

The Lancet Countdown on Health and Climate Change

# Policy brief for India

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# Climate change: a threat to public health

*“I want a better future. I want to save my future. I want to save our future. I want to save the future of all the children and all people of future generations.”*

***Ridhima Pandey, 2019, Indian climate activist, age 11 years***

Climate change is the greatest public health challenge of the 21<sup>st</sup> century. Even as country leaders around the world concur that climate change poses a severe threat and that concerted efforts to address its causes are imperative, children have also come together to build unprecedented momentum for a response. Yet greenhouse gas emissions continue to cause global warming, undermining efforts to comply with the Paris Agreement. Unabated and unaddressed, climate change is certain to impact the lives and futures of current and future generations of children, prompting a new sense of urgency. Often the most exposed to the severe effects of a changing climate, low and middle-income countries are the least able to respond, on account of weaker health systems and poorer infrastructure. This exacerbates existing health and economic inequities and hinders overall growth.

Total emissions from the power sector are responsible for a large proportion of energy-related CO<sub>2</sub> emissions. Emissions can be diminished by transitioning to renewable energy sources but fossil fuels continue to contribute significantly to the energy mix in many countries, also leading to air pollution and related health impacts. Climate variability due to changes in temperature, precipitation and humidity has contributed to increasing numbers of extreme weather events. Record temperatures in the past decade have led to rising heat-related morbidity and mortality. Related changes in vector-

borne disease patterns has led not only to increased frequency of such diseases, but also emergence of diseases in new regions.

Vulnerable populations, including children, women, the elderly and the sick are likely to face the greatest impacts of climate change. As a potent “threat-multiplier”, climate change is poised to undermine health, economic and social progress in regions around the world. Climate-related health impacts necessitate a renewed approach to building health systems that are equipped to respond to a disease burden which is both growing and changing. The healthcare sector is responsible for 4.6 % of greenhouse gas emissions,<sup>1</sup> and a conscious effort is needed to reorient health systems to become not only resilient and climate-prepared, but also ‘climate-smart’ (i.e., implementing strategies for emission reduction) in their operations.

This briefing, launched in parallel with the 2019 global Lancet Countdown report<sup>1</sup> focuses on the critical linkages between health and climate change in three key areas: vulnerability to mosquito-borne diseases; terrestrial food security and undernutrition; and zero carbon emission electricity. It explores their implications for India’s commitments as a nation to addressing climate change, and provides recommendations for policymakers.

# Key messages and recommendations

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Establish real-time monitoring and disease surveillance systems linked to early warning systems for vector-borne disease outbreaks. Adequate and appropriate training and health system preparedness for emerging infectious diseases and enhanced public and stakeholder awareness of prevention strategies should also be integrated.

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Promote and facilitate crop diversification, water-smart and less labour intensive agricultural operations to mitigate the impacts of climate change on food security and nutrition, coupled with improved market systems that can ensure food and nutrient access and availability, while also protecting the social and economic security of those in agriculture sector.

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Prioritize development and implementation of a coal phase-out strategy and accelerated transition to low carbon and renewable energy sources, taking into account appropriate energy mix, alternate livelihood opportunities for employees in the coal industry and the potential health co-benefits from reduced fossil fuel combustion.

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With updated Nationally Determined Contributions under the Paris Agreement due to be submitted by 2020, health considerations should be integrated throughout India's proposed interventions, with particular consideration to vector-borne diseases, food security and nutrition, and energy policy.

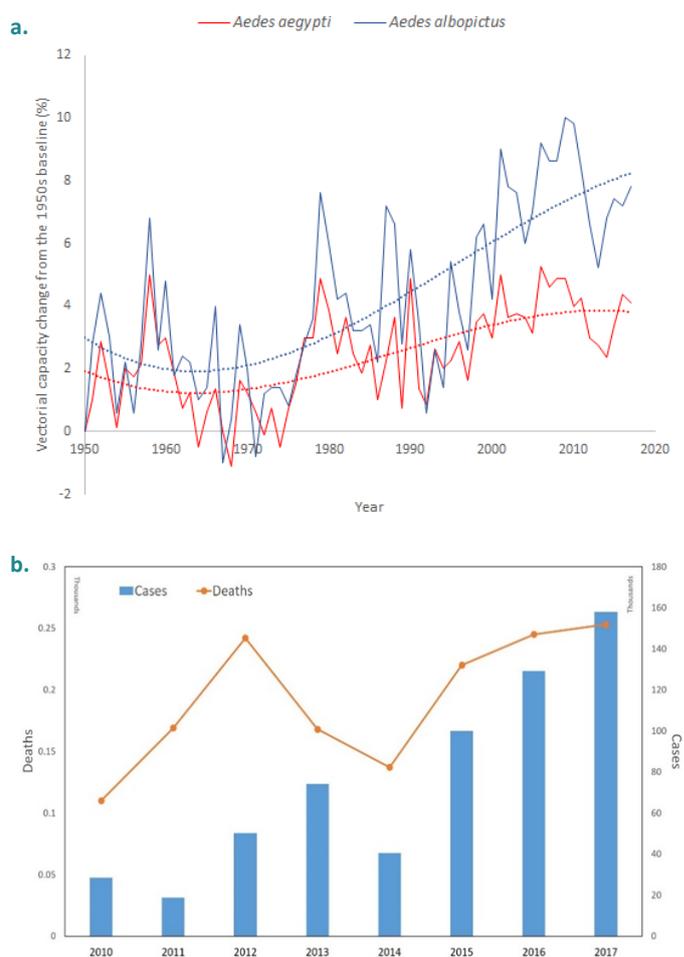
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# Vulnerability to mosquito-borne diseases

Changing climate is altering environmental conditions, such as temperature, precipitation and humidity. This increases the suitability for transmission of various infectious diseases, including mosquito-borne infections such as dengue, malaria and chikungunya. Globally, climate suitability for vector-borne diseases has shown an upward trend.

The dengue virus is spread by *Aedes aegypti* and *Aedes albopictus* mosquitos. The mosquitos' survival, reproduction, and development are sensitive to climatic conditions.<sup>1</sup> Vectorial capacity (VC) for *A. aegypti*, and *A. albopictus* expresses the average daily rate of subsequent cases in a susceptible population resulting from one infected case. The VC of *A. aegypti* and *A. albopictus* has increased both globally and in India during recent years (Figure 1a). Globally, since 1950, 9 of the 10 most suitable years for the transmission of dengue occurred after the year 2000. In India, the VC of *A. aegypti* and *A. albopictus* to transmit dengue has increased by 2.3% and 4.6% respectively.<sup>1</sup> The number of cases and deaths due to dengue has also steadily increased over the past two decades in India<sup>2</sup> (Figure 1 b). Originally restricted to the plains, dengue is now increasingly common in the hilly regions, and vector suitability in western as well as north-eastern Himalayan states is rising.<sup>3</sup> The Himalayan states of Himachal Pradesh, Uttarakhand, Manipur, Mizoram, Nagaland, Sikkim and Tripura have seen 15-20 fold increases in numbers of cases since 2013. Similar trends have been observed in southern states of Tamil Nadu and Kerala.<sup>4</sup>

Similarly, climate change is altering spatial and seasonal patterns of malaria, threatening progress made by India to date in controlling the disease. The tropical highlands are becoming more suitable for development of the parasite and for disease transmission.<sup>5,6</sup> Based on transmission window criteria, in the 2050s, malaria is likely to persist in Orissa, West Bengal and southern parts of Assam, bordering north of West Bengal. Some new states may become malaria prone in the north and northeast, including Himachal Pradesh, Arunachal Pradesh, Nagaland, Manipur and Mizoram. The burden will primarily shift from the central Indian region to the south western coastal states of Maharashtra, Karnataka and Kerala. The transmission window



**Figure 1: (a) Change in vectorial capacity of *A. aegypti* and *A. albopictus* to transmit dengue from 1950s baseline (Data from the 2019 global Lancet Countdown report), (b) Cases and deaths due to dengue in India over the years (CBHI, 2018)**

is projected to widen as well in northern and western states.<sup>7</sup>

Chikungunya is another disease transmitted by *A. aegypti* and *A. albopictus* mosquitos and is affected by climate change. From 2013 to 2017, the number of clinically suspected cases of chikungunya in India have more than tripled, with Bihar worst hit, recording 1249 cases in 2017. A gradual decrease in climatic suitability for chikungunya in central India is projected, while the southern regions of the country will continue to have persistently strong suitability for the disease.<sup>8</sup>

# Terrestrial food security and undernutrition

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Climate change is expected to affect all the four dimensions of food security: availability, accessibility, utilization and food systems stability. Pathways include higher temperatures, increased incidences of pests and pathogens, water scarcity, and more frequent and intense extreme weather events. Rising temperatures therefore have adverse implications for progress towards achieving Sustainable Development Goal 2, aimed at ending hunger by 2030. As India ranks 102 of 117 countries according to the 2019 Global Hunger Index, the impacts of climate change on food and nutrient security in India are of especially high importance.

Globally, crop growth duration has decreased by 3.8% for winter wheat, 2.4% for rice, 3.1% for soybean, and 2.9% for maize.<sup>1</sup> A shorter crop duration means the crop matures too quickly with lower seed yield, and lower yield potential. In India, similar trends in lowered crop growth duration have been observed since the 1960s, with decreases of 2% for maize and rice and 1% for wheat and soybean<sup>1</sup> with projected reduction for rice and wheat estimated to be 7% and 9% respectively. In addition, the country is expected to suffer pest-induced loss of 2% for rice and 1.6% for wheat.<sup>9</sup>

Apart from negative impacts on the crop yield, climate change is also expected to decrease the nutrient content of the crops. By 2050, CO<sub>2</sub> concentrations are projected to reach levels which will lead to zinc and protein deficiencies in an additional 50 million and 38 million people respectively in India by 2050; and 0.4 billion women of childbearing age and 0.1 billion children under 5 at greater risk of iron deficiency.<sup>10</sup> In addition, it is estimated that climate change could also cause a decline in land productivity (in monetary terms) of 49%, dramatically impacting the livelihood of farmers in India.<sup>11</sup>

The impacts of climate change on agricultural production, food and nutrient security warrant a combination of interventions. Potential strategies include a transition away from resource and water-intensive agricultural production, to methods which are both resilient, less labour-intensive (often mechanised), and water smart, with both crop diversification and implementation of crop rotation practices. Together with improved market systems, such interventions will help to ensure sustainable agricultural production without jeopardising food and nutrient availability.

## Zero carbon emission electricity

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Globally, electricity generation has been dependent for several decades on a mix of sources, though fossil fuels continue to contribute significantly to the energy mix. Given 38% of total energy-related CO<sub>2</sub> emissions are from power generation, mostly from fossil fuel combustion, transition to renewable energy options is crucial. Fossil fuel combustion also contributes to PM<sub>2.5</sub> air pollution, a major problem for cities of India, and coal alone is estimated to have been responsible for 440,000 premature deaths globally in 2016.<sup>1</sup>

Nations are increasingly transitioning to renewable energy sources. Renewables accounted for 45% of global energy growth in 2018, of which 27% was due to wind and solar. This trend must continue, as generation from new renewables sources (solar, wind, geothermal, wave and tidal, excluding hydro) needs to increase by 9.7% annually up to 2050 to align with 1.5 degree-compliant scenarios.

In India, total installed capacity of grid interactive renewable power\* increased 28% from 2017 to 2018, from 57 GW to 73 GW. Installed generating capacity of thermal (coal-based) utilities in the country is also rising at the rate of 16 GW per year based on the data for past decade.<sup>12</sup> Coal production in the country during the year 2017-18 was 675.40 million tonnes (Mt), increasing 2.7% from the previous year. Despite an increasing share of renewables, India's reliance on coal for energy production is expected to persist until 2047. The projected percentage of coal in the energy mix for the

country is 42%-50%.<sup>12</sup> With a growing population and increasing energy demand, coal currently continues to be the preferred option in order to ensure energy security on account of its lower prices, but with severe implications for health.

Estimated renewable energy generation potential for India in 2018 was 1000 GW; with solar, wind, small-hydro power, biomass, and others accounting for 68%, 28%, 1%, 2%, 1% respectively of this total potential. The percentage share of coal based electricity generation (among the generating capacity of all the installed utilities) in India has not changed much over the past decade, while the share of hydro is declining, and that for other renewable sources (ORS; excluding nuclear and hydro) shows a steady increase.<sup>12</sup>

Transition to renewable energy sources can have immense health co-benefits due to reductions in air pollution from fossil fuel combustion together with long term mitigation of climate change. Deteriorating air quality and its dangerous impacts on health and economy in India can be largely addressed through phase-out of coal. Appropriate demand generation for cleaner fuels through awareness generation, sensitization of health impacts and appropriate market mechanisms, subsidies for transition to low carbon energy sources and a phase-out of coal with strategies to support alternate livelihoods for employees is imperative.

\*Grid interactive power describes systems which are linked to the grid but can stand alone in the event that grid power is interrupted.

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## Organisations and acknowledgements

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The concept of this brief was developed by the Lancet Countdown. The brief was written by Richa Sharma and Poornima Prabhakaran. Critical review and inputs were provided by Srinath Reddy. Review on behalf of the Lancet Countdown was provided by Jessica Beagley and Alice McGushin.

### **THE LANCET COUNTDOWN**

The Lancet Countdown: Tracking Progress on Health and Climate Change is an international, multi-disciplinary collaboration that exists to monitor the links between public health and climate change. It brings together 35 academic institutions and UN agencies from every continent, drawing on the expertise of climate scientists, engineers, economists, political scientists, public health professionals and doctors. Each year, the Lancet Countdown publishes an annual assessment of the state of climate change and human health, seeking to provide decision-makers with access to high-quality evidence-based policy guidance. For the full 2019 assessment, visit [www.lancetcountdown.org/2019-report/](http://www.lancetcountdown.org/2019-report/).

### **THE PUBLIC HEALTH FOUNDATION OF INDIA**

The Public Health Foundation of India (PHFI) is a public private initiative that has collaboratively evolved through consultations with multiple constituencies including Indian and international academia, state and central

governments, multi & bi-lateral agencies and civil society groups. Launched in 2006 by Prime Minister Manmohan Singh, PHFI is a response to redress the limited institutional capacity in India for strengthening training, research and policy development in the area of Public Health. PHFI recognizes the fact that meeting the shortfall of health professionals is imperative to a sustained and holistic response to the public health concerns in the country, which in turn requires health care to be addressed not only from the scientific perspective of what works, but also from the social perspective of, who needs it the most.

### **THE CENTRE FOR ENVIRONMENTAL HEALTH, PHFI**

The Centre for Environmental Health was launched in May 2016 as a joint initiative of the Public Health Foundation of India and the Tata Institute of Social Sciences, with support from Tata Sons and Tata Consultancy Services. The aim of the Centre is to build capacity in India on environmental health research and training, and to provide evidence-informed policy guidance based on research in several thematic areas including air pollution, water, sanitation and hygiene, chemical exposures, climate change and other environmental issues of concern.