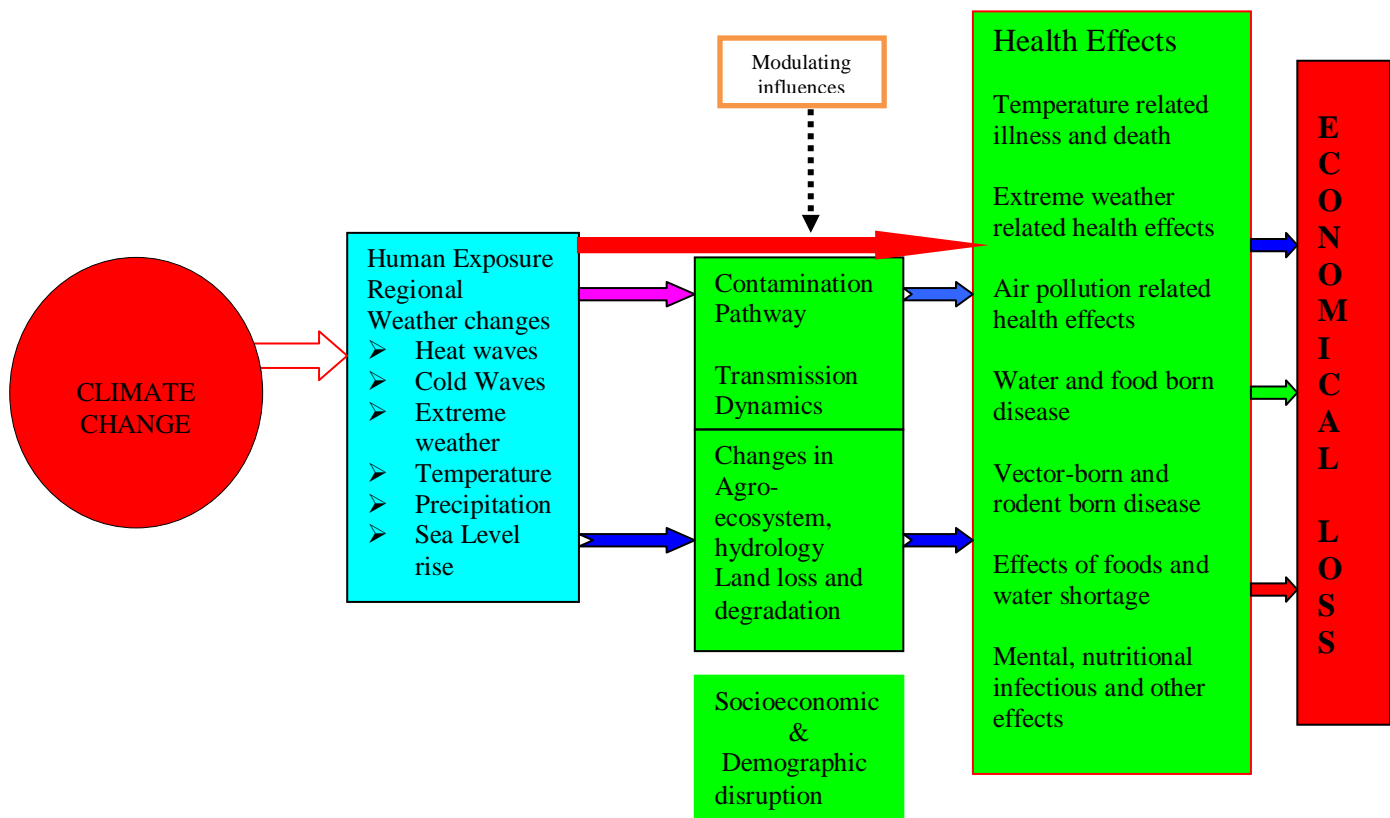


Fig. 1 Pathways by which climate change affects human health and economy of the nation’s [Modified Reference, 7]

One recent study predicted that climate change will put 40 million to 300 million extra people at risk of hunger in 2060. This population would join the 640 million others expected to face food shortage by that date even without climate change, one study by researchers in Netherlands estimates that climate change will case 1 million extra malarial deaths per year by the middle of the this century.

Climate change will have three general types of effects on health:

1. Direct effects of extreme climate events;
2. Effects caused by environmental damage;
3. Tertiary effects caused by the displacement of populations as a result of economic problems, environmental degradation or conflicts arising from climate change (i.e., traumas, infections, psychological diseases and negative effects on food security, among others).^{13]}

Reduce child mortality - Extreme climate conditions such as out-of-season rains, floods and droughts may increase infant mortality. Water-borne diseases and those caused by poor sanitation (such as diarrhea) and respiratory infections related to

pollution, are the main causes of mortality in children under five years of age.^{4]}

Health effects of rising sea levels - Today about 350 million people can be considered displaced ^[8] – some temporarily, some long-term. They include over 150 million people involuntarily displaced—people forced from their homes by weather-related disasters, gradual environmental degradation such as desertification and sea level rise or due to development projects, such as the construction of dams, mines, roads, factories, plantations and wildlife reserves. The IPCC and the Stern review speak in the next 20 years 150 million and 200 million permanently displaced due to rising sea-levels, floods and droughts in 2050. These are widely disputed estimates^[5], but give an order of magnitude that shows that by 2030, the number of Climate Displaced People could at least triple. They migrate because they are driven from their homelands by weather disasters or gradual environmental degradation that generates economic migration.^[5,9]

Table 1. Health impact of climate change and ozone layer depletion (Modified from reference 13)

Health Effects	Known Effects
Thermal Stresses	<ul style="list-style-type: none"> • Mortality (especially cardiopulmonary) increases with cold and warm temperatures • Older age group and people with underlying organic diseases are particularly vulnerable • Mortality increases sharply during heat wave
Vector-born diseases	<ul style="list-style-type: none"> • Climate conditions (particularly temperature) necessary for some vectors to thrive and for the microorganisms to multiply within the vectors are relatively well Known
Water/food-born diseases	<ul style="list-style-type: none"> • Survival of disease organisms (and insects which may spread them) is related to temperature • Water-borne diseases most likely to occur in communities with poor water supply and sanitation • Climate condition affect water availability • Contamination of portable water, particularly following extreme rainfall; seepage of contaminants from illegal dumping of solid waste and other waste into underground aquifers
Food Production	<ul style="list-style-type: none"> • Temperature, precipitation, solar radiation and carbon dioxide are important for crop production • The potential indirect effect of increased UV-B level reaching the Earth lead to impairment of photosynthesis on land (food crops) and in the sea (phytoplankton), reducing the world’s food production • Crop failure may lead to malnutrition • Undernourishment may increase susceptibility to infectious diseases
Skin Cancer	<ul style="list-style-type: none"> • Skin cancer is related to UV exposure (both melanoma skin cancer and non-melanoma skin cancer), people with lightly pigmented skin being most susceptible • Aging increases the risk of skin cancer
Cataracts	<ul style="list-style-type: none"> • UV radiation damages the eye, more particularly the lens • Different types of cataracts will react differently to changes to UV radiation • Aetiology of cataracts is assisted with age, diabetes, malnutrition, heavy smoking, hypertension, renal failure, high alcohol consumption, and excessive heat

Immune suppression	<ul style="list-style-type: none">• UV suppresses immune system in animal models, and may adversely affect various infections• In man, serial UV radiation may cause proper immunization to fail• UV-induced immuno-suppression appear to be a risk factor for skin carcinomas
--------------------	--

Potential effects on health due to sea level rise^[6] include:

1. Death and injury due to flooding.
2. Reduced availability of fresh water due to saltwater intrusion.
3. Contamination of water supply through pollutants from submerged waste dumps.
4. Change in the distribution of disease-spreading insects.
5. Health effect on the nutrition due to a loss in agriculture land and changes in fish catch
6. Health impacts associated with population displacement.

India has a 7500 km long densely populated coast line, which is vulnerable to coastal floods, hurricanes, cyclones, and tsunamis. Any increase in frequency and severity of these extreme climate events or change in coastline as projected is likely to have serious effects and can cause population displacement. These displaced people are likely to face diverse health consequences - traumatic, infectious, nutritional, psychological, and other - that occur in demoralized and displaced populations in the wake of climate-induced economic dislocation, environmental decline, and conflict situations.^[14]

IV. CONCLUSION

Climate change endangers human health, affecting all sectors of society, both domestically and globally. Global climate change has become one of the most visible environmental concerns of the 21st century. The carbon dioxide levels are currently highest of the available data, the values is 345 ppm and 450 ppm is supposed to be very risky. The number of people at risk from flooding by coastal storm surgery is projected to increase from the current 75 million to 200 million in a scenario of mid-range climate change, in which a rise in the sea level of 9-88 cm is envisaged by the 2100s.

REFERENCES

- [1] Hansen James E. et al., 2006, Goddard Institute for Space Studies, GIS surface Temperature Analysis. NASA Goddard Institute for Space Studies.
- [2] IPCC. (2007). Fourth Assessment Report (FAR) Climate Change 2007. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.
- [3] Intergovernmental Panel on Climate Change (2001). Impact Adaptation and vulnerability, Contribution of working group to the third Assessment Report, Cambridge University Press Cambridge. UK, 1-1000.

- [4] Malchinkhuu, D. (2001). 2001 MGL: Survey on Mortality in Children under Five: Causes and Influencing Factors. UNICEF and MOHSW.
- [5] Myers, N. (2005). Environmental refugees: an emergent security issue. 13 Economic Forums. http://www.osce.org/documents/eea/2005/05/14488_en.pdf.
- [6] Patil, R.R. and Deepa T M. (2007). Climate change: The challenges for public health preparedness and response: An Indian case study. Indian J Occup Environ Med., 11:113-5.
- [7] Patz, J. A. (2000). The potential health impacts of climate variability and change for the report of the health sector of the U. S. National Assessment. Environmental Health perspective, 108(4):367-76
- [8] Renner, M. (2008). Environment a Growing Driver in Displacement of People. World Watch Institute, September. <http://www.worldwatch.org/node/5888>.
- [9] Stern, N., et al. (2006). Stern Review: The Economics of Climate Change. HM Treasury, Chapter 6, http://www.hm-treasury.gov.uk/stern_review_report.htm.
- [10] Thullier, W. (2007). Climate Change and the Ecologist, in: Nature 448/2: 550-552.
- [11] United Nations Educational, Scientific and Cultural Organization (UNESCO) & Scientific Committee on Problems of the Environment (SCOPE). (2006). the Global Carbon Cycle. UNESCO-SCOPE Policy Briefs 2, Paris.
- [12] UNDP (2007/8). Fighting climate change: Human Solidarity in a divided world. Human Development Report.
- [13] World Health Organization. (2003). Climate change and human health – Risks and responses. [<http://www.who.int/globalchange/climate/en/ccSCREEN.pdf>]. (Last consulted 01 March 2011).
- [14] World Health Organization. (2005). Health impacts from climate variability and change in the Hindu Kush-Himalayan Region: Report of an inter-regional workshop, Mukteshwar, India. New Delhi: WHO Regional Office for South-East Asia; 2005.
- [15] Wyman & Stevenson. (2000). All nations and all human beings share the same atmosphere and we only have one. UNDP, 2007.
- [16] Confalonieri, U., B. Menne, R. Akhtar, K.L. Ebi, M. Hauengue, R.S. Kovats, B. Revich and A. Woodward, 2007: Human health. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 391-431.

AUTHORS

First Author – R. K. Prajapati, Ph.D., Department of Energy and Environment, Mahatma Gandhi Chittrakoot Gramodaya University Chittrakoot-485335 Satna (M.P.) INDIA
rajsvps11@gmail.com