

NO VACCINE FOR CLIMATE CHANGE

A GUIDANCE DOCUMENT

ON CLIMATE CHANGE AND HEALTH IMPACTS

FOR HEALTH PROFESSIONALS IN INDIA

healthy
energy
initiative

Health Care

Without Harm

ACKNOWLEDGEMENTS

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We welcome your feedback on the guide, including opportunities to co-brand and tailor it to your stakeholder population.

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FOREWORD



Dr. Maria Neira

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*Public Health, Environment and Social Determinants of Health Department
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Climate change is the greatest health challenge of the 21st century. It is a threat we have been warned about by scientists and health professionals for over a decade, and, increasingly, are witnessing firsthand.

India has seen a sharp rise of extreme temperatures and heat stress events, cyclones, floods, drought and malnutrition. Often it is the poorest and most vulnerable among us that are worst affected, pushing many into poverty. The health impacts of climate change have become all too real and are catching our health systems off guard.

The health sector has a unique opportunity to combat climate change, to help people understand that the same pollution that endangers our health also drives climate change. Fossil-fueled air pollution causes millions of premature deaths every year, of which a large burden occurs in India. It is the silent pandemic, the consequence of decades of inaction despite stark warnings from science. We must put a stop to it, this decade, and we can.

India has suffered immensely from the COVID-19 pandemic, putting health inequities and vulnerabilities in sharp view. We cannot go back to the way things were before. The recovery from COVID-19 that will be taking place over the next few years therefore provides a crucial window of action to improve public health, end our reliance on pollution for energy and growth, and become more resilient to the impacts of climate change. Health professionals have a crucial role to play in this; they have been at the front of the current health crisis and need to be at the front of the escalating climate crisis too.

I applaud the efforts of the authors in producing this communications guide - “No Vaccine for Climate Change”. This guide is designed to prepare health and care workers for various conversations around climate change, and its impacts on the health of their patients and their community.

Health professionals are both trusted communicators and important actors when it comes to protecting public health. It is only fitting, then, that they are equipped with the necessary knowledge and tools to tackle the biggest health challenge of the 21st century, climate change.

FOREWORD



Gary Cohen

President, Health Care Without Harm

The climate crisis is the world's biggest health challenge. It will affect everyone, primarily due to the rising sea levels and temperatures, air pollution related to burning fossil fuels, and acceleration of extreme weather events. With an increase in temperature and water scarcity, incidents of extreme heat stress would be more common. With extreme rainfall and floods, we will see an increase in water- and vector-borne diseases. With frequent occurrences of droughts in some parts of the world, the progress being made on feeding hungry people will be reversed. It is also estimated that low- and middle-income nations will be the worst affected – they have the least capacity to adapt to the situation due to weaker infrastructures and health systems, and also because of disproportionately higher exposure. So the climate crisis is also a crisis of basic human rights and health equity.

Climate change induced events directly affect human health, and hence, it is important to be proactive in framing plans and policies to meet the health needs of the affected populations. It is also important to see health systems not merely as providers of healthcare, but equally as the basic foundation for community resilience and preventive care. Health care also needs to take the lead in communicating to the public to protect themselves against the most extreme health impacts related to a warning planet.

Health workers' voices are critical in promoting actions that address climate change and its impacts on health. Healthcare professionals can make a big difference – with their patients, in their practices and in their health care institutions, and most importantly, in their recognition that health professionals have a larger healing and truth telling mission in the Age of Climate Change.

In India, healthcare professionals generally play an important role in carrying health messages to the public. They are considered to be credible sources of health information because they see the adverse health outcomes in their clinics and hospitals. The COVID-19 pandemic has presented itself as an opportunity for health voices to be heard and amplified through various media; and its reception has reflected that public health professionals are regarded as key advocates for health protection. Fighting global health risks and diseases, including outbreaks with pandemic potential, are fundamentally about fighting climate change.

Last year, in partnership with Healthy Energy Initiative India, Health Care Without Harm conducted one of the largest studies of the Knowledge, Attitude and Practice of Health Care Professionals on Climate Change in India. We found in the study, that while the awareness on the term climate change was high among the healthcare professionals, they also expressed a need for more comprehensive and nuanced understanding on the subject and their roles in particular.

Following up on that need we have produced this guidance document - *"No Vaccine for Climate Change – A Communication Guide on Climate and Health for the Healthcare Professionals in India"*. This document will act as the crucial first step in orienting our health workers so that they can become trusted communicators on climate change and health impacts. This effort will be a milestone for health, and it will educate and guide them in understanding, communicating and leading on this crucial matter of global survival.

MESSAGE



Dr Pankaj Chaturvedi

*Deputy Director, Center for Cancer Epidemiology, Tata Memorial Center
Professor and Surgeon, Department of Head Neck Surgery, Tata Memorial Center
Secretary General, International Federation of Head and Neck Oncologic Societies*

In the last 130 years, the world has warmed by approximately 0.850C. Each of the last decades has been successively warmer than any preceding decade since 1850s. Climate change is today's biggest health challenge. The impact and its severity of climate change upon public health has been discussed time and again. It is estimated that low- and middle-income nations will be the worst affected – they have the least capacity to adapt to the situation due to weaker infrastructures and health systems, and also because of disproportionately higher exposure.

The rising sea-levels and temperatures leading to frequent extreme weather events primarily result in public health problems. Rising temperature and the resulting water scarcity result in a two-fold problem in the form of droughts and associated issues and heat stress. With frequent occurrences of droughts in some parts of the world, the progress being made on under-nutrition would be reversed. On the other end of the spectrum, lies extreme rainfall and floods, we will see an increase in water- and vector-borne diseases. The bottom-line is that the climate change affects many of the social and environmental determinants of health – clean air, safe drinking water, sufficient food and secure shelter.

The results of climate change directly affect human health, and hence, it is imperative that we should be proactive in framing plans and policies to meet the health needs of the affected populations. The health care system should not be viewed merely as providers of healthcare, rather should be the basic foundation for preventive care and the lead runner protecting against the health effects of climate change. The health sector has a unique opportunity to combat climate change, to help people understand that the same pollution that compromises respiratory health also drives climate change and, more importantly, spread the word to promote carbon-neutral practices and infrastructure in the health sector.

In general, especially in India, healthcare professionals play an important role in carrying the health messages to the public. They are considered a credible source of health information because they see the adverse health outcomes as closely as possible. The COVID-19 pandemic has presented itself as an opportunity for health voices to be heard and amplified through various media; and its reception has reflected that public health professionals are regarded as key advocates around health impacts. A health worker's voice is critical in promoting actions that address climate change and its impacts on health. Healthcare professional can make a big difference – with their patients, in their practice and health care institutions, and most importantly, in their community, and the policy arenas.

I applaud the efforts of public health and communication experts in producing this guidance document - *"No Vaccine for Climate Change – A Communication Guide on Climate and Health for the Healthcare Professionals in India"*. This document will act as the crucial first step in orienting our health workers on the issue so that they can become trusted communicators on climate change and health impacts.



“ THERE
IS NO
VACCINE
FOR
CLIMATE
CHANGE ”

**Dr. Tedros Adhanom
Ghebreyesus**
Director-General,
World Health Organization



1 INTRODUCTION

Climate change is the greatest health challenge of the 21st century. It threatens our air, food, water, shelter, and security – the basics on which human life depends. This is because – through its effects on air quality¹, food and water security² – climate change induced heat waves³, floods⁴, storms⁵, wildfires⁶, infectious diseases⁷, migration⁸, conflict⁹ and mental health¹⁰ – both exacerbate existing health threats and create new ones.

There may be no vaccine for climate change, but at the same time, action on climate change provides one of our greatest health opportunities because many climate change solutions improve community environments and public health and reduce health inequities. Everybody benefits from reducing air pollution, improving diets, and encouraging a more active lifestyle, and saving millions of lives across the world every year.¹¹

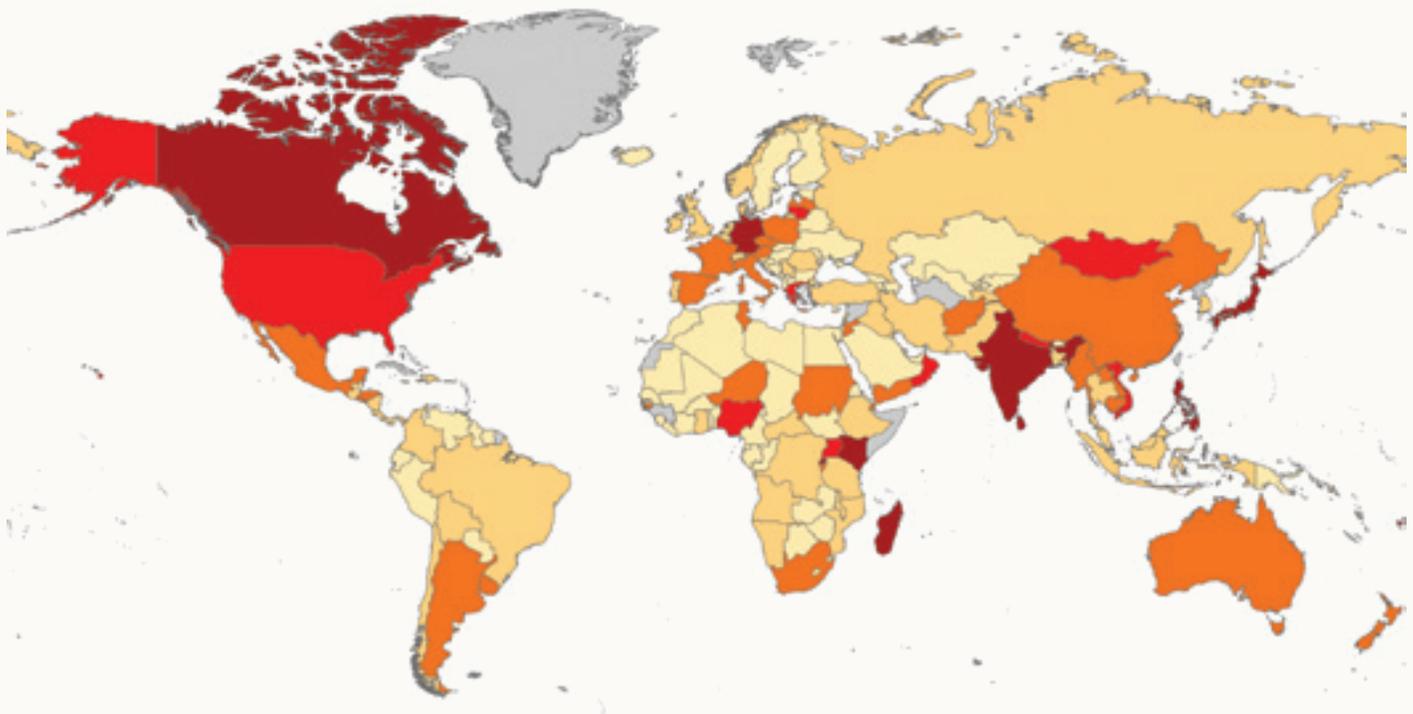
India was the seventh most affected by the devastating impact of climate change globally in 2020 according to the Global Climate Risk Index. A recent survey by Healthy Energy Initiative, to understand climate change knowledge, attitudes, and practices amongst health professionals in India, revealed that health workers from all groups believe that they should play a role in educating patients and the public on the health impacts of climate change. The survey contributes to the understanding of the level of awareness (knowledge), views (attitude), and measures already being undertaken to address climate change (practice), in order to prepare our health systems to lead the response to climate challenge.¹²

Globally, healthcare professionals play an important role in carrying health messages to the public, as they are considered a credible source of health information. The COVID-19 pandemic has presented itself as an opportunity for health voices to be heard and amplified through various media; and its reception has reflected that public health professionals are regarded as key advocates around health impacts. Fighting global health risks and diseases – including outbreaks with pandemic potential – is also, fundamentally, about fighting climate change.

As a health worker, your voice is critical in promoting actions that address climate change and its impacts on health. You can make a big difference – with your patients, in your practice and healthcare institutions and, most importantly, in your community and policy arenas. Together, we have a unique opportunity to help people understand that the same pollution that compromises respiratory health also drives climate change, and, more importantly, spread the word to promote carbon-neutral practices and infrastructure in the health sector.

This communications guide is designed to prepare you for various conversations around climate change and health impacts with your patients and community, and to prepare for media interviews and meetings with legislators or policymakers, as well as to create news articles or professional presentations.

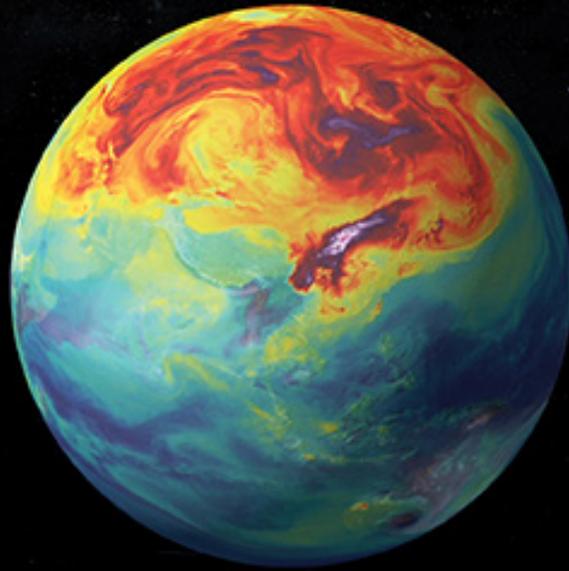
 **CLIMATE RISK INDEX 2020**



Climate Risk Index: Ranking 2018



Source: <https://www.germanwatch.org/en/17307>



CLIMATE CHANGE BASICS

“Climate change is a systematic change in the long-term state of the atmosphere over multiple decades or longer”

Intergovernmental Panel on Climate Change
Fifth Assessment Report



CLIMATE CHANGE BASICS

All the world's leading scientists unanimously agree that:

- **the earth's average temperature is rising at an unprecedented rate**
- **human activities, namely the use of fossil fuels — coal, oil, and natural gas — are the primary drivers of climate change and this rapid warming of the earth**
- **continued warming is expected to have harmful effects worldwide**

Data taken from ice cores shows that the earth's average temperature is rising more now than it has in 800,000 years. Scientists say this is largely a result of human activities over the last 150 years, such as burning of fossil fuels and deforestation. These activities have dramatically increased the amount of heat-trapping greenhouse gases (GHG), primarily carbon dioxide, in the atmosphere, causing the planet to warm.

These GHG act like a greenhouse (or a blanket or car windshield) to trap the sun's energy and heat, rather than letting it reflect into space. When the concentration of GHG is too high, too much heat is trapped, and the earth's temperature rises outside the range of natural variability.

There are many GHG, each with a different ability to trap heat (known as its "global warming potential"). GHG are sometimes called "climate active pollutants" because most have additional effects, most notably on human health.

Fast Fact

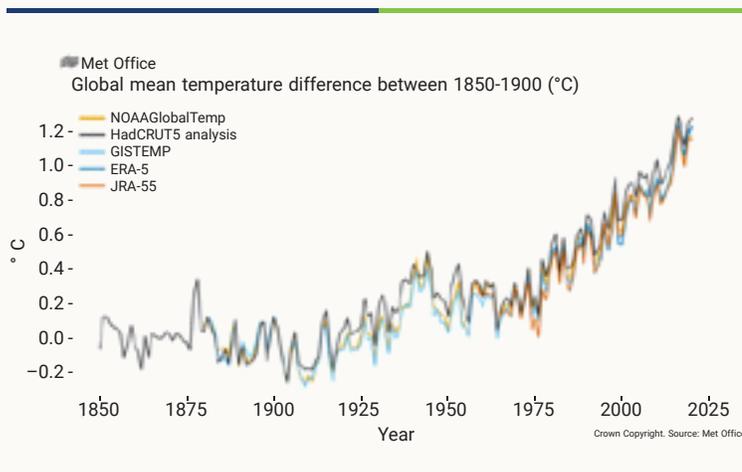
What is the difference between weather, climate and climate variability?

- Weather is the temperature, humidity, precipitation, cloudiness and wind that we experience in the atmosphere at a given time in a specific location.
- Climate is the average weather over a long time period (30–50 years) in a region.
- Climate variability refers to the natural variation in climate that occurs over months or decades. El Niño, which changes temperature, rain and wind patterns in many regions over about 2–7 years, is a good example of natural climate variability, also called natural variability.

The Problem **RISING CARBON DIOXIDE IN THE ATMOSPHERE**

The level of carbon dioxide (CO₂) has been rising since the industrial revolution and is now at its highest in about 4 million years. The rate of the rise is even more striking – the fastest for 66 million years – with scientists saying we are in “uncharted territory.”

Carbon dioxide (CO₂) is the GHG responsible for the greatest amount of warming to date. The majority of CO₂ is released from the incomplete combustion of fossil fuels – coal, oil, and gas – used for electricity production, transportation, and industrial processes. Together, these three activities account for more than 80% of the CO₂ released into the atmosphere. Other important GHG include methane, nitrous oxide, black carbon, and various fluorinated gases. Although these gases are emitted in smaller quantities than CO₂, they trap more heat in the atmosphere than CO₂ does.



The planet is set to warm by 3°C (5.4°F) above pre-industrial levels just this century, with 2020 tied with 2016 as the hottest year on record.

Global warming refers only to the earth’s rising surface temperature, while climate change includes warming and the “side effects” of warming – like melting glaciers, heavier rainstorms, or more frequent drought. Said another way, global warming is one symptom of the much larger problem of human-caused climate change.

Climate change is causing **5 CRITICAL GLOBAL ENVIRONMENTAL CHANGES**

- **Warming the temperature of the earth’s surface and the oceans:** The earth has warmed at a rate of 0.13°C per decade since 1957, almost twice as fast as its rate of warming during the previous century.
- **Melting glaciers and snowpack:** Across the globe, nearly all glaciers are decreasing in area, volume and mass. One billion people living in river watersheds fed by glaciers and snowmelt are thus impacted.
- **Changes in the global water cycle (hydrologic cycle):** Over the past century there have been distinct geographical changes in total annual precipitation, with some areas experiencing severe and long-term drought and others experiencing increased annual precipitation. The frequency and intensity of storms increases as the atmosphere warms and is able to hold more water vapor.
- **Sea level rise:** Warmer water expands. So, as oceans warm, the increased volume of water is causing sea levels to rise. Melting glaciers and snowpack also contribute to rising sea levels.
- **Ocean acidification:** Oceans absorb about 25% of the CO₂ emitted into the atmosphere, leading to the acidification of seawater.

These large-scale global changes result in what we experience as changes in our local weather and climate

- Higher average temperatures
- Greater variability, with “wetter wets”, “drier dries” and “hotter hots”
- More frequent and severe extreme heat events
- Longer pollen seasons and more pollen production
- More severe droughts
- More intense precipitation, such as severe rains and cyclones
- More frequent and severe floods due to intense precipitation and spring snowmelt
- Recurrent coastal flooding with high tides and storm surges
- Worsening air quality: Higher temperatures increase the production of ozone (a key contributor to smog) and pollen, as well as increasing the risk of wildfires¹³

SOLUTIONS?

In general, climate solutions fall into two big buckets: “mitigation” and “adaptation.” And increasingly, government and community organizations are talking about measures to increase climate “resilience.” These concepts are not distinct and are all interrelated.

- **Mitigation** refers to “measures to reduce the amount and speed of future climate change by reducing emissions of heat-trapping gases or removing carbon dioxide from the atmosphere.”

There are many mitigation strategies that offer feasible and cost-effective ways to reduce greenhouse gas emissions. These include the use of clean and renewable energy for electricity production; walking, biking, and using low-carbon or zero-emission vehicles; reducing meat consumption; decreased air travel; changing agricultural practices; limiting deforestation; and planting trees.

- **Adaptation** refers to measures taken to reduce the harmful impacts of climate change or taking advantage of any beneficial opportunities through “adjustments in natural or human systems.”

Because GHG persist in the atmosphere for a long time, more serious climate impacts would be experienced even if we halted all GHG emissions today. Adaptation strategies are needed to reduce the harmful impacts of climate change and allow communities to thrive in the face of climate change.

- **Resilience** means the “capability to anticipate, prepare for, respond to, and recover from significant threats with minimum damage to social well-being, the economy, and the environment.” Climate vulnerability is the degree to which people or communities are at risk of experiencing the negative impacts of climate change.¹⁴ The flip side of climate vulnerability is climate resilience, which is the capacity to anticipate, plan for and reduce the dangers of the environmental and social changes brought about by climate change, and to seize any opportunities associated with these changes.¹⁵

NATIONAL PROGRAM ON CLIMATE CHANGE AND HUMAN HEALTH

by the National Centre for Disease Control, Ministry of Health and Family Welfare; Government of India¹⁶

The National Action Plan for Climate Change and Human Health (NAPCCHH) was prepared in 2018 with the objective to strengthen healthcare services against the adverse impacts of climate change on health. The Ministry of Health and Family Welfare (MoHFW) approved the National Programme on Climate Change and Human Health (NPCCHH) under the National Health Mission (NHM) in February 2019. Common Climate Sensitive Diseases (CSDs) are air pollution related, heat related, water-borne, vector-borne, cardiopulmonary diseases, mental health, food-borne, nutrition related illnesses, etc. Currently the three key areas of focus for NPCCHH include air pollution, heat related illnesses and the creation of green and climate resilient healthcare facilities.

IMPORTANT INTERNATIONAL AGREEMENTS ON CLIMATE CHANGE

Montreal Protocol, 1987

Though not intended to tackle climate change, the Montreal Protocol was a historic environmental accord that became a model for future diplomacy on the issue. Every country in the world eventually ratified the treaty, which required them to stop producing substances that damage the ozone layer, such as chlorofluorocarbons (CFCs). The protocol has succeeded in eliminating nearly 99 percent of these ozone depleting substances. In 2016, parties agreed via the Kigali Amendment to also reduce their production of hydrofluorocarbons (HFCs), powerful greenhouse gases that contribute to climate change.

UN Framework Convention on Climate Change (UNFCCC), 1992: Ratified by 197 countries, this landmark accord was the first global treaty to explicitly address climate change. It established an annual forum, known as the Conference of the Parties, or COP, for international discussions aimed at stabilizing the concentration of greenhouse gases in the atmosphere. These meetings produced the Kyoto Protocol and the Paris Agreement.

Kyoto Protocol, 2005

The Kyoto Protocol [PDF], adopted in 1997 and entered into force in 2005, was the first legally binding climate treaty. It required developed countries to reduce emissions by an average of 5% below 1990 levels, and established a system to monitor the progress of the countries. But the treaty did not compel developing countries, including major carbon emitters China and India, to take action. The United States signed the agreement in 1998 but never ratified it and later withdrew its signature.

Paris Agreement, 2015

The most significant global climate agreement to date, the Paris Agreement requires all countries to set emissions-reduction pledges. Governments set targets, known as nationally determined contributions, with the goal of preventing the global average temperature from rising 2°C (3.6°F) above preindustrial levels and pursuing efforts to keep it below 1.5°C (2.7°F). It also aims to reach global net-zero emissions, where the amount of greenhouse gases emitted equals the amount removed from the atmosphere, in the second half of the century (also known as being climate neutral or carbon neutral).

Under the Paris Agreement, countries are supposed to assess their progress towards implementing the agreement through a process known as the global stock-take every five years, the first of which is planned for 2023. However, countries set their own targets, and there are no mechanisms to ensure they meet them.

To stay below a 1.5°C rise requires that from now on, total global emissions cannot exceed 240 billion tons of carbon into the earth's atmosphere. This is referred to as our "carbon budget." At current emissions rates, this carbon budget will be used up within the next 6 to 11 years.

Most experts say that the Paris Agreement will not be enough to prevent the global average temperature from rising 1.5°C. Current policies would result in a near 3°C rise by 2100, according to a tracker by Germany based nonprofits Climate Analytics and New Climate Institute. If governments follow through on the pledges they have made so far under the Paris Agreement, it will still result in a 2.7°C rise. If that happens, the world will suffer devastating consequences such as heat waves and floods which would endanger lives and livelihoods of millions of citizens.





CLIMATE
CHANGE

& HEALTH





3 CLIMATE CHANGE & HEALTH

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., 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 ongoing efforts to protect human health. The Third Assessment Report concluded that vulnerability to climate change is a function of exposure, sensitivity, and adaptive capacity.¹⁷

Nearly 700 million of India's over one billion population, living in rural areas, directly depend on climate-sensitive sectors (agriculture, fisheries, and forests) and natural resources (such as water, biodiversity, mangroves, coastal zones, grasslands) for their subsistence and livelihoods.

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 have had significant costs in terms of economic losses and damage to property. Malaria, malnutrition, and diarrhea are major public health problems. Any further increase in these incidents, as projected in weather-related disasters and related health effects, may cripple the already inadequate public health infrastructure in the country.



Whether you live in a



Droughts, Floods and Heatwaves will increase

Vector-borne Diseases like malaria and dengue will increase with more humidity and heat

CLIMATE CHANGE THREATENS YOUR HEALTH

BASIC NECESSITIES WILL BE DISRUPTED

FOOD

Hunger and Famine will increase as food production is destabilised by drought

AIR

Pollution and pollen seasons will increase leading to more allergies and asthma

WATER

Warmer water and flooding will increase exposure to diseases in drinking and recreational waters

Between 2030-50 climate change is expected to cause

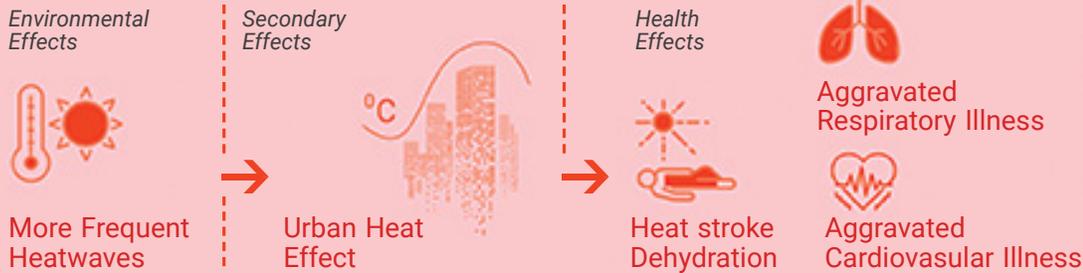
2,50,000

additional deaths/year due to malaria, malnutrition, diarrhoea and heat stress

Source: WHO

HOW CLIMATE CHANGE AFFECTS YOUR HEALTH

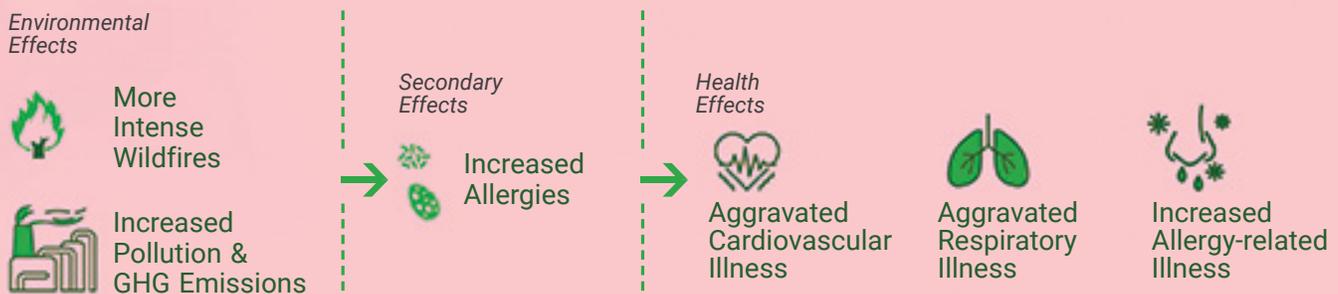
RISING TEMPERATURES



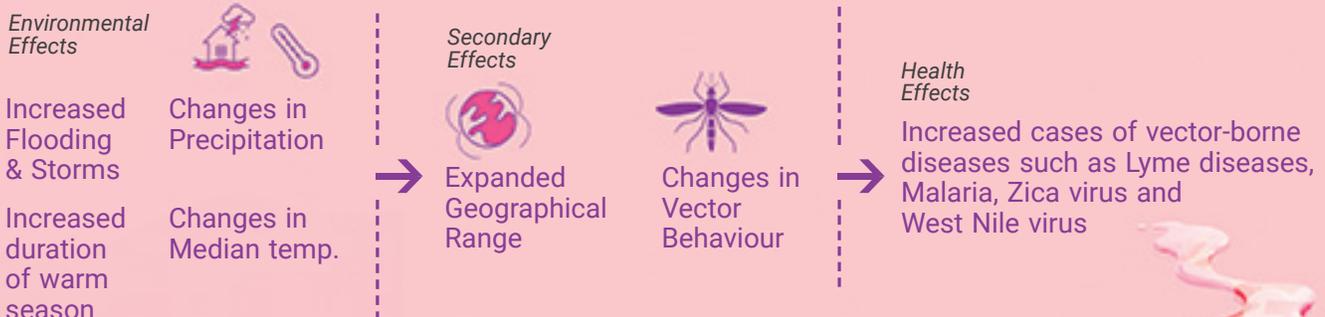
EXTREME WEATHER



AIR QUALITY



VECTOR-BORNE DISEASE





Exposure Pathways

- Extreme heat
- Poor air quality
- Reduced food and water quality
- Changes in infectious agents
- Population displacement

CLIMATE DRIVERS

- Increased temperatures
- Precipitation extremes
- Extreme weather events
- Sea level rise

Social + Behavioral Vulnerability

- Age and gender
- Race/ethnicity/caste
- Income
- Housing and infrastructure
- Education
- Discrimination
- Access to care and community health
- Pre-existing health conditions

HEALTH IMPACTS + OUTCOMES

Asthma
Respiratory allergies
Vector-borne diseases (*Lyme, malaria, Zika, etc.*)
Injuries, fatalities
Cardiovascular disease and failure

Malnutrition
Dehydration
Mental health
Heat stroke
Chronic lung disease

CLIMATE CHANGE

HEALTH IMPACTS

AND

OUTCOMES

Acute + Long-Term

Air Pollution

Higher levels of air pollution, coupled with rising temperatures, may trigger respiratory diseases such as asthma and chronic lung disease.

Higher levels of ground-level ozone may result in increased hospital admissions and emergency room visits for asthma, as well as increases in premature deaths.

Changes in Vector Ecology

Changing weather patterns and the resulting migration of animals and insects are likely to spread vector-borne diseases such as Lyme disease, malaria, dengue fever and Zika virus disease to new geographical areas.

Increasing Allergens

Higher levels of pollen, as well as longer pollen seasons, may aggravate asthma and allergy symptoms.

Water Quality

Rising sea levels, droughts, and extreme weather events may contaminate water supplies and limit access to safe water sources.

Water and Food Supply

Changing temperatures and rainfall patterns are likely to increase the number of food and water-borne infections, such as diarrheal disease.

Changing growing seasons and more frequent droughts pose threats to food security, including lower crop yields and poorer nutritional quality of the food supply.

Infrastructure Degradation

Changing weather patterns and more severe extreme weather events may impact a community's infrastructure, leading to forced migration and climate refugees, civil conflict, and mental and emotional distress.

Severe Weather

More frequent and severe extreme weather events, such as heat waves, droughts, and floods, may increase rates of heat stroke, drowning, infectious diseases, injury, and mental stress, among others.

Extreme Heat

Periods of extreme heat result in higher rates of death from heat stroke, cardiovascular disease, and respiratory disease, as well as increased hospital admission rates for heart-related illnesses, including kidney problems and cardiac dysrhythmia (irregular heartbeat)

Rising temperatures and extreme heat may have a negative impact on people suffering from depression and other mental illnesses, leading to higher rates of stress and suicide.

Psychiatric medications can increase individuals' sensitivity to heat or sun, making it difficult for them to regulate their body temperature.

Mental Health

Direct and gradual physical impacts of climate change on the environment, society, and infrastructure can lead to trauma, shock, stress, anxiety, depression, and other mental health impacts.



CLIMATE
CHANGE

HEAT WAVES & HEALTH IMPACTS

“ ... an additional 1.5 million
people may die in India
each year due to extreme
heat by 2100 ”

University of Chicago's Climate Impact Lab
and Tata Centre for Development (2019)





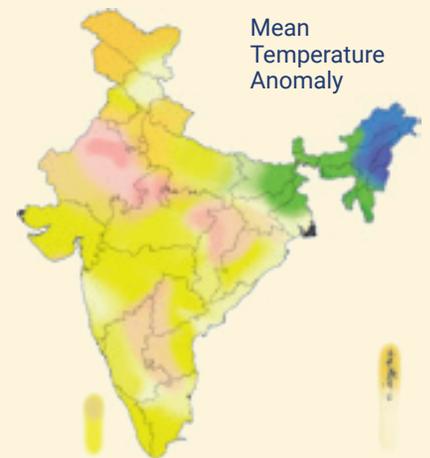
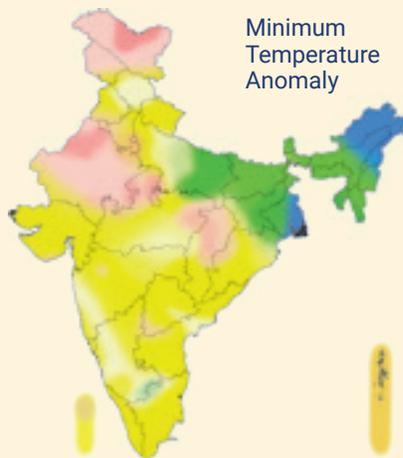
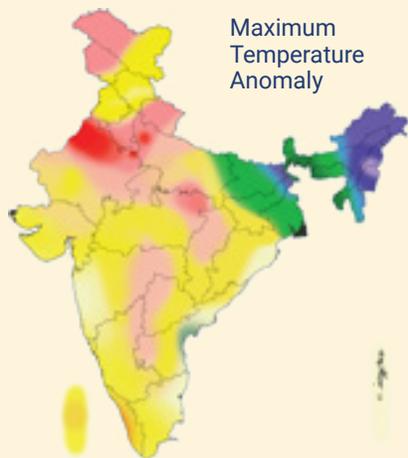
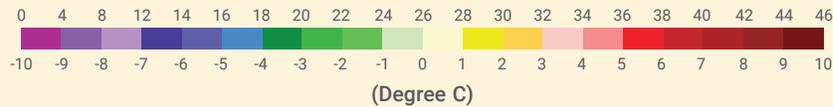
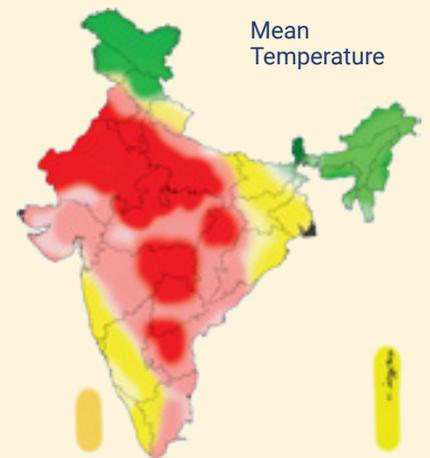
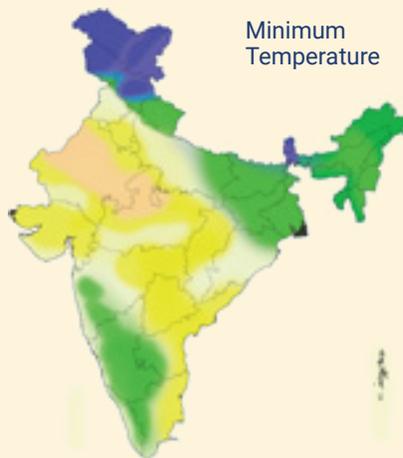
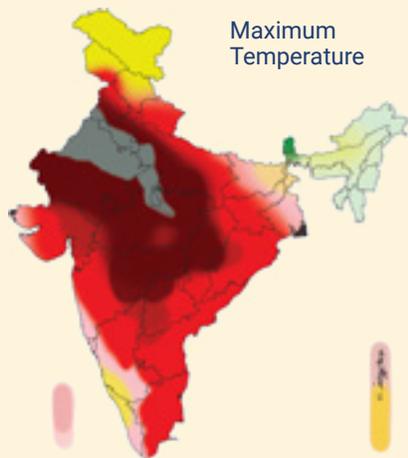
4 CLIMATE CHANGE, HEAT WAVES & HEALTH IMPACTS

REALIZED WEATHER - TEMPERATURE

27 MAY 2020

28 MAY 2020

27 MAY 2020



Source: <https://medium.com/@thegeospatialnews/satellite-imagery-shows-unusual-2020-heatwave-in-india-6f61f097f7ba>

Higher daily peak temperatures, and longer, more intense heat waves are becoming increasingly frequent globally due to climate change.

The World Meteorological Organization's 2020 statement on global climate indicates that global temperatures will continue to increase. The years 2015–2019 have been confirmed as the five warmest years on record. In 2019, unlike in earlier years, even night temperatures were high. Between 1992 and 2015, they caused 24,223 deaths across the country (see Table 1).

Table 1: Year-wise details of recorded deaths caused by heat waves in India

1992	612	2000	534	2008	616
1993	631	2001	505	2009	1071
1994	773	2002	720	2010	1274
1995	1677	2003	807	2011	793
1996	434	2004	756	2012	1247
1997	393	2005	1075	2013	1216
1998	3058	2006	754	2014	1677
1999	628	2007	932	2015	2040

Source: Compiled from the Revenue and Disaster Management Departments of several state governments and from IMD reports, as per the National Guidelines for Preparation of Action Plan—Prevention and Management of Heat Wave, published in October 2019

Extreme heat has direct effects on health. Heat kills more people than any other extreme weather event, through heat stroke, heat exhaustion and exacerbation of chronic illness. Heat increases ozone levels, worsening asthma and other respiratory and cardiovascular diseases.

A heat wave is a period of abnormally high temperatures —

more than the normal maximum temperature that occurs during the summer season in the northwestern parts of India. Because individuals acclimatize to their local climate, extreme heat is not defined in absolute terms by a specific number, but rather by a relative change from past local conditions.

A heat wave need not be considered till the maximum temperature of a place reaches at least 40°C for plains and at least 30°C for hilly regions. When the normal maximum temperature of a place is less than or equal to 40°C, heat wave departure from normal is 5°C to 6°C and severe heat wave departure from normal is 7°C or more. When the normal maximum temperature of a place is more than 40°C, heat wave departure from normal is 4°C to 5°C and severe heat wave departure from normal is 6°C or more (National Disaster Management Authority, India).

HEALTH IMPACTS OF heat waves

The health impacts of heat waves typically involve dehydration, heat cramps, heat exhaustion and/or heat stroke. The signs and symptoms are as follows:

- **Heat Cramps:** Edema (swelling) and Syncope (fainting) generally accompanied by fever below 39°C i.e., 102°F.
- **Heat Exhaustion:** Fatigue, weakness, dizziness, headache, nausea, vomiting, muscle cramps and sweating.
- **Heat Stroke:** Body temperature of 40°C i.e., 104°F or more along with delirium, seizures or coma. This is a potentially fatal condition.

Fast Fact

Urban heat islands

Dense urban areas with fewer trees, less green space, more buildings, higher energy use, and more impervious asphalt and concrete are characteristic of "urban heat islands," where night time temperatures may be as much as 5.5°C higher than surrounding areas.

WHAT CAN HEALTH PROFESSIONALS DO

to address climate change and extreme heat?

- Make sure your hospital and local health department have an extreme heat emergency preparedness contingency plan.
- Talk to patients about the risks and dangers of extreme heat, and how to prevent heat related health impacts:
 - a) Avoid strenuous activity in hot weather, drink fluids and rest frequently in a cool spot. Try to schedule exercise or physical labor for cooler parts of the day, such as early morning or evening.
 - b) Wear loose fitting, lightweight cotton clothing to allow your body to cool properly.
 - c) Drink plenty of fluids. Staying hydrated will help your body sweat and maintain a normal body temperature.
 - d) Take extra precautions with certain medications that can interfere with your body's ability to stay hydrated and dissipate heat.
- Encourage the development of a neighborhood response network to check in on vulnerable individuals during extreme heat events.
- Advise patients with pre-existing respiratory illness (asthma, COPD) to check air quality levels during extreme heat events and to limit outdoor air exposure when air quality is poor.
- The local Heat Action Plan should advocate “urban greening” – planting trees and building green infrastructure – in neighborhoods that are lacking in trees and parks, to increase shade and cooling.
- Support policies that increase energy efficiency and the use of clean, renewable energy. This limits global warming, and also reduces local impacts like the creation of urban heat islands, which often result from increased energy use at the local level.
- Find out if your city has a heat action plan and disseminate the plan among the patients. If there is no plan, develop appropriate guidance in your region.

WHAT CAN HEALTH SYSTEMS DO

to address heat waves and health impacts?

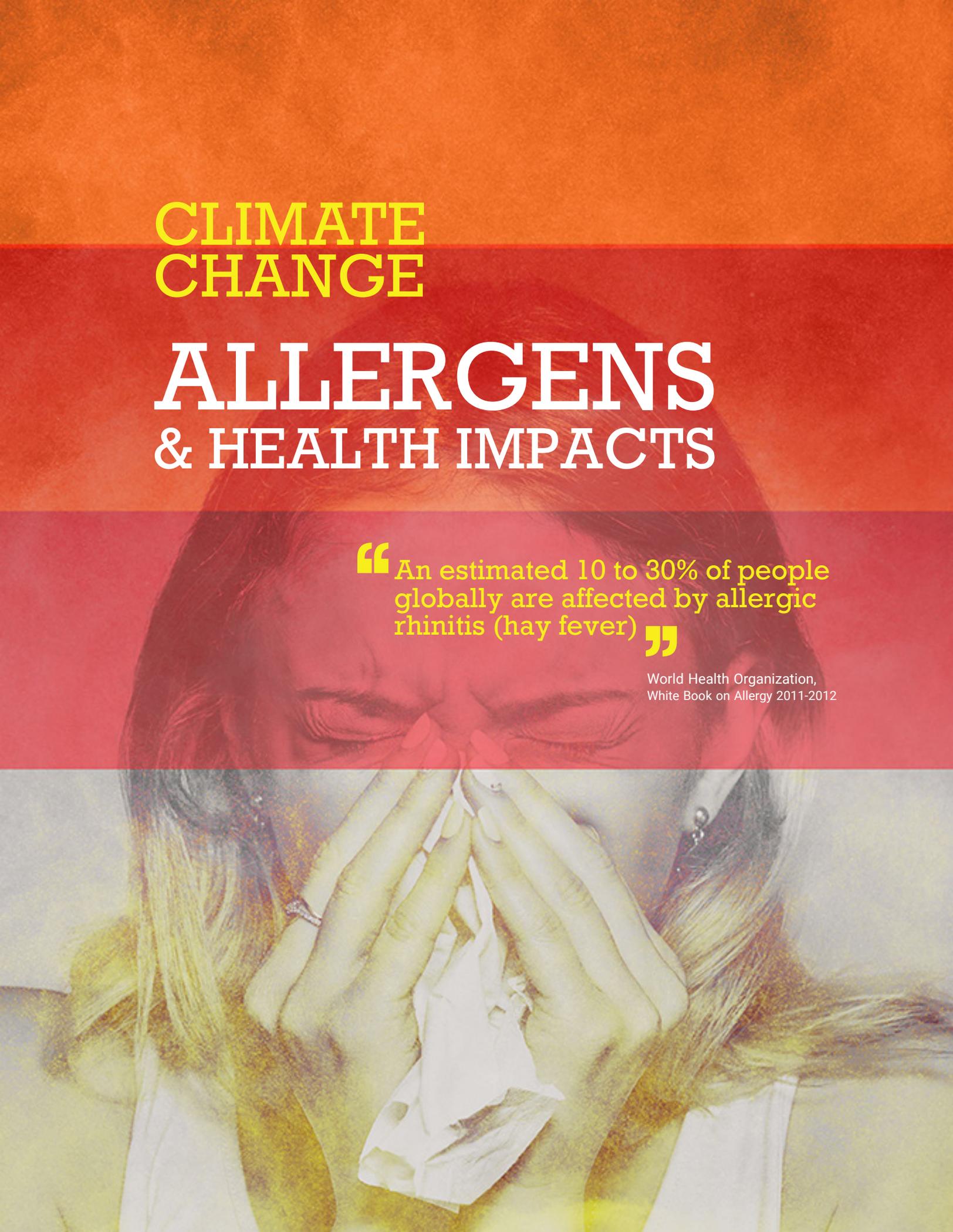
- A separate area to attend to heat related illness.
- Advisories for hospital preparedness, enhanced surveillance, and weekly meetings, including capacity building.
- Standard Operating Procedures to tackle all levels of heat related illness. Capacity building measures for doctors, nurses and other staff should be undertaken.
- Surge capacities to be identified and beds dedicated to treating heat stroke victims and enhanced emergency department preparedness to handle more patients.
- RRTs (Rapid Response Teams) to respond to any exigency call outside the hospital.
- Adequate arrangement of staff, beds, IV fluids, ORS, and essential medicines and management of volume depletion and electrolyte imbalance.
- Outreach clinics at various locations easily accessible to the vulnerable population to reduce the number of cases affected.
- Awareness campaigns for neighborhood communities using different means of information dissemination.
- Primary health centers must refer the Patients to higher facilities only after ensuring adequate stabilization and basic definitive care (cooling and hydration).
- Proper networking with nearby facilities and medical centers to share patient loads which exceed their surge capacities.
- Implementation of cool roof techniques to reduce the heat impact in the health center.
- Building plan and location of facilities (e.g., Neonatal ICU) or equipment based on heat stress of the hospital.
- Reporting of all cases of heat related illnesses (suspected or confirmed) to IDSP (Integrated disease surveillance program) unit of the district.¹⁸

CLIMATE
CHANGE

ALLERGENS & HEALTH IMPACTS

“An estimated 10 to 30% of people globally are affected by allergic rhinitis (hay fever)”

World Health Organization,
White Book on Allergy 2011-2012





CLIMATE CHANGE, ALLERGENS & HEALTH IMPACTS

“As per the results of a large-scale survey conducted across India in 2019, about 29 percent of the respondents from the coastal city of Kochi suffered from allergies. The number of people suffering from allergies¹⁹ had increased from 13 percent in 2018 to 16.7 percent in 2019 across the country.”²⁰

For millions of people in India, the annual changes in season bring an onslaught of itchy eyes, wheezing, sneezing, and other symptoms sparked by allergic rhinitis, known to most people as “hay fever.”

Climate change is increasing the length of the pollen season and its intensity, with big impacts on the millions of Indians who already suffer from allergies. “Pollens are the most common allergen present in the air and the allergy (pollinosis) could affect 10-15% of the population.”¹⁹ Higher carbon dioxide levels cause greater plant growth, resulting in increased pollen production and increased pollen potency. More winter precipitation further contributes to increased pollen production.²¹ Higher temperatures also increase the production of ozone in the atmosphere which sensitizes the respiratory tract to allergens.²²

According to new studies, an estimated 25% of India’s population today suffers from allergic diseases, out of which one in five people suffers from pollen allergy. House dust mites are the leading allergen (50%) followed by pollen (23%), insect (16%) and food (1-5%) allergens.²³

HEALTH IMPACTS OF increased allergens

Hay fever, asthma, and eczema are the three major allergic diseases associated with exposure to aeroallergens – pollen from trees, weeds, and grasses, molds, and other indoor allergens.²⁴

For those with allergies, pollen triggers sneezing, wheezing, asthma attacks, and inflammation of the nose and eye membranes. Outdoor workers face increased exposure to pollen and allergenic plants. Low-wage workers without paid sick leave face job and economic loss if they are forced to miss work due to allergies or asthma. Exposure to aeroallergens can trigger asthma symptoms.

New research²⁵ from a team of Florida State University scientists shows that rapid weather variability because of climate change could increase the risk of a flu epidemic in some highly populated regions in the late 21st century. According to the research published in January 2020, “the continuing change in the earth’s climate will affect the viral activity and transmission of influenza over the coming decades”.

According to Zhaohua Wu, an associate professor in the Department of Earth, Ocean and Atmospheric Science, and scientist with the Center for Ocean-Atmospheric Prediction Studies, “historical flu data from different parts of the world has shown that the spread of a flu epidemic has been more closely tied to rapid weather variability, implying that the lapsed human immune system in winter caused by rapidly changing weather makes a person more susceptible to flu virus.” The researchers specifically looked at data from the United States, mainland China, Italy and France. The study revealed that the widespread 2017–2018 influenza epidemic in the US can be attributed to the abnormally strong rapid weather variability. Researchers demonstrated, using historical data, that large rapid weather variability in autumn can precondition the deadly influenza epidemic in the subsequent months in highly populated northern mid-latitudes; and the influenza epidemic season of 2017–2018 was a typical case. The climate model projections in the study conclude that “the rapid weather variability in autumn will continue to strengthen in some regions of northern mid-latitudes in a warming climate, implying that the risk of an influenza epidemic may increase 20% to 50% in some highly populated regions in the later 21st century.”

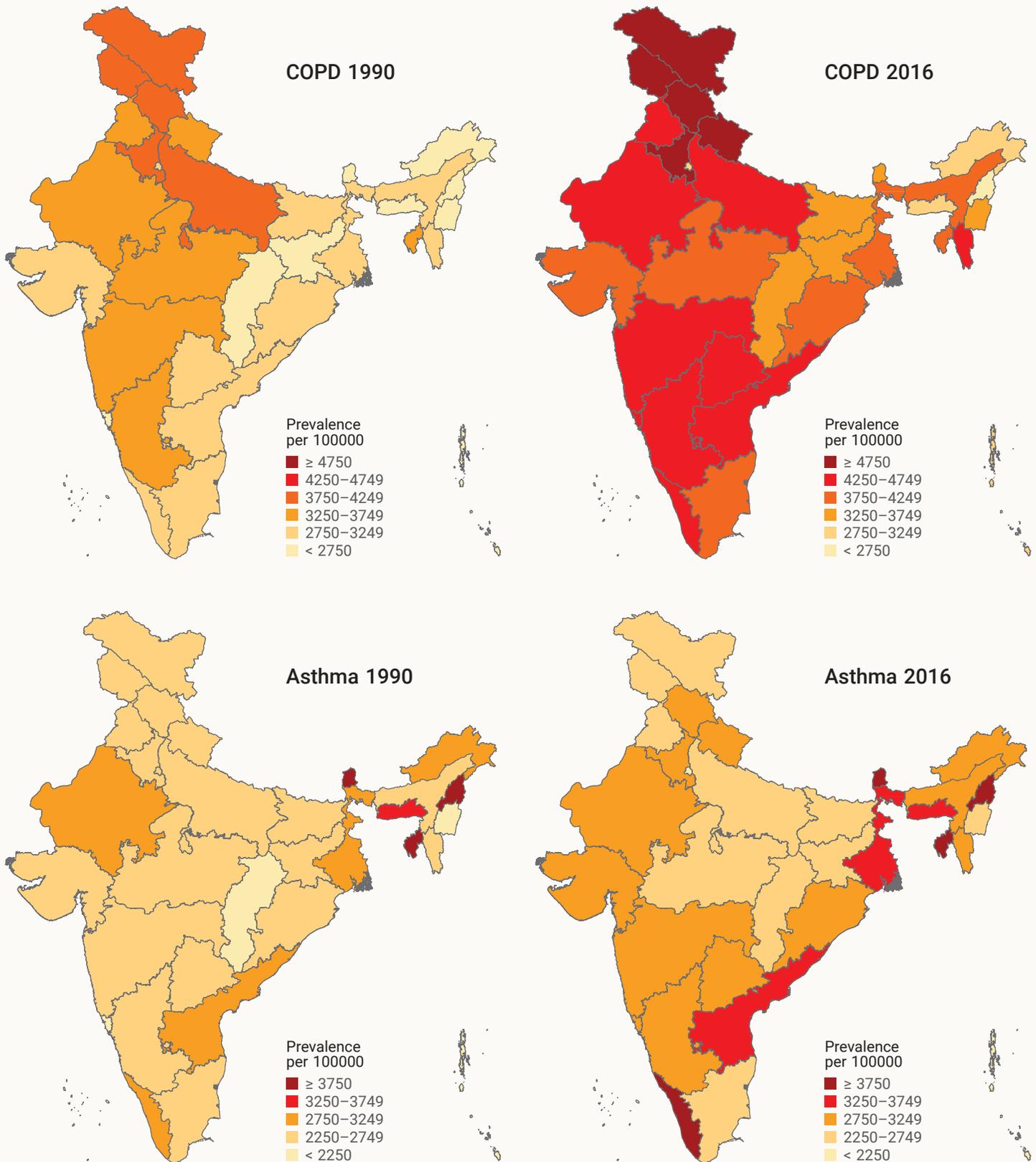
WHAT CAN HEALTH PROFESSIONALS DO to address climate change and allergies?

- ▶ Talk to patients about how climate change is increasing exposure to allergens, and what they can do to minimize their exposure, to reduce allergy and asthma symptoms.
- ▶ Ask patients to check pollen levels frequently; for patients with allergies, the best times to be outdoors is when pollen levels are lower, typically on rainy, cloudy, and windless days. Keep windows closed during allergy season to prevent pollen from drifting inside; drive with car windows closed.
- ▶ Advise patients to stay indoors during windy days.
- ▶ Advise patients to remove clothes they’ve worn outside and shower to rinse pollen from their skin and hair once they return from outdoors.
- ▶ Wear pollen masks while stepping outdoors.
- ▶ Educate colleagues and the community on the links between climate change, allergens, and health, and how adverse health impacts can be prevented.
- ▶ Promote mitigation and adaptation strategies related to climate change and allergies. Encourage local planning departments to plant low-allergenicity trees, shrubs and plants in neighborhoods.
- ▶ Support policies and programs in your community and health system that authentically engage and partner with community residents in addressing climate and health problems. Address social and economic inequities and vulnerabilities to allergen-related illness, for individuals and communities.

WHAT CAN HEALTH SYSTEMS DO to address climate change and allergens?

- ▶ Maintain a pollen calendar or coordinate with the meteorological department to get information on pollen count.
- ▶ Disseminate the information and health advisories in prominent places in the hospital on pollen levels.
- ▶ Provide training to staff to identify and respond to allergic reactions.
- ▶ Stock up appropriate emergency medication like antihistamines, decongestants, nasal corticosteroids, etc. in the event of pollen allergy-related cases.

**CRUDE PREVALENCE OF COPD AND ASTHMA
IN THE STATES OF INDIA, 1990 AND 2016**

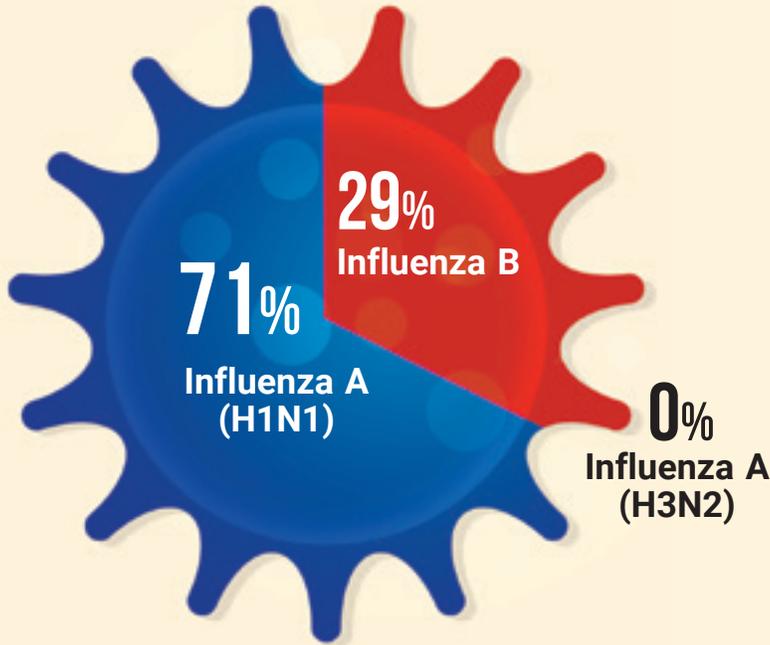


Source: *The burden of chronic respiratory diseases and their heterogeneity across the states of India: The Global Burden of Disease Study 1990–2016; The Lancet Global Health, ISSN: 2214-109X, Vol: 6, Issue: 12, Page: e1363-e1374; Publication Year 2018*

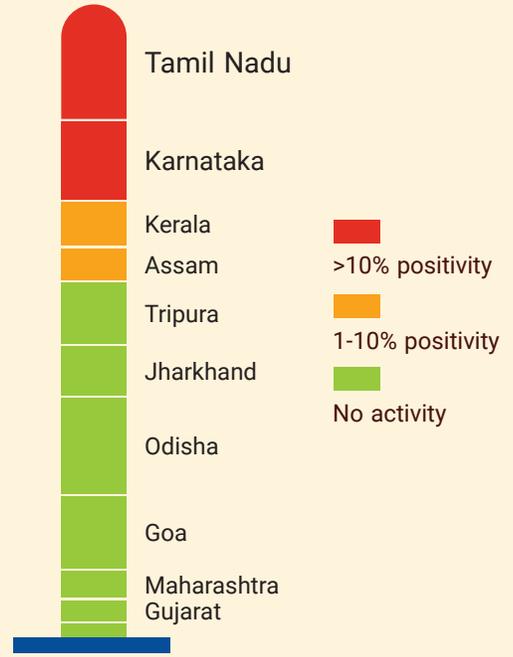
[https://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(18\)30409-1/fulltext](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(18)30409-1/fulltext)

INFLUENZA VIRUS ACTIVITY IN INDIA

Distribution of Influenza virus subtypes in January 2017

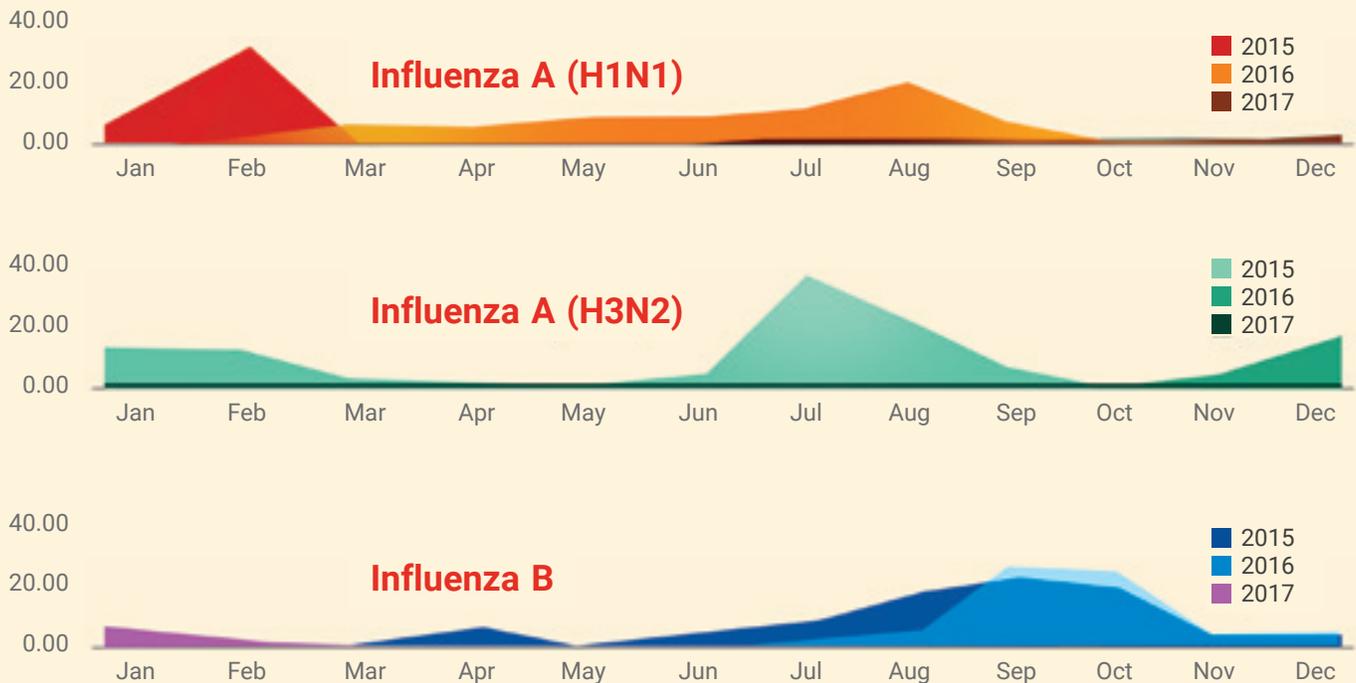


INFLUENZA: %size positivity among ARI cases in January 2017



Bar size is relative of the total samples tested. Colour is indicative of the % positivity of influenza cases.

Influenza activity 2015-17 in Western Ghats Region, India



Source: <https://scroll.in/pulse/831692/medical-researchers-are-building-indias-first-map-of-infectious-diseases-one-patient-at-a-time>

The background of the entire image is a close-up photograph of parched, cracked earth. The soil is a light tan or beige color, and the cracks are deep and dark, forming a complex, irregular pattern across the surface. The lighting is bright, creating strong shadows in the crevices and highlighting the texture of the soil.

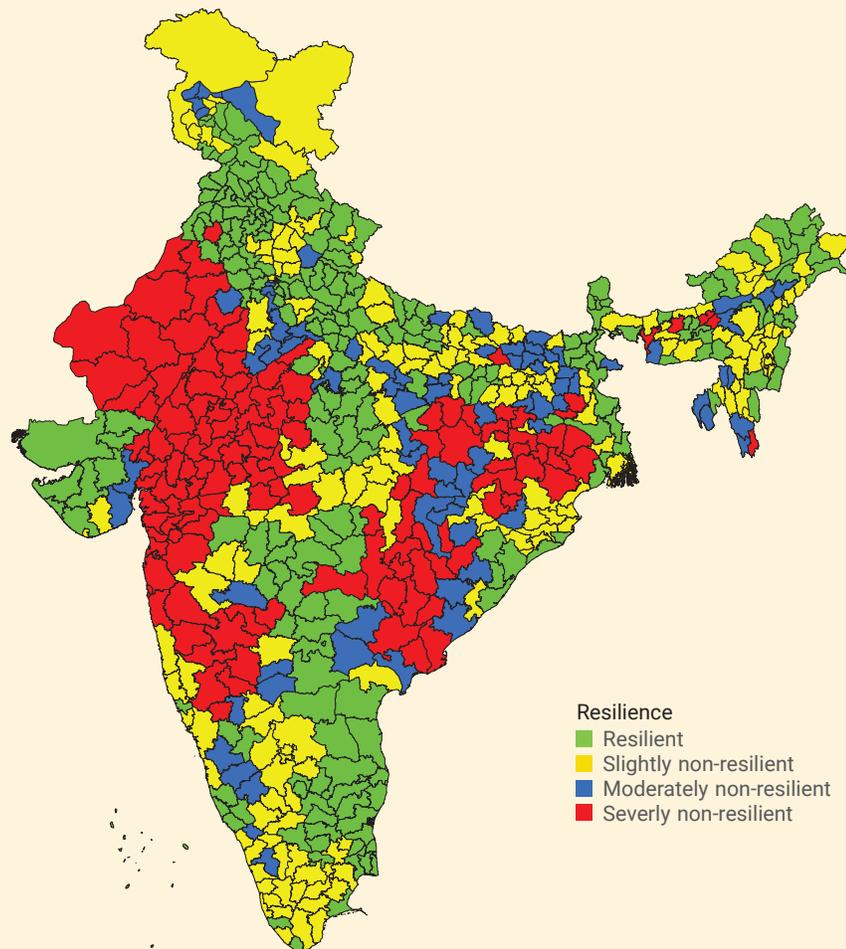
**CLIMATE
CHANGE**

DROUGHT
& HEALTH
IMPACTS



CLIMATE CHANGE, DROUGHTS & HEALTH IMPACTS

DROUGHT PRONE DISTRICTS OF INDIA²⁶



Climate change is increasing the frequency, severity, and duration of droughts as a result of:

- less total precipitation
- a higher proportion of precipitation as rain instead of snow
- less snowpack with more and earlier spring runoff
- higher temperatures that increase evaporation rates

According to the Ministry of Earth Sciences (MoES), the overall decrease of seasonal summer monsoon rainfall during the last six-to-seven decades has led to an increased propensity for droughts all over India. Both the frequency and spatial extent of droughts have increased significantly during 1951–2016. In particular, areas over central India, southwestern coastal, southern peninsular and north-eastern India have experienced more than two droughts per decade, on average, during this period. The area affected by drought has also increased by 1.3% per decade over the same period.²⁷

Rainfed areas are highly drought prone. On an average, India's rainfed regions suffer from drought every three years. Often the drought persists for three to six years and affects the availability of water for people and livestock, and crop and fodder production. Drought has direct and negative impacts on agricultural production. Severe droughts in rainfed areas have reduced agricultural production by 20 to 40 percent.

Parts of Andhra Pradesh and Rajasthan have faced four droughts in the last four years while more than 20 districts in Karnataka have reeled under a drought for three years during this period. At the same time, Maharashtra, Uttar Pradesh, Chhattisgarh, Madhya Pradesh and Odisha have faced two droughts.

According to the Ministry of Agriculture, the frequent droughts in the last four years have not only affected the kharif and rabi crops but also destroyed kharif supplementary crops in these states.²⁸

HEALTH IMPACTS OF drought

- Drought results in lower crop yields and increased crop loss or destruction, exposing large populations of people to rising food prices, food insecurity and – especially in developing nations – malnutrition, famine, and forced migration.
- During droughts, communities increasingly turn to groundwater stores for water supply. Groundwater is often contaminated with industrial material, heavy metals and agriculture runoff, including nitrates from fertilizers. Drought increases the concentration of these contaminants, further increasing the risk of waterborne disease.
- Drought conditions create the need to conserve water, which may limit personal sanitation and hygiene practices, resulting in greater exposure to disease-causing organisms or chemicals.
- The multiple and interconnected impacts of drought on physical health, food security, economic livelihood, and social stability can have serious mental health impacts. Long-term drought and its impacts have been linked to increased rates of suicide among rural farmers in India.
- Dry vegetation and increased heat from drought are associated with more frequent and intense wildfires, which pose a risk of smoke inhalation and increased exposure to particulate matter and resultant asthma exacerbation, other respiratory illness, and cardiovascular disease.
- Warmer temperatures and changes in precipitation have impacts on the habitat and distribution of disease carrying vectors such as mosquitos carrying West Nile virus or dengue, and ticks transmitting Lyme disease.

WHAT CAN HEALTH PROFESSIONALS DO

to address climate change and drought?

- Talk to patients about the impacts of drought and how best to protect their health, especially nutritional deficiencies.
- Discuss the social and psychological impacts of drought on patients and refer them to appropriate mental healthcare resources.
- Advocate for measures to protect against risks of vector-borne disease due to drought.
- Advocate for efficient sanitation and hygiene techniques keeping in mind the drought.
- Advocate for patients to stay hydrated and maintain nutritional balance during droughts.
- Advocate for patients to conserve water during droughts without compromising personal health and hygiene.
- Educate your colleagues and community on the links between climate change, drought, and health, and what can be done to prevent adverse health impacts.
- Advocate and promote action to protect groundwater and surface water from contamination – for example, through the reduced use of fossil fuel based agricultural inputs like pesticides and nitrogen-based fertilizers, and through the use of green infrastructure.
- Advocate and promote water conservation in agriculture and in cities.
- Promote local and sustainable agriculture practices, such as urban gardens, to reduce food insecurity when food prices increase.
- Promote rainwater harvesting and the restoration of natural waterbodies.

WHAT CAN HEALTH SYSTEMS DO

to address climate change and drought?

- Ensure that there are supplementary nutritional programmes extended to drought-prone areas.
- All the vulnerable population in drought-prone areas should be covered under health insurance.
- Raise awareness on sanitation, health and hygiene, nutritional status, socio psychological aspects, and counselling.²⁹
- Install rainwater harvesting techniques to conserve water at the health center.
- Implement best practices of healthcare with water conservation methods.



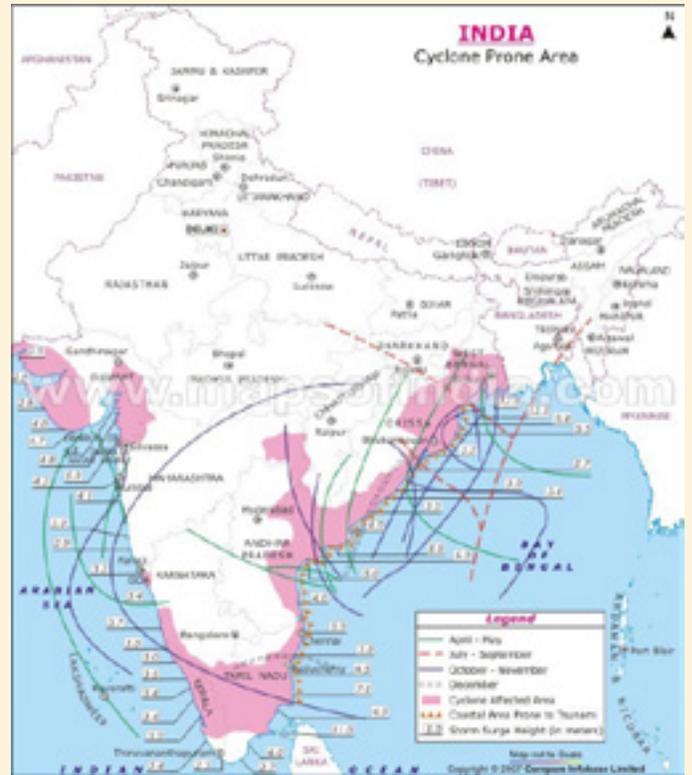
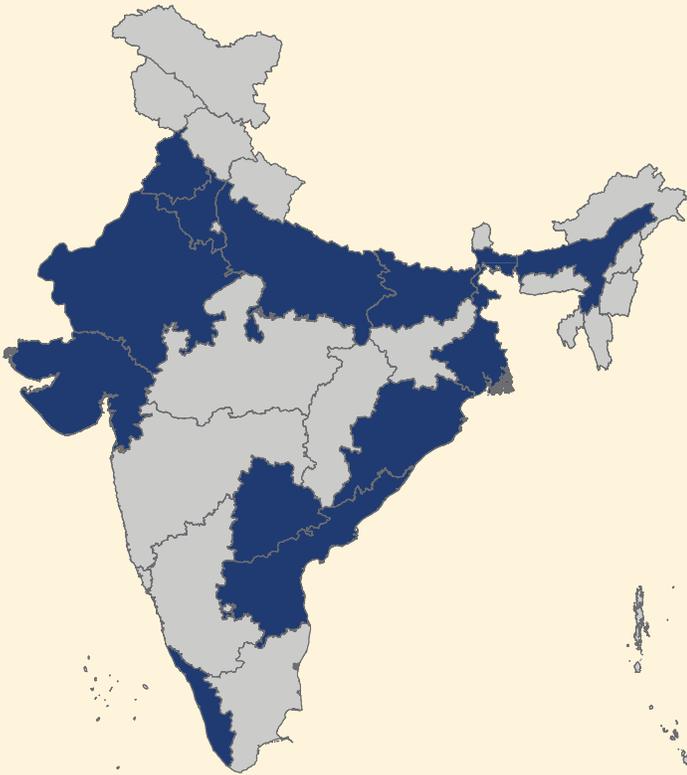
CLIMATE
CHANGE

CYCLONES,
FLOODS

& HEALTH
IMPACTS



7 CLIMATE CHANGE, CYCLONES, FLOODS & HEALTH IMPACTS



Source: <https://www.mapsofindia.com/top-ten/geography/india-flood.html/flood-and-drought-management-through-water-resources-development-india>

Source: <https://www.mapsofindia.com/maps/india/cyclone-prone-areas.html>

Climate change is altering precipitation patterns worldwide and increasing the frequency of severe storms and flooding. Some areas are already experiencing “wetter wets” in the form of increased average rainfall and more frequent and severe cyclones and storms. From urban flooding to indoor mold to mudslides, this excess precipitation has negative impacts on health.

In 2019, the monsoon continued for a month longer than normal in India. From June to the end of September 2019, 110% of the long period average rainfall was recorded. Flooding caused by heavy rain was responsible for 1,800 deaths across 14 states (Maharashtra, Karnataka, Kerala, Gujarat, Rajasthan, Andhra Pradesh, Odisha, Uttarakhand, Madhya Pradesh, Bihar, Uttar Pradesh, West Bengal, Assam and Punjab) and led to the displacement of 1.8 million people. Overall, 11.8 million people were affected by the intense monsoon with the economic damage estimated to be US \$10 billion. In the same period, there were eight tropical cyclones. Six of them intensified to become “very severe.” “Extremely severe cyclone” Fani affected 28 million people, killing nearly 90 people in India and Bangladesh, and causing economic losses of US \$8.1 billion, according to the Global Climate Risk Index, 2021, released by Germanwatch – an NGO based in Bonn, Germany.

HEALTH IMPACTS OF cyclones and floods

- Severe storms result in injury and death due to trauma or drowning.
- Extreme weather causes disruption of medical care, particularly for those with chronic illness.
- Critical infrastructure is disrupted, including electricity, sanitation & water treatment, food refrigeration, healthcare, communication systems and transportation.
- Indoor air quality declines, as excess moisture from rainfall and flooding often results in increased mold production in the months after an extreme event.
- Risk of infectious disease increases, particularly with exposure to water-borne pathogens as sewage or water treatment systems overflow, or due to skin wounds and fungal infections.
- Diarrheal illness, acute respiratory illness, and skin infections are all reported post disasters.
- Exposure to toxic chemicals increases, due to the overflowing of toxic waste sites or chemical storage facilities.
- Floods and cyclones are frequently followed by a proliferation of mosquito populations, possibly increasing the risk of vector-borne illnesses particularly in warmer climates.
- Risk of snake bites increases during and after floods.

WHAT CAN HEALTH PROFESSIONALS DO to address the health impacts of extreme rainfall and storms due to climate change?

- Talk to patients about the health risks of extreme precipitation, floods and storms, and how to stay safe and healthy. Advise families on food and water safety during and after floods and storms.
- Educate individuals on the increased risk of vector-borne disease following extreme rainfall. Advise them to not leave stagnant water in their yards, and also protective measures.
- Encourage individuals and families to create emergency response plans to be followed in the event of flooding or extreme storms. Encourage patients and families to follow emergency communications in the event of anticipated extreme storms or flooding.
- Work with your colleagues and hospital and clinic administrators to assess the vulnerability of healthcare facilities to extreme weather events, and to develop and implement a plan to ensure that facilities remain operational during an extreme event.
- Advocate for stronger emergency response systems and resources for the most vulnerable communities, including closing the digital and communications divide.

WHAT CAN HEALTH SYSTEMS DO

to address climate change, cyclones and floods?

- Creating awareness to the types of injuries, illnesses and other health problems caused by cyclones to all the medical teams and the community at large.
 - Promoting personal hygiene practices and the use of boiled/safe water and food will be part of community education.
 - Creating trained medical first responders for providing first aid to the injured, and resuscitation measures for cases of drowning. Medical staff must be trained for cardiopulmonary resuscitation and basic life support in cases of drowning. An inventory of trained medical and paramedical staff must also be made available to the district authorities.
 - Medical treatment kits need to be prepared for the management of cyclone casualties. Intravenous (IV) fluid ventilator, oxygen, splint, dressing material, tetanus toxoid drugs, antibiotics, vaccines, anti-snake venom and anti-diarrheal drugs will be the most commonly needed medical resources. Sources of availability of largescale medical supplies must be identified³⁰.
 - Patient Evacuation Plan: Emergency medical equipment and drugs must be made available for resuscitation, at the cyclone site. Paramedical staff must be trained for resuscitation, triage and maintaining vital parameters like pulse, blood pressure, respiration and intravenous drip during evacuation. Heli-ambulances need to cater to evacuation of casualties in case of roadblocks. Ambulances must have SOPs for treatment procedures.
 - Disaster Management plans need to be prepared by all hospitals in coastal areas. Medical facilities, training of medical personnel, creating awareness about drowning and its management will be part of the plan. Hospitals must nominate an incident officer for coordinating the management for cyclone casualties. Contingency plans must be made ready for capacity expansion of hospitals.
- Oxygen cylinders, continuous positive air pressure (CPAP), ventilators, splint, dressing material, blood and IV fluids for transfusion, must be stocked.
- Hospital casualty rooms will be equipped with resuscitation equipment like suction apparatus, airways, laryngoscope, pulse oximeter, defibrillator and life-saving drugs.
 - Hospital building and design should be planned based on the flood vulnerability of the region. If in a vulnerable region, the hospital should plan to locate emergency power backups, medicine stock and expensive equipment in an elevated level that cannot be inundated.
 - In the aftermath of a cyclone, public health response is one of the prime responsibilities of medical authorities. They must ensure safe water supply and availability of clean food, along with maintenance of hygiene and sanitation through proper bio-waste disposal. Water testing and food inspection is required to be carried out regularly to prevent the outbreak of any epidemic. An effective communication system is an essential requirement for prompt medical response.
 - The state should develop contingency plans to have enough mortuaries. And mortuaries must have enough capacity to preserve dead bodies. After proper identification, dead bodies must be immediately disposed of through district authorities to prevent any outbreak of epidemics and environmental pollution. Planning for creating makeshift mortuary facilities is also to be carried out for emergency use.
 - Health systems should have a communicable diseases prevention plan and deployment protocols in the aftermath of floods.
 - Documentation throughout the medical response process is very important for data collection, records, and references. Research programmes, data analysis, and follow-up would be used as feedback for lessons learnt and future improvement.³¹

CLIMATE CHANGE

AIR QUALITY & HEALTH IMPACTS

“If no additional measures are taken to change the ongoing regular air pollution crises, deaths from air pollution in India will rise from 1.1 million in 2015 to 1.7 million in 2030 and 3.6 million annually by 2050.”

Health Effects Institute.³²



CLIMATE CHANGE, AIR QUALITY & HEALTH IMPACTS

Climate change is reducing air quality in many ways. Air pollution caused by the burning of fossil fuels such as coal and oil was responsible for 8.7 million deaths globally in 2018, a staggering one in five of all people who died that year.³³

Fossil fuel combustion emits particulate matter ($PM_{2.5}$) harmful to public health. In India, 2.5 million premature deaths annually can be attributed to the fossil-fuel component of $PM_{2.5}$. The global total of 10.2 million premature deaths annually can also be attributed to the fossil-fuel component of $PM_{2.5}$.³⁴

Fine particulate pollution such as black carbon, sulfates and nitrates penetrate deep into the bloodstream and lungs, creating serious health impacts; these are also known to weaken the immune system³⁵.

The increasing frequency and severity of droughts due to climate change dries out the soil and increases dust levels, causing respiratory irritation. With higher temperatures and more extreme heat days, air conditioner usage increases. The associated greater energy demand increases air pollution from fossil fuel-based electricity production.



HEALTH IMPACTS OF air pollution

Chronic illness: Individuals with pre-existing chronic conditions such as asthma, other respiratory disease, and cardiovascular disease, are at greater risk of disease exacerbation and complications due to air pollution.

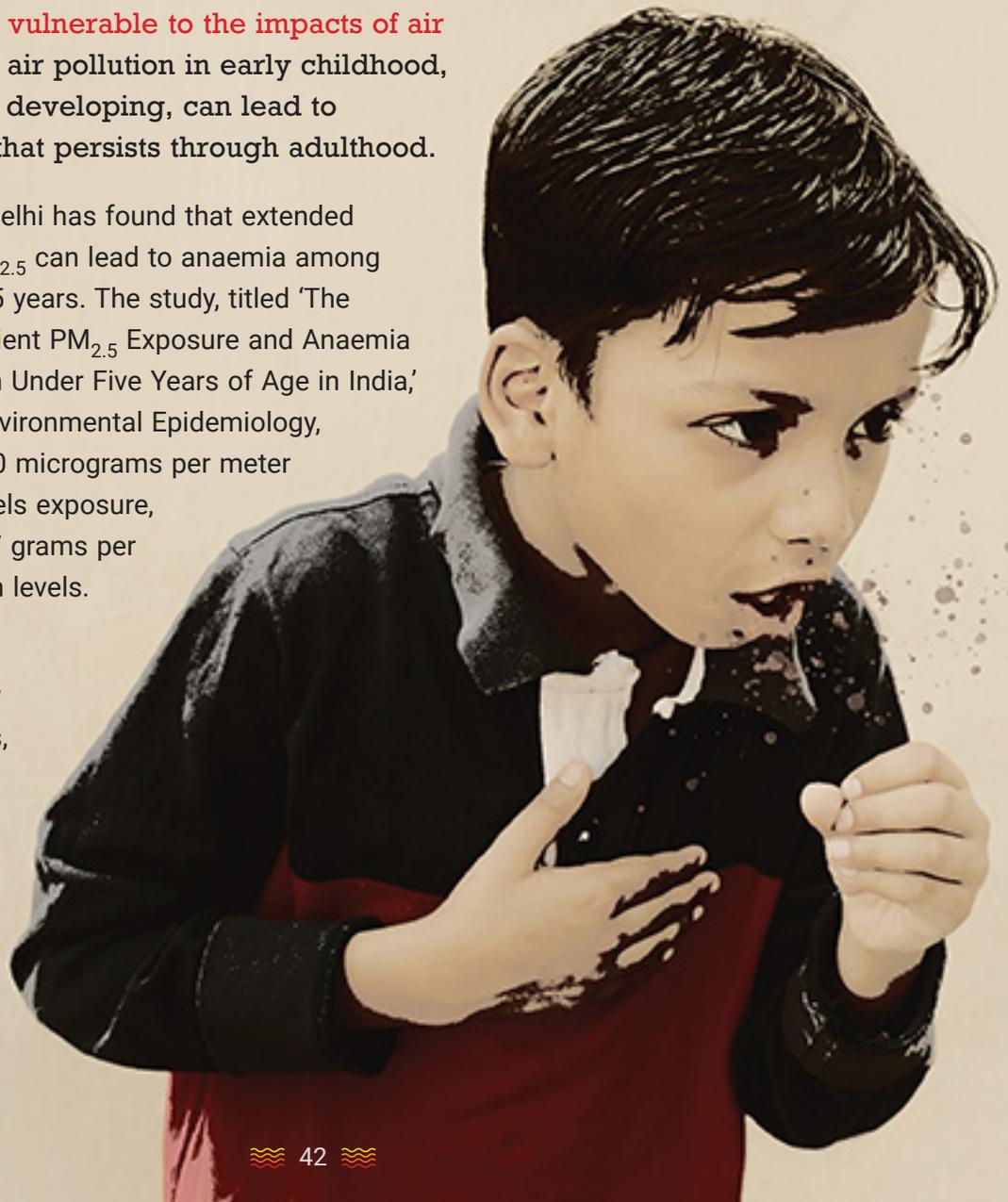
Scientists have suggested that air pollution particles may act as vehicles for viral transmission. An increase in fine particulate pollution of just 1 microgram per cubic meter corresponded to a 15% increase in COVID-19 deaths.³⁶

Preliminary research by Greenpeace³⁷ in Italy, Harvard University³⁸ in the United States, and Martin Luther University Halle-Wittenberg³⁹ in Germany suggests that air pollution increases the risk of COVID-19 spreading faster and becoming deadlier. New York City in the United States, Lombardy in Italy, and China's Wuhan province – all urban, industrial areas with high levels of air pollution – were heavily impacted by the novel coronavirus. A research paper from Chhattisgarh has confirmed the view that air pollution increases vulnerability to COVID-19 and exacerbates its symptoms.⁴⁰

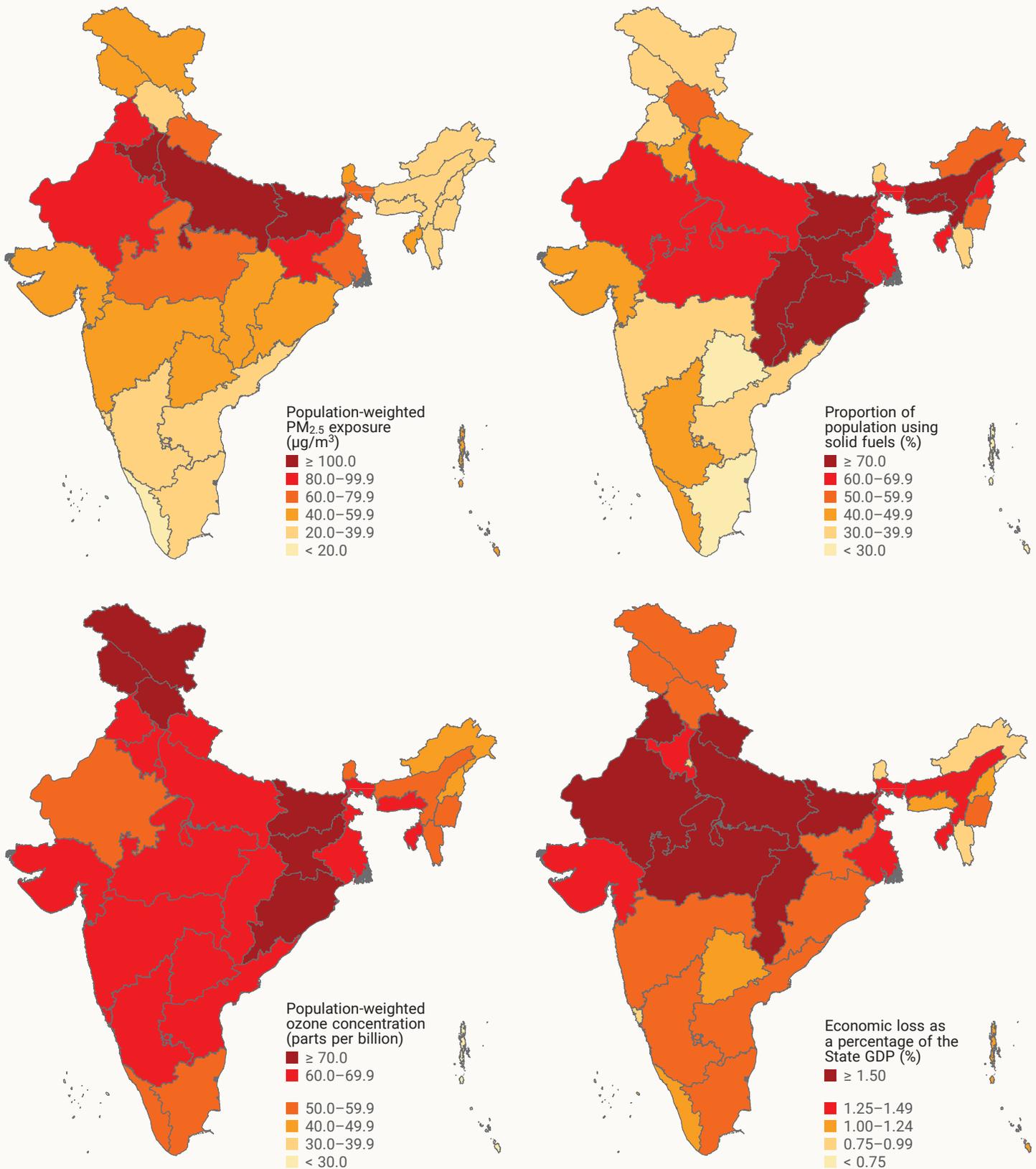
Children are especially vulnerable to the impacts of air pollution⁴¹: exposure to air pollution in early childhood, when the lungs are still developing, can lead to reduced lung capacity that persists through adulthood.

A study conducted by IIT-Delhi has found that extended periods of exposure to PM_{2.5} can lead to anaemia among children under the age of 5 years. The study, titled 'The Association Between Ambient PM_{2.5} Exposure and Anaemia Outcomes Among Children Under Five Years of Age in India,' published in the journal *Environmental Epidemiology*, has found that for every 10 micrograms per meter cube increase in PM_{2.5} levels exposure, there is a decrease of 0.07 grams per dL in average haemoglobin levels.

Beyond shortening lives, air pollution can negatively impact our day-to-day lives, causing respiratory illness and leading to days of missed work and school.⁴²



EXPOSURE TO AIR POLLUTION AND ECONOMIC LOSS DUE TO PREMATURE DEATHS AND MORBIDITY ATTRIBUTABLE TO AIR POLLUTION IN THE STATES OF INDIA, 2019



Source: Health and economic impact of air pollution in the states of India: the Global Burden of Disease Study 2019; The Lancet Planetary Health, ISSN: 2542-5196, Vol: 5, Issue: 1, Page: e25-e38; Publication Year 2021 [https://www.thelancet.com/journals/lanph/article/PIIS2542-5196\(20\)30298-9/fulltext](https://www.thelancet.com/journals/lanph/article/PIIS2542-5196(20)30298-9/fulltext)

WHAT CAN PHYSICIANS DO

to address climate change and poor air quality?

- Talk to patients about how climate change worsens air quality, and what they can do to minimise its impact on health.
- Advise patients with asthma or other respiratory illness to check the Air Quality Index for unsafe ozone and particulate levels before they step out. Advocate for patients to wear masks when outdoors.
- Advise patients to stay indoors and carry their appropriate medication while stepping out on poor air quality days.
- Talk to patients about adjusting their activities and recreation when air quality is poor. Advise them to contact their doctors in case of an emergency.
- Encourage patients who smoke (or whose family members smoke) to quit and provide resource support.
- Educate patients to engage in healthy behaviour that reduces individual footprint of air pollution. Some examples are – use of public transport, walking and cycling, waste segregation at source, composting and desisting from burning waste or dry leaves.
- Educate colleagues and communities on the links between climate change, air quality and health, and what strategies can reduce the risks of both.

WHAT CAN HEALTH SYSTEMS DO

to address climate change and air pollution?

- Relay information on air quality with requisite health advisories to the public.
- Promote the co-benefits of clean air in terms of health gains.
- Promote sustainable, non-fossil-fuel based transportation options for staff and patients.
- Opt for non-fossil-fuel based energy options to power health centers.
- Upgrade capacity to provide emergency and daily medical care to patients impacted by air pollution.
- Train healthcare staff to identify and provide care to patients impacted by air pollution.
- Conduct short-, medium-, and long-term research on correlating air quality with emergency room admissions in the region and publish the information periodically.



The background features a world map in shades of yellow and orange. A red sun with rays is positioned over the African continent. Below the map, a network of black lines connects numerous small human figures, suggesting a global network or community. The overall color palette is warm, dominated by yellows, oranges, and browns.

**CLIMATE
CHANGE**

**INFECTIOUS DISEASES
& HEALTH IMPACTS**



9

CLIMATE CHANGE, INFECTIOUS DISEASES & HEALTH IMPACTS



DELHI



RAJASTHAN



GUJARAT



MAHARASHTRA



KARNATAKA



KERALA



TAMIL NADU



ANDHRA PRADESH



ODISHA



WEST BENGAL



TRIPURA, MIZORAM MEGHALAYA



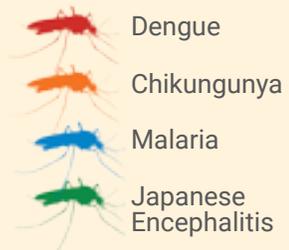
MANIPUR



UTTAR PRADESH



Mosquito-Borne



Air-Borne



Water-Borne



Source: *Deep in the Miasma, a monsoon that refuses to go away breeds a panoply of diseases;* Amba Batra Bakshi, Snigdha Hasan, Madhavi Tata. <https://magazine.outlookindia.com/story/deep-in-the-miasma/267214>

An estimated 75% of new infectious diseases are zoonotic, meaning they transmit from animals to humans.⁴³ Melting of ice and permafrost could lead to the re-emergence of ancient diseases.⁴⁴

Rising temperatures and precipitation, melting ice and permafrost, air pollution, constant loss of wildlife habitat, and long-term climate change are emerging as the main drivers of infectious diseases, whether by expanding the footprint of malaria- and dengue-carrying mosquitos or defrosting prehistoric pathogens from the Siberian permafrost.

The COVID-19 pandemic that has swept the globe and claimed over 3.2 million lives so far almost certainly was transmitted from a wild bat, clearly showing the danger of humanity's constant encroachment of the planet's fast-disappearing forests which are also wildlife habitat.

According to a New York-based non-profit, EcoHealthAlliance, deforestation is linked to 31% of disease outbreaks⁴⁵ such as those caused by the Ebola, Zika and Nipah viruses. Deforestation, human encroachment, and mass forest fires are responsible for habitat loss; they contribute to climate change or are caused by it, creating a feedback loop. Climate change is affecting infectious disease transmission patterns⁴⁶ in multiple ways.

Changes in temperatures and precipitation are making higher and cooler mountainous regions more susceptible to "southern" or "low land" diseases like malaria. Before 1970, dengue fever caused severe outbreaks in only nine countries. But now, it is endemic in more than 100 countries.⁴⁷

As ice and permafrost melt, not only will it further accelerate climate change, but infectious agents may (re) emerge too. A team of researchers collected samples of the earth's oldest glacial ice from 50 meters below the surface in Tibet and uncovered 28 ancient viruses⁴⁸ previously unknown to scientists. As climate change causes ice to melt rapidly, there are concerns that pathogens⁴⁹ – for which our immune systems would be unprepared – could be released.

A changing climate could also unlock new infectious diseases as pathogens mutate and evolve to adapt to warmer temperatures in much of the world. A study⁵⁰ published by Johns Hopkins University in January 2020 raises concerns that climate change will cause new heat-tolerant diseases to evolve, which jeopardizes one of our key natural defenses – fever, the ability of mammals to maintain high temperatures to fight infections. Global warming could cause viral mutations that resist our defenses for fighting illness.⁵¹

Climate change is increasing the global emergence, resurgence, and redistribution of the risk of infectious diseases across all of these modes of transmission.

Improving air quality and reducing emissions, especially in cities, could have significant benefits for fighting both viral and climate risks.⁵²

Addressing CLIMATE AND INFECTIOUS DISEASES SIMULTANEOUSLY

Scientific evidence points to the need for accurate forecasting and monitoring of climate change and its impact on infectious diseases.⁵³ This effort must be coupled with enhanced surveillance systems and technologies for detecting human and animal diseases to provide early information about new pathogenic microbes. Increased cross-country cooperation is needed to identify and mount a public health response to outbreaks and epidemics.

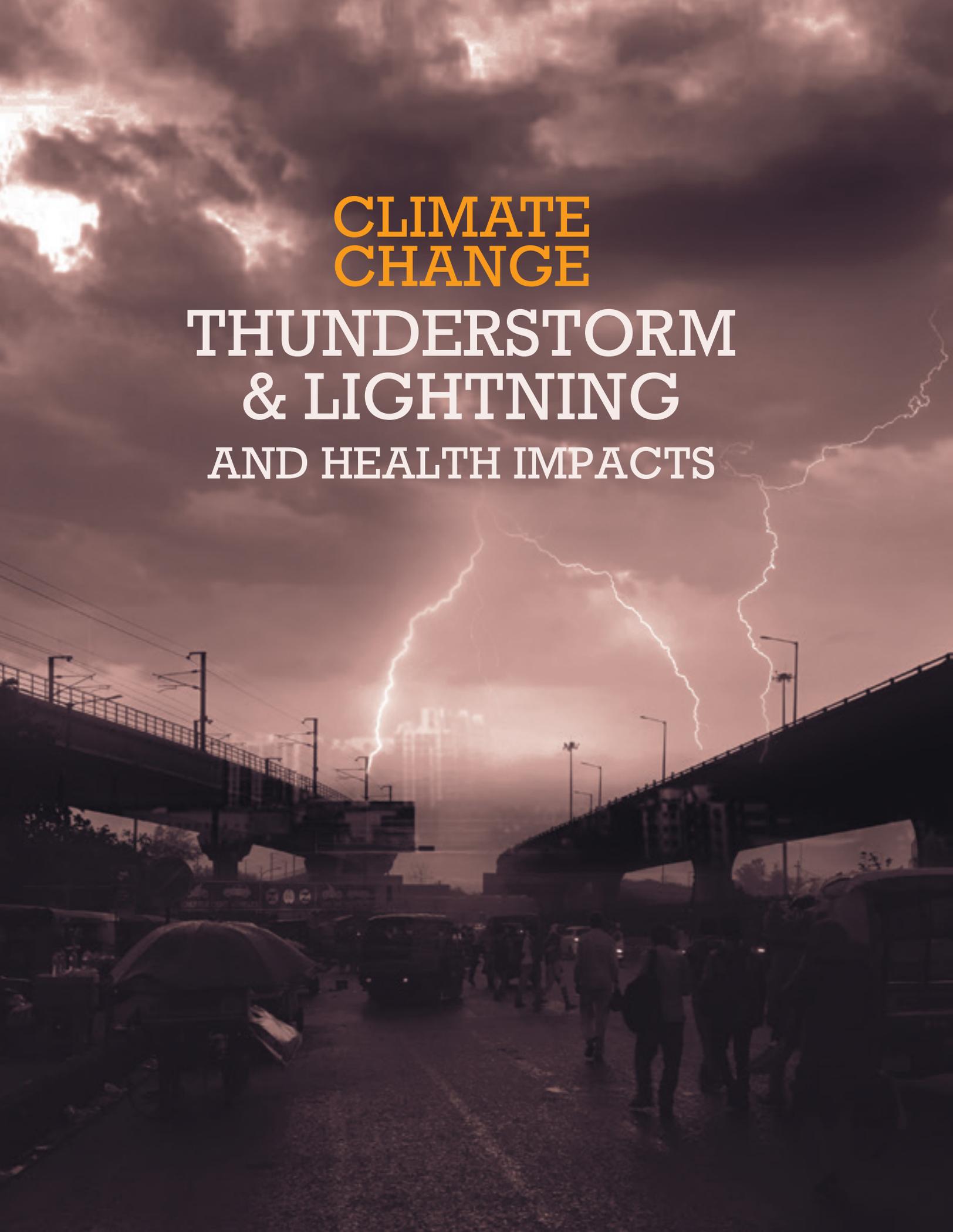
Like infectious diseases, greenhouse gas emissions know no borders. Global cooperation is needed to address both.⁵⁴ Combating climate change as a root cause of disease transmission can also simultaneously mitigate the threats of biodiversity loss and pandemics. The world will have an opportunity, in pandemic recovery, to strengthen the link between health and climate agendas. Countries can prioritize investments that help meet their overall climate commitments while addressing climate and environmental impacts on health. Fighting global health risks and diseases, including outbreaks with pandemic potential, is also, fundamentally, about fighting climate change. We need to treat the health of humans, animals, the economy, and the planet as one.⁵⁵

There is much evidence of associations between climatic conditions and infectious diseases. Malaria is a great public health concern and seems likely to be the vector borne disease most sensitive to long-term climate change. It varies seasonally in highly endemic areas. The link between malaria and extreme climatic events has long been studied in India, for example. Early last century, the river-irrigated Punjab region experienced periodic malaria epidemics. Excessive monsoon rainfall and high humidity were identified early on as a major influence, enhancing mosquito breeding and survival. Recent analyses have shown that the malaria epidemic risk increases around five-fold in the year after an El Niño event.

WHAT CAN HEALTH SYSTEMS DO

to address climate change and outbreak of infectious diseases?

- ▶ Hospital systems should have an established mechanism for developing and implementing a Hospital Emergency Risk Management Programme designed to ensure the effective management of the risks of internal and external emergencies, including epidemics.
- ▶ Hospital systems should have an established mechanism for developing and implementing a Hospital Emergency Response Plan, which includes an Epidemic Sub-plan for responding to the specific risks of an imminent or ongoing epidemic.
- ▶ Hospital personnel should be fully aware of their roles in preparing for, and responding to, an emergency, are to be trained to perform the necessary actions and at the same time be able to provide day-to-day hospital services or have arrangements in place for deciding to suspend these services or refer patients to other health facilities in an emergency. The lines of communication needed to facilitate the coordination of the overall response to an emergency must function effectively:
 - within and between the different departments of a hospital.
 - between hospital managers and staff and policymakers in public health authorities; between different hospitals.
 - between hospitals, public health authorities and other healthcare entities.
 - between hospitals, the local health workforce and the communities they serve, between hospitals and emergency services, and local providers of water, power, waste management, transport and communication services, and medical supplies.
- ▶ Health systems should be able to adapt to the specific challenges of an epidemic, whatever the nature of the disease and the resources needed, and even in the event of a concurrent emergency.
- ▶ Appropriate resources should be available in sufficient quantities and must be used effectively despite problems associated with an epidemic, such as the potentially large number of people affected, community anxieties, misinformation, and so on.
- ▶ Due attention should be paid to the physical, mental, emotional and social needs of hospital staff and their families during an epidemic.
- ▶ The emergency response should build on existing knowledge, practice, capabilities and capacities within the hospital, the health system, and the community.⁵⁶



**CLIMATE
CHANGE**

**THUNDERSTORM
& LIGHTNING
AND HEALTH IMPACTS**



CLIMATE CHANGE, THUNDERSTORM & LIGHTNING AND HEALTH IMPACTS

According to the National Disaster Management Authority, a thunderstorm is said to have occurred if thunder is heard or lightning is seen. Usually, thunder can be heard up to a distance of 40 km from the source of origin. Thunderstorms fall in the category of Meso-gamma weather systems with a spatial extent of around 2~20 km and a temporal scale of a few hours. Considering their intensity, thunderstorms in India are categorized as follows:

- Moderate thunderstorm: Loud peals of thunder with associated lightning flashes, moderate to heavy rain spells and maximum wind speed of 29 to 74 kmph.
- Severe thunderstorm: Continuous thunder and occasional hailstorm, and maximum wind speed exceeding 74 kmph.

Lightning is a high-energy luminous electrical discharge often accompanied by thunder.

It is of
3 TYPES

- **Thundercloud or Intra-cloud lightning (IC)**
- **Cloud-to-cloud or Inter-cloud lightning (CC)**
- **Cloud-to-ground lightning (CG)**

The third type of lightning takes a toll on lives and property, and therefore, is of greater concern to us. However, inter-cloud and intra-cloud lightning are also dangerous as they may hit aircraft. These are also the precursor to cloud-to-ground lightning.

Lightning has a total path length of a few kilometers. Its peak power and total energy are very high, with the peak power discharge in the order of a 100 million watts per meter of the channel and the peak channel temperature approaching 30,000 °C. Peak currents in a lightning discharge range up to hundreds of kilo amperes (kA) with its typical value being 40 kA.⁵⁷

Table 2: Deaths from thunderstorms and lightning-strikes in India

2001	1507	2011	2550
2002	1383	2012	2263
2003	1792	2013	2833
2004	1842	2014	2582
2005	2064	2015	2641
2006	2387	2016	1489
2007	2790	2017	2057
2008	2553	2018	2028
2009	2113	2019	1771
2010	2622	2020*	946

Source:

NDMA Guidelines for Action Plan on Thunderstorm & Lightning/Squall and Strong Winds

**Note: Death counts only from the south-west monsoon period*

Thunderstorms and lightning strikes mainly affect the weaker sections of the population – small and marginal farmers, vendors, street hawkers, construction workers, fisherfolk, field officials/employees. As these people work in the open, they are the most affected, along with other weaker sections of the population. Rural and forest areas are the most vulnerable given the high presence of tall trees and water bodies.⁵⁸

A moderate thunderstorm can damage thatched huts, kutcha roads, standing crops, orchards, and power and communication lines. A severe thunderstorm can cause major damage to thatched houses/huts. Rooftops may also blow off. Unattached or loosely tied metal sheets may fly. It can also damage power and communication lines as well as roads, besides flooding of escape routes, breaking of tree branches, uprooting of large trees, etc.⁵⁹

HEALTH IMPACTS OF thunderstorm

- Allergies, Rhinitis and Asthma
- Injuries, Outbreak of epidemics, Death
- Lightning can cause burns, loss of sight, hearing, or even a heart attack.⁶⁰

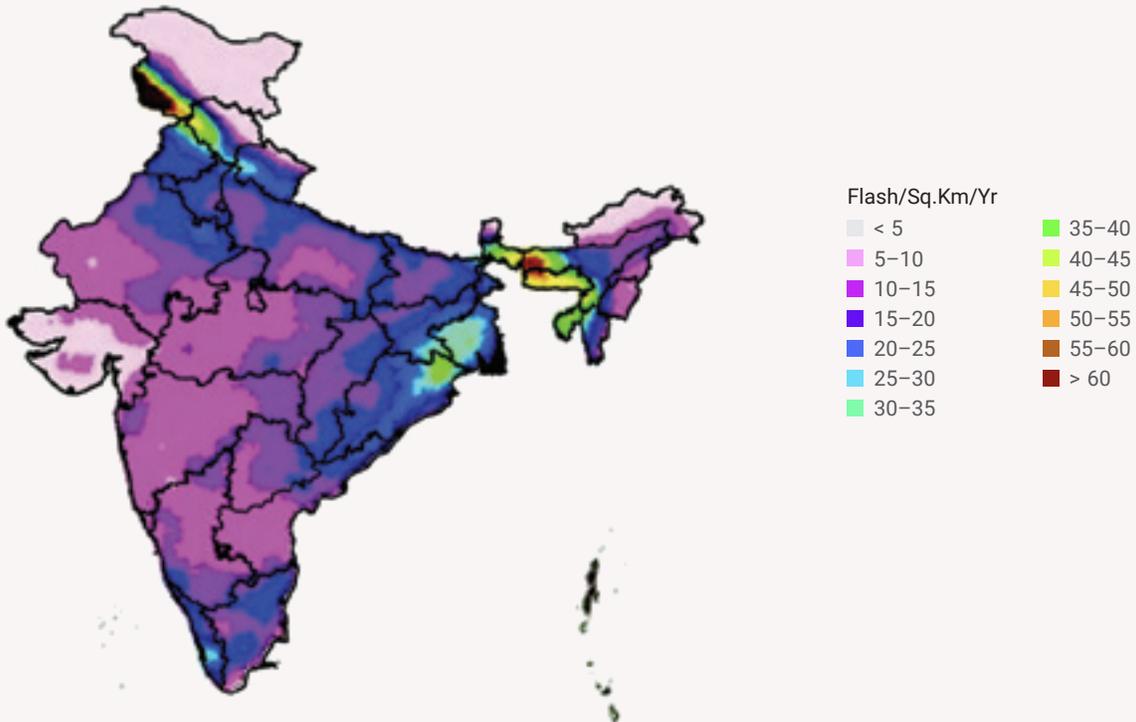
WHAT CAN HEALTH PROFESSIONALS DO to address climate change and thunderstorm?

- Make sure your hospital and local health department have a thunderstorm and lightning preparedness contingency plan.
- Talk to patients on Dos and Don'ts before, during, and after the thunderstorm and lightning.
- Talk to vulnerable population such as small and marginal farmers, vendors, street hawkers, construction workers, fisherfolk, field officials/ employees about the risks and dangers of thunderstorm and lightning.
- Talk to vulnerable patients such as the elderly, those with comorbidities, and children and pregnant women, encouraging them to take adequate precaution before, during, and after the thunderstorm and lightning.
- Special care should be taken for susceptible population groups who are sensitive to the aeroallergen and have a history of allergic rhinitis or asthma.
- Talk to patients about how climate change is increasing exposure to allergens, and what they can do to minimize their exposure to reduce allergy and asthma symptoms during thunderstorms.⁶¹
- Health professionals should be equipped to prevent the outbreak of infectious diseases in the post thunderstorm scenario.
- Health professionals should be trained to provide first aid to any victims of lightning.⁶²

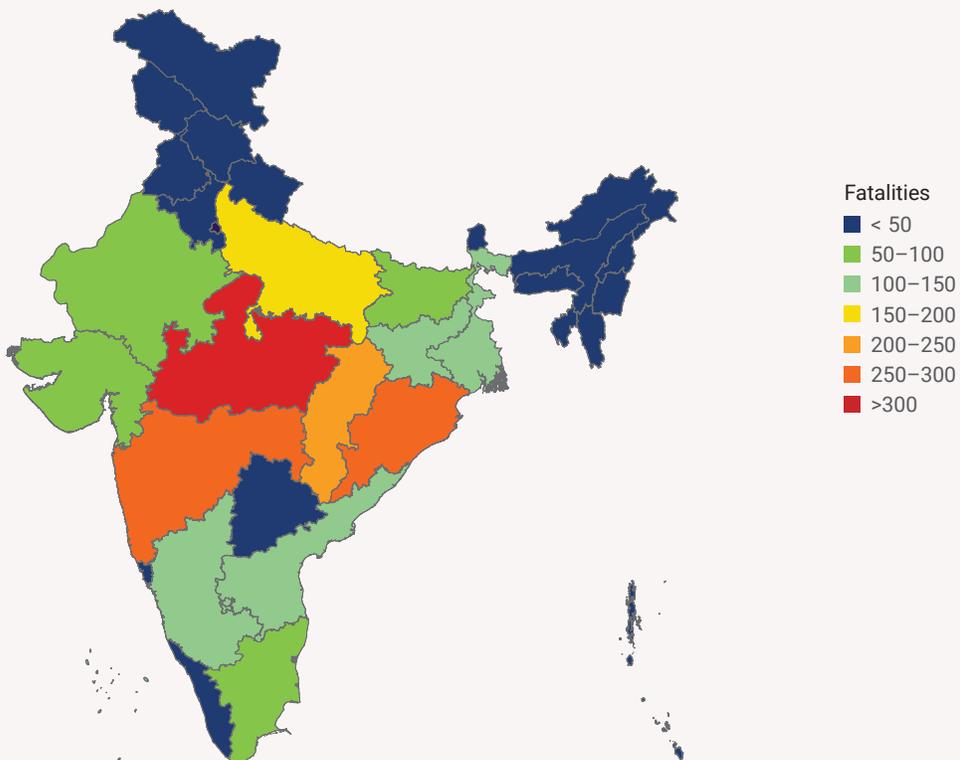
WHAT CAN HEALTH SYSTEMS DO to address climate change, thunderstorm and lightning?

- Ensure hospital buildings are hazard resistant constructions.
- Ensure proper laying of underground electricity cables and telephone lines of the hospital building.
- Ensure that the hospital has an Emergency Communication System during hazards.
- Ensure that the hospital has lightning shields for the protection of buildings and other structures.
- Ensure that lightweight panels are properly secured with their supporting frames.
- Ensure the availability of appropriate medical staff and facilities at the place of incident.
- Strengthen health centers with a network of paramedical professionals.
- Ensure stockpiling of life-saving drugs, detoxicants, anaesthesia, and availability of halogen tablets in vulnerable areas.⁶³

ANNUAL LIGHTNING MAP OF INDIA



FATALITIES DUE TO LIGHTNING



Source: Pramod Kumar Yadava & Manish Soni & Sunita Verma & Harshbardhan Kumar & Ajay Sharma & Swagata Payra, 2020. "The major lightning regions and associated casualties over India," *Natural Hazards: Journal of the International Society for the Prevention and Mitigation of Natural Hazards*, Springer; International Society for the Prevention and Mitigation of Natural Hazards, vol. 101(1), pages 217-229, March.



CLIMATE CHANGE

HEALTH IMPACTS ON

CHILDREN & WOMEN



CLIMATE CHANGE AND HEALTH IMPACTS ON CHILDREN & WOMEN

Nearly 90% of global disease burden related to climate change is borne by children under 5 years of age, in both developed and developing countries.⁶⁴

The World Health Organization has projected that approximately 250,000 additional deaths will occur annually through 2030 from malnutrition, malaria, diarrhoea and heat stress attributable to climate change.⁶⁵

Anaemic women and malnourished children from remote and impoverished parts of India face severe threats from both air and water pollution, from infectious and parasitic diseases carried by a range of vectors and contaminated water; from acute water scarcity, possible displacement, migration, and violence triggered by climate change and conflict around scarce essential resources.⁶⁶

Children who are already deprived in many dimensions of their lives are likely to face some of the most immediate dangers of climate change as their families are most exposed to the potential harm, making it the hardest for them to bounce back from climate-related shocks. Many families living above the threshold of extreme poverty maybe just one disaster away from falling into it.

Children, due to their developing brains and bodies, and their dependence on adult caretakers, are particularly vulnerable to the health impacts of climate change. On their own, children have fewer resources at their disposal to cope with climate change hazards, making them more vulnerable to injury and illness from various exposures related to climate change.

Women are affected differently and more severely by climate change and its impacts on agriculture, natural disasters, and climate change-induced migrations because of social roles, discrimination and poverty. Women often experience additional duties as labourers and caregivers as a result of extreme weather events and climate change, and also from society's responses to climate change (e.g., male migration). They face more psychological and emotional distress, reduced food intake, and adverse mental health outcomes due to displacement, and often, increasing incidences of domestic violence.

Children and the elderly are usually at a greater risk due to narrow mobility, susceptibility to infectious diseases, reduced caloric intake, and social isolation; young children are more likely to die from or be severely compromised by diarrheal diseases. The elderly face disproportional physical harm and death from heat stress, droughts, and wildfires.⁶⁷

Climate-related exposures may lead to adverse pregnancy and newborn health outcomes, including spontaneous abortion, low birth weight, preterm birth, increased neonatal death, dehydration and associated renal failure, malnutrition, diarrhea, and respiratory disease.

HEALTH IMPACTS OF climate change on children

Children often spend more time outdoors, which increases their risk of exposure to air pollution, allergens, extreme heat or water-borne pathogens from climate change.

Due to their immature thermoregulatory systems, children are more vulnerable to heat stress, especially those under 1 year of age.

Climate change is increasing the risk of several vector-borne diseases that influence children, including malaria, dengue fever, and chikungunya. Malaria is a leading cause of global child mortality. Dengue fever is the most rapidly spreading mosquito-borne virus in the world, and the majority share of annual mortality by dengue fever is among children.

Diarrheal disease causes approximately 1.6 million deaths per year in children under the age of 5, making it the leading cause of child mortality globally. Because of their higher respiratory rate and amount of time spent doing outdoor activities, children are more vulnerable to air quality exposures than other groups. Disasters can also harm children through devastation of the community resources that they rely on for their healthy mental and physical development, like schools and hospitals. Climate change significantly affects children's mental health and wellbeing. Children experience high rates of PTSD symptoms after natural disasters such as hurricanes and floods.

Children displaced by extreme events experience disruption in school, and demonstrate poor school performance and behavior problems. It is estimated that children need 4–6 months to recover academically when a severe weather event causes school displacement.⁶⁸

Medical practitioners have also expressed concern about the levels of anxiety they are seeing in children and youth who understand that climate change will impact their future wellbeing.



CLIMATE CHANGE IMPACT ON pregnant women

Pregnant and postpartum women and their infants are uniquely vulnerable to the health impacts of climate change, due to the many physiological and social changes that occur as a result of pregnancy. Extreme heat events are also associated with adverse birth outcomes, such as preterm birth, low birth weight and infant mortality.

Exposure to air pollutants and ground-level ozone can cause respiratory illness in pregnant women and lead to low birth weight or pre-term babies. Nutrition is essential to a healthy pregnancy, nursing, and newborn outcomes. Pregnant women are therefore particularly vulnerable to the climate-related impacts on food safety, access, and nutritional value. Poor nutrition is related to delivery problems, low birth weight, and even newborn death.

**CLIMATE
CHANGE
& MENTAL
HEALTH**





12 CLIMATE CHANGE & MENTAL HEALTH

Disasters, whether natural or man-made, cause enormous devastation and human suffering to the community. They usually leave a trail of human agony, including loss of human life and injuries, emotional trauma, loss of livestock, property, and livelihood, resulting in long-term psychosocial and mental health problems. Climate-induced extreme weather events like flooding and prolonged droughts have been associated with elevated levels of anxiety, depression, and post-traumatic stress disorders. The trauma and losses from a disaster, such as losing a home or job and being disconnected from neighborhood and community, can contribute to depression and anxiety.

Each year since 2008, more than 20 million people on an average are forced to move because of weather-related events such as floods, storms, wildfires, or extreme temperatures.

People with pre-existing mental health conditions are relatively more prone to be affected by extreme weather conditions which can be further precipitated by poverty, migration, ongoing psychiatric medications, food scarcity or food quality issues.

Mental health services in disaster interventions are aimed at identification and management of stress-related psychological signs and symptoms of mental disorders among disaster-affected persons and persons with pre-existing mental health problems. In addition, psychosocial support interventions are aimed at mental health and psychological well-being, promotion, and prevention of psychological and psychiatric symptoms among disaster-affected communities.

Psychosocial support and mental health aspects of disasters in India – in terms of service delivery, training and research activities carried out during the last two decades – reveal a progressive shift in the nature and scope of services. This shift is well reflected in the developments that have taken place during major disasters like the Bhopal gas tragedy (1984), Latur earthquake (1993), Orissa super cyclone (1999), Gujarat earthquake (2001), Indian Ocean Tsunami (2004) and Kashmir earthquake (2005).

Psychosocial support and mental health services shall be considered as a continuum of the interventions, as an important component of general health services in disaster situations. The available resources for psychosocial support and mental health services are currently limited in the country.⁶⁹

Table 3: Status of Global Mental Health Professionals

Per 100,000 population					
	World	USA	UK	Australia	India
Psychiatrists	1.20	13.7	11	14	0.2
Psychologists	0.60	31.1	9	5	0.03
Social Workers	0.40	35.3	58	5	0.03
Psychiatric Nurses	2.0	6.5	104	53	0.05

Source: Mental Health Atlas, 2005

Fast Fact

Almost all people affected by emergencies will experience psychological distress, which for most people will improve over time.

Among the people who have experienced war or other conflict in the previous 10 years, one in 11 (9%) will have a moderate or severe mental disorder.

One person in five (22%) living in an area affected by conflict is estimated to have depression, anxiety, post-traumatic stress disorder, bipolar disorder, or schizophrenia.

Depression tends to be more common among women than men.

Depression and anxiety become more common as people get older.

People with severe mental disorders are especially vulnerable during emergencies, and need access to mental healthcare and other basic facilities.

International guidelines recommend services at a number of levels: from basic services to clinical care, and indicate that mental healthcare needs to be made available immediately for specific, urgent mental health problems as part of the health response.

Despite their tragic nature and adverse effects on mental health, emergencies have shown to be opportunities to build sustainable mental health systems for all people in need.⁷⁰

WHAT CAN HEALTH PROFESSIONALS DO to address climate change and mental health impacts?

Health professionals should be able to provide Psycho-Social First Aid (PSFA), which means providing immediate psycho-social intervention helping the affected population to deal with immediate reactions and panic related to loss of life and property.

Early identification of mental health illness among victims and directing them to the appropriate assistance.

Training on community-level workers for providing psychosocial support to the community.

Monitor the mental and physical health status of disaster relief workers during disaster pre-deployment (assessment of personality and training), deployment (hand-holding), and post-deployment phases (to build resilience).⁷¹

WHAT CAN HEALTH SYSTEMS DO

to address climate change and mental health impacts?

- Provide standardized training to mental health professionals like psychiatrists, psychologists, psychiatric social workers. Training should also be given to paramedics, community-level workers and NGOs on PSSMHS from time to time.
- In view of the acute shortage of psychiatrists, it is necessary to train medical officers who can identify the psychological signs and symptoms and mental health problems of the affected people going to primary health centers.
- Undertake new research initiatives using evidence-based research studies in the disaster areas. The research also needs to identify the risks and protective factors among the population during and after disasters.
- Undertake epidemiological studies on the incidence and prevalence of mental disorders and psychosocial effects on the affected community as well as general population to ascertain the differences.
- Undertake documentation of the details of disasters, preparedness, response, mitigation, quality, and quantity of response provided to the community. Detailed documentation needs to be shared periodically at the district, state and national level for cross-learning, feedback, and future planning.
- Undertake capacity building for providing adequate mental health services. Upgradation of existing physical infrastructure and creation of additional infrastructure at the center, state, and district levels.
- Should create more zonal centers or upgrade the existing ones to meet the enhanced need during a disaster. Wherever such institutions are not available, the departments of psychiatry in medical colleges can be engaged.
- Establish a well-functioning referral system, which is a specialized service required when psychosocial disorders cannot be managed or resolved at the disaster site or at the PHC.
- Hospital preparedness is an important part of disaster management where the hospital disaster management plan should include mental health service as one of the components.
- Proper networking of existing institutions should be established for capacity development of human resources for proper management of mental health services.

Climate change is an ongoing pandemic and threatens the future of the earth. Eco-anxiety refers to the psychological impacts due to the same. The American Psychology Association (APA) describes eco-anxiety as “the chronic fear of environmental cataclysm that comes from observing the seemingly irrevocable impact of climate change and the associated concern for one’s future and that of next generations.”

Eco-anxiety is a relatively new concept and is closely linked to another concept, “Nostalgia”, which refers to a set of psychological disorders that occur in a native population following destructive changes in their territory, whether as a result of human activities or the climate. Both these concepts are not considered as diseases and are still being studied.



**ROLE OF
HEALTH SECTOR
IN CLIMATE CHANGE
MITIGATION**



ROLE OF HEALTH SECTOR IN CLIMATE CHANGE MITIGATION

Contributing 4.4% to the global net emission, the healthcare sector has both moral responsibility and historic opportunity to invest in healthy, resilient communities for all.

The worst effects of climate change can be prevented, and such prevention presents an opportunity for healthcare to play a leadership role by implementing resilience and low-carbon development strategies within the sector while influencing others to mitigate climate change and improve population health. As a public health professional, there are many ways that you can act as a Climate and Health Champion in your practice, in your local community, and more widely in influencing community leaders and policymakers who make decisions with larger impacts.

Health Care Without Harm, a non-profit network of European hospitals and healthcare providers has developed its climate program with the goal to transform healthcare into a climate-smart, resilient, and innovative sector that protects public health from climate change, and accelerates the transition to a low-carbon economy while improving health equity and access.

The health sector's climate action rests on a three-pronged approach:

1. MITIGATION

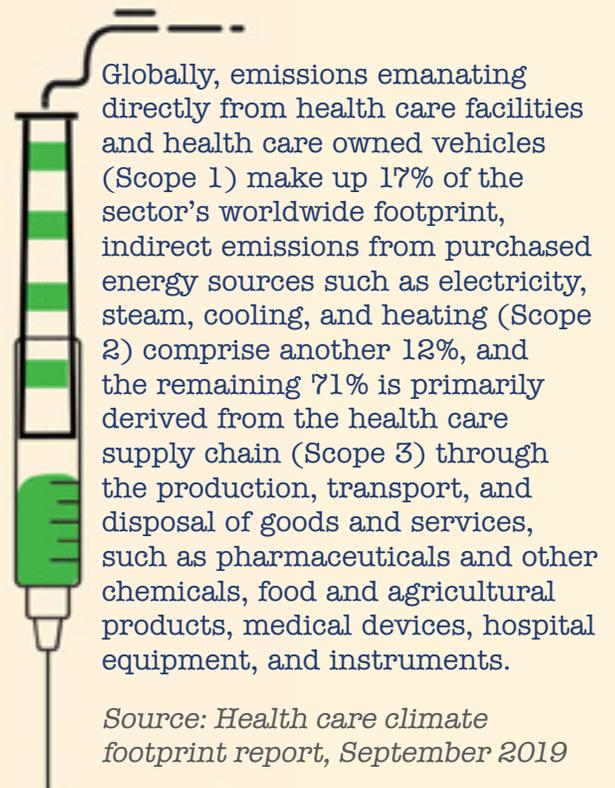
Reduce healthcare's own carbon footprint.

By decarbonizing healthcare's energy consumption, operations, and supply chain, reducing its climate footprint in alignment with the ambition of the Paris accord.

2. RESILIENCE

Prepare for the impacts of extreme weather, slow-onset disasters, and the shifting burden of disease.

By building health systems and facilities to withstand the impacts of climate change while deploying climate-smart and resilient healthcare as an anchor strategy to achieve more equitable access to care, resulting in healthy, resilient communities.



3. LEADERSHIP

Educate staff and the public about climate and health and promote policies to protect public health from climate change.

That is by accelerating the transition to a low-carbon economy by activating health care as a climate policy advocate, leveraging health care's purchasing power to hasten societal de-carbonization, and mobilizing health care institutions and their employees as trusted climate communicators.

PERSONAL CLIMATE ACTION LIST

for Public Health Professionals

- ✓ Take steps to reduce your own carbon footprint.
- ✓ Walk or bike instead of driving; drive a low- or no-carbon vehicle.
- ✓ Be energy-efficient at home and in your office: use energy-efficient appliances, electronics, and light bulbs.
- ✓ Engage in effective waste management practices, segregation and composting.
- ✓ Reduce the use of plastic in all forms
- ✓ Place climate change educational material brochures, factsheets, posters about climate change and health at the health center/hospital.
- ✓ Look for appropriate ways to incorporate climate change and health into patient education materials (e.g., disease management plans, discharge materials, medication sheets, etc.).
- ✓ Speak on the health impacts of climate change, and strategies to address them, at your local clubs or community meetings.
- ✓ Include climate change and health information when your clinic participates in community events.
- ✓ Write an Op-Ed in your local or regional newspaper on the connections between climate change and health equity.
- ✓ Capitalize on current events: Write Letters to the Editor after relevant events such as extreme weather incidents, about the connection between such occurrences, climate change and health.
- ✓ Speak on local radio or television programmes about climate change and health.



10 Climate Action Goals FOR HEALTHCARE INSTITUTIONS

ENERGY

Implement energy efficiency and clean, renewable energy generation. Greater energy efficiency and transitioning to clean, renewable energy sources, such as solar and wind, can both significantly reduce greenhouse gas emissions and protect public health from the myriad impacts of climate change, including increased heat-related illnesses, the expansion of vector-borne diseases, increased droughts and water scarcity in some regions and storms and flooding in others. Moving away from fossil fuels also brings with it the health and direct economic benefit of cost efficiency and reduced electricity bills and co-benefits of reductions in hospital admissions and treatments for chronic illnesses such as asthma, lung and heart disease caused by the pollution created from the extraction, refining and combustion of coal, oil and gas.

WATER

Reduce hospital water consumption and supply potable water. Health facilities can conserve water resources by closely metering water use, installing water-efficient fixtures and technologies, growing drought-resistant landscape, and making sure that leaks are quickly repaired. For even greater impact on overall usage, hospitals in a number of countries are harvesting rainwater. Others recycle water for process purposes

BUILDINGS

Support green and healthy hospital design and construction. Aspire to carbon-neutral building operation in a planned manner. Protect and restore natural habitat; minimize the combined footprint of building, parking, roads and walks. Design within local natural and social contexts in order to better integrate the building with the community and natural environment. Site facilities after conducting a thorough climatic vulnerability assessment and in accordance with solar orientation and prevailing wind.

TRANSPORTATION

Improve transportation strategies for patients and staff & develop transportation and service delivery strategies that reduce hospitals' climate footprint and their contribution to local pollution. Plan shifting to hybrid technologies, all-electric vehicles, as well as compressed natural gas or some biofuels. This will all have the net impact of reducing emissions for fleet vehicles such as ambulances and vans. Encouraging hospital staff and patients to use bicycles, public transportation and carpools can also help reduce the air pollution emissions related to health care facilities.

● CHEMICALS

Substitute harmful chemicals with safer alternatives; By addressing chemical exposure in health settings, the health sector can not only protect patient and worker health, but also actively demonstrate the safe management of chemicals thereby leading by example.

Develop institution-wide chemicals and materials policy and protocols to protect patient, worker, and community health and the environment, while helping drive societywide demand for alternatives.

● WASTE

Reduce, treat and safely dispose of healthcare waste; Protect public health by reducing the volume and toxicity of waste produced by the health sector, while implementing the most environmentally sound waste management and disposal options.

● PHARMACEUTICALS

Safely manage and dispose of pharmaceuticals. Prescribe appropriately, safely manage and properly dispose of pharmaceuticals. Reduce pharmaceuticals pollution by reducing over-prescription practices, minimizing inappropriate pharmaceutical waste disposal, promoting manufacturer take-back, and ending the dumping of pharmaceuticals as part of disaster relief.

● PURCHASING

Buy safer and more sustainable products and materials. Source sustainably produced supply chain materials from socially and environmentally responsible vendors.

● FOOD

Purchase and serve sustainably grown, healthy food. By promoting and supporting nutritious, localized sustainable food systems, hospitals can both reduce their own immediate footprint while supporting food access and nutrition, thereby helping to foster the prevention of disease, a reduction in the health sector's environmental health impacts and contributing to a longer-term reduction in the population's need for healthcare.

● LEADERSHIP

Prioritize environmental health; Develop and commit to a system-wide green and healthy hospital policy. This means making environmental health, safety and sustainability key organizational priorities. This can be achieved through education, goal setting, accountability, and incorporating these priorities in all external relations and communications. It amounts to a major change in the culture of the organization

Climate-Smart Healthcare:

A “Climate-Smart Healthcare” approach: Mitigation and Anchoring Community Resilience

In 2017 the World Bank published a report, co-produced with Health Care Without Harm, establishing a new approach that bridges the divide between adaptation and mitigation in the health sector. While mitigation and resilience are often placed in separate silos in the climate world, the “Climate-Smart Healthcare” approach encompasses both low-carbon and resilience strategies in an overarching framework.

Indeed, as hospitals and health systems explore opportunities to address climate change, they are finding significant overlaps and synergy between mitigation measures and climate change resilience interventions.

Many of these strategies can yield significant operational cost-savings as well as facility resilience in the case of short-term grid energy loss. For instance, hospitals are finding that the interventions which enable them to reduce their dependence on large power grids and infrastructure also enable them to better withstand situations like increased storms, which disable centralized infrastructure.

By jointly implementing resilience and de-carbonization strategies within the sector, climate-smart healthcare can reduce emissions from large systems. This approach can form a foundation from which healthcare can contribute to broader policy, economic and communications initiatives in concert with global climate and health goals.

Thousands of hospitals, health centers, and entire health systems around the world are already implementing climate-smart healthcare strategies. Kaiser Permanente, one of the largest hospital systems in the U.S., will be carbon net positive by 2025. Working with the UNDP, the government of Zimbabwe installed solar energy systems in more than 400 health centers across the country. Health systems in New Zealand, Canada, Costa Rica and more are committed to becoming carbon neutral.



Health Care Climate Challenge

The Health Care Climate Challenge is mobilizing healthcare institutions around the world to protect public health from climate change. As the only sector with healing as its mission, healthcare has an opportunity to use its ethical, economic, and political influence to be a leader in climate solutions.

By moving towards climate-smart healthcare, the health sector can mitigate its own climate impact, save money, and lead by example. By becoming more resilient, healthcare can help prepare their own facilities and their communities for the growing impacts of climate change. And by providing societal leadership, the health sector can help forge a vision of a future with healthy hospitals and healthy people living on a healthy planet.

For more details on the Health Care Climate Challenge please visit:

<https://www.greenhospitals.net/join-climate-challenge/>



Global Green and Healthy Hospitals Network (GGHH)

An HCWH project, GGHH is an international network of hospitals, healthcare facilities, health systems, and health organizations dedicated to reducing their environmental footprint and promoting public and environmental health. As of June 2018, GGHH had more than 1,000 institutional members in 541 countries who represent the interests of over 321,000 hospitals and health centers. GGHH members commit to a framework and roadmap to reach 10 interconnected sustainability goals. GGHH staff are based in Argentina, Australia, Brazil, Belgium, China, Costa Rica, England, India, Nepal, the Philippines, South Africa and the United States. The Network is increasingly prioritizing climate, providing members with tools, resources and expertise to address climate-related issues such as carbon footprint reduction and resilience, through sustainability strategies on energy, waste, buildings, procurement and more.

<https://www.greenhospitals.net/>



Doctors For Clean Air & Climate Action (DFCA)

Doctors for Clean Air (DFCA) is a network of leading doctors from all over India who are championing the fight against air pollution. DFCA works with doctors to raise health-related awareness of the ill-effects of air pollution, advocate for systemic changes to control air pollution and protect public health. DFCA in its network has about 200,000 doctors and 20 National Medical Associations who lend their voices to the health impacts of air pollution in various regional, national as well as international forums.

Key Objectives of DFCA:

- **Spread Awareness:**
Among the public about the serious health impacts of air pollution and climate change.
- **Bring About Awakening:**
Of citizens and policymakers to understand the threat of air pollution and climate change, and the need for faster action.
- **Influence Action:**
By citizens, administrators and policymakers towards cleaner air, climate-resilient and healthy living.

<https://www.doctorsforcleanair.org>



Health and Environment Leadership Platform—India

In February 2017, HCWH and the Public Health Foundation of India co-founded and launched the Health and Environment Leadership Platform (HELP). HELP is a coalition of fifteen leading health organizations (public and private) that together represent the interests of more than 5,600 hospitals and health systems across the country. HELP is a health sector coalition vehicle that will have a strong policy advocacy presence, the ability to educate and train health professionals working in its member institutions, the capacity to communicate to the public on air pollution, climate, and other crucial environmental health issues and the commitment of its members to lead by example by implementing climate-smart healthcare.

<https://www.ceh.org.in/activities/help/about/>



Medical Students Association of India (MSAI)

Medical Students Association of India (MSAI) is India's first and largest nationally and internationally represented medical students' organization comprising of over 20,000 medical students across the country. It spans over 26 states and 5 union territories. MSAI currently works on Public Health, Sexual and Reproductive Health and Rights, Human Rights and Peace, and Medical Education including Bioethics. MSAI's grassroots action and advocacy efforts are geared towards accelerating progress in these areas of intervention. MSAI has also been represented at high-level UN and WHO meetings frequently.

Advocating for Climate Action has always been one of MSAI's core priorities and the organization has worked towards the same by conducting workshops for future healthcare professionals on climate change and health, through online surveys and by the conduction of on-ground and online awareness events.

MSAI's advocacy efforts on climate change have been represented at the UNGA Side Event on Planetary Health in 2019 and Conference on Climate Change, London in July 2019.

As an organization, MSAI strives to provide its members with numerous opportunities to develop themselves as global health leaders of today and tomorrow. MSAI closely follows the principle of Think Globally, Act Locally.

<https://www.msaindia.org/>



FINDINGS
OF FIRST-EVER
SURVEY OF
CLIMATE CHANGE
KNOWLEDGE, ATTITUDE
& PRACTICE

AMONGST
HEALTHCARE PROFESSIONALS
IN INDIA



FINDINGS OF FIRST EVER SURVEY OF CLIMATE CHANGE KNOWLEDGE, ATTITUDE & PRACTICE AMONGST HEALTH PROFESSIONALS IN INDIA

This study contributes to the understanding about the level of awareness (knowledge), views (attitude) and measures already being undertaken to address climate change (practice) in order to prepare the health systems to lead the response to climate challenge. It will also be used to develop sector-specific information and communications material to empower medical and public health professionals to become key advocates around climate change and its impacts on health.

- **Study Population:** Doctors, nurses, paramedical staff, hospital administration, ASHA workers, NGO health workers, healthcare students.
- **Sample Size:** 3,062 Respondents
- **Sampled Area:** Six states representative of different zones in India: Uttar Pradesh (North), Bihar (East), Chhattisgarh (Central), Maharashtra (West), Karnataka (South), Meghalaya (North-East).
- **Ethics Clearance:** Obtained from State Health Resource Centre, Raipur, Chhattisgarh.
- **Pilot Study:** A pilot study was conducted to test the questionnaire framed to determine the knowledge, attitude, and practice of the medical, paramedical, and public health community with respect to climate change and its health impacts. The questionnaire was tested on seven healthcare professionals chosen through purposive sampling. The overall feedback about the study was positive, and the responses pointed to some gaps in the questionnaire and some changes which were incorporated in the final questionnaire used for the study.
- **Data Collection:** Administration of the questionnaire among survey participants was carried out by Morsel India. Medical database such as *Dial me 24*, *Scribe*, *AWS Database Provider*, *B2B Database Provider*, *Yes Data*, *Click UP*, *Lime Leads*, *Yellow pages* etc. were used to gather contacts. Apart from this, contacts of respondents were also obtained through government health networks like IMA (Indian Medical Association) and NHM (National Health Mission), medical colleges and non-profits like *Doctors for You and Lung Care Foundation*. A total of 5,850 healthcare professionals from various streams were contacted. With a response rate of 52%, a total of 3062 health professionals responded to the survey. Methods included phone call/online data collection as well as personal/field data collection. Due to the COVID-19 pandemic, many healthcare professionals were unavailable over telephonic interviews. Hence, personal/field data collection was also carried out following all safety protocols.
- **Analysis of Results:** The data was analyzed using IBM SPSS v19. The categorical variables were expressed as proportions and continuous variables were expressed as mean (SD) or median (IQR).

KNOWLEDGE

Understanding How Much Healthcare Professionals Know About Climate Change



AWARENESS

Overall Awareness of the term 'Climate Change'

93%

Out of the 7 streams of health professionals surveyed,⁷² a relatively higher proportion of doctors reported awareness of the terminology

97.5%
Doctors

94.8%
Healthcare Students

94.3%
Hospital Administration

92.5%
Asha Workers

92.2%
NGO Health Workers

91.2%
Para-medical Staff

89.6%
Nurses



SOURCE OF INFORMATION FOR HEALTHCARE PROFESSIONALS

28.3%
Newspaper

18.4%
Social Media (Twitter, Facebook)

25.6%
Television

7%
Personal Involvement

5.9%
Textbooks/ Scientific Journals

3.6%
Websites/ Online courses

1.7%
Radio

4.4%
NGO Community

3.5%
WhatsApp

1.6%
Weekly Magazine



UNDERSTANDING ON SOCIO-ECOLOGICAL IMPACTS OF CLIMATE CHANGE

Increased occurrences of extreme weather events in last 10 years



HIGH AWARENESS

82.1%

Changes in Rainfall pattern

81.7%

Heat waves

81.5%

Floods and Cyclones

74.8%

Forest fires

72.9%

Droughts

70%

Rise in Sea level

MODERATE AWARENESS

57.7%

Saline intrusion in groundwater

52.4%

Scarcity of Groundwater due to Increased Salinity

56.3%

Increase in Climate induced Migration

49.7%

Social Conflicts

43.9%

Deaths due to Drowning

81.4%

considered deforestation, burning fossil fuels, waste generation, emissions from industries, population growth

as **MAIN REASONS** for climate change



UNDERSTANDING OF THE IMPACTS OF CLIMATE CHANGE ON HEALTH

74.3%

Increase in climate-sensitive diseases

88.7%

Air quality related illness

81.1%

Heat related illness

79.5%

Vector borne diseases

79.3%

Cold related illness

78.2%

Water borne diseases

78%

Communicable diseases

69.3%

Mental illness like depression, anxiety etc

58.4%

Malnutrition

68.9%

Direct impact on health care sector



ROLE OF HEALTH SECTOR AND HEALTHCARE PROFESSIONALS IN ACTION AND ADVOCACY AROUND CLIMATE CHANGE



HEALTHCARE PROFESSIONALS FOR BETTER TRAINING AND UNDERSTANDING OF CLIMATE CHANGE

72.8%

Climate change and health impacts should be introduced as a subject in the medical curriculum



WHO IS MORE VULNERABLE TO CLIMATE CHANGE?



67.7% EVERYONE

82.8% CHILDREN

80.2% ELDERLY



63.5%

perceived WOMEN are more vulnerable to the impacts of climate change than men

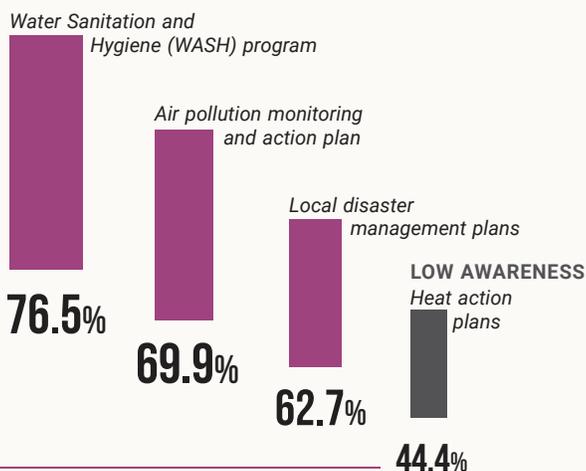


KNOWLEDGE OF NATIONAL AND INTERNATIONAL POLICIES

72.3%

HIGH AWARENESS

on national governmental initiatives like the Ministry of Health and Family Welfare's Action Plan on Climate Change and Human Health (NAPCCHH)



67.6%

HIGH AWARENESS on Sustainable Development Goals (SDGs)



43.5%

LOW AWARENESS

on international climate negotiations and treaties like the Paris Agreement on Climate Change by the United Nations Framework Convention on Climate Change (UNFCCC)

ATTITUDE

Understanding How Healthcare Professionals View Climate Change



HIGH TO MODERATE INTEREST to know more about:

- 72.9%** Linkages between infectious disease outbreaks and climate change
- 68%** To improve a sustainable transportation strategies for patients and staff
- 59%** To implement energy efficiency and clean, renewable energy generation
- 58.8%** Building climate resilient health systems and reducing health sectors' own carbon footprint
- 58.2%** To buy safer and more sustainable products and materials
- 57.6%** To support green and healthy hospital design and construction
- 57.3%** Impacts of climate change on human health
- 57%** Impact of climate change on healthcare infrastructure
- 55.8%** To reduce hospital water consumption and supply of potable water
- 55.6%** To reduce, treat and safely dispose healthcare waste

AVERAGE TO LOW INTEREST to know more about:

- The role of Governments and NGOs in mitigating the impacts of CC
- To safely manage and dispose pharmaceuticals
- Prioritizing environmental health at their workplace and practices
- To purchase and serve sustainably grown healthy food
- Substitute harmful chemicals with safer alternatives

PRACTICE

Understanding Measures Already in Place to Address Climate Change



87.1%

Participated in climate change and health related programs or discussed it with their colleagues



70.8%

Participated in air pollution and health related programs and discussed public transport and active transport like walking, cycling etc. as part of that program.

55.2%

actually raised awareness among public on the issue or conducted research on the matter

PREPARATION TO DEAL WITH FUTURE CLIMATE CHANGE EVENTS

Pathways for Climate Resilience

93.4%

INDICATED NEED FOR

Better emergency care

93.1%

Better patient care facilities and regular supply of medicines and PPE kits

90.9%

Advance information about the diseases (Early Warning Systems)

90.6%

Regular supply of water

90.1%

Better coordination among departments

89.5%

Supply of electricity

89.1%

Better building infrastructure



TALKING

CLIMATE &
CHANGE HEALTH



TALKING CLIMATE CHANGE & HEALTH

As a public health practitioner, whether a doctor or a nurse, we can make a difference in our community by talking about climate change and health. We need to understand the various ways in which climate change impacts health so that we can then speak with authority to our patients, communities, peers, and local leaders on the climate–health connection, and the benefits of building resilience to climate change.

See below a short selection of salient points, starting points, talking points and counters for sceptics. Tailor and use them in your conversations, speeches, and writing to build support for climate solutions.

SALIENT POINTS

You don't need (much) data: First and foremost, your primary task is not to tell people that climate change is happening, or to make them worry about it. They already know, and they are already concerned.

Talk about what is already happening: To create urgency, talk about what we are already experiencing. For example, extreme heat — last year was the hottest year (ever) — and how it brought storms, fires and floods that killed at least 8,200 people and cost the world \$210 billion in losses.

Localize the impacts: Emphasize how climate change affects us here and now, in our everyday lives. Talk about the local and most recent impacts of climate change that affect the community, instead of generalizing or globalizing.

Emphasize solutions: Using tangible, local examples, point out how climate solutions are accessible, are available here and now, and are creating safe and healthy communities that protect our families' health.

Focus on personal benefit: Let them know we can save money by saving energy, be healthier by eating locally grown food and biking or walking instead of driving, and protect and promote the well-being of our families and communities by reducing carbon pollution. When people realize they will gain benefits from climate solutions, they are more willing to participate.

"I'm a health professional because I care about the health of everyone in our community. I want to heal people, but it's even more important to prevent the causes of illness and injury."

"We can prevent further climate change and protect our health at the same time."

"Fossil fuels pollute our air and water. The toxic pollution we're adding to the atmosphere is not going away; it is steadily building up to dangerous levels."

"Healthy people and healthy communities require clean air and water to grow healthy food and prevent respiratory disease and other illnesses. We have a fundamental right to clean air and water."

STARTING POINTS

"If we stop pollution from fossil fuels, we stop climate change and improve our health. We reduce diseases, illness, and injury brought on by pollution and severe weather."

"Some people are more vulnerable to the health impacts of climate change - especially children, the elderly and the sick. Our efforts to stop pollution help all of these groups live longer, healthier lives."

"We slow the rising temperatures that are changing weather patterns and causing more intense storms and heat-waves, all of which impact food prices and create health threats."



“The health risks of heat, air pollution and flooding are increasing as climate change brings warmer temperatures, more extreme weather events and rising sea levels.”

“Climate change will reduce worldwide food production through adverse impacts on crop yields and fisheries. This will increase food insecurity and increase the risk of chronic illness and under-nutrition.”

“Switching from coal combustion and other fossil fuels to clean, safe, renewable energy - like wind, solar and hydroelectric - is one of the most important things we can do for our health and for the climate.”

“Energy efficiency and clean renewable energy have substantial benefits for health, including reduction in asthma and other respiratory diseases, cardiovascular diseases, and premature deaths.”

“Trees absorb carbon dioxide, improve air quality, capture rainwater, and replenish groundwater.”

“Our car-dependent land use, housing and transportation patterns have taken physical activity out of our daily routines. Sedentary lifestyle increases the risk of heart disease, stroke, diabetes, depression, osteoporosis, obesity, and some cancers.”

“Replacing car travel with walking, biking, and using public transit increases physical activity and significantly reduces risk of chronic disease, while also reducing air pollution.”

“Increased energy efficiency (in homes, offices, and industry) allows us to meet our energy needs at a lower cost and with less climate and air pollution.”

“Urban greening reduces the risk of heat illness and flooding, lowers energy costs, and improves health.”

“Green spaces provide places for us to be physically active and improve our overall wellbeing.”

“Sustainable agricultural practices conserve water, reduce pesticide and fertilizer use, protect topsoil and store carbon.”

TALKING POINTS



Talking to CYNICS, SCEPTICS AND DENIERS

“Climate change does not affect me”

1 Climate change affects us all because it affects the world our children will live in. The causes and consequences of our changing climate are impacting personal and public health now, across the nation, and this will accelerate if we don't curb carbon pollution. Indians are suffering from a higher frequency and intensity of diseases, illness, injury, and other health impacts brought on by pollution and climate change-related severe weather.

“I am more concerned about my family/health/job right now”

2 Exactly. All of which are at risk directly or indirectly due to climate change. The Indian Lung Association tells us that toxic pollution in the air we breathe is affecting the health of nearly half of all Indians. We have a problem. All of us want to live in the best place for our families. Let's ensure our families have clean air, clean water, and safe communities to live in, now and in the future, by moving away from the dirty fuels that make us sick, and shifting towards safe and clean energy like wind and solar. Caring for our climate is caring for ourselves, our family and our health.

“There is nothing I can do to stop climate change”

3 In nearly every aspect of our daily lives, we can do something to prevent climate change. From saving energy at home to recycling, eating locally produced fresh food, and taking public transportation, we can reduce energy consumption and emissions that damage our climate, and protect and enhance our health at the same time.

“Why should we do anything when the western/developed countries aren't?”

4 Indeed, India has a very low carbon footprint, but that should not deter us from embracing clean energy: affordable, local solar and wind power made here and now. India has solved great challenges before, and we can lead again with innovations that fuel a cleaner, safer, and healthier world for our families. For example, we see climate change occurring here, in our backyards, and we can't wait for politicians in New Delhi or anywhere else in the world to solve our problems. Right now, in our own communities, we can reduce pollution and improve our health by producing and using clean energy. We can protect our cities by leaving dirty fuels behind. We can let our local leaders know that we support and demand climate solutions; and that a community with sustainable solutions is the place we want to call home.

KEY TERMS

1. **Climate change:** A change of climate which is attributed directly or indirectly to human activity, which alters the composition of the global atmosphere, and is in addition to natural climate variability observed over comparable time periods.
2. **Climate change adaptation:** The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm, or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.
3. **Climate migration:** The movement of a person or groups of persons who, predominantly for reasons of sudden or progressive change in the environment due to climate change, are obliged to leave their habitual place of residence, or choose to do so, either temporarily or permanently, within a state or across an international border.

Reference: Warsaw International Mechanism, Executive Committee, Action Area 6: Migration, Displacement and Human Mobility – Submission from the International Organization for Migration (IOM, 2016); M. Traore Chazalnoël and D. Ionesco, Defining Climate Migrants – Beyond Semantics (IOM weblog, 6 June 2016).

4. **Climate change mitigation:** Efforts to reduce or prevent emission of greenhouse gases; can mean using new technologies and renewable energies, making older equipment more energy efficient, or changing management practices or consumer behavior.
5. **Loss and Damage:** While there is no commonly accepted definition available yet, here is a working definition of loss and damage as a baseline for common understanding of the concept at a local level. Loss and damage refers to the negative effects of climate variability and climate change that people have not been able to cope with or adapt to. This definition includes the inability to respond to climate stresses (i.e., the costs of inaction) and the costs associated with existing coping and adaptive strategies (in comparison with erosive coping strategies and maladaptation). Such costs can be monetary or non-monetary.
6. **Social protection:** The set of policies and programmes that aim to reduce poverty and vulnerability, and to enhance the capacity of people to manage economic and social risks like unemployment, sickness, disability, and old age. It includes social assistance programmes which are not conditional on having previously made contributions (e.g., cash transfers to poor households), and social insurance programmes which are conditional on past contributions (e.g., contributory old age pensions).
7. **Vulnerability:** The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems, to the impacts of hazards.

Reference: United Nations office for Disaster Risk Reduction

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Health Care Without Harm works to transform health care worldwide so that it reduces its environmental footprint, becomes a community anchor for sustainability and a leader in the global movement for environmental health and justice.

For more details visit: <https://noharm.org/>



Healthy Energy Initiative (HEI) is led by 'Health Care Without Harm' and is comprised of a network of partners made up of health professionals, health organizations, and academic research institutions, from around the world. The Healthy Energy Initiative in India is coordinated by Community Environmental Monitoring (CEM), a program of The Other Media. Based in Chennai, CEM addresses the plight of pollution impacted communities through environmental health monitoring skills training, information and organizing support, and emergency response services and funding.