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Climate change and health: Why should India is concerned

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ABSTRACT
Overwhelming evidence shows that climate change presents growing threats to public health security – from extreme weather-related disasters to wider spread of such vector-borne diseases as malaria and dengue. The impacts of climate on human health will not be evenly distributed around the world. The Third Assessment Report (Intergovernmental Panel on Climate Change-2001) concluded that vulnerability to climate change is a function of exposure, sensitivity, and adaptive capacity. Developing country populations, particularly in small island states, arid and high mountain zones, and in densely populated coastal areas are considered to be particularly vulnerable. India is a large developing country, with the Great Himalayas, the world's third largest ice mass in the north, 7500 km long, and densely populated coast line in the south. Nearly 700 million of her over one billion population living in rural areas directly depends on climate-sensitive sectors (agriculture, forests, and fisheries) and natural resources (such as water, biodiversity, mangroves, coastal zones, grasslands) for their subsistence and livelihoods. Heat wave, floods (land and coastal), and draughts occur commonly. Malaria, malnutrition, and diarrhea are major public health problems. Any further increase, as projected in weather-related disasters and related health effects, may cripple the already inadequate public health infrastructure in the country. Hence, there is an urgent need to respond to the situation. Response options to protect health from effects of climate change include mitigation as well as adaptation. Both can complement each other and together can significantly reduce the risks of climate change.

I. INTRODUCTION

Climate change is a significant and emerging threat to public health. Hence, it is finding an increasingly central position on the international agenda as most recently evidenced by the Nobel Prize awarded to the former US Vice President, Al Gore, and a team of UN experts under the chairmanship of Dr.Rajendra K. Pachauri (Director General, The Energy and Resources Institute, New Delhi) for their work on the subject. In 2008, the World Health Organization (WHO) focused on the need to protect health from the adverse effects of climate change. The World Health Day – 2008 theme "Protecting health from climate change" raises the profile of health dangers posed by global climate variability and change. It was selected because overwhelming evidence shows that climate change presents growing threats to international public health security.

SCOPE

This article describes the process of global climate change, its current and future impacts on human health in general and India in particular, and how we can lessen those adverse impacts by mitigation and adaptation strategies.

GLOBAL CLIMATE CHANGE

Climate change occurs over decades or longer time scales. Until now, changes in the global climate have occurred naturally, across centuries or millennia, because of continental drift, various astronomical cycles, variations in solar energy output, and volcanic activity. Over the past few decades, it has become increasingly apparent that human actions are changing atmospheric composition, thereby causing global climate change.[1] Humankind's activities are altering the world's climate by increasing the atmospheric concentration of energy-trapping gases (greenhouse gases [GHGs]), thereby amplifying the natural "greenhouse effect" that makes the Earth habitable. These GHGs comprise, principally, carbon dioxide (mostly from fossil fuel combustion and forest burning) plus other heat-trapping gases such as methane (from irrigated agriculture, animal husbandry, and oil extraction), nitrous oxide, and various human-made halocarbons. According to the Fourth Assessment Report (2007) of the

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Intergovernmental Panel on Climate Change (IPCC), the observed effects include:

- The global average surface temperature has increased by approximately 0.65°C over the last 50 years.
- Eleven of the last 12 years (1995–2006) rank among the 12 warmest years since records began in the 1850s.
- The rates of warming and of sea level rise have accelerated in recent decades.
- Many areas, particularly mid- to high-latitude countries, have experienced increases in precipitation and there has been a general increase in the frequency of extreme rainfall.
- In some regions, such as parts of Asia and Africa, the frequency and intensity of droughts have increased in recent decades.
- The frequency of the most intense tropical cyclones has increased in some areas, such as the North Atlantic, since the 1970s.

As we continue to change atmospheric composition, climatologists forecast further warming during the coming century and beyond. The IPCC has made the following projections for the next century:

Global mean surface temperature will rise by 1.1–6.4° C, depending partly on future trends in energy use. Warming will be greatest over land areas and at high latitudes.

Heat waves, heavy precipitation events, and other extreme events will become more frequent and intense.

Sea level rise is expected to continue at an accelerating rate.

IMPACT OF CLIMATE CHANGE ON HUMAN HEALTH

Our personal health may seem to relate mostly to prudent behaviour, heredity, occupation, local environmental exposures, and health-care access, but sustained population health requires the life supporting "services" of the biosphere. Populations of all animal species depend on supplies of food and water, freedom from excess infectious disease, and the physical safety and comfort conferred by climatic stability. The world's climate system is fundamental to this life support. A changing climate is likely to affect all these conditions and hence have a powerful impact on human health and well-being. In its Third Assessment Report, the United Nation's IPCC concluded that "climate change is projected to increase threats to human health." Climate change can affect human health directly (e.g., impacts of thermal stress, death/injury in floods and storms) and indirectly through changes in the ranges of disease vectors (e.g., mosquitoes), water-borne pathogens, water quality, air quality, and food availability and quality. Global climate change is, therefore, a newer challenge to on-going efforts to protect human health.

WHY SHOULD INDIA BE CONCERNED?

The Third Assessment Report (IPCC-2001) concluded that vulnerability to climate change is a function of exposure, sensitivity, and adaptive capacity. India is a large developing country, with the Great Himalayas, the world's third largest ice mass in the north, 7500 km long, and densely populated coast line in the south. Nearly 700 million of her one billion population living in rural areas directly depends on climate-sensitive sectors (agriculture, forests, and fisheries) and natural resources (such as water, biodiversity, mangroves, coastal zones, grasslands) for their subsistence and livelihoods. Further, the adaptive capacity of dry land farmers, forest dwellers, fisher folk, and nomadic shepherds is very lowClimate change is likely to impact all the natural ecosystems as well as socioeconomic systems, as shown by the National Communications Report of India to the United Nations Framework Convention on Climate Change

The latest high-resolution climate change scenarios and projections for India, based on the Regional Climate Modelling system, known as PRECIS, developed by the Hadley Centre and applied for India using IPCC scenarios A2 and B2,show an annual mean surface temperature rise by the end of the century, ranging from 3 to 5°C under the A2 scenario and 2.5 to 4°C under the B2 scenario, with warming more pronounced in the northern parts of India. A 20% rise in all India summer monsoon rainfall and further rise in rainfall is projected over all states except Punjab, Rajasthan, and Tamil Nadu, which show a slight decrease. Extremes in maximum and minimum temperatures are also expected to increase and similarly extreme precipitation also shows substantial increases, particularly over the west coast of India and west central India. Rapid mountain glacier retreat has been documented in the Himalayas, meltwater from the Himalayan glaciers contributing a sizeable portion of river flows to the Ganges, Brahmaputra, Indus, and other river systems. Public health, to a large extent, depends on safe drinking water, sufficient food, secure shelter, and good social conditions. A changing climate is likely to affect all these conditions.

Health effects of extreme temperatures

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Extremes of temperature can kill. While Himachal Pradesh and Uttaranchal experienced a cold wave, other parts in the country were subjected to heat wave. In 1998, the heat wave in Orissa was recorded as one of the worst, claiming more than 2000 lives. 1998 was the warmest year globally.Andhra Pradesh reeled under heat wave in 2003, killing 1421 people, which is an all-time high in the history of Andhra Pradesh.Effects of heat wave were also observed in Uttar Pradesh, Haryana, Punjab, Rajasthan, Gujarat, Bihar, and Orissa in 2003. In June 2005, Orissa recorded the highest temperature of 46.3°C in Bhubaneswar of the last 33 years, which is 10° above normal,leading to a heat wave. This is not limited to India only. In July 1995, a heat wave in Chicago, USA, caused 514 heat-related deaths (12 per 100,000 population) and 3300 excess emergency admissions. The record high temperatures in Western Europe in the summer of 2003 were associated with a spike of an estimated 70,000 more deaths than the equivalent periods in previous years. Most of the excess deaths during times of thermal extreme are in persons with pre-existing disease, especially cardiovascular and respiratory disease. The very old, the very young, and the frail are the most susceptible. Extremes in maximum and minimum temperatures are also expected to increase. Therefore, it is anticipated that there will be an increase in the number of deaths due to greater frequency and severity of heat waves.

Health effects of extreme weather events

Extreme weather events such as severe storms, floods, and drought have claimed thousands of lives during the last few years and have adversely affected the lives of millions and cost significantly in terms of economic losses and damage to property. India and the subcontinent saw five of the 20 major natural calamities recorded worldwide in terms of victims. Orissa is no stranger to cyclones, but the 1999 cyclone was unprecedented for the sheer severity, with wind speed reaching over 300 km/h, leaving nearly 10,000 dead, and has gone down in history as the Super cyclone. In 2003, floods claimed thousands of lives and rendered millions of people homeless in Assam, Bihar, West Bengal, Orissa, Uttar Pradesh, Himachal Pradesh, Rajasthan, and Gujarat. Severe drought conditions is most of the north west, major parts of north India, north east India, and parts of Andhra Pradesh, the Telangana and Rayalseema regions, and parts of Tamil Nadu destroyed crops to the tune of USD 25 million, with many starvation deaths being reported. Floods are an annual feature in Bihar, but the 2004 floods was unique for its severity. Recent climate emergencies in India included a heat wave in Orissa (2004), a cold wave in Uttaranchal and Uttar Pradesh (2004), a tsunami affecting Tamil Nadu, Andhra, Kerala, and the Andaman-Nicobar Islands (2004), floods in Madhya Pradesh and Gujarat (2005), rains and floods in Maharashtra (2005), and a cyclone in Andhra Pradesh (2005). These climate extremes, apart from health, also damage the public health infrastructure. India, like other developing countries, is poorly equipped to deal with weather extremes. Hence, the number of people killed, injured, or made homeless by natural disasters has been increasing rapidly.

Health effects of more variable precipitation patterns

The Indian metropolitan city of Mumbai was besieged with India's heaviest downpour of the century in July 2005, killing nearly 600 people. According to the Indian Meteorological department, it was the heaviest ever rainfall received in a single day anywhere in India, recorded at 94.4 cm in the last 100 years. It broke the record of the previous highest rainfall at one place in India at Cherrapunjee in Meghalaya of 83.82 cm, recorded on 12 July, 1910. On the other hand, Cherrapunjee in the north eastern state of Meghalaya, generally well known for being the wettest place in the world, is going through a rare rain crisis and is experiencing dry spells. This may lead to floods in some areas and drought in other areas and thus endangering food security and also affecting the quantity and quality of water. More variable rainfall patterns are likely to compromise the supply of fresh water. For example, in Kashmir (India), heat events have been increasing in the last decade. Rainfall in Srinagar appears to have been declining and Kashmir has experienced warmer than average winters, with snow melting as early as January and droughts occurring in the summer months of July and August. Water shortages have been reported during what have traditionally been wet summer months, with water having to be trucked in on occasion. There has been an increase in waterborne diseases and skin problems due to water shortages

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