

Climate Change Impacts on

Human Health in India



Predicted impacts on human health due to climate change include increases in temperature related illnesses, vector borne diseases, health impacts related to extreme weather events, and health effects due to food insecurity. These changes will require more emphasis to be placed on planning for health facilities, as well as increased capacity of the medical community to cope with these changes.



Human Health and climate change

Both climatological and medical communities are increasingly concerned that climate change is likely to have wide-ranging impacts on health. The poor, as well as the elderly, children, and the disabled are likely to be most vulnerable to these changes, as they already face limited access to health facilities.

Among vector-borne diseases in India, malaria is of considerable concern. Periodic epidemics of malaria occur every five to seven years, and the World Bank estimates that about 577,000 DALYs (disability-adjusted life years) were lost due to malaria in India in 1998. Climate change could increase the incidence of malaria in areas that are already malaria-prone, and also introduce malaria into new areas.

The National Physical Laboratory (NPL), New Delhi undertook a study of the impacts of predicted climate change on human health in India, with a particular focus on malaria.

The National Physical Laboratory

The National Physical Laboratory (NPL) is one of the earliest national laboratories set up under the Council of Scientific & Industrial Research, Government of India. The main activity of NPL, in addition to its role as custodian of national standards, is to strengthen and advance physics-based research for the overall development of science & technology in the country. NPL has a center dedicated to Global Climate Change, and is one of the leading organisations in the country working on various studies on climate change for international donors, as well as other government departments and universities. www.nplindia.org/npl

Description of methodology

A range of potential health impacts caused by climate change were identified as a part of this study. Table 9.1 below describes the potential health vulnerabilities in greater detail.

The NPL study focused on malaria, a vector borne disease, because of its prevalence in India. The project considered the present malaria scenario in seven states with large tribal populations that are particularly vulnerable to malaria, and investigated climate determinants which are conducive to malaria parasite growth and transmission (defined in terms of temperature, precipitation and humidity). Using the climate determinants, and the outputs of the climate change scenarios as derived from the HadRM2 model (see Keysheet 2), future temporal and spatial projections of disease in India have been identified. The climate determinants were prepared by statistical analysis of meteorological parameters and malaria incidences. These environmental

determinants in conjunction with each other seem to have major impacts on occurrences of malaria in those regions.

Predicted changes in Malaria incidence due to climate change

Transmission windows (TWs) for malaria are predicted to increase with climate change (Figure 9.1). For most vectors of malaria, the temperature range of 20°C – 30°C is optimal for development and transmission. A relative humidity higher than 55% is optimal for vector longevity, enabling the successful completion of sporogony. Analysis of average temperature, humidity, precipitation and incidences indicate that the maximum incidence occurs in the months of June, July and August when the relative humidity is in the range of >60% and <80%, at temperatures ranging between 25°C to 30°C. This window shifts from state to state depending on the arrival of the monsoon.

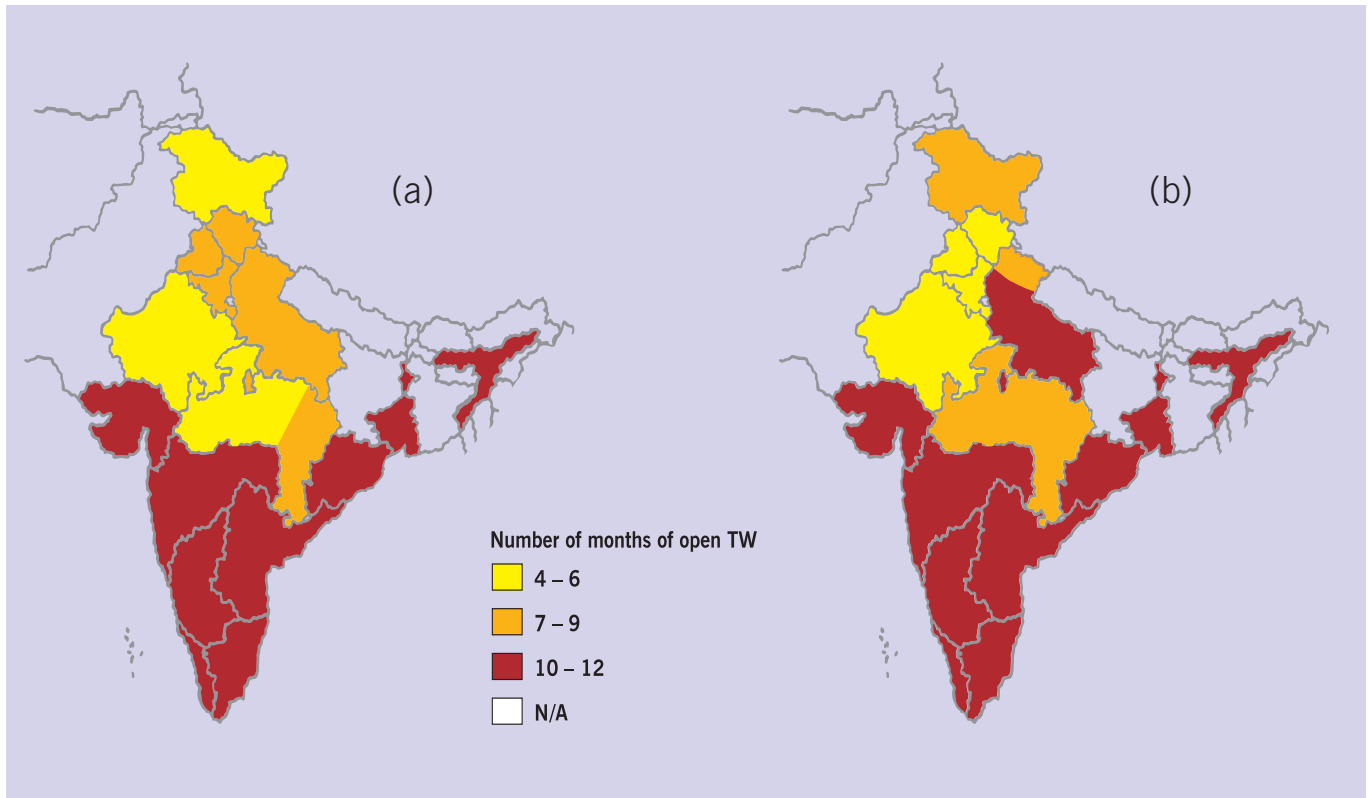
Table 9.1:
Health concerns and vulnerabilities due to climate change

Health Concerns	Vulnerabilities due to climate change
Temperature related morbidity:	<ul style="list-style-type: none"> Heat and cold related illness Cardio vascular illnesses
Vector borne diseases	<ul style="list-style-type: none"> Changed patterns of diseases by region and by climate parameter Malaria, Filaria, Kala-azar, Japanese Encephalitis, and Dengue caused by bacteria, viruses and other pathogens carried by mosquitoes, ticks, and other vectors.
Health effects of extreme weather	<ul style="list-style-type: none"> Diarrhoea, Cholera and intoxication caused by biological and chemical contaminants in water. Damaged public health infrastructure due to cyclones / floods Injuries and illness Social and mental health stress due to disasters and displacement
Health effects due to insecurity in food production	<ul style="list-style-type: none"> Malnutrition, hunger, particularly in children

Figure 9.1

Transmission Window of Malaria in Different States of India

(a) for base case and (b) under projected climate change scenario



What are the policy implications of these predictions?

Policymakers concerned about human health will need to work to strengthen the healthcare systems, along with water and wastewater systems and federal and local governments, to be able to anticipate and respond to the predicted changes in public health as a result of climate change.

In order to better address some of the predicted changes taking place in India more emphasis may be required on the following policies:

- Health and welfare, provision of drinking water and sanitation, accessibility of health centers with malaria treatment facilities and educating people about malaria and other climate related diseases; and
- Policies on urban planning, provision of funding for low income communities with poor sheltering and high exposure/risk to heat and cold waves.

Moreover, the uncertainties associated with predicting the health effects of climate change will require the medical community to provide policy makers with new tools to evaluate and respond to the threat. Some of these new tools are already available. For example, analogue studies indicate short-term changes to regional climate systems, and provide models for likely impacts of global climate change. However, these studies are targeted to

specific locations, and further development is required in order to broaden the applicability of these studies.

Needs for further research

Further studies to improve understanding of health impacts of climate change could include:

- Studies of other vector borne diseases
- Strengthening coping strategies for health impacts;
- Linkages between health and food security; and
- Preparedness for extreme weather events and its potential impacts on health.

Malaria specific studies would benefit from the following:

- Studies of the effect of different combinations of temperature and relative humidity on the development of malaria vectors infected with *P. vivax* and *P. falciparum*, the common parasites of malaria in different regions of the country;
- Studies of the impact of socio-economic parameters and land use change patterns on malaria occurrences.
- District scale prospective studies in different eco-epidemiological types of epidemic prone areas to evaluate the role of temperature, rainfall and relative humidity on mosquito vectors and malaria so as to develop early warning systems for proactive adaptation measures.

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OVERVIEW	Keysheet 1
CLIMATE CHANGE SCENARIOS	Keysheet 2
SOCIO-ECONOMIC SCENARIOS	Keysheet 3
SEA LEVEL	Keysheet 4
WATER RESOURCES	Keysheet 5
AGRICULTURE	Keysheet 6
FORESTS	Keysheet 7
INDUSTRY	Keysheet 8
HUMAN HEALTH	Keysheet 9