National Health Adaptation Plan For Climate Change Related Disasters

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NATIONAL INSTITUTE OF DISASTER MANAGEMENT
NEW DELHI
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<tr>
<td>CCD</td>
<td>Climate Change related Disasters</td>
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<tr>
<td>NIDM</td>
<td>National Institute of Disaster Management</td>
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<tr>
<td>IMD</td>
<td>Indian Meteorological Department</td>
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<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
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<td>NCDC</td>
<td>National Centre for Disease Control</td>
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<td>NHAP</td>
<td>National Health Adaptation Plan</td>
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<td>NGO</td>
<td>Non-Governmental Organizations</td>
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<td>NDMA</td>
<td>National Disaster Management Authority</td>
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<td>CECR</td>
<td>Centre of Excellence on Climate Resilience</td>
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<td>PHC</td>
<td>Primary Health Centre</td>
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<td>NDRF</td>
<td>National Disaster Response Force</td>
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<td>DGHS</td>
<td>Directorate General of Health Services</td>
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<td>MoHFW</td>
<td>Ministry of Health and Family Welfare</td>
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<tr>
<td>DHS</td>
<td>Directorate of Health Services</td>
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<td>SDMA</td>
<td>State Disaster Management Authority</td>
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<td>MoEFCC</td>
<td>Ministry of Environment Forest and Climate Change</td>
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<tr>
<td>DST</td>
<td>Department of Science and Technology</td>
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<td>MoNew</td>
<td>Ministry of New and Renewable Resources</td>
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<td>BIS</td>
<td>Bureau of Indian Standards</td>
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<td>MoUD</td>
<td>Ministry of Urban Development</td>
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<td>NIHFW</td>
<td>National Institute of Health and Family Welfare</td>
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<td>NHSRC</td>
<td>National Health System Resources Centre</td>
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<tr>
<td>SIHFW</td>
<td>State Institute of Health and Family Welfare</td>
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<td>CSO</td>
<td>Central Statistical Office</td>
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<td>NIC</td>
<td>National Informatics Centre</td>
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<td>ICSSR</td>
<td>Indian Council of Social Science Research</td>
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<td>ICMR</td>
<td>Indian Council of Medical Research</td>
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<td>CSIR</td>
<td>Council of Scientific and Industrial Research</td>
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<td>UGC</td>
<td>University Grants Commission</td>
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<tr>
<td>EMR</td>
<td>Emergency Medical Response</td>
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<td>RRT</td>
<td>Rapid Response Team</td>
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<td>SDRF</td>
<td>State Disaster Response Force</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>WASH</td>
<td>Water Sanitation and Hygiene</td>
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<td>BMW</td>
<td>Bio Medical Waste</td>
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<td>IPHS</td>
<td>Indian Public Health Standard</td>
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<td>MIS</td>
<td>Management Information System</td>
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<td>SOP</td>
<td>Standard Operating Procedures</td>
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1. BACKGROUND

The 21st century is witnessing the unprecedented challenges associated with climate change, and equally unprecedented integrated international action is needed to mitigate its effects. The Intergovernmental Panel on Climate Change (IPCC), has reported that anthropogenic activities have caused an increase of approximately 1.0°C in the global average surface temperature above pre-industrial levels, which is expected to increase to 1.5°C between 2030 and 2052, if current trends continue.¹

Along with global warming, rates of sea level rise have accelerated and frequency as well as intensity of tropical cyclones and precipitation have increased. The incidence of natural disasters is increasing, and almost 4.5 billion people have been affected by floods, droughts cyclones and extreme temperature events over the past 20 years.²

The Global Climate Risk Index 2020 places India as the 5th most climate change-affected country in the world, while her contribution to greenhouse gas emissions have been a fraction to that of the United States and China.³

As observed and was predicted by climatologists, the Indian subcontinent has witnessed a unanimous, yet uneven rise in mean surface temperature as well. This has resulted in more energy consumption and generation, and magnified the frequency and severity of climate change disasters. Over the past two decades, the nation has recorded significant anomalies in temperature variabilities, precipitation patterns and lethality of disasters.⁴

More than eighty percent of India’s land mass is at multi-hazard risk and is vulnerable to disasters such as cyclones, floods, drought, heat waves and cold waves, as well as other localized hazards. Almost three fourth of the country’s population resides in these areas, as a result, over 44 million people every year are affected by natural disasters.⁵ However, this figure is a likely underestimation as it does not take into account areas affected by urban flood, flash floods and the increasing peri-urban challenges emerging due to climate change.

Despite the functioning of national health programs, availability of health manpower and infrastructure to address the existing health problems of the country, India still grapples to cope with

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¹ IPCC special report on Global warming of 1.5°C. 2018
² CRED-EMDAT-UNSIDR. Economic Losses, Poverty and Disasters 1998-2017
³ Global Climate Risk Index 2020.
the dual burden of communicable and non-communicable diseases. Climate change is expected to further increase the incidence of natural disasters and its associated diseases.

Identifying this critical gap in the current health scenario, the Centre for Excellence on Climate Resilience at NIDM has prepared the National Health Adaptation Plan (NHAP) for Climate Change related Disasters (CCD) to enable the development of resilient health services, help institutions strengthen their preparedness and capacity to address these issues, and mitigate the effects of climate change related disasters.

**APPROACH AND METHODOLOGY**

An expert group committee was formed with representation from various stakeholders from the sectors of health, academia, disaster management, environment, climate change, agriculture, water sanitation, rural and urban development, industry, medical institutions, private sector and Non-Governmental Organizations (NGOs). Extensive literature review was done, analyzing existing global adaptation plans and policies. A participatory approach was adopted and a national level consultation was conducted, where key program managers from all the states and Union Territories (UTs), representatives from the World Health Organization (WHO) and other NGOs, public and private sectors were invited for deliberations. Subsequently, four regional consultations were held to capture all region specific issues. The NHAP was thus formulated to serve as a guidepost for policy makers and program managers in addressing and adapting to health problems associated with climate change related disasters.
2. GOALS AND OBJECTIVES

Goal:

Development of resilient health services and systems to mitigate and manage the health effects of climate change related disasters.

Objectives:

1. To identify and assess health hazards and vulnerabilities associated with climate change related disasters.

2. To recommend appropriate measures for prevention, mitigation and preparedness to deal with climate change related health risks.

3. To build human resource capacity through policy planning, advocacy, research, training and education and knowledge management.

4. To provide a roadmap and action points for stakeholders with clearly defined roles, responsibilities and timelines.
3. HAZARD-RISK, VULNERABILITY AND CAPACITY GAPS

A. HAZARD - RISK

A hazard is defined as any process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation; while risk is a measure of the expected losses (deaths, injuries, property, economic activity etc.) due to a hazard of a particular magnitude occurring in a given area over a specific time period.\(^6\)

Floods, droughts, cyclones, earthquakes and landslides have been recurrent phenomena in the history of the Indian sub-continent. About 60% of the landmass is prone to earthquakes of various intensities; over 40 million hectares is prone to floods; about 8% of the total area is prone to cyclones and 68% of the area is susceptible to drought.

However whether the hazard constitutes a disaster or not depends on the risk or potential for losses involved in the affected area. According to the Disaster Management Act, 2005, a disaster is defined as “a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of property, or damage to, or degradation of environment and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area.”\(^7\)

India has been experiencing an increasing number of climate change related natural disasters, resulting in extensive loss of lives, livelihoods, the environment and economy. During Kerala floods of 2018, almost 5.4 million people were affected\(^8\); while Cyclone Fani in Orissa affected almost 16.5 million people. These two disasters led to a total loss and damages of almost 5 billion USD.\(^9\)

Figure 1 shows the various hazard prone zones of the country.

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\(^6\) NIDM. Handbook for Nodal Officers on Disaster Management.

\(^7\)Disaster Management Act, Government of India 2005

\(^8\)Post Disaster Needs Assessment-Kerala. Government of Kerala, 2018

\(^9\)Cyclone Fani- Damage, Loss and need Assessment, 2019, Government of Orissa
Figures reproduced from (Geomatics, Natural Hazards and Risk, Mapping disaster vulnerability in India using analytical hierarchy process Anusheema Chakrabortya & P.K. Joshi, 2014).
The IPCC defines vulnerability as ‘the susceptibility of human and environmental systems that are likely to experience harm or damage from the exposure to stresses and from the absence of capacity to adapt’. It is also understood as “the characteristics of a person or group and their situation that influences their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard.”

Vulnerabilities are independent of exposure and are inherent characteristics of each community. A community can be vulnerable to health effects of climate change and natural disasters owing to its geographic location, socio-demographic composition, economic and environmental resources to name a few. It is therefore imperative to understand and define vulnerability in a local, state and region-specific context, as immense variation in each domain exists between region to region.

i) Environmental Vulnerability: The landscape, natural resources, ecology, geographic location of a community determines its environmental vulnerability. Development at the cost of exploitation and degradation of the environment, and depletion of natural resources renders the community more vulnerable to the effects of climate change. Also, areas where there is existing water scarcity, and depletion of ground water reserves are more vulnerable.

ii) Physical (structural) vulnerability: Remoteness of location, materials used for construction of buildings, faulty site or building designs, population density, connectivity with hospitals with bridges and roadways, etc determine the physical vulnerability of a community.

iii) Socio-economic vulnerability: This is determined by an interplay of social factors such as poverty, overcrowding, illiteracy, lack of access to healthcare, social inequity; as well as cultural and ideological factors such as patriarchy, gender inequity, decision making authorities, and values of basic human rights. The economic status of the country, community and individual also determines the level of vulnerability, as it directly affects their capacity to build sturdy buildings, use technological and engineering advances, or provide for remedial measures following disruption. The poorer the individual, the more exposed and vulnerable they are to their surroundings

iv) Systemic vulnerability: This refers to vulnerabilities that are inherent in social institutions and systems. These vulnerabilities are often linked to existing economic and political structures or systems operating at regional, national or international levels. Poor implementation of policies and programs, lack of intersectoral co-ordination contribute to systemic vulnerabilities.

It is estimated that with her current vulnerabilities, India stands to incur great economic losses as a result of climate change. States like Chhattisgarh, Madhya Pradesh, Rajasthan, Uttar Pradesh and Maharashtra will be amongst the severely affected states, owing to their existing economic vulnerabilities.
CAPACITY GAPS

The **capacity** of any organization, community or society is defined as the combination of all the strengths, attributes and resources available within it, to manage and reduce disaster risks and strengthen resilience.

The presence of functional health infrastructure, trained health manpower, uninterrupted drug and logistic supplies, robust disease surveillance mechanisms, and existence of disaster preparedness plans are all strengths of the community. They constitute critical components of the community’s capacity to deal with climate change and related disasters. Any lacunae in the above constitute capacity gaps which increase the risk and vulnerabilities of the community and are avenues that require strengthening while adapting to climate change.

The state of health infrastructure has marked variations in the country, with an unequitable distribution of resources. While two thirds of the Indian population lives in rural areas, health facilities, doctors and infrastructure is concentrated more in the urban areas. The health services available in the rural areas often fail to meet the Indian Public Health Standards and challenges such as unavailability of health manpower, inadequate infrastructure, lack of basic amenities such as water sanitation and hygiene are common woes.

While different states have their own set of challenges and burden of diseases, the states such as Bihar, Uttar Pradesh Jharkhand, Madhya Pradesh, Jharkhand and Odisha, where the burden of diseases such as malnutrition are high, provision of safe Water, Sanitation and Hygiene (WaSH) are a challenge, the quality of health services are poor due to inadequate infrastructure, logistics and scarcity of health manpower, are more vulnerable than others to the impact of climate change.
3. HEALTH IMPLICATIONS OF CLIMATE CHANGE AND RELATED DISASTERS

1. Heat Stress:
The rise in temperatures consequent to climate change has resulted in extreme heat being witnessed in summers, with temperatures reaching higher than 50 degrees C in some parts of India. This results in heat stress and heat stroke related symptoms such as fatigue, headache, fainting episodes, and dehydration to name a few. Exposure to temperature extremes and heat waves affects the working capacity of people, and can cause kidney failure, liver failure, cardiovascular and respiratory diseases on long-term exposure. The elderly, undernourished and people with underlying organic illnesses are more prone to mortality, which is known to rise during heat waves.

Role and Responsibilities: As heat waves affect major cities and industrial townships and to some extent rural areas, its prevention and management should be looked after by the directorate of health services of all states and center.

2. Vector Borne Diseases:
Precipitation that is scattered, intense and untimely provide more favorable conditions for vector breeding than usual. Temperature changes also favor vector longevity and thriving, as well as the multiplication of the microorganisms within their vectors, such as Malaria, Dengue and Chikungunya.

Role and Responsibilities: The prevention and management of vector borne diseases requires integrated approach from various departments. However, the health impacts are handled primarily by Directorate of National Vector borne disease control programme at the central level and at the state level all municipalities play a significant role in its prevention.

3. Zoonosis
Certain zoonosis that are rodent-borne such as leptospirosis, viral hemorrhagic diseases and tularemia; have an epidemic potential following flooding. Diseases such as Lyme disease, Hantavirus pulmonary syndrome and tick borne encephalitis, which are transmitted through ticks and rodents, are also associated with variations in the climate.

Role and Responsibilities: The Division of Zoonotic Disease Programmes under National Centre for Disease Control is responsible for management at the centre level. But there is a need for coordination with veterinary and animal husbandry department at all levels.

4. Water and food-borne diseases:
With the change in mean temperatures, survival time of disease-causing microbes also changes. Change in rainfall patterns, leaching of chemicals and pathogens into ground water following heavy rains, and increased occurrence of natural disasters also result in contamination of water sources. In areas where water supply and sanitation are already compromised, climate change can further affect the availability and quality of water. All these factors could result in an increase in the occurrence of water and food borne illnesses such as Diarrhea, Dysentery, Cholera, etc.
Role and Responsibilities: National Water and Sanitation Programme provides adequate and safe water supply in rural and urban development. Management of all diseases is looked after by Directorate of Health Services at state level and Directorate General of Health Services at the Centre level.

5. Respiratory tract and cardiovascular disorders:
The morbidity from chronic respiratory diseases such as Asthma, Chronic Obstructive Pulmonary Disease (COPD) and bronchitis among others, has steadily been rising over the decades, and reflect the state of air pollution in the environment. Chronic respiratory diseases are in-fact, the third largest contributor to mortality, and also becoming some of the costliest illnesses to treat. Temperature extremes and natural disasters are known factors that precipitate cardiovascular diseases like myocardial infarctions and strokes.
Consequent to climate change and increasing temperatures, more and more secondary pollutants are produced such as ozone and particulates. It is predicted that the increased production of these aeroallergens will further precipitate respiratory allergies, increase the episodes of exacerbations of asthma and COPD, as well as result in higher cardio-respiratory mortality.

Role and Responsibilities: Management of all diseases related to respiratory tract and cardiovascular disorders by Directorate of Health Services at state level and Directorate General Health Services at centre level. There is also National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke.

6. Malnutrition:
India is among the largest contributors to global malnutrition. Changes in temperature and precipitation patterns also impact the crop harvest, and can ultimately reduce the world’s food production. Crop failure and scarcity of food availability to the poor would aggravate the problem of malnutrition. Several reports have stated that those suffering from malnutrition will be amongst the population most vulnerable to the effects of climate change. Malnourished children and adults have weaker immunity, and simple infections, allergens, trauma or stresses can get complicated and have life-threatening consequences.

Role and Responsibilities: The Department of Women and Child development under Integrated Child Development Services runs the Mid-day meal programme for school going children for prevention and control of malnutrition. Management of the condition is done by DGHS at centre level and DHS at the state level. There also needs to be a synergy with the Department of Food and Public Distribution.

7. Mental disorders:
Emotional stress and impaired mental health consequent to effects of climate change, increased morbidity, physical ill-health, socio-economic and demographic disruptions is a domain that is often underestimated and neglected. The increased frequency and intensity of natural disasters such as floods, cyclones and droughts, along with the scarcity of food and water result in loss of lives,
disruption of families, migration, resettlement, damage to property and loss of livelihood. All these are known precipitating factors for mental illnesses that are predicted to rise with time.

**Role and Responsibilities:** The National Mental Health programme run by DGHS at the centre level works towards prevention and management of mental disorders. They should also have action groups to handle mental disorders related to climate change and post disasters.

8. Injuries:
According to an EM-DAT review, more than 760,000 people have lost their lives, 2 million have been injured and 2 billion have been affected by natural disasters over the past 10 years. While the largest proportion of mortality and injuries post disaster are contributed by earthquakes, it is estimated that climate related disasters such as floods, storms and cyclones have a less than 10% rate of injury. The incidences of animal, insect and snake bites, as well as scorpion stings are reported to increase during disasters like floods which result in disruption of their natural habitat and increased man-animal interaction.

**Role and Responsibilities:** The injuries are managed by DHS at state level and Emergency Medical Response division of Ministry of Health and Family Welfare at the Centre level. These are however handled immediately by National Disaster Response Force during and post the disasters.

9. Occupational health:
Climate change has the potential to impact occupational health of workers both directly and indirectly, resulting in lack of concentration, increased incidence of injuries, stress, heat/ cold exposure, increased workplace violence and reduced productivity. Particularly vulnerable are those workers whose occupations involve exposure to extreme weather conditions and intense physical activities outdoors such as laborers, construction workers, military and para military workers, rickshaw pullers, etc. Post disasters, rescue and relief workers are also at increased risk of occupational injuries and diseases as unprecedented risks may arise due to climate change.

**Role and Responsibilities:** The Ministry of Labour & Employment should formulate a plan to handle occupational health problems due to Climate Change and Disasters in collaboration with MoHFW.

10. Epidemics and Outbreaks
Post disasters, the threat and occurrence of epidemics of water and food borne illnesses, as well as vector borne diseases is known to occur. Common diseases include outbreaks of diarrhoeal diseases, cholera, hepatitis A, food poisoning, malaria, dengue and chikungunya. In the immediate post disaster relief phase, overcrowding in camps and health facilities can precipitate outbreaks of illnesses like acute respiratory infections and measles.

**Role and Responsibilities:** These are mainly managed by NCDC at centre level and DHS at state level. In urban areas, it’s the municipality which handles the preparedness for epidemics and outbreaks.
Different disasters can be linked with different health implications, which are summarized in Table 1.

Table 1. Health implications associated with different types of climate change related disasters.

<table>
<thead>
<tr>
<th>Common Climate / Weather Extremes and Disasters</th>
<th>Health Implications</th>
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<tr>
<td><strong>Primary</strong></td>
<td></td>
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<tr>
<td>Heavy Rainfall</td>
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<tr>
<td>• Floods</td>
<td>Injuries, water borne diseases, vector borne diseases, death, drowning, hypothermia, and late injuries (infected wounds, complications of injury, poisoning, poor mental health, communicable diseases, and starvation)</td>
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<tr>
<td>• Flash floods</td>
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<td>• Urban floods</td>
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<td>• Landslides/slope failures</td>
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<tr>
<td><strong>Secondary</strong></td>
<td></td>
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<tr>
<td>Dry spells / Low Rainfall</td>
<td></td>
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<tr>
<td>• Drought</td>
<td>Nutrition-related, Dust-related and airborne, migration-related</td>
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<tr>
<td>• Desertification</td>
<td></td>
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<tr>
<td>• Forest fire</td>
<td></td>
</tr>
<tr>
<td>Oceanic storms</td>
<td></td>
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<tr>
<td>• Cyclones</td>
<td>Trauma, Drowning, Injuries, gastroenteritis, vector-borne disease and acute respiratory illness.</td>
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<tr>
<td>Winds</td>
<td></td>
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<tr>
<td>• Dust storms / Sand storms</td>
<td>Respiratory problems, eye problems.</td>
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<tr>
<td>• Thunderstorms</td>
<td>Injuries, Thunderstorm asthma.</td>
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<tr>
<td>• Air Pollution</td>
<td>Respiratory Disorders, Cardiovascular Disorders, Ophthalmic Disorders</td>
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<tr>
<td>Temperature extremes</td>
<td></td>
</tr>
<tr>
<td>• Heat wave</td>
<td>Dehydration, Heat cramps, Heat stroke; accelerated respiratory disease &amp; cardiovascular disease</td>
</tr>
<tr>
<td>• Cold wave</td>
<td>Heart attacks, Injuries, frost nip and frost bite, Hypothermia, immersion foot, influenza, Norovirus, Asthma, Sore throats</td>
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<tr>
<td>• Fires (urban, rural, industrial)</td>
<td>Burns, Mortality, wheezing, coughing, sore eyes, respiratory issues, heat induced illnesses, Carbon Monoxide poisoning</td>
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<tr>
<td>Lightening</td>
<td></td>
</tr>
<tr>
<td>• Lightening disaster</td>
<td>Mortality, Injury, Burn, Disability</td>
</tr>
</tbody>
</table>
5. REGION SPECIFIC ISSUES AND OPPORTUNITIES

NORTH REGION

States Included: Jammu & Kashmir, Himachal Pradesh, Punjab, Uttarakhand, Uttar Pradesh and Haryana

General Climatic Profile:
The North region of the country has a tropical climate with severe summers alternating with cold winters when the temperatures touch freezing points. Due to extreme the heat over summer months, the northern region draws moist winds causing summer or south-west monsoons. These monsoons contribute to 75% of annual rain over a period of four months (June to September), affecting the Indian climate very significantly. Any variability in the rainfall during this period in turn affects the water resources, power generation, agriculture, disease-pattern and ecosystems in the country. Winter season starts early in December and goes on till February for most of the areas in Northern regions, extending even till mid-march for areas at higher altitudes. Maximum temperatures rise sharply exceeding 45 °C by the end of May and early June resulting in harsh summers in the region. Decrease in humidity levels and clear skies over most parts of north India after mid-October are characteristics features of autumn season.

Demography:
- Uttar Pradesh is the most populous state of India with estimated population of 199,812,341 in 2011.
- The National Capital Region of Delhi alone has a population of 16,787,941.
- The state of Himachal Pradesh has the highest share of rural population (89.97%) in India.
- While the NCR Delhi region has the country’s most urban population, almost 97.50%.

General Disaster Profile:
- Major part of Jammu and Kashmir and Himachal Pradesh is a cold desert.
- In the states of J & K, Himachal Pradesh, Uttarakhand and Western Uttar Pradesh, most of the area falls in Seismic Zone IV for earthquakes, and some area even in Zone V, while the remaining states fall in Zone III.
- The states of Uttar Pradesh and Punjab are prone to floods.
- There are also drought prone areas in Uttarakhand and western J& K.
Regional Issues:

- Sudden and more frequent extreme hot and cold events.
- It has been observed that the amount of rainfall hasn’t significantly increased but the wet days are lesser, with greater intensity of rainfall in a shorter period, creating flood-like situations in the region. The rainy season has even shifted now, starting in mid-July till late September, instead of June till September earlier.
- In the event of displacement after disasters, there are often areas of complete isolation. Sometimes, there is even complete collapse of health services.
- There is lack of co-ordination between departments, in terms of timely information sharing.
- The provisions pertaining to occupational health are limited to certain big industries, while there isn’t proper check on small set ups.
- There is limited research available in Indian Context.
- Industrialised areas of Northern India like Delhi, Lucknow, Kanpur, Chandigarh, Baddi and Jammu have seen a rampant urbanisation, increasing the pressure on all sectors.
- There was a history of outbreaks of Japanese Encephalitis in eastern region of the country but in the past few years there have been incidents of disease even in Northern region, taking the health sector by a storm.
- There is also need of vulnerability mapping for diseases, disasters and seasonality of both, for better preparedness of both the system as well the individuals.
- It has also been observed that there is an increase in the deaths due to snake bites after floods, because of closer contact between human and animal population after disasters. Health system is often not prepared for such events with proper inventory.
- The number of vector borne disease cases have risen significantly in the past few years like dengue, chikungunya and malaria.
- The mortality and morbidity data available right now is hospital based, while there is a need to have more population based data for getting an actual picture of the level of disease in the population.
- There are limited facilities available at the primary health care level, increasing the burden over tertiary care facilities.
- The facilities that are already available are not adequately utilised.
SOUTH REGION

States Included:
Telangana, Karnataka, Andhra Pradesh, Tamil Nadu and Kerala

General Climatic Profile:
The Southern region of the country has a tropical climate. In coastal areas there is little difference between the summer and winter temperature. April and May are the hottest months of the year. During the summers temperature shoots up to 40 degrees centigrade and above. Coastal regions too get hot and humid during these months while in the plateau region, summers are cooler though. Nights, however, are cool and sea breeze that sets in during the afternoons bring the much-needed comfort to the people. Winter falls in the month of November and continues till February, although these months are not too cold. June to September is the time of the rainy season brought about by the southwest monsoon that dominates the climate of the region. Humidity, however, increases during the period and rainfalls can continue for a couple of days at a stretch.

Demography:
- Tamil Nadu is the most populated state of southern region with estimated population of 72,147,030 in 2011.
- Followed by Karnataka and Andhra Pradesh with population of 61,095,297 and 49,576,777 respectively. Telangana and Kerala follow further with populations of 35,004,000 and 33,406,061.
- The states of Tamil Nadu and Kerala have almost equal distribution of urban and rural population.
- While the states of Karnataka, Andhra Pradesh and Telangana have almost 60% rural population and 40% urban population.

General Disaster Profile:
- The states of Kerala, Tamil Nadu as well as the coastal regions of Telangana and Andhra Pradesh are prone to cyclones.
- Major region of Karnataka, Andhra Pradesh, Southern Telangana as well as Southern region of Tamil Nadu are severely affected by drought.
- The coastal regions are also prone to coastal flooding. Even some internal areas in Karnataka and Andhra Pradesh are also prone to flooding.
- In the past few years, may incidents of heat waves have been seen in the region.
Regional Issues:

- There has been an increase in flood incidents in Kerala and Tamil Nadu. Incidents of cloud burst and heat waves have also been seen in Telangana. Also, drought in south and central Karnataka.
- Prolonged periods of increase in temperature have been seen in many areas.
- Rainfall peak events have increased. Coastline erosion has also been observed but more data is needed in this context.
- Severe cyclones in Andaman & Nicobar Islands have significantly damaged the coral reef cover.
- The temperature and sea level are constantly rising, affecting the ecosystems significantly. This in turn affects the sea catch and thus the nutrition of coastal population.
- Wind speed changes affect the spread of infectious agents causing the diseases.
- Increase in the cases of vector borne diseases in the past few years like malaria, dengue, chikungunya etc.
- Morbidity data for many diseases is missing, while hospital based mortality data is present.
- Even non-communicable diseases incidence and severity is affected in the event of disasters due to hindrances in the supply chain of medicines.
- There is also an increase in injuries and violence against the vulnerable populations’ post-disasters.
- Occupational health of industrial workers is affected due to changing temperatures, making them take longer and more frequent breaks during the day and at the same time increasing the hours of late-night shifts.
- Accessibility to health care facilities and health workers is also decreased due to extreme weather events.
- Due to effect of disasters on animals, predators come in close contact with humans, causing loss of life.
EASTERN REGION

States Included:
Bihar, West Bengal, Jharkhand, Odisha and Chhattisgarh.

General Climatic Profile:
The climate of eastern region varies from tropical in Bihar, Jharkhand and Northern West Bengal to sub-tropical in Southern West Bengal, Odisha and Chhattisgarh. Spatial pattern of trends in the mean annual temperature shows significant increasing trends in all states except in Bihar where decreasing trends have been observed. The eastern coastal areas of Odisha and West Bengal are highly vulnerable to tropical cyclones. Rainfall is decreasing over most parts of the country during the pre-monsoon season. However during the post-monsoon season, rainfall is increasing for almost all regions.

Demography:
- Bihar is the most populated state in the region with a population of 104,099,452 in 2011.
- Closely followed by West Bengal with population of 91,276,115 people.
- Odisha, Jharkhand and Chhattisgarh have populations of 41,974,218, 32,988,134 and 25,545,198 respectively.
- Bihar and Odisha are 2 states having significantly large share of rural population i.e., 88.71% and 83.31%.
- Other states in the region too have a rural population of more than 68.13%.

General Disaster Profile:
- Major areas of Bihar and West Bengal are prone to floods.
- The southern West Bengal area and eastern Odisha are prone to Tropical Cyclones.
- There are many drought prone areas in Odisha, West Bengal, Jharkhand and even Bihar.
- Extreme Northern Bihar falls in seismic zone V and West Bengal fall in seismic zone 1V

Regional Issues:
- The region now sees longer summers, more intense heat waves and diminished winters.
- There are floods every year in state of Bihar and West Bengal.
- In the recent years, the number of cyclones in the coastal areas has risen significantly.
- The cases of diseases like Dengue, Malaria and Chikungunya are common in the region.
- Lack of coordination among different disasters.
- During floods and cyclones, there is often close contact with wild animals.
- Now the cases of Scrub Typhus disease are being seen in urban areas in West Bengal as well, which were limited to rural areas earlier.
- Vector borne diseases are spreading to even hilly areas, where these were not found earlier.
WESTERN REGION

States Included: Gujarat, Rajasthan, Madhya Pradesh, Maharashtra and Goa

General Climatic Profile:
The Western region has a predominantly coastal climate because of the Arabian Sea and the Gulf of Kutch. Many areas the west exhibit high day-time and low night-time temperatures during pre-monsoon season. The range of the daytime maximum and night-time minimum temperatures is found more than 15 °C at some places. Maximum temperatures rise sharply exceeding 45 °C by the end of May and early June resulting in harsh summers in the region. The days and night are hot and humid during the summer season. Monsoon strikes in July and lasts till September. The state of Rajasthan has an arid climate due to Thar Desert in the area. In the states of Gujarat and Rajasthan significant decrease in the mean annual temperature trends are observed unlike the rest of the country showing an increasing trend. From October onwards, the climate becomes cool.

Demography:
- Maharashtra is the second most populated state of India with estimated population of 112,374,333 in 2011.
- Followed by Madhya Pradesh, Rajasthan and Gujarat in the western region with population of 72,626,809, 68,548,437 and 60,439,692 respectively.
- Goa is the least populated state in the region with the population of 1,458,545.
- Rajasthan has 75.13% and Madhya Pradesh has 72.37% rural population.
- Gujarat and Maharashtra have 57.40% and 54.78% rural population.
- Goa has more urban population rather than rural of 62.17%.

General Disaster Profile:
- Most of the area in Rajasthan and adjacent area of Gujarat is a hot desert.
- The South-Eastern area of Gujarat and Western Maharashtra and Madhya Pradesh are prone to cyclones, and floods.
- The state of Rajasthan has highest occurrences of drought. The adjoining Gujarat Region which mostly belongs to semi-arid climate also experiences high incidences of drought.
- Cases of droughts have been observed in Maharashtra as well.
- Western most part of Gujarat State is in seismic zone V, followed by Zone IV in adjacent region as well as a small region in western Maharashtra.
- Most of the western region is in seismic zone II with some outlining area of all western states in zone III.
Regional Issues:
- The summers have now become longer with higher temperatures. While the winter season has become shorter.
- There have been incidences of floods and coastal floods in the region, even Rajasthan.
- The heat wave cases in Gujarat, Rajasthan and Madhya Pradesh have become more intense and frequent in the recent years.
- Due to changing climate, there have been rising cases of Crimean-Congo Haemorrhagic Fever, Swine flu, zika virus, malaria, respiratory infections, dengue and leptospirosis.
- The incidence of vector borne diseases has also gone up.
- There are even issues related to shortage of human resources that is properly trained for handling emergency situations.
- Health Infrastructure is not resilient enough to withstand the effect of climate disasters.
- Due to climate change, even food production is going down.
NORTH EASTERN REGION

States Included: Assam, Sikkim, Meghalaya, Tripura, Manipur, Mizoram, Nagaland and Arunachal Pradesh

General Climatic Profile:
Lying very close to the Tropics, North-East India displays, to a large extent, the character of tropical climate, especially in the valleys. The region has a monsoon climate with heavy to very heavy rains, confined within four summer months from June to September. The southwest monsoon is the main source of rain, and June is the rainiest month. There are three seasons in the area, winter, summer and rainy season, though rainy season, as in the rest of India, coincides with summer months. There is a climatic contrast between the valleys and the mountainous region. While the mean January temperature in the valley region of Assam is around 16 °C, the temperatures in the mountainous region of Arunachal Pradesh and Nagaland hover around a maximum of 14 °C and a sub-zero minimum temperature. The summer temperatures in the plains vary between 30 and 33 °C, while the hills have a mean summer temperature of around 20 °C with a mean minimum of 15 °C. No part of North-East India receives rainfall below 1,000 mm. Shillong plateau with its southern limit marked by a 1,200-m-high scarp overlooking the Bangladesh plain receives very heavy rains. Cherrapunji, situated on the top of the scarp, receives a mean annual rainfall of 11,465 mm. About 90 % of the rain is received during the southwest summer monsoon, and June is by far the rainiest month.

Demography:
- Assam is the most populated state of North-eastern with estimated population of 31,205,576 in 2011.
- Followed by Tripura, Meghalaya, Manipur and Nagaland with population of 3,673,917, 2,966,889, 2,855,794 and 1,978,502 respectively.
- The states of Arunachal Pradesh and Mizoram share the least population burden in the region with populations of 1,383,727 and 1,097,206.
- Assam, Meghalaya and Arunachal Pradesh have greater rural population of 85.90%, 79.93% and 77.06%.
- The states of Sikkim, Tripura, Nagaland and Manipur also have above 70% rural population.
- While Mizoram has almost equal rural and urban population, 47.89%: 52.11%.

General Disaster Profile:
- The state of Assam has a large area prone to floods.
- In the states of J & K, Himachal Pradesh, Uttarakhand and Western Uttar Pradesh, most of the area falls in Seismic Zone IV for earthquakes, and some area even in Zone V, while the remaining states fall in Zone III.
• All the states in the region fall in Zone V seismic zone for earthquakes with very high vulnerability, except Sikkim that falls in Zone IV of seismic activity.
• Even hailstorms are frequent in the state of Assam.

Regional Issues:
➢ The region has warmed significantly over the last decade. Both the minimum temperature and maximum temperature in all states of the region is constantly rising, making the surface air warmer.
➢ The region has been receiving lesser rainfall since past few years. The number of wet days in decreasing while the intensity of rainfall is increasing.
➢ Mosquito-borne diseases, including malaria, Japanese encephalitis (JE), lymphatic filariasis and dengue, are major public health concerns in the north-eastern states.
➢ Since a decade, Chikungunya has been emerging in this region.
➢ Even Scrub Typhus has re-emerged in hilly areas of the region.
➢ There is a lack of reliable data available on existing health situation.
➢ The facilities that are already available are not adequately utilised.

Opportunities: The participatory consultation and analysis of the regional issues has resulted in bringing forth several opportunities for filling the capacity gaps in the health system. These are:

➢ Policy interventions:
  • Regulations to create a synergy between public and private healthcare sectors are needed.
  • Regulations and guidelines for post disaster waste management, including BMW are needed.
  • Intersectoral coordination between the environment / climate change department, disaster management department and the health sector institutions should be encouraged.
  • Regular meetings should be held, among all stakeholders, to address forthcoming season specific risks.
  • A district level health plan for climate change should be made. It may be linked to the mission mode like Swacch-bharat mission, etc.

➢ Infrastructure- Related:
  • All health care facilities should be made disaster resilient.
  • Eco- Friendly infrastructures for all facilities should be encouraged.
  • Town planning guidelines should be laid down to ensure provision of green corridors, green health care systems.
  • Annual evaluation of health system infrastructure should be done.
  • The rural areas need better and more accessible public-healthcare facilities.
Capacity Building

- Periodic preparedness drills should be done to make sure all health professionals, support staff and other stakeholders know their roles and duties.
- Quality research should be encouraged to better utilise local resources and technologies for every region.
- Persons with high occupational vulnerability to extreme weather conditions should have flexible working hours.
- Awareness workshops and trainings should be arranged regularly for the keeping the health professionals updated with latest knowledge.
- The competence of grassroots workers regarding management of health situations during emergencies should be enhanced.
- There is a need for inclusion of climate change and its health implications in the school and college curriculum for better sensitization of the youth.
- Data consciousness should be inculcated at all levels of the health system and academic programs, so that better data is available for knowledge development.
- There is a need for professionals who can interpret meteorological data and warnings in terms of their health implications.

Community-centric approaches

- Community champions can be selected from amongst the community for capacity building to support health response during disasters. Health volunteering among local communities should be encouraged.
- The Tamil Nadu Government offers a scheme where tribals are given incentives to catch and remove venom from snakes before the rainy season so that in case of contact with the animal post disaster, the mortality can be brought down. The venom removed is then sent to different laboratories to make anti venoms. Similar programmes can be adopted by other states to encourage community participation.
- Social media platform can be used for information dissemination related to upcoming disasters and diseases in the region.

Others

- Resources that are already available should be used more efficiently.
- The central public procurement system for medical inventory should be strengthened at state, district and even block level in all states for emergency response.
- More human resource engagements can be made at grassroots level to collect and disseminate information better.
- There is a need for better data sharing through official portals for reliability.
- Better investment has to be done in disaster management and healthcare system strengthening.
6. ADAPTATION STRATEGIES

The NHAP proposes a seven-pronged strategic approach to achieve its goal of developing a climate change resilient health system:

- Health System Strengthening
- Capacity Building
- Strengthening Partnerships
- Promoting Research and Development
- Community Mobilization
- Strengthening Emergency preparedness and response
- Mainstreaming climate change adaptation to key sectors

In the next section, interventions are proposed that will enable the implementation of these strategies, and these are classified as structural and non-structural health-risk mitigation measures. Further, disaster specific interventions and strategies are presented for enhancing adaptation and preparedness towards heat and cold waves, floods and droughts.
7. MEASURES FOR HEALTH RISK MITIGATION

The implementation of the resilience and adaptation include both structural and non-structural approaches. The structural measures for health risk mitigation include engineering centric approaches that involve improvised construction technology, material design, fitting and fixtures and efficient use of technology. The non-structural measures include improvements in the policy environment, plans and procedures, human resource capacity, effective co-ordination, education, research and development, and inclusiveness.

STRUCTURAL MEASURES FOR HEALTH RISK MITIGATION

1. Safe and resilient health care facilities at all levels

The Pan American Health Organization (PAHO) and the World Health Organisation (WHO) have defined: “a Safe Hospital as one that will not collapse in disasters, killing patients and staff; can continue to function and provide its services as a critical community facility when it is most needed; is organised, with contingency plans in place and health workforce trained to keep the network operational.” The NDMA has developed and released guidelines in 2016 for making health care facilities “safe” and disaster resilient. These guidelines need to be disseminated to administrators for retrofitting of the health infrastructure buildings; and for planners and programmers to ensure these guidelines are incorporated in the development of new buildings. Administrators need to ensure that audit of the physical infrastructure of the health facilities is done regularly, and that the building codes, bylaws under municipal acts are not compromised.

2. Promoting climate resilient subset facilities

A health care facility is comprised of several subset facilities like Water Sanitation and Hygiene (WaSH), electricity, biomedical waste (BMW) management, transportation and kitchen services are critical to the functioning of the health system.

Health care facilities need to develop resilience to climate sensitive disasters by strengthening all these aspects, specially WaSH standards. In the absence of WaSH, health centres can themselves become source of infections like diarrhoea, cholera, and other food borne and respiratory infections. WaSH facilities need to have a buffer for increased service utilization expected during outbreaks, disasters and other emergencies.

10 Safe Hospitals in Emergencies and Disasters: Structural, Non-structural and Functional Indicators. World Health Organisation (WHO)

A disaster it is likely to disrupt the electricity supply for proper functioning of basic facilities like hospitals. Efforts have to be made to use appropriate engineering measures, equipment and materials to build power supply systems that can withstand any disaster and recover within a short time frame.

Adequate BMW management during and post disaster is also critical, however there is a lacunae in the guidelines regarding the same. During a disaster the usual mechanism of biomedical waste handling and management may not function. Ideally, manual collection with the use of appropriate PPE (Personal protective Equipment), segregation, and disposal at properly engineered sanitary landfill under controlled management should continue. However, if controlled disposal or sanitary landfills are compromised, an intermediate, temporary storing site should be pre-identified.

During disasters kitchen services are often most vulnerable and are susceptible to disruption due to shortage of food, water and other essential input supplies. Keeping a minimum few-weeks stockpile of basic food supply and non-perishable food items is an effective way for ensuring functionality of hospital kitchens during emergency.

Effective communication during disasters can help in directing patients to appropriate health facilities, alerting hospitals, other facilities about the inflow of patients or sharing important information. This would require a well-established communication network, connected to regional/state disaster management and public healthcare agencies, and can function despite compromise in power facilities.

NON-STRUCTURAL MEASURES FOR RISK MITIGATION

1. Development of guidelines and SoPS for safe and resilient health care facilities

While the NDMA has released hospital safety standard guidelines, primarily focussing on making health facilities resilient to disasters like earthquakes, due consideration needs to be given to make the facilities resilient even to climate change related disasters, such as heat and cold waves, floods and droughts. The building bylaws proposed by the Indian Public Health System (IPHS) need to be upgraded to adapt to the changing scenario of climate risks and region specific vulnerabilities.12

12 DGHS. MoHFW. Indian Public Health Standards (Iphs ) Guidelines for Sub-Centres, PHCs, CHCs and DHs. Revised 2012
2. Capacity building of health personnel and allied sectors

Capacity building and sensitization of medical and para-medical professionals is necessary at all levels- from policy makers and administrators at the top to doctors, nurses and even the grassroot workers like ASHA and aanganwadi workers- towards the health implications of climate change and its related disorders.

Medical professionals need to be trained in recognizing and managing climate sensitive diseases, like heat strokes, and adequately notifying them to the concerned authorities. Medical officers at the district and state level also need to be trained regarding the optimal use of IDSP data for the interpretation of climate sensitive diseases to ensure timely action for their control and prevention.

Sensitization of two other sectors is critical to successfully building the capacity of the health system- these include the private health sector and the AYUSH practitioners. Integrations with the private sector, including private clinics, nursing homes and hospitals; and practitioners of systems of indigenous medicine like AYUSH is important to develop and implement a holistic adaptation plan.

3. Strengthening database and MIS

In the current scenario, there are multiple sources of data regarding various environmental parameters, such as temperature, water, and air; data on the population and demography and also from the health sector. There is a need to integrate the systems to develop a common database that serves as an important policy and decision making tool. The role of the District Information Office (DIO) should be strengthened in context of integrating data from environment, health and disaster sectors. Monitoring of trends of climate sensitive illnesses can facilitate efficient logistic management by health institutions, as they can budget for and procure drugs, vaccines and other consumables as per the increased requirement.

The IDSP, launched in 2005, has given a boost to the nation’s surveillance and monitoring mechanisms. It has facilitated data collection and reporting of diseases of public health importance and increased the sensitivity and response to outbreak-prone communicable diseases. However, challenges of completeness, timeliness and accuracy of reporting still remain. The strengthening of IDSP is critical to adaptation and preparedness towards the health effects of climate change related disasters. As the IDSP already provides data on water and vector borne illnesses, its scope may also be expanded to included diseases prone to heat and cold stresses as well.

The health facilities need to strengthen their surveillance systems to monitor food, air and water quality, vector breeding, malnutrition and other risk factors and behaviors, which make the community more vulnerable to the effects of climate change related disasters.
4. Promoting resource efficiency

Despite the advent of renewable sources of energy, and availability of subsidies, some traditional practices like burning of bio-mass as an energy source, or dependence on coal for power generation are still practiced. For the sake of development and expansion of construction, large areas of the limited forest reserves in urban and peri-urban areas continue to be degraded and uprooted. The health systems need to transition to more sustainable and environment-friendly alternatives and promote the use of renewable energy, water conservation measures and practices. Better resource consumption patterns need to be adopted as an important measure for adapting to climate change.

5. Encouraging research and development on health and climate change

Since most of the predicted health impact of climate change are forecasted on the basis of modelling techniques from different sources of data, the local effects of climate change are not so well documented or understood. Little information is available on the extent of damage caused by climate change, its associated disasters and quantification of impact at the community level and further research is warranted in the field.

Research will help generate evidence from strategies and interventions that help increase the adaptive capacity at the micro level, and can be replicated as successful models in similar communities. Further, training and knowledge sharing, dissemination of the research findings, case studies and vulnerability assessments is an important component of developing a resilient health system.

6. Enhancing health emergency response

The focus of current emergency response strategies is either on the normal health challenges or on saving life and property. The effective response for aggravated health challenges and epidemics still remains a gap area. As the frequency and intensity of climate related disasters in increasing, the health emergency response services, and the rapid response teams need to strengthen their capacities for responding to the disasters.
7. Building community resilience

The community is the most important stakeholder facing the impact of climate change, and also has the power to be prepared for and mitigate its effects. One of the most important interventions is to educate the community and generate awareness among the population regarding the basic concepts of climate change related disasters, and its possible impact. They need to be empowered with methods to prepare themselves for disasters associated with climate change, and at the same time adopt measures to decrease their own carbon emissions. Health adaptation is incomplete without adaptation by the community, and therefore mobilization of the community for climate change is of paramount importance.

Few interventions that could help generate awareness among the community include:

- Community mobilization with the help of ASHA workers and ANMs, to impart knowledge about climate change through interpersonal communication with patients.
- Demonstrations on disaster preparedness and mock drills in the community.
- Training of community volunteers in first aid and rescue, as the first responders after a disaster are generally members of the community itself.
- Use of folk tales, street plays and camp approaches, and use of mass communication techniques during VHND.
- Conducting demonstrations during village meets on sustainable practices and alternative lifestyles with lower carbon footprint.
- Promoting health care seeking behaviour, and enhancing awareness about climate sensitive diseases.
- Involving the community in surveillance of diseases and early reporting.
- Promoting the use local and traditional medicine systems
- Promoting measures to safeguard the environment and mitigate the impact of climate change.

8. Sensitization of pharmaceutical and biomedical industry

During epidemics and disasters, the demand for medicines, drugs, vaccines and other logistics increases manifold. In the absence of efficient warning systems, or improper planning, situations can worsen if the health system is under-stocked with essential medications. Not only is the situation of the victims and patients in disasters and epidemics aggravated, but discontinuity of basic essential services such as safe delivery, supply of anti-hypertensives, oral hypo-glycaemic agents, anti-tubercular drugs and other emergency services could worsen the disease outcomes for the community.

During disasters, access to medicine and logistics can be impaired as roadways and other transportation facilities are disrupted. Disruption of power sources could result in break in the cold chain and exposure of large quantities of vaccines and sensitive-drugs to damaging temperatures.
Therefore interventions such as demand forecasting, efficient inventory management, maintenance of buffer stock, and back-up cold chain equipment to mitigate these situations should be in place before hand. Health facilities should also adopt and promote the use of approved indigenous and locally sourced drugs, medical equipment, products and therapeutic agents, as their cost and supply chain management can be more efficient in times disaster and emergencies.

9. Mainstreaming climate change related health resilience into key sectors

Health is affected by various physical, biological, social and environmental determinants, to name a few, hence the functioning of all sectors of development impacts the functioning of the health system as well. Climate change is a phenomenon that can disrupt the progress and development of all sectors, hence is imperative to integrate actions for mitigating its effects in sectoral development plans and policies. Sectors like water, energy, urban and rural development, all need to collaborate and adopt their roles in the NHAP to support the health sector.
DISASTER-SPECIFIC HEALTH MITIGATION MEASURES

Though many parts of the country are prone to multiple hazards, and mitigation strategies should be implemented in an integrated manner to ensure that the health system is prepared to deal with any type of disaster, in some areas, the health systems have disaster-specific lacunae. For the benefit of such facilities, the following disaster-specific mitigation measures are proposed:

1. HEAT AND COLD WAVES

<table>
<thead>
<tr>
<th>STRATEGY</th>
<th>INTERVENTIONS</th>
</tr>
</thead>
</table>
| Heat wave vulnerability analysis and mapping | 1.1 Data management and processing  
1.2 Developing heat impact index  
1.3 Developing heat risk maps |
| Early warning and communications | 2.1 Forecast and issuance of heat alert and warning  
2.2 Forecast and issuance of cold alert and warning |
| Developing and implementing mitigation and response plan | 3.1 Enhancing mitigation measures in hospitals and health Centres.  
3.2 Capturing data on heat and cold related illnesses  
3.2 Coordination of mitigation and response  
Relief and rehabilitation |
| Enhancing community preparedness | 4.1 Timely dissemination of prediction of heat and cold waves.  
4.2 Information education communication activities on measures for the prevention of heat and cold related illnesses. |
| Capacity building of health professionals and health system | 5.1 Training of medical and paramedical professionals in identification of heat and cold related illnesses.  
5.2 Dissemination of SoPs for management of heat syncope, stroke, etc.  
5.3 Emergency expansion plan for Civil Hospitals, Community Health Centres, PHCs, private health providers and schemes for mobile medical teams for post-disaster situation.  
5.4 Listing of hospitals of Army, Govt. (both Centre and State) and private hospitals and nursing homes in each district.  
5.5 Phone numbers of all these medical facilities should be available at District Control Room as well as in the State Emergency Operations Centre.  
5.6 Prior reservation must be done, considering the hazard assessment and medicines like oxygen, saline water, OT and life-saving drugs should be kept ready.  
5.7 Vacant post of doctors and Para medical staff should be filled in all the government hospitals in order to make available the required number of medical workers at the time of emergency. |
## 2. FLOODS

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<td>Flood prevention, preparedness and</td>
<td>2.1 Structural measures for health care facilities (building infrastructures</td>
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<td>mitigation</td>
<td>etc.)</td>
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<td>2.2 Non-Structural Measures</td>
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<td>3.2 Survey of Flood Prone Areas</td>
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<td>Enhancing community preparedness &amp;</td>
<td>4.1 Flood Education &amp; Awareness for community preparedness</td>
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<td>response</td>
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<td>coordination</td>
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<td>4.4 Role of the Corporate/ Public Sector</td>
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<td>4.5 Providing Emergency Logistics &amp; emergency Medical Response</td>
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<td>Capacity building</td>
<td>5.1 Capacity Building of Professionals</td>
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<td></td>
<td>5.2 Providing training &amp; education</td>
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<td>5.3 Research and development</td>
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<td>5.4 Documentation</td>
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3. DROUGHTS

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<td>1.2 Assessment of water storage facilities in drought-prone areas</td>
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<td>Regulation and enforcement</td>
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<td>3.2 Updation of criteria and assessment methods for drought declaration</td>
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<td>Enhancing community preparedness and response</td>
<td>4.1 Building community based institutions</td>
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<tr>
<td>coordination</td>
<td>4.2 Provision for Financial instruments: crop insurance, relief fund etc</td>
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<td>4.3 Encouraging community level drought mitigation plans</td>
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<td>4.4 Adoption of water resource management strategies</td>
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<td>Training and Capacity building</td>
<td>5.1 Training and capacity building program for drought management</td>
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<td>5.2 Ensuring availability of qualified and experienced trainers</td>
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<td>5.3 Conducting training programs for officials at various levels</td>
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<td>5.4 Documentation of success stories of effective drought management</td>
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<td>5.5 Promoting awareness about drought related mitigation measures/policies</td>
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## 4. CYCLONE

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<tbody>
<tr>
<td>Forecasting &amp; early warning</td>
<td>1.1 Early Warning and Communications</td>
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</tbody>
</table>
| Cyclone prevention, preparedness and mitigation | 2.1 Structural measures for health care facilities (building infrastructures etc.)  
2.2 Preventive Health Care in Cyclone Centres  
2.3 Non-Structural Measures  
2.4 Rehabilitation and Maintenance  
2.5 Medical Preparedness |
| Regulation and enforcement | 3.1 Buildings bye laws in Cyclone Prone/Coastal Areas  
3.2 Survey of Cyclone Prone Areas  
3.3 Health Implications for CRZ Notification  
3.4 Coordination and Enforcement |
| Enhancing community preparedness & response coordination | 4.1 Education & Awareness for coastal community preparedness  
4.2 Awareness and Preparedness of Fishing Communities  
4.3 Emergency Search and Rescue  
4.4 Emergency Relief Services/Camps  
4.5 Role of the Corporate/ Public Sector  
4.6 Providing Emergency Logistics & emergency Medical Response |
| Capacity building | 5.1 Capacity Building of Professionals  
5.2 Providing training & education  
5.3 Research and development  
5.4 Documentation |
### 8. ADAPTATION ROADMAP & IMPLEMENTATION OF NHAP-CCD

<table>
<thead>
<tr>
<th>S. No.</th>
<th>INTERVENTIONS</th>
<th>INDICATORS</th>
<th>NODAL AGENCY</th>
<th>PARTNERING AGENCIES</th>
<th>STATE/UT Agency</th>
</tr>
</thead>
</table>
| 1.     | Safe and resilient health care facilities at all levels | 1. Proportion of existing health facilities upgraded to “Disaster resilient Safe Health facilities.” (as per NDMA guidelines)  
2. Number of new safe and resilient health facilities established. (according to IPHS and NDMA norms) | MoHFW        | NDMA, NIDM, MoAYUSH Medical institutions | DHS, SDMA       |
| 2.     | Promoting climate resilient subset facilities.         | 1. Proportion of health facilities equipped with: a) alternative power back up.  
b) WaSH facilities as per WHO standard.  
c) capacity to handle BMW during disaster.  
d) alternative telecommunication systems | MoHFW        | MoEFCC, NDMA, NIDM, MoAYUSH             | DHS, SDMA, local administration |
| 3.     | Promoting resource efficiency                          | 1. Proportion of health facilities with solar or other renewable energy source.  
2. Proportion of green health facilities  
3. Proportion of health facilities with rainwater harvesting. | MoEFCC       | MoHFW, NDMA, NIDM, DST, MoAYUSH, MoNew and Renewable energy | DHS, SDMA |
| 4.     | Development of guidelines and SoPs for safe and resilient health care facilities | 1. Upgradation of IPHS guidelines  
2. Development of model SoPs for resilient subset facilities | MoHFW        | MoUD, BIS, NDMA                        | DHS             |
| 5.     | Capacity building of medical and paramedical professionals and allied sectors | 1. Proportion of policy makers, administrators, and health managers sensitized to climate change and health adaptation.  
2. Proportion of medical and paramedical workers trained in management climate related illnesses. | NIDM         | NIHFW, NCDC, MoAYUSH, NHSRC Medical institutions | SIHFW Administrative training institutes, DHS |
|   |   | 3. Proportion of disaster management and environment professionals trained to integrate health adaptation issues of climate change.  
4. Number of training programs held for target groups under indicators 1,2,3.  
5. Number of training modules developed. | NCDC | NIC, NDMA NIDM, DGHS, DST, CSO, MoAYUSH | SDMA, DHS |
|---|---|---|---|---|---|
| 6. | Strengthening database and MIS | 1. Proportion of states and districts with integrated database and MIS.  
2. Proportion of state and districts with trained manpower for integrated data management. | ICMR | DST, NIDM, UGC, CSIR, ICSSR, MoHFW, MoAYUSH, Medical Institutions |   |
| 7. | Encouraging research and development on health and climate change | 1. Number of research projects related to climate change and health adaptation.  
2. Number of institutions involved with research related to climate change and health.  
3. Number of compendiums, case studies developed and research papers published related to climate change and health. | MOHFW / DGHS | Mo Social justice and empowerment. MRD, MWCD, Dept. of school education | DHS, District administration |
| 8. | Building community resilience | 1. Proportion of ASHA workers and ANMs sensitized towards climate change and its health effects.  
2. Number of community volunteers trained in developing health resilience.  
3. Number of CBOs, NGOs and RWAs sensitized towards climate change and health effects. | Dept. of Pharmaceuticals | NDMA, NIDM, DGHS, MoAYUSH | DHS |
<p>| 9. | Sensitizing pharmaceutical and biomedical industry | 1. Number of sensitization sessions conducted for pharmaceutical and industrial organizations. |   |   |   |
| 10. | Enhancing health emergency response | 1. Proportion of RRTs at state and district level trained to manage health effects of climate change and related disasters. | MoHFW/EMR | NDMA, NDRF, DGHS | RRT, DHS, SDMA, SDRF |</p>
<table>
<thead>
<tr>
<th></th>
<th>Mainstreaming climate change related health resilience into key sectors</th>
<th>1. Number of departments and ministries that have incorporated climate change and health related aspects in their program implementation plans.</th>
<th>MoHFW</th>
<th>MoEFCC, NDMA, NIDM, Jal Shakti, Power, MoRD, MoUD, MoAYUSH, Mo Road transport and highways</th>
<th>DHS SDMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.</td>
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</tbody>
</table>
## 9. ANNEXURES

**Annexure 1:** Indicators for building safe and disaster-resilient health facilities.⁶

<table>
<thead>
<tr>
<th>INDICATORS</th>
<th>DESCRIPTION</th>
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</thead>
</table>
| **SITE AND ACCESSIBILITY**                      | ▪ Hazard resilient site  
                                              ▪ Building codes and hazard specific designs  
                                              ▪ Well connected through good road networks and transportation facilities  
                                              ▪ Alternate routes to the health facilities must be there  |
| **INTERNAL CIRCULATION AND INTEROPERABILITY**   | ▪ Well defined zones within an health facilities emergency, ICU, Testing Labs, diagnostic units, OPDs, blood bank and OTs  
                                              ▪ Well defined zones for regional health hazards: malaria,  
                                              ▪ Identified areas (vacant or needed to be vacated) to be converted for patients in case of emergency.                                         |
| **EQUIPMENT AND SUPPLIES**                      | ▪ Well maintained inventory of equipment and supplies (medicines)                                                                                                                                            |
| **EMERGENCY SOP**                               | ▪ Emergency exit plans (floor-wise/building-wise)  
                                              ▪ Emergency plans for dealing with influx of patients/ limited resources.                                                                                                             |
| **LOGISTICS SYSTEM AND UTILITIES**             | ▪ Well placed logistic support systems  
                                              ▪ Warehouse management  
                                              ▪ Supply Inventory                                                                                                                                  |
| **TRANSPORTATION AND COMMUNICATION SYSTEMS**   | ▪ Well-equipped and adequate means of transportation  
                                              ▪ Back communication and IT systems (databases)  
                                              ▪ Early warnings including SMS  
                                              ▪ Coordinated management                                                                                                                               |
| **HUMAN RESOURCES**                            | ▪ Assessing health risk to staff (doctor, nurses and others) and patients during emergency and ensuring their safety  
                                              ▪ Groups and committees responsible for responding and executing emergency plans at the health facility at all levels.  
                                              ▪ Training and capacity building of these groups                                                                                                       |
| **MONITORING AND EVALUATION**                   | ▪ Health surveillance facilities (monitoring disease outbreak pre and post disasters)  
                                              ▪ Post emergency need assessment                                                                                                                       |
### Annexure 2: Areas of intervention for climate resilient WaSH facilities. 13

<table>
<thead>
<tr>
<th>INTERVENTIONS</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backup arrangements</td>
<td>Water</td>
</tr>
<tr>
<td></td>
<td>Power</td>
</tr>
<tr>
<td>Protective arrangements</td>
<td>Design and location of WASH facilities/supplies which are resilient to climate risk</td>
</tr>
<tr>
<td>WASH stockpiles</td>
<td>Drawing estimates of important WASH supplies and keeping stocks</td>
</tr>
<tr>
<td>Preventative maintenance</td>
<td>Well maintained and functional WASH equipment and facilities</td>
</tr>
<tr>
<td>Training</td>
<td>On WASH emergency response for all staff</td>
</tr>
<tr>
<td>Surge capacity</td>
<td>WASH personnel and team who can be mobilized during emergency</td>
</tr>
<tr>
<td>Overflow capacity</td>
<td>Capacity estimation and identification of areas that can be utilized for accommodating patient influx</td>
</tr>
<tr>
<td>Infection control readiness</td>
<td>Ensuring that hygiene protocols (hand washing, personal protective equipment, waste management etc.) are followed pre- and post- emergency</td>
</tr>
<tr>
<td>Coordination</td>
<td>Team and nodal team within health facility ensuring co-ordination of WASH facilities</td>
</tr>
</tbody>
</table>

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13 Water, sanitation and hygiene in health care facilities. Status in low- and middle-income countries and way forward. WHO