



Climate Change and Global Warming: An Impact on Public Health in India

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ABSTRACT

India as a developing country does not have any commitments or responsibilities at present for reducing the emissions of greenhouse gases such as CO₂ that lead to global warming, pressure is increasing on India and other large, rapidly developing countries like China and Brazil to adopt a more protective role. The sources cited in this research paper are mainly taken from the internet. However, as the main focus of this article is on policies and not on science, I hope that this research paper does not contain ambiguities concerning policies.

There is scientific consensus that the global climate is changing, with rising surface temperatures, melting ice and snow, rising sea levels, and increasing climate variability. These changes are expected to have substantial impacts on human health. There are known, effective public health responses for many of these impacts, but the scope, timeline, and complexity of climate change are unprecedented. We propose a public health approach to climate change, based on the essential public health services, that extends to both clinical and population health services and emphasizes the coordination of government agencies (federal, state, and local), academia, the private sector, and nongovernmental organizations.

Keywords: Global Warming, Climate Change, Public, Human Health.

INTRODUCTION

Global warming has emerged as one of the most important environmental issues ever to confront humanity. This concern arises from the fact that our everyday activities may be leading to changes in the earth's atmosphere that have the potential to significantly alter the planet's heat and radiation balance. It could lead to a warmer climate in the next century and thereafter, portending a potpourri of possible effects – mostly adverse.

International efforts to address this problem have been ongoing for the last decade, with the Earth Summit at Rio in 1992 as an important launching point, and the Conference of Parties in Buenos Aires in 1998 as the most recent step. Although India as a developing country does not have any commitments or responsibilities at present for reducing the emissions of greenhouse gases such as CO₂ that lead to global warming, pressure is increasing on India and other large, rapidly developing countries such as China and Brazil to adopt a more pro-active role. At the same time, the developed countries of the North are trying to limit the extent of their commitments for emission reduction. In this situation, the public and policy makers need to be aware of the ramifications and implications of the global warming problem, even if it is a problem that may manifest itself only sometime in the next century.

OVERVIEW OF THE HEALTH EFFECTS OF CLIMATE CHANGE GLOBAL SCENARIO

Climate change affects health in many ways. This is highlighted by the World Health Organization (WHO) when it chose to mark 'World Health Day 2008' with the theme International Perspectives on Global Environmental Change: Protecting Health from Climate Change." The relationship between climate change and human health is multidimensional. The fourth assessment report of IPCC, 2007 has already identified three areas in which human health has already been affected by climate change. The effects of climate change on human health are influenced by a variety of pathways and there may be long delays between causes and effects. Various methods have been developed for quantitative estimation of health impacts of future climate change.

WHO has defined a general methodology to quantify the disease burden caused by 26 risk factors at selected time points up to 2030. In Comparative Risk Assessment (CRA); the major **environmental, occupational,**

behavioural and lifestyle risk factors include smoking, alcohol consumption, unsafe sex, diet, air pollution, water and sanitation, and climate change. However, measurements of climate change and its effects on human.

Health would take several decades as we do not have standardized monitoring methods for longterm measurement of climate sensitive diseases. Also it is difficult to control the effects of natural climate variability over the years. Relatively small, but significant climatic changes that have occurred so far, are poor proxies for the larger changes forecast for the coming decades.

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as ‘a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods’.

In the last 130 years, the world has warmed by approximately 0.85°C. Each of the last 3 decades has been successively warmer than any preceding decade since 1850.

There are significant impacts of climate change in the form of changing weather pattern, rising sea levels, melting of glaciers, forest fires, changing precipitation patterns and more extreme weather events, such as Kashmir floods (2014), Uttarakhand flash floods (2013), Tsunami (2004) are some vivid examples. Globally an estimated 12.6 million deaths are caused by avoidable environmental risk factors every year.

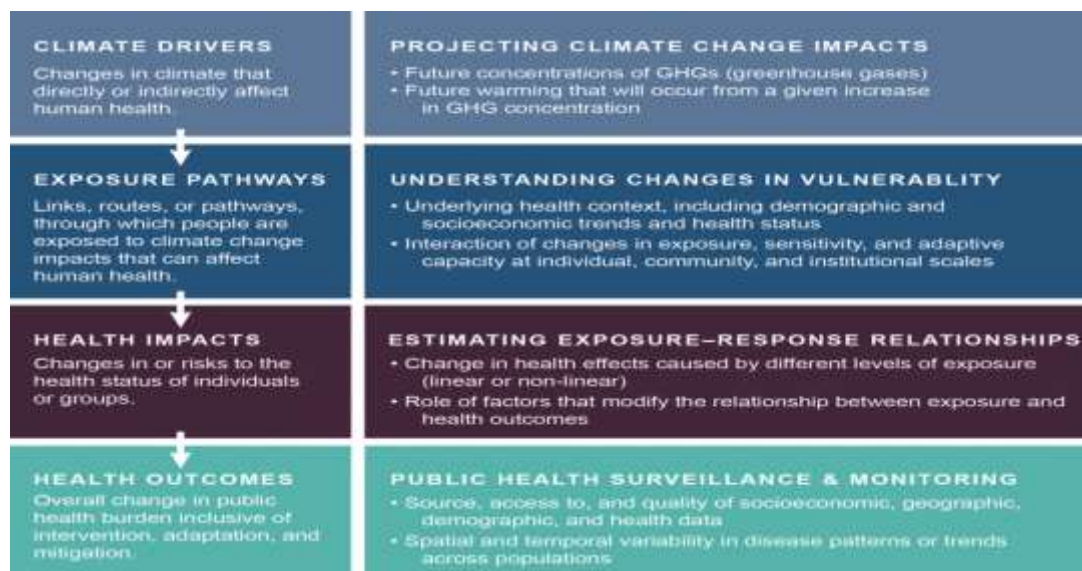
Impact of climate change on human health:



INDIAN SCENARIO

The major brunt of global climate change in terms of adverse health impact will be mostly borne by the poor and developing countries, even though the rich and industrialized countries account for maximum greenhouse gas emission. Though India has contributed only 2 per cent of the total carbon emissions from fossil fuel burning over the last 100 years, still it is likely to experience greater effects from the ‘extreme weather’ events. Major health effects due to changing climate can be broadly classified as follows:

- Extreme weather-related health effects
- Air pollution-related health effects
- Water and food-borne diseases
- Vector-borne diseases • Effects of food and water shortages
- Psycho-social impacts on displaced populations
- Health impacts from conflicts over access to vital resources



Besides the visible effects on people's livelihoods, global warming is predicted to have a strong and adverse impact on human health. The populations of countries that have contributed the least to global warming are the most vulnerable to death and diseases brought about by higher temperatures. The coastlines along the Pacific Ocean and the Indian Ocean and in sub-Saharan Africa will be at higher risk of enduring the health effects of climate change.

The World Health Organization (WHO) reports that climate change is responsible for at least 150,000 deaths per year, a number that is expected to double by 2030. The effects of global warming will cause direct health consequences:

HEAT WAVES

Prolonged periods of abnormally high temperatures can have serious health effects on vulnerable populations, such as the elderly and the sick. This was already seen during the 2003 heat wave in Europe, which claimed approximately 35,000 lives. In a study by Hadley Centre for Climate Prediction and Research in the United Kingdom, scientists using computer models showed how greenhouse gas emissions have increased the likelihood of heat waves. The most common health effect is hyperthermia or heatstroke that can be fatal if left untreated. IPCC predicts that global warming will lead to hot days, followed by nights of high temperatures.

WATER-BORNE DISEASES

A warmer climate could cause water-borne diseases to become more frequent, including cholera and diarrhoeal diseases such as giardiasis, salmonellosis, and cryptosporidiosis. Diarrhoeal diseases are already a major cause of morbidity and mortality in South Asia, particularly among children. It is estimated that one-quarter of childhood deaths in South Asia are due to diarrhoeal diseases. As rising ambient temperatures increase, bacterial survival time and proliferation and thus the incidence of diarrhoeal diseases might further increase.

Diarrhoeal diseases are largely attributable to unsafe drinking water and lack of basic sanitation; thus, reductions in the availability of freshwater are likely to increase the incidence of such diseases. Rapid urbanization and industrialization, population growth, and inefficient water use are already causing water shortages in India, Pakistan, Nepal, and Bangladesh. Climate change will exacerbate the lack of available fresh water as annual mean rainfall decreases in many areas.

Cholera is a well-known water-borne diarrhoeal disease that has afflicted humankind since ancient times. Outbreaks of cholera have occurred in India, Bangladesh, and more recently, Latin America and Africa. Molecular techniques have shown that bacteria are now recognized as naturally occurring in aquatic environments, with bacterial population peaks in spring and fall in association with plankton blooms. The discovery of *Vibrio cholerae* in the natural environment, with a dormant state between epidemics, changed the understanding that this disease had only a human reservoir. A relationship has been observed between increase in sea-surface temperature and the onset of cholera epidemics, with the cholera outbreaks following the seasonal rise and fall in sea-surface height and temperature. Increases in cholera bacterial populations associated with plankton blooms in spring and summer have been noted off the coasts of several Latin American countries and in Bangladesh.

OTHER VECTOR-BORNE AND ZOO NOTIC DISEASES

Climate change might affect other diseases endemic to South Asia. These include mosquito-borne diseases such as chikungunya fever and dengue, parasitic diseases such as leishmaniasis, lymphatic filariasis and onchocerciasis, and tick-borne diseases, which may exhibit changes in transmission intensity or shifts in their geographical ranges due to the impact of climate on the relevant vector populations. Climatic factors might also influence human plague, a bacterial disease carried by rodents and transmitted by fleas. Temperature and rainfall are important determinants of rodent population abundance and distribution. Combined with the influence of temperature and humidity on flea survival and development, changes in any of these climatic components may result in changes in plague incidence. Murine typhus, a rickettsia disease, is also transmitted by fleas and thus may exhibit similar climate sensitivity.

The arboviral diseases chikungunya and dengue may also be influenced by climate, as both are transmitted by the common vector *Aedes aegypti*. The first reported outbreak of chikungunya in India was in 1963 in Calcutta (now Kolkata), with transmission continuing until 1973. The virus reemerged in 2005, and has since spread rapidly, with more than one million cases reported - despite no standardized surveillance system for the disease. Dengue has also been a significant problem, with more than 50 dengue outbreaks reported in India since 1960. The activity, abundance, distribution, and ability to transmit viruses is influenced by temperature and precipitation.

INDIRECT IMPACTS

➤ Infectious Diseases

IPCC predicts that global warming will worsen human health conditions, especially in tropical regions. In places like Africa, an increase in temperature signifies an increase in mosquito populations, thus escalating the risk of malaria, dengue and other insect-borne infections. Other regions are also affected. The United States experienced varying levels of malaria outbreaks; in 2006, the United Kingdom was plagued by an outbreak of legionnaires' diseases -- a bacterial lung infection that scientists attribute to global warming. WHO states that global warming will also cause a major increase in insect-borne diseases in Europe? Countries like Azerbaijan, Tajikistan and Turkey might already be in the danger zone for mosquito-borne malaria. However, the ability to tolerate temperature changes differs from region to region. Richer societies can utilize technological advances; for example, the use of more powerful air conditioners and the construction of houses minimize heat retention. On the other hand, developing countries lack not only the technological know-how, but also the resources and public health systems, required to prevent such outbreak.

Loss of Agricultural Productivity

Global warming can result in droughts that can worsen living conditions, particularly in Africa. The World Wild Fund has reported that climate change can drastically alter rainfall pattern, and risk water and food supplies for millions. The IPCC report estimates that approximately 75 million to 250 million people in Africa will be without adequate water and will face food shortages by 2020, as crop productivity will decline by about 50 per cent. Rising temperature could also result in food shortages for 130 million people in Asia.

Asthma and Other Respiratory Diseases

People suffering from heart problems are more vulnerable to increased temperatures, especially those living in already warm areas, as their cardiovascular system must work harder to keep their body cool. Hot temperatures increase the ozone concentration, which can damage people's lung tissue and cause complications for asthma patients and those with lung diseases. Increased global warming can also pose a threat to national security, affecting food security, which, in turn, can lead to resource conflicts. At the UN Security Council debate on energy, security and climate, British Foreign Secretary Margaret Beckett introduced global warming as a security risk. Despite opposition from many Council members, such as the Russian Federation and China, she argued that the loss of basic needs due to climate change in poor countries can increase the risk of conflicts. Similarly, Ugandan President Yoweri Museveni has labelled climate change as "an act of aggression by the rich against the poor".

Air Quality-Respiratory Diseases

Warmer air temperatures can influence the concentration of regional air pollutants and aeroallergens. Allergenic pollens grow more profusely in a warmer climate leading to respiratory disorders such as asthma, emphysema and chronic bronchitis, and allergy problems. Vehicular pollution, particularly in metropolitan cities experience heavy smog and haze resulting in asthmatic attacks. When combined with smog and other atmospheric pollutants, illness from allergic respiratory diseases, particularly asthma, could increase. Changes in the climate also affect diseases like chronic obstructive pulmonary disease, pneumothorax, and respiratory infections in children. There are also indications of relationship between air

pollution and tuberculosis. Further, there is some evidence that dust storm in deserts as well as high altitude areas can lead to respiratory problems. There is ample scope of establishing a relationship between climate change and exacerbations in respiratory diseases in India.

The quality of air is likely to decrease as surface ozone concentrations begin to rise with increasing temperatures. This will lead to an increasing incidence of asthma and other cardiovascular and respiratory diseases. This is-sue is being addressed by the Govt. of India by introducing compressed natural gas (CNG) for transport and replacement of wood fire for cooking by the liquid petroleum gas (LPG) in villages. It is an excellent example of co-benefits of other sectors to human health Air quality-respiratory diseases Warmer air temperatures can influence the concentration of regional air pollutants and aeroallergens. Allergenic pollens grow more profusely in a warmer climate leading to respiratory disorders such as asthma, emphysema and chronic bronchitis, and allergy problems. Vehicular pollution, particularly in metropolitan cities experience heavy smog and haze resulting in asthmatic attacks. When combined with smog and other atmospheric pollutants, illness from allergic respiratory diseases, particularly asthma, could increase. Changes in the climate also affect diseases like chronic obstructive pulmonary disease, pneumothorax, and respiratory infections in children. There are also indications of relationship between air pollution and tuberculosis. Further, there is some evidence that dust storm in deserts as well as high altitude areas can lead to respiratory problems. There is ample scope of establishing a relationship between climate change and exacerbation in respiratory diseases in India.

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DIRECT IMPACTS

Direct impacts on mental health happen when a community experiences extreme weather and changed environment. Direct impacts like landscape changes, impaired place attachment, and psychological trauma are all immediate and localized problems resulting from extreme weather events and environmental changes. extreme weather events cause negative changes to landscape and agriculture. This leads to communities facing economic aspects, especially for communities that use agriculture as a main source of income. After economic fall, communities face loss of livelihoods and poverty. Many communities will also face isolation, alienation, grief, bereavement, and displacement from these effects. Individuals will have an increased rate of anxiety and emotional stress. The rate of effects on mental health increases in already-vulnerable communities. Clayton reinforces that the more powerful the extreme weather event, and the more frequent these weather events are, the more damage is done to the mental health of the community. Some of the extreme weather events responsible for these mental health changes include wildfires, earthquakes, hurricanes, fires, floods, and extreme heat.

PSYCHOLOGICAL IMPACT

Psychological impacts are the effects that heat, drought, migrations, and climate-related conflicts have on social life and community life. This includes post-disaster adjustment. Most of these effects are indirect instead of direct, but Clayton and Berry place them in a separate category because they deal with the relationships within a community. Many of the results are from how people use and occupy territory. Human migration of large communities causes discord within those communities because the already scarce resources are even more limited during migration. Agriculture and aquaculture are severely impacted by the extreme weather events of climate change, the suitability of territory being the most notable kind of change. During and after migration, the geographical distribution of populations is altered. Children and parents may be separated at these times. The early separation of children from their parents can cause symptoms of grieving, depression, and detachment in both the young and old.

The loss in resources can also lead to inter-community violence and aggression. Two groups may fight over remaining natural resources. A community may choose to migrate to find better resources, and encroach on another community's territory, either accidentally or purposefully. Civil unrest can occur when governments fail to adequately protect communities against the extreme weather events that cause these effects. When this happens, individuals lose confidence and trust in their government. A loss in trust can be the beginning of oncoming mental health problems. The disruption of a community when they are forced to relocate results in the deterioration of geographic and social connections. This leads to grief, anxiety, and an overall sense of loss.

GLOBAL WARMING AND CLIMATE CHANGE PREVENTION

1. Renewable energies

The first way to prevent climate change is to move away from fossil fuels. What are the alternatives? Renewable energies like solar, wind, biomass and geothermal.

2. Energy & water efficiency

Producing clean energy is essential, but reducing our consumption of energy and water by using more efficient devices (e.g. LED light bulbs, innovative shower system) is less costly and equally important.

3. Sustainable transportation

Promoting public transportation, carpooling, but also electric and **hydrogen mobility**, can definitely help reduce CO2 emissions and thus fight global warming.

4. Sustainable infrastructure

In order to reduce the CO2 emissions from buildings - caused by heating, air conditioning, hot water or lighting - it is necessary both to build new low energy buildings, and to renovate the existing constructions.

5. Sustainable agriculture & forest management

Encouraging better use of natural resources, stopping massive deforestation as well as **making agriculture greener** and more efficient should also be a priority.

6. Responsible consumption & recycling

Adopting responsible consumption habits is crucial, be it regarding food (particularly meat), clothing, cosmetics or cleaning products. Last but not least, recycling is an absolute necessity for dealing with waste.

CONCLUDING REMARKS

International agreements to deal with global environmental issues such as climate change should invoke the principles of sustainable development proposed in Agenda 21 and the UNFCCC.

These include the precautionary principle described earlier, the principle of costs and responsibility, implying that the cost of pollution or environmental damage should be borne by those responsible, and that of equity. Considerations of equity or fairness can apply within and between countries and over time (between generations). Equity implies having equal or similar opportunities, allowing all to maintain an acceptable level of living conditions or quality of life. The balance of benefits and costs of climate change, for example, is likely to differ between affluent communities in wealthy countries and marginal populations in poor countries, and between current generations (some may benefit from early stages of warming) and future generations.

KEY PRINCIPLES IN AGENDA 21 AND UNFCCC PRECAUTIONARY APPROACH AGENDA 21

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. UNFCCC: The Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing such measures, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost.

COSTS AND RESPONSIBILITY AGENDA 21

National authorities should endeavour to promote the internationalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment. UNFCCC: The Parties should protect the climate system for the benefit of present and future generations of humankind on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed countries should take the lead in combating climate change and the adverse effects thereof.

EQUITY AGENDA 21

Adherence to these principles would make a substantial contribution towards the prevention of any future global environmental threat and the reduction of existing ones. As climate change processes already are underway, efforts also must focus on assessing current and future vulnerabilities and identifying necessary interventions or adaptation options. Adaptation has the potential to reduce adverse effects of climate change but is not expected to prevent all damages. Therefore, early planning for health is essential to reduce, hopefully avoid, near future and longer-term health impacts of global climate change. The optimal solution, however, is in the hands of governments, society and every individual—a commitment for a change in values to enable a full transition to sustainable development.

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