सत्यमेव जयते

# HEALTH ADAPTATION AND RESILIENCE TO CLIMATE RISKS







2021

A Training Manual prepared under the HERCAP project supported by WHO India

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Resilient India - Disaster Free India


National Institute of Disaster Management

(Ministry of Home Affairs, Government of India)




# Health Adaptation and Resilience to Climate Risks

## Training Manual

**National Institute of Disaster Management (NIDM)**
*(Ministry of Home Affairs, Government of India)*

Plot No.15, Pocket 3, Block-B, Sector-29, Rohini, Delhi-110042
Website: www.nidm.gov.in

# Health Adaptation and Resilience to Climate Risks
## Training Manual

ISBN No.: 978-93-82571-53-7

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**Edition:**
2021

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**Citation**
Gupta, A.K., Sood, A., Barwal, A., Acharya, P., Chondol, T., Madan, A., Singh, P., Bharadwaj, S., Kishore, J., Sethi, S., 2021. Health Adaptation and Resilience to Climate Risks. Training Manual. National Institute of Disaster Management, New Delhi, P-148

**Published By**
National Institute of Disaster Management, Ministry of Home Affairs, New Delhi

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The document can be downloaded from the website http://www.nidm.gov.in

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प्रधानमंत्री जन आरोग्य योजना
आयुष्मान भारत
PM-JAY

जय विज्ञान
जय अनुसंधान

सबका साथ, सबका विकास, सबका विश्वास
Sabka Saath, Sabka Vikas, Sabka Vishwas

सत्यमेव जयते


डॉ हर्ष वर्धन
**Dr Harsh Vardhan**

स्वास्थ्य एवं परिवार कल्याण, विज्ञान और प्रौद्योगिकी
व पृथ्वी विज्ञान मंत्री, भारत सरकार
**Union Minister for Health & Family Welfare,**
**Science & Technology and Earth Sciences**
**Government of India**




## MESSAGE

I am happy to note that National Institute of Disaster Management, New Delhi has developed Training Manual on 'Health Adaptation and Resilience to Climate risks'. The manual provides a distinctive platform for integrating health services and systems with climate change related disaster risk reduction (DRR) approaches and will contribute towards bridging the existing knowledge gaps in health challenges of climate change related disasters.

India is committed to implement disaster risk reduction strategies at national and sub-national levels as per the Sendai Framework for Disaster Risk Reduction (SFDRR). For this global treaty under the United Nations International Strategy for Disaster Risk Reduction, Government of India formulated the National Disaster Management Plan in 2016 to achieve substantial reduction in disaster risk in terms of losses in lives, livelihoods, health and for economic, physical, social, cultural and environmental assists of persons, businesses and communities.

To promote climate resilience and to make the society disaster proof, the State and local bodies are now focusing on the integration of Disaster Risk Reduction components into the climate planning process.

The manual is designed to build and improve the capacity of officials at the regional and State level including both public health and disaster management authorities towards developing resilient health systems in order to mitigate the adverse impacts of climate change related disasters. It will also act as a base document or practical guidance for understanding the vulnerabilities of the existing health systems to climate and weather sensitive diseases in the context of extreme events & disasters.

I extend my good wishes for the success of the Training Manual on 'Health Adaptation and Resilience to Climate risks' and I am sure that this manual would be useful to a range of trainers from cross-cutting domains of health, environmental sciences & disaster management.

Harsh

**(Dr. Harsh Vardhan)**


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**Dr. Roderico H. Ofrin**
WHO Representative to India

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# MESSAGE



Climate change affects health through a spectrum of pathways, including extreme weather events such as heatwaves, cyclones, floods and droughts. The consequences on health is scientifically proven and recognised in the major multilateral climate agreements, such as the United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement.

In addition, at the 72nd World Health Assembly in May 2019, WHO Member States adopted the WHO global strategy on health, environment and climate change to accelerate sustained transformation to improve lives and well-being through healthy environments. The strategy provides a way forward for the world and its public health community to respond to environmental health risks and challenges up to 2030 and to ensure safe, enabling and equitable environments for all by transforming our way of living, working, producing, consuming and governing.

I congratulate the Government of India for taking the lead in integrating health outcomes in its strategy to increase climate resilience. The training manual on Health Adaptation and Resilience to Climate Risks developed by the National Institute of Disaster Management will provide guidance to professionals in the health and disaster domain on addressing the complex challenges presented by climate change. The training manual provides critical information on the threats that climate change presents to human health and the solutions to prevent and minimise these impacts.

The manual promotes a multi-sectoral approach to sustainably address the health impacts of climate change. Collaboration and partnerships with relevant partners at national and state levels are crucial to implement policies developed to safeguard human health from climate impacts. In addition, building the capacity of diverse stakeholders from health and disaster sectors will promote relevant initiatives and projects to build India's resilience to climate shocks.

**(Dr. Roderico H. Ofrin)**

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# MESSAGE



Climate change poses significant risks to human health in many ways. Weather extremes like precipitation and temperature, increased pollution and environmental toxins, and changes in food security can all exacerbate physical and mental health problems. Disaster risk is magnified by climate change; it can increase the hazard while at the same time decreasing the resilience of households and communities. Natural disasters and extreme weather events can cause injury, mental health issues, increased risk of infection, and death. Damage to infrastructure can also cause long-term setbacks to health and well-being. Addressing climate change is vital to help limit these effects and health risks.

This Training Manual on Health Adaptation and Resilience to Climate Risks developed by National Institute of Disaster Management New Delhi with the support of World Health Organization, India is an important attempt towards the capacity building of relevant stakeholders. as local-level health workers. I would like to compliment Prof Anil K. Gupta and his team for this document. Prof Gupta is also implementing the CAP-RES project supported by DST, Govt. of India in which health is also one of the key component.

The manual provides a distinctive platform for integrating health services and systems with climate change related disaster risk reduction approaches. This manual will help in capacity building to mitigate the adverse impacts of climate change related disasters for cross-domain professionals dealing with health impacts of climate risks in respective regimes as well

**(Dr. Akhilesh Gupta)**

Maj Gen Manoj Kumar Bindal
VSM
Executive Director

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# FOREWORD



Implications of climate change on disaster risk and vulnerability and human health- especially those related with water and weather system, extreme events, ecosystems, forests, biodiversity, coastal hazards, associated disease & epidemics, etc. are well recognized scientifically and socially. The recent report of IPCC cautions about more complex and challenging consequences of Global Warming. The report also calls for significant improvement in human behaviour, in terms of consumption patterns, managing our natural resources in a much more prudent and effective manner to meet the demands of sustainability. 'Resilience' is the 'Mantra' for adaptive development benefits, for which disaster risk reduction should necessarily be woven across developmental planning and implementation processes. The various aspects of creating climate resilience, thus, are key to disaster risk reduction, for attaining sustainable development.

National Institute of Disaster Management (NIDM) has been working for developing training modules and educational materials, undertaking training, research, documentation and publication for disaster risk reduction and resilience as well as to promote awareness among different stakeholders for enhancing the human capacity to avoid, prevent, mitigate, prepare, respond and recover efficiently in a proactive, holistic and integrated manner from disasters. This training manual on 'Health Adaptation and Resilience to Climate Risks' has also been developed with the same vision.

Hopefully, this training manual will enhance the capacity of relevant stakeholders dealing with the health impacts of climate change related disasters and building health systems resilience.

MK Bindal

(Manoj Kumar Bindal)

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# PREFACE



Globally, the number of reported weather-related natural disasters has more than tripled since the 1960s. Every year, these disasters result in over 60000 deaths, mainly in developing countries. Rising sea levels and increasingly extreme weather events will destroy homes, medical facilities and other essential services. Increasingly variable rainfall patterns are likely to affect the supply of fresh water. A lack of safe water can compromise hygiene and increase the risk of diarrhoeal disease, which kills many children aged under 5 years every year. In extreme cases, water scarcity leads to drought and famine. Floods and extreme precipitation are also increasing in frequency and intensity. Floods contaminate freshwater supplies, heighten the risk of water-borne diseases, and create breeding grounds for disease-carrying insects such as mosquitoes. Extreme high air temperatures contribute directly to deaths from cardiovascular and respiratory disease, particularly among elderly people.

This training manual on Health Adaptation and Resilience to Climate Risks was prepared by a team of experts in 2020 under the HER-CAP project. It is a product of collaborative effort of WHO India and National Institute of Disaster Management (NIDM). The training manual consists of 5 modules covering a range of topics that will prove very useful to build the capacity of public health professionals who are involved in management of health systems impacted by climate change. The modules are also designed for ease of use by professionals from other sectors such as the environment, transport, disaster preparedness, etc., enabling them to understand the intersectoral nature of the issue and to address health impacts jointly with other sectors. One or more modules can be used as advocacy material as well as to orient different target audiences such as policymakers.

It is hoped that the present module will provide an insight to the trainees in the basic understanding about integration of DRR and CCA into the health sector adaptation and the various measures required for reducing the risks at different levels. The trainees are encouraged to interact with field experts and resources persons in this field to prepare themselves better for building the capacity of the Health Sector.

(Prof. Anil K Gupta)

# ACKNOWLEDGEMENT

At the outset, I am very grateful to the Executive Director, NIDM, Major General Manoj Kumar Bindal for guiding us extensively throughout and continued encouragement. I am also thankful to Lt. Col. D.C. Vashista, Joint Director, NIDM for extending his support. I would like to acknowledge the support provided by the World Health Organization India especially Ms. Payden, Deputy Country Representative; Mr. Manjeet S. Saluja, National Professional Officer and Ms. Renuka Saroha, National Consultant at WHO India office.

My special thanks goes to Dr. Sujeet K. Singh, Director, National Centre for Disease Control (NCDC), Dr. Aakash Shrivastava, Joint Director and Head, NCDC and Dr. Shikha Vardhan, Deputy Director, NCDC for consistently providing their advice and encouragement throughout the project. I would also like to thank Dr. Akhilesh Gupta, Senior Advisor & Head SPLICE and Climate Change, DST, GoI and Climate Adaptive Planning for Resilience and Sustainability in Multi-Hazard Environment (CAP-RES) project team for their constant support.

I am thankful to the all the internal as well as external reviewers namely Dr. Ramesh C. Dhiman, Senior Consultant, ICMR-NIMR and Dr. Surabhi Sethi, Asst. Prof. Community Medicine, NDMC and Hindu Rao Hospital for their useful comments, especially Dr. Jugal Kishore, Director, Prof. & Head of community Medicine, Vardhman Mahavir Medical College (VMMC) & Safdarjung Hospital, Delhi for sharing his expertise and priceless insights during the course of this research.

I am grateful to all the contributors and participants of the sectoral consultation workshops whose recommendations and inputs provided a template for developing and designing the modules and course works.

None of this would have been possible without the valuable contribution made by my team members namely Ms. Atisha Sood and Dr. Anjali Barwal at NIDM, New Delhi.

It gives me an immense pleasure in acknowledging the cooperation of my colleagues Sh. S.K. Tiwari, Ms. Sonali jain and other supporting staff at NIDM.



**(Prof. Anil K Gupta)**

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# ABBREVIATIONS

| | |
|---|---|
| DRI | Disaster Related Illnesses |
| BIS | Bureau of Indian Standards |
| BMW | Bio Medical Waste |
| CECR | Centre of Excellence on Climate Resilience |
| CSIR | Council of Scientific and Industrial Research |
| CSO | Central Statistical Office |
| DGHS | Directorate General of Health Services |
| DHS | Directorate of Health Services |
| DST | Department of Science and Technology |
| EMR | Emergency Medical Response |
| ICMR | Indian Council of Medical Research |
| ICSSR | Indian Council of Social Science Research |
| IMD | Indian Meteorological Department |
| IPCC | Intergovernmental Panel on Climate Change |
| IPHS | Indian Public Health Standard |
| MIS | Management Information System |
| MoEFCC | Ministry of Environment Forest and Climate Change |
| MoHFW | Ministry of Health and Family Welfare |
| MoNew | Ministry of New and Renewable Resources |
| MoUD | Ministry of Urban Development |
| NCDC | National Centre for Disease Control |
| NDMA | National Disaster Management Authority |
| NDRF | National Disaster Response Force |
| NGO | Non-Governmental Organizations |
| NHAP | National Health Adaptation Plan |

| | |
|---|---|
| NHSRC | National Health System Resources Centre |
| NIDM | National Institute of Disaster Management |
| NIHFW | National Institute of Health and Family Welfare |
| PHC | Primary Health Centre |
| RRT | Rapid Response Team |
| SDMA | State Disaster Management Authority |
| SDRF | State Disaster Response Force |
| SIHFW | State Institute of Health and Family Welfare |
| SOP | Standard Operating Procedures |
| UGC | University Grants Commission |
| WASH | Water Sanitation and Hygiene |
| WHO | World Health Organization |

# GLOSSARY

- **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.
- **Adaptation assessment:** The practice of identifying options to adapt to climate change and evaluating them in terms of criteria such as availability, benefits, costs, effectiveness, efficiency, and feasibility.
- **Adaptation Fund:** A Fund established under the Kyoto Protocol in 2001 and officially launched in 2007. The Fund finances adaptation projects and programmes in developing countries that are Parties to the Kyoto Protocol. Financing comes mainly from sales of Certified Emissions Reductions (CERs) and a share of proceeds amounting to 2% of the value of CERs issued each year for Clean Development Mechanism (CDM) projects. The Adaptation Fund can also receive funds from government, private sector, and individuals.
- **Adaptation measures:** This refers to actual adjustments, or changes in decision environments, which might enhance resilience or reduce vulnerability to observed or expected changes in climate.
- **Ambient air pollution:** Air pollution in the ambient environment, that is, in outdoor air, but able to enter homes.
- **Air pollution:** One or more chemicals or substances in high enough concentrations in the air to harm humans, other animals, vegetation, or materials. Such chemicals or physical conditions (such as excess heat or noise) are called air pollutants.
- **Air quality guidelines:** Value at or under which a pollutant is considered to have no or minimal impact on health.
- **Anthropogenic:** Human made. In the context of greenhouse gases, emissions that are produced as a result of human activities.
- **Atmosphere:** The gaseous envelope surrounding the earth, divided into five layers — the troposphere which contains half of the earth's atmosphere, the stratosphere, the mesosphere, the thermosphere, and the exosphere, which is the outer limit of the atmosphere. The dry atmosphere consists almost entirely of nitrogen (78.1% volume mixing ratio) and oxygen (20.9% volume mixing ratio), together with a number of trace gases, such as argon (0.93% volume mixing ratio), helium and radiatively active greenhouse gases (GHGs) such as carbon dioxide ($CO_2$) (0.035% volume mixing ratio)

and ozone ($O_3$). In addition, the atmosphere contains the GHG water vapour ($H_2O$), whose amounts are highly variable but typically around 1% volume mixing ratio. The atmosphere also contains clouds and aerosols.

- **Carbon dioxide:** A colourless, odourless, non-poisonous gas that is a normal part of the ambient air. Carbon dioxide is a product of fossil fuel combustion. Although carbon dioxide does not directly impair human health, it is a greenhouse gas that traps terrestrial (i.e., infrared) radiation and contributes to the potential for global warming.
- **Capacity-building:** In the context of climate change, the process of developing the technical skills and institutional capability in developing countries and economies in transition to enable them to address effectively the causes and results of climate change.
- **Climate change:** Climate change refers to a change in the state of the climate that can be identified (e. g., by using statistical tests) by changes in the mean and / or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use. Note that the United Nations Framework Convention on Climate Change (UNFCCC), in its Article 1, defines climate change as: 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'. The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition, and climate variability attributable to natural causes.
- **Climate-Sensitive Health Outcome** is any health outcome whose geographic range, incidence, or intensity of transmission is directly or indirectly associated with weather or climate.
- **Climate Variability** describes variations in the mean state and other statistics (e.g., standard deviations, the occurrence of extreme events, etc.) of climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system or to variations in natural or anthropogenic external forcing.
- **Cholera:** An intestinal infection, caused by the bacterium Vibrio cholerae, which results in frequent watery stools, cramping abdominal pain, and eventual collapse from dehydration. It is thought that zooplankton in cold waters may carry large number of cholera vibrios on their bodies. Zooplankton feed by grazing on phytoplankton which bloom with sunshine and warm conditions. Thus, a

phytoplankton (algal) bloom may lead to an increase in the population of zooplankton which carry the vibrios.

- **Conference of the Parties (COP):** The supreme body of the United Nations Framework Convention on Climate Change (UNFCCC), comprising countries with a right to vote that have ratified or acceded to the convention. It currently meets once a year to review the Convention's progress. The word "conference" is not used here in the sense of "meeting" but rather of "association". The "Conference" meets in sessional periods, for example, the "fourth session of the Conference of the Parties."
- **Dengue:** An acute febrile syndrome caused by dengue arbovirus type 1-4, commonly transmitted by the mosquitoes Aedes aegypti and Ae. albopictus, which breed in small water bodies in containers, car tyres, etc. Dengue is often called breakbone fever because it is characterized by severe pain in joints and back. Subsequent infections of dengue virus may lead to dengue haemorrhagic fever, which can be fatal.
- **Disability Adjusted Life Year (DALY):** An indicator of life expectancy combining mortality and morbidity into one summary measure of population health to account for the number of years lived in less than optimal health. It is a health measure developed for calculating the global burden of disease that is also used by WHO, the World Bank and other organizations to compare the outcomes of different interventions.
- **Disaster:** A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.
- **Disaster risk management (DRM):** Processes for designing, implementing, and evaluating strategies, policies, and measures to improve the understanding of disaster risk, foster disaster risk reduction and transfer, and promote continuous improvement in disaster preparedness, response, and recovery practices, with the explicit purpose of increasing human security, well-being, quality of life, and sustainable development.
- **Drought:** The phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances.
- **Dysentery:** An infection of the gut caused by shigella bacteria. Symptoms include acute bloody diarrhoea, vomiting, stomach pains and fever.
- **Early warning systems (EWS):** A system consisting of Mathematical models and surveillance measures designed for the early detection, prevention and control of an epidemic of infectious disease or other abnormal event (e.g., famine or heat waves).
- **Extreme weather event:** An extreme weather event is an event that is rare within its statistical reference distribution at a particular place. Definitions of "rare" vary, but

an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile. By definition, the characteristics of what is called extreme weather may vary from place to place. An extreme climate event is an average of a number of weather events over a certain period of time, an average which is itself extreme (e.g., rainfall over a season).

- **Global warming (GW):** usually: the warming trend over the past century or so; also: any period in which the temperature of the Earth's atmosphere increases; also the theory of such changes.
- **Emissions:** Releases of gases to the atmosphere (e.g., the release of carbon dioxide during fuel combustion). Emissions can be either intended or unintended releases.
- **Exposure:** Amount of a factor to which a group or individual was exposed; sometimes contrasted with dose (the amount that enters or interacts with the organism). Exposures may be either beneficial or harmful.
- **Fecal-oral transmission:** is a route of transmission of a disease, when pathogens in fecal particles passing from one host are introduced into the oral cavity of another host.
- **Food security:** A situation that exists when people have secure access to sufficient amounts of safe and nutritious food for normal growth, development and an active and healthy life. Food insecurity may be caused by the unavailability of food, insufficient purchasing power, inappropriate distribution, or inadequate use of food at the household level.
- **Flood:** Temporary partial or complete inundation of normally dry areas caused by rapid runoff or overflow from lakes, rivers, or tidal waters.
- **Fossil fuels:** Carbon-based fuels from fossil hydrocarbon deposits, including coal, peat, oil, and natural gas.
- **Gastroenteritis:** Inflammation of the stomach and the intestines. Gastroenteritis can cause nausea, vomiting, and diarrhoea. Gastroenteritis has numerous causes, including infections (viruses, bacteria, and parasites), food poisoning, and stress.
- **Global warming:** Global warming refers to the gradual increase, observed or projected, in global surface temperature, as one of the consequences of radiative forcing caused by anthropogenic emissions.
- **Green Climate Fund (GCF):** The Green Climate Fund was established by the 16th Session of the Conference of the Parties (COP) in 2010 as an operating entity of the financial mechanism of the United Nations Framework Convention on Climate Change (UNFCCC), in accordance with Article 11 of the Convention, to support projects, programmes and policies and other activities in developing country Parties. The Fund

is governed by a Board and will receive guidance of the COP. The Fund is headquartered in Songdo, Republic of Korea.

- **Greenhouse gas (GHG):** Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the earth's surface, the atmosphere itself, and by clouds. This property causes the greenhouse effect. Water vapour ($H_2O$), carbon dioxide ($CO_2$), nitrous oxide ($N_2O$), methane ($CH_4$) and ozone ($O_3$) are the primary GHGs in the earth's atmosphere. Moreover, there are a number of entirely human-made GHGs in the atmosphere, such as the halocarbons and other chlorine- and bromine containing substances, dealt with under the Montreal Protocol. Beside $CO_2$, $N_2O$ and $CH_4$, the Kyoto Protocol deals with the GHGs sulphur hexafluoride ($SF_6$), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). For a list of well-mixed GHGs, see WGI AR5 Table 2.A.1.
- **Greenhouse effect:** The effect created by the band of greenhouse gases that blanket the Earth. The greenhouse effect keeps the Earth's surface within a temperature range that makes life on Earth (as we know it) possible.
- **Health:** A state of complete physical, mental and social well being, and not merely the absence of disease or infirmity.
- **Health impact assessment (HIA):** A combination of procedures, methods and tools by which a policy, project or hazard may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population.
- **Health Systems:** Comprises all the organizations, institutions, and resources that are devoted to producing actions principally aimed at improving, maintaining, or restoring health. (World Health Organization, 2007)
- **Health system strengthening:** Defined by the WHO in reference to its current framework as, “improving the six building blocks and managing their interactions in ways that achieve more equitable and sustained improvements across health services and health outcomes, requiring both technical and political knowledge and action.”
- **Intergovernmental Panel on Climate Change (IPCC):** Established in 1988 by the World Meteorological Organization and the UN Environment Programme, the IPCC surveys worldwide scientific and technical literature and publishes assessment reports that are widely recognized as the most credible existing sources of information on climate change. The IPCC also works on methodologies and responds to specific requests from the Convention's subsidiary bodies. The IPCC is independent of the Convention.
- **Land use and land-use change:** Land use refers to the total of arrangements, activities, and inputs undertaken in a certain land cover type (a set of human actions). The term land use is also used in the sense of the social and economic purposes for

which land is managed (e.g., grazing, timber extraction, and conservation). Land-use change refers to a change in the use or management of land by humans, which may lead to a change in land cover. Land cover and land-use change may have an impact on the surface albedo, evapotranspiration, sources and sinks of greenhouse gases, or other properties of the climate system and may thus have radiative forcing and/or other impacts on climate, locally or globally.

- **Malaria:** Endemic or epidemic parasitic disease caused by four species of the protozoan genus Plasmodium that are transmitted to humans by the bite of female Anopheles mosquitoes. Disease is characterised by high fever attacks and systemic disorders and is responsible for approximately 2 million deaths every year, 90% of which occur in SubSaharan Africa. Malaria is the most serious and common vector-borne disease in the world.
- **Mitigation (of climate change):** A human intervention to reduce the sources or enhance the sinks of greenhouse gases (GHGs). This report also assesses human interventions to reduce the sources of other substances that may contribute directly or indirectly to limiting climate change, including, for example, the reduction of particulate matter (PM) emissions that can directly alter the radiation balance (e. g.,black carbon) or measures that control emissions of carbon monoxide, nitrogen oxides (NOx), volatile organic compounds (VOCs) and other pollutants that can alter the concentration of tropospheric ozone ($O_3$), which has an indirect effect on the climate.
- **Montreal Protocol:** The Montreal Protocol on Substances that Deplete the Ozone Layer, an international agreement adopted in Montreal in 1987.
- **Morbidity:** Rate of occurrence of disease or other health disorder within a population, taking account of the age-specific morbidity rates. Morbidity indicators include chronic disease incidence/prevalence, rates of hospitalization, primary care consultations, disability days (i.e., days of absence from work), and prevalence of symptoms.
- **Mortality:** Rate of occurrence of death within a population; calculation of mortality takes account of age-specific death rates, and can thus yield measures of life expectancy and the extent of premature death.
- **Nitrous oxide ($N_2O$):** One of the six greenhouse gases (GHGs) to be mitigated under the Kyoto Protocol. The main anthropogenic source of $N_2O$ is agriculture (soil and animal manure management), but important contributions also come from sewage treatment, fossil fuel combustion, and chemical industrial processes. $N_2O$ is also produced naturally from a wide variety of biological sources in soil and water, particularly microbial action in wet tropical forests.

- **Ozone ($O_3$):** Ozone, the triatomic form of oxygen ($O_3$), is a gaseous atmospheric constituent. In the troposphere, it is created both naturally and by photochemical reactions involving gases resulting from human activities (smog). Tropospheric $O_3$ acts as a greenhouse gas (GHG). In the stratosphere, it is created by the interaction between solar ultraviolet radiation and molecular oxygen ($O_2$). Stratospheric $O_3$ plays a dominant role in the stratospheric radiative balance. Its concentration is highest in the $O_3$ layer.
- **Particulate matter (PM):** Very small solid particles emitted during the combustion of biomass and fossil fuels. PM may consist of a wide variety of substances. Of greatest concern for health are particulates of diameter less than or equal to 10 nanometres, usually designated as $PM_{10}$.
- **Pathogen:** An infectious agent such as a virus, bacterium, prion, fungus, viroid, or parasite that causes disease in its host. The host may be an animal, a plant, a fungus, or even another microorganism.
- **Policies (for mitigation of or adaptation to climate change):** Policies are a course of action taken and / or mandated by a government, e. g., to enhance mitigation and adaptation. Examples of policies aimed at mitigation are support mechanisms for renewable energy (RE) supplies, carbon or energy taxes, fuel efficiency standards for automobiles.
- **Precipitation:** Rain, hail, mist, sleet, snow or any other moisture that falls to the Earth.
- **Radiation:** Energy emitted in the form of electromagnetic waves. Radiation has differing characteristics depending upon the wavelength. Because the radiation from the Sun is relatively energetic, it has a short wavelength (e.g., ultraviolet, visible, and near infrared) while energy re-radiated from the Earth's surface and the atmosphere has a longer wavelength (e.g., infrared radiation) because the Earth is cooler than the Sun.
- **Resilience:** The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation (Arctic Council, 2013).
- **Response:** The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected.
- **Risk:** (i.e., climate-related risk) is a product of the likelihood of exposure and the consequence(s) of that exposure. It arises from the interaction of a physically defined

hazard (e.g., floods and other extreme weather events, increasing temperature) with the properties of the exposed system, its vulnerability (UNDP, 2003). System vulnerability is a critical determinant of the risk a region or subpopulation faces when exposed to a particular hazard. This means that programs to decrease vulnerability will decrease risk.

- **Sea level change/sea level rise:** Sea level can change, both globally and locally, due to changes in the shape of the ocean basins, changes in the total mass of water and changes in water density. Factors leading to sea-level rise under global warming include both increases in the total mass of water from the melting of land-based snow and ice, and changes in water density from an increase in ocean water temperatures and salinity changes. Relative sea level rise occurs where there is a local increase in the level of the ocean relative to the land, which might be due to ocean rise and/or land level subsidence.
- **Sensitivity:** describes an individual's or subpopulation increased responsiveness, primarily for biological reasons, to a particular exposure. Biological sensitivity may be related to developmental stage, preexisting medical conditions, acquired factors (such as immunity), and genetic factors. Socioeconomic factors also play a critical role in altering vulnerability and sensitivity, by interacting with biological factors that mediate risk (such as nutritional status) and/or lead to differences in the ability to adapt or respond to exposures or early phases of illness and injury.
- **Seasonality/seasonal variation:** Seasonal fluctuations in disease incidence or prevalence or other phenomena (e.g. abundance of vectors). Shigellosis is an acute invasive enteric infection caused by bacteria belonging to the genus Shigella; it is clinically manifested by diarrhoea that is frequently bloody.
- **Sulfur dioxide ($SO_2$):** A compound composed of one sulfur and two oxygen molecules. Sulfur dioxide emitted into the atmosphere through natural and anthropogenic processes is changed in a complex series of chemical reactions in the atmosphere to sulfate aerosols. These aerosols are believed to result in negative radiative forcing (i.e., tending to cool the Earth's surface) and do result in acid deposition (e.g., acid rain).
- **Sustainable development:** Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
- **Surveillance:** Continuous analysis, interpretation and feedback of systematically collected data for the detection of trends in the occurrence or spread of a disease, based on practical and standardized methods of notification or registration. Sources of data may be related directly to disease or factors influencing disease.

- **Transmission cycle:** The transmission of pathogens from current to future host follows a repeating cycle. This cycle can be simple, with a direct transmission from current to future host, or complex, where transmission occurs through (multiple) intermediate hosts or vectors. Typhoid fever is a bacterial disease, caused by Salmonella typhi. It is transmitted through the ingestion of food or drink contaminated by the faeces or urine of infected people.
- **United Nations Framework Convention on Climate Change (UNFCCC):** The Convention was adopted on 9 May 1992 in New York and signed at the 1992 Earth Summit in Rio de Janeiro by more than 150 countries and the European Community. Its ultimate objective is the 'stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system'. It contains commitments for all Parties under the principle of 'common but differentiated responsibilities'. Under the Convention, Parties included in Annex I aimed to return greenhouse gas (GHG) emissions not controlled by the Montreal Protocol to 1990 levels by the year 2000. The convention entered in force in March 1994. In 1997, the UNFCCC adopted the Kyoto Protocol.
- **Uncertainty:** An expression of the degree to which a value is unknown. This can result from lack of information or disagreement about what is known. Uncertainty can be represented by quantitative measures (e.g. a range of values calculated by mathematical models) or qualitative statements (e.g. reflecting the judgement of a team of experts).
- **Undernutrition:** Is defined as the outcome of insufficient food intake and repeated infectious diseases. It includes being underweight for one's age, too short for one's age (stunted), dangerously thin for one's height (wasted) and deficient in vitamins and minerals (micronutrient malnutrition).
- **Vector:** An organism that acts as an essential intermediate host or definite host for a human pathogen and that plays an active role in its transmission; for example, Anopheles mosquitoes are vectors of malaria. This definition excludes mechanical carriers of infective materials (such as houseflies and cockroaches), strictly passive intermediate hosts (e.g. the snail hosts of schistosomiasis) and reservoir species (e.g. foxes carrying rabies).
- **Vector-borne diseases:** Range of infectious diseases that are transmitted between hosts by vectors such as mosquitoes or ticks (e.g. malaria, dengue fever, Lyme disease).
- **Vulnerability:** The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

- **Weather:** Atmospheric condition at any given time or place. It is measured in terms of such things as wind, temperature, humidity, atmospheric pressure, cloudiness, and precipitation. In most places, weather can change from hour-to-hour, day-to-day, and season-to-season. Climate in a narrow sense is usually defined as the "average weather", or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period is 30 years, as defined by the World Meteorological Organization (WMO). These quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system. A simple way of remembering the difference is that climate is what you expect (e.g. cold winters) and 'weather' is what you get (e.g. a blizzard).
- **Water-related diseases:** those caused by micro-organisms and chemicals in water people drink; diseases like schistosomiasis which have part of their lifecycle in water; diseases like malaria with water-related vectors; drowning and some injuries; and others such as legionellosis carried by aerosols containing certain micro-organisms.
- **Zoonosis:** An infectious disease of vertebrate animals, such as rabies, which can be transmitted to humans.
- **Zoonotic disease:** A disease that can be passed between animals and humans. Zoonotic diseases can be caused by viruses, bacteria, parasites, and fungi.

# CONTEXT

Climate change is one of the most pressing challenges to human beings in anthropocene: the era of humans. With the rise in global temperatures, incidences of disasters have increased manifolds. Reports claim that over the last 130 years, the world has warmed by 0.85 degrees Celsius . Changes in climatic factors are causing extreme events and disasters like drought, flood, heat waves etc. Such extreme events associated with climate change also trigger a number of health challenges. It also impacts food production, changes food habits and effects nutrition security by increasing malnutrition and under-nutrition. Changes in profile and patterns of temperature, humidity promotes various vector borne diseases, intensifies allergies and other respiratory problems. In addition, cases of animal bites have also become common during hydro-metrological disasters.

Learning from the past disasters, the state and local bodies have now become proactive in addressing disasters from extreme events and climate change. To promote climate resilience societies, the state and local bodies are now focusing on the integration of Disaster Risk Reduction (DRR) components into the climate planning process. The states are revising the State Action Plan on Climate Change (SAPCCs) considering the Sendai Framework for Disaster Risk Reduction and Sustainable Development Goals. However, the impact of disaster on health and the link between climate change on health impacts and diseases are not been given proper attention. Thus, there is a need to focus on health services and systems to make them resilient towards climate related disasters.

Understanding this need, National Institute of Disaster Management and World Health Organization, India collaboratively developed the National Health Adaptation Plan. The plan focuses on addressing the region-specific health challenges associated with climate change related disasters. Under the project NIDM developed this training manual to contribute towards bridging the existing knowledge gaps in health challenges of climate change related disasters.

# ABOUT THE TRAINING MANUAL

## Training Design and Brief

This training manual has been developed as a part of the National Health Adaptation Plan (NHAP) by the National Institute of Disaster Management (NIDM) with partner World Health Organization (WHO) India. The manual provides a distinctive platform for integrating health services and systems with climate change related disaster risk reduction (DRR) approaches.

The manual is designed to build and improve the capacity of officials at the regional/local and state level including public health and disaster management authorities/bodies towards developing resilient health systems in order to mitigate the adverse impacts of climate change related disasters. It will also act as a base document and practical guidance for understanding the vulnerabilities of the existing health systems to climate and weather sensitive diseases in the context of extreme events & disasters.

Given the above backdrop, the training manual has been designed to focus on the following two central research questions:

[i] What are the systemic factors within regions that contribute to resilience or exacerbate vulnerability of health systems in the context of climate change?

To address this question, detailed analysis of a specific region was done to improve the ability to identify practical points where interventions could be included to build resilience in the health sector.

[ii] What specific policy innovations could help to bridge the vertical gap between the integrated national policy framework and local/regional contexts and the horizontal gap between actions within sectoral development programs to integrate concepts of resilient health within the system and practice?

To address this question, the intent is to focus on the local, regional, state and international perspectives on the challenges associated with new dimension of diseases outbreak due to changing climatic conditions.

## Aim of the Training Manual

The aim of this training manual is to develop an understanding of the health aspects of climate related disasters and provide a guidance document for the officers at local level and state level on actions needed to develop resilient health systems and services.

## Training Objectives

At the end of the training the participants should be able to:

- Identify health implications of climate change and related disasters.
- Identify and analyse heath risks and vulnerabilities.
- Understand the specific vulnerabilities of disasters caused due to water, temperature and wind, extreme events in health and develop a health centric resilient framework.
- Understand and analyse the social dimensions and implications of public health with respect to climate change.
- Understand the needs of adaptation and resilience in health services and systems.
- Understand and identify the occupational and industrial health safety with respect to climate change and related disasters.
- Understand and describe climate sensitive and weather sensitive diseases outbreaks and role of institutions in resilient development planning process.
- Analyse and delineate the pathways, approaches, process of resilience building in health system preparedness through adaptive management of health resources including health related policies and programmes.
- Link the Local, National and International goals and policies relating to the themes of resilient health, climate change and DRR.

## Target Groups/Audience

The training manual has been developed keeping in mind the performance gaps and the knowledge needs of the following group of participants:

- Senior to middle level officials from the state and local level bodies from line departments and central ministries of government of India.

- Executives and professionals from other government agencies and boards as well as programmes and schemes in charges including public sector undertakings like Indian Meteorological Department (IMD), Central Water Commission (CWC), Disaster Management Authority (DDMA), Pollution Control Board (SPCB) etc.
- Members and representatives of non-governmental and community organizations engaged in activities related to assessment, planning, implementation or monitoring of any aspect of disaster risk and management, public health development, occupational health and safety etc
- Faculty members or professionals from training, education and research institutes and other master trainers related in the field of public health, planning and development, environment, climate change and disaster management sector etc.
- Private Sector and industry officials involved in water supply, sanitation, environmental and occupational health, waste management, power, industries, communication, risk management, etc. in cities.
- Local community workers and others including Non-Governmental Organisations (NGOs), Chief Security Officer (CSO), Resident Welfare Association (RWA), Panchayats, Volunteer Organization, Bilateral etc.

## Structure of the Modules

This training manual offers a training tool along with course guidelines which will enable participants to develop a holistic view of health hazards and vulnerabilities associated with climate change related disasters. The manual will also provide an understanding of the appropriate mitigation and preparedness measures to deal with health risks and vulnerabilities with respect to climate change related disasters. The module provides a good mix of theoretical and practical exercise developed from various literatures available on the subject across a range of sources.

The training manual consists of five modules and has been designed as a five-day course with interesting learning activities, case studies and tools to support the overall framework of the manual. The five modules are as below-

# LEARNING UNITS

**MODULE 1: Understanding Environment and Climate Change Implications on Health**

a) Understanding Climate change: an overview

b) Environmental change: key driver of climatic and disaster risk

c) Consequences of climate change and disasters on health

d) Case studies on health and climate change

**MODULE 2: Disasters, Health Dimensions and Policy**

a) Hydro- metrological disasters: Floods, Drought and Cyclone

b) Temperature related disasters (heat & cold wave) and wind related disasters (Dust & Sandstorm)

c) Policy, Legislations and programmes

   i. Climate change and health adaptation strategy and national/sub-national health action plans

   ii. Adaptation and resilience through health related policies, legislations and programmes

Group Activities: Interactive Discussion on mainstreaming health sector into developmental plans

**MODULE 3: Climate and Weather Sensitive Diseases and Outbreaks**

a) Climate change and disease outbreak epidemics

b) Occupational, environmental and industrial health & safety with respect to climate change

c) One Health: Climate change, animal health and human health

d) Understanding DRR and Review of SAPCCs with respect to Climate related Health Implications

Group Exercise: Identifying the entry-points and pathways to incorporate health sector in SAPCCs.

**MODULE 4: Risk, Vulnerability & Impact Assessment: Integrating DRR in Health Sector**

a) Vulnerability of health systems and resources: Health impact and adaptive capacity assessment in relation to climate change

b) Health Risk and Vulnerability Assessment: Environment vulnerability, economic vulnerability, livelihood vulnerability

c) Post-disaster and Need Assessment (PDNA) in Health Sector: Impact and Needs

d) Lessons from COVID 19 Pandemic

Group exercise: Vulnerability assessment exercises for participants

**MODULE 5: Health System and Health Resources Adaptation and Resilience**

a) Current Health Scenario:
   i) Health care delivery system of the country
   ii) SWOT analysis of the health system

b) The National Health Adaptation Plan (NHAP) for Disaster Related Illnesses

Group exercise: Localizing NHAP for District level

1. Understanding Environment and Climate Change Implications on Health
2. Disasters, Health Dimensions and Policy
3. Climate and Weather Sensitive Diseases and Outbreaks
4. Risk, Vulnerability & Impact Assessment: Integrating DRR into Health Sector
5. Health System and Health Resources Adaptation and Resilience

Figure 1: Modules in the Training Manual

| Modules | Learning Units | Duration | Training Method |
|---|---|---|---|
| **Understanding environment and climate change implications on health** | Understanding Climate change: an overview | 90 minutes | Lecture, Power Point (PPT) Presentations Case Studies, Audio/Visuals, Question & Answer (Q&A), Group Discussions Activities |
| | Environmental change: key driver of climatic and disaster risk | 90 minutes | |
| | Consequences of climate change and disasters on health | 90 minutes | |
| | Case studies on health and climate change | 90 minutes | |
| **Disasters, Health Dimensions and Policy** | Hydro- metrological disasters: Floods, Drought and Cyclone | 90 minutes | |
| | Temperature related disasters (heat & cold wave) and wind related disasters (Dust & Sandstorm) | | |
| | Policy, Legislations and programmes | 90 minutes | |
| | Climate change and health adaptation strategy and national/ sub-national health action plans | | |
| | Adaptation and resilience through Health related policies, legislations and programmes | | |
| | Group Activities: Interactive Discussion on mainstreaming health sector into developmental plans | 90 minutes | Experience and knowledge sharing |
| **Climate and Weather Sensitive Diseases and Outbreaks: Integrating DRR in Health Sector** | Climate change and disease outbreak/epidemics | 90 minutes | Lecture or PPT, Short films on climate change related disasters & health, Perception check questionnaire (or Q&A) |
| | Occupational, health & safety with respect to climate change | 90 minutes | |
| | One Health: Climate change, animal health and human health | 90 minutes | |
| | Understanding DRR and review of SAPCCs with respect to Climate related Health Implications | 90 minutes | |
| | Group Exercise: Identifying the entry-points and pathways to incorporate health sector in SAPCCs. | 90 minutes | |

| Modules | Learning Units | Duration | Training Method |
|---|---|---|---|
| Risk - Vulnerability & Impact Assessment: Methods and Tools | Vulnerability of health, systems and resources: Health impact and adaptive capacity assessment in relation to climate change | 90 minutes | Lecture or Power Point Presentations, Short films on different type of assessments, Experience sharing, Discussion |
| | Health Risk and Vulnerability Assessment: Environment vulnerability, economic vulnerability, livelihood vulnerability | 90 minutes | |
| | Post-disaster and Need Assessment (PDNA) in Health Sector: Impact and Needs | 90 minutes | |
| | Group exercise: Vulnerability assessment of exercises for participant | 90 minutes | Group exercise involving case studies for conducting different type of assessments |
| Health System and Health Resources Adaptation and Resilience | Current Health Scenario | 90 minutes | Lecture Power Point Presentations Case Studies Audio/Visuals, Q&A Group Discussions Activities |
| | Health care delivery system of the country | | |
| | SWOT analysis of the health system | 90 minutes | |
| | The National Health Adaptation Plan for climate change related disasters | 90 minutes | |
| | Group Exercise: Localizing NHAP for District level | 90 minutes | |

## Selection of Trainees

The participants selected for the training programme will be based on the following criteria:

| | |
|---|---|
| Target level trainees | As specified under target group/audience (Senior to middle level officials/professionals/agency representative) |
| Nature of the group | Heterogeneous (from various departments, agencies and academic institutions), with representation of women colleagues. |
| Qualification | At least graduation and preferably post-graduation, having written and spoken ability in English/Hindi. Computer knowledge is desirable. |
| Medium of Instructions | Mainly English with blend of Hindi/regional language |

## Pre-requisite for the Trainer/Course Faculty

The training team should consist of a minimum of three trainers, of which one shall be from the region where training is being conducted or planned. Other criteria for the course trainer are as follows:

| | |
|---|---|
| Eligibility | Interdisciplinary expert with knowledge on health issues, climate change impacts, resilience, disaster risk reduction, public health, health infrastructure and systems, occupational health and safety, planning and governance, environment and developmental planning issues and have experience in conducting interactive training sessions. |
| Training Approach | Friendly and informal approach and have ability to involve heterogeneous group at a single platform |
| Challenges to be addressed by the trainer | Motivating the participants to bring them at similar level of knowledge and experience sharing |
| Strategies to overcome the challenges | Provide reading materials during registration (or preferably can be mailed in advance). Involve the participants through group exercise, video clippings and quiz sessions, etc. |

## Tips for using the Training Manual

To make learning easy and interesting and more participatory the following techniques can be used:

- Question-Answer/Quiz Sessions
- Group activities like group work and discussions
- Presentations using Multimedia tools
- Table Top/Class Room Exercises
- Field Visit
- Case Studies

## Expected Benefits

Capacity enhancement of the officials/professionals engaged in planning, designing, executing and/or governing various aspects of public health services and systems, disaster management authorities, developmental planning and actions in National, State and Local levels its sectors/departments and allied activities.

The overall capacity of administration, academic institutions and non-governmental organizations improved in identification, assessment of health hazards and vulnerabilities due to climate change and mitigation and preparedness to deal with health hazards from extreme climatic events.

Overall sensitization of officials of the local bodies and state bodies to understand climate and disaster resilience issues and their effects to health systems and services.

Improved ability to collaborate with the each other both horizontally and vertically for achieving resilient health services and systems to mitigate impacts of climate change on health at national level.

## Instructions for Using the Manual

1. The module can be implemented at local or state level and even at national level with suitable modification utilizing its flexibility. For example, at national level, courses may be organized by concerned Ministries, Institutes and leading NGOs, whereas at state and district level the course may be organized by State Disaster Management Authorities (SDMAs), Administrative Training Institutes (ATIs), Public Health Institutions, Centre for Disaster Management, Climate Change Cell, leading NGOs etc.
2. Learning shall be facilitated by trained trainers in relevant subject and preferably in a Training of Trainers (ToT) course on this manual. Appropriate resource persons shall be selected and invited as speakers/moderators for taking up the case studies and field surveys based technical sessions. It is advisable to conduct a Training of Trainers (ToT) courses in every State in order to build their capacities in conducting training programs at sub-national level.
3. Various learning unit include case studies, group work etc. The course facilitator shall ensure that the manual has been taught considering the target group's background, time and resources available.
4. Entire manual is designed in a way to complete it within the given duration of about 5 days, depending upon the field visit exercise.
5. At the end of the training, a feedback session shall be conducted by the facilitators in order to understand the opportunities and shortcomings of the manual. These feedbacks shall be complied and appropriately included in the future training programs.

## Action Plan/Post-Training Assignment

It is well understood that training has more impact on ground if a mechanism for follow-up is in place. During the first activity in this module, participants review the gaps identified throughout the training in order to identify the changes they might be able to make in their own departmental/organizations' work.

Working as a group, they will:

- Identify areas for future action;
- Develop criteria for prioritizing future actions;
- Prioritize these actions according to the criteria;
- Create an action plan (and framework for writing an assignment)
- Assignment submission guidelines.

This manual presents an opportunity for capturing the motivation that participants have at the end of training and for them to return home with a tool - the action plan - to help them to focus on changes they want to make when faced with the day-to-day challenges of work. The action plan should help them build these changes into their routines, creating demands and eventually those of the department/organization.

## Training Assessment

| Context and description of the Session (0.5 hours) | |
|---|---|
| The session shall consist of either written or oral question-answer/discussion round to gauge the perception level of the participants at the entry level of the training course. This would be repeated at the end of the course (post training session) during valediction to understand the impact of the course. A film can also be shown to trigger the expression of participants prevailing knowledge and/or perception on aspects of climate change, disaster risks and child vulnerability, with example from city environment. | |
| **Learning Objective** | **Methodology** |
| 1. To compare the entry and exit behaviour of the trainees.<br>2. To evaluate the knowledge and skills gained from the training.<br>3. To assess perceived competency of participants on disaster risks and climate resilient cities.<br>4. To carry out a formal internal evaluation methodology using questionnaires. | Question-answers<br>Discussion<br>Ice-breaking<br>Games<br>Film Screening |

| Guidance |
| --- |
| 1. Questionnaire based assessment of the participants' perception at the entry level (and also at the exit level) may be carried out.<br>2. The questions shall be identified or framed by the course director or coordination team looking into the course module's scope, participants profile and duties or background and context of the film being screened.<br>3. It is advised that the course coordinator or trainers keep pre-developed notes as own cues for delivering course session.<br>4. The resource person for this session is expected to have a broad knowledge of all aspects associated with health issues, climate change impacts, resilience, disaster risk reduction, public health, health infrastructure and systems, occupational health and safety, planning and governance, environment and developmental planning issues. Ideally there should be a team of two or three resource persons with background in public health, climate change, disaster management, environment studies, epidemiology, medicine & medical services urban development / or planning. Prior experience of health services, disaster management and climate resilience should be desirable eligibility. |



# Module 1:
# Understanding Environment and Climate Change Implications on Health

*Source: Photo by NOAA on Unsplash*

# Module 1:
# Understanding Environment and Climate Change Implications on Health

## Context and description of the session

This module focuses on the conceptual understanding and inter-relation between environment and climate change related disasters and its implications on health. It involves professionals and officials of public administration, industrial associations/corporations, non-governmental organizations, academicians and researchers at national or sub-national level. The main intention of this first module is to provide a broad overview on climate variability and change, disaster pattern and their associated health risk, and the role of the health sector in climate change and disaster risks.

Our climate is changing. Observed changes over the 20$^{th}$ century include increases in global average air and ocean temperature, rising global sea levels, long-term sustained widespread reduction of snow and ice cover, changes in atmospheric and ocean circulation and regional weather patterns, which influence seasonal rainfall conditions. These changes are caused by extra heat in the climate system due to the addition of greenhouse gases (carbon dioxide, methane, water vapors, ozone, nitrous oxides and fluorinated gases) to the atmosphere. The additional greenhouse gases are primarily input by human activities such as the burning of fossil fuels (coal, oil, and natural gas), agriculture, large scale livestock rearing and land clearing. These activities increase the amount of heat-trapping greenhouse gases in the atmosphere. The pattern of observed changes in the climate system is consistent with an increased greenhouse effect. Other climatic influences like volcanoes, the sun and natural variability cannot alone explain the timing and extent of the observed changes in the climate. The detailed mechanism of the climatic change and its impact on atmosphere is out of scope of this module and may be explained by the trainers if situation arise during training.

In the past, carbon dioxide concentration levels have risen between 180-300 ppmv (parts per million by volume) due to natural as well as anthropogenic factors. Due to the industrial revolution, carbon dioxide concentration is rising linearly from the year 1950 and is touching new heights every year.

With increasing global surface temperatures, the possibility of more droughts and increased intensity of storms has increased. As more water vapor is evaporated into the atmosphere it becomes fuel for more powerful storms to develop. More heat in the atmosphere and warmer ocean surface temperatures can lead to increased wind speeds in tropical storms. Increase of air and water temperatures lead to rising sea levels, supercharged storms and higher wind speeds, more intense and prolonged droughts, heavier precipitation and flooding. Extreme heat events are becoming hotter, last longer and occur more often as the global average temperature rises. Currently, we see an average of 400 extreme weather events occur every year. The impacts of climate change on human health are significant and varied. Exposure to health hazards related to climate change affects different people and different communities to different degrees.

With climate change, the frequency, severity, duration, and location of weather and climate phenomena like rising temperatures, heavy rains and droughts, and some other kinds of severe weather are changing. This means that areas already experiencing health-threatening weather and climate phenomena, such as severe heat or hurricanes, are likely to experience worsening impacts, such as even higher temperatures and increased storm intensity, rainfall rates, and storm surge. It also means that some locations will experience new climate-related health threats. For example, areas previously unaffected by toxic algal blooms or waterborne diseases because of cooler water temperatures may face these hazards in the future as increasing water temperatures allow the organisms that cause these health risks to thrive. Even areas that currently experience these health threats may see a shift in the timing of the seasons that pose the greatest risk to human health. Therefore, climate change will have an effect on human health in two major ways – one is directly by extremes of weather conditions and disasters and another way is occurrence of diseases due to change in vectors or pathogens or conditions suitable for its spread.

A vector is any organism - such as fleas, ticks, or mosquitoes - that can transmit a pathogen, or infectious agent, from one host to another. India is afflicted with six major vector borne diseases (VBDs) namely malaria, dengue, chikungunya, filariasis, Japanese encephalitis and leishmaniasis. Zoonoses, such as Avian Flu and swine flu, are diseases that can be transmitted from animals to humans by either contact with the animals or through vectors that carry zoonotic pathogens to from animals to humans. Climate change enhances the transmission season and expands the geographical distribution of vector-borne and zoonotic diseases (like

dengue, malaria), as warmer temperature and humidity favor the breeding and geographical distribution of insect vectors. Climatic factors also influence bacterial, viral and protozoal behavior resulting outbreaks and epidemics. Figure 2 shows the impact of climate change on human health.

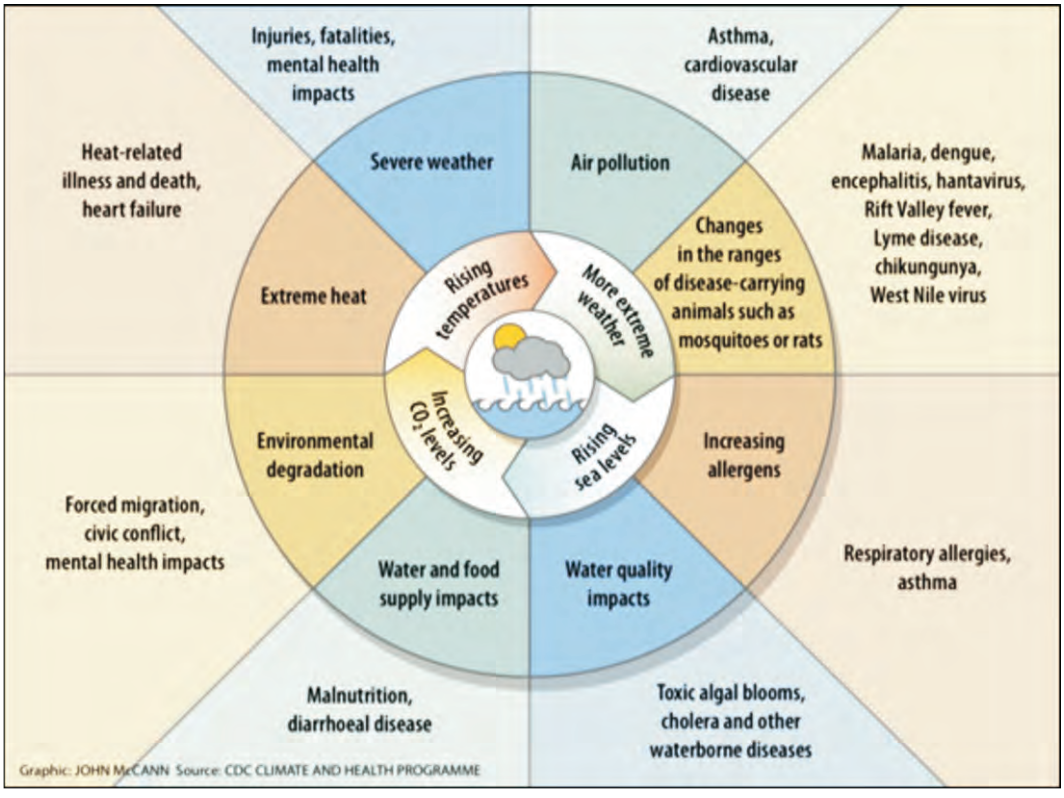



**Figure 2: Impact of climate change on human health (Source: CDC Climate & Health Programme)**

A useful approach to understand how climate change affects health is to consider specific exposure pathways and how they can lead to human disease. Figure 3 represents that the concept of exposure pathways is adapted from its use in climatic disaster risk assessment, and in this context describes the main routes by which climate change affects health. While often assessed individually, exposure to multiple climate change threats can occur simultaneously, resulting in compounding or cascading health impacts. Climate change threats may also accumulate over time, leading to longer-term changes in resilience and health.

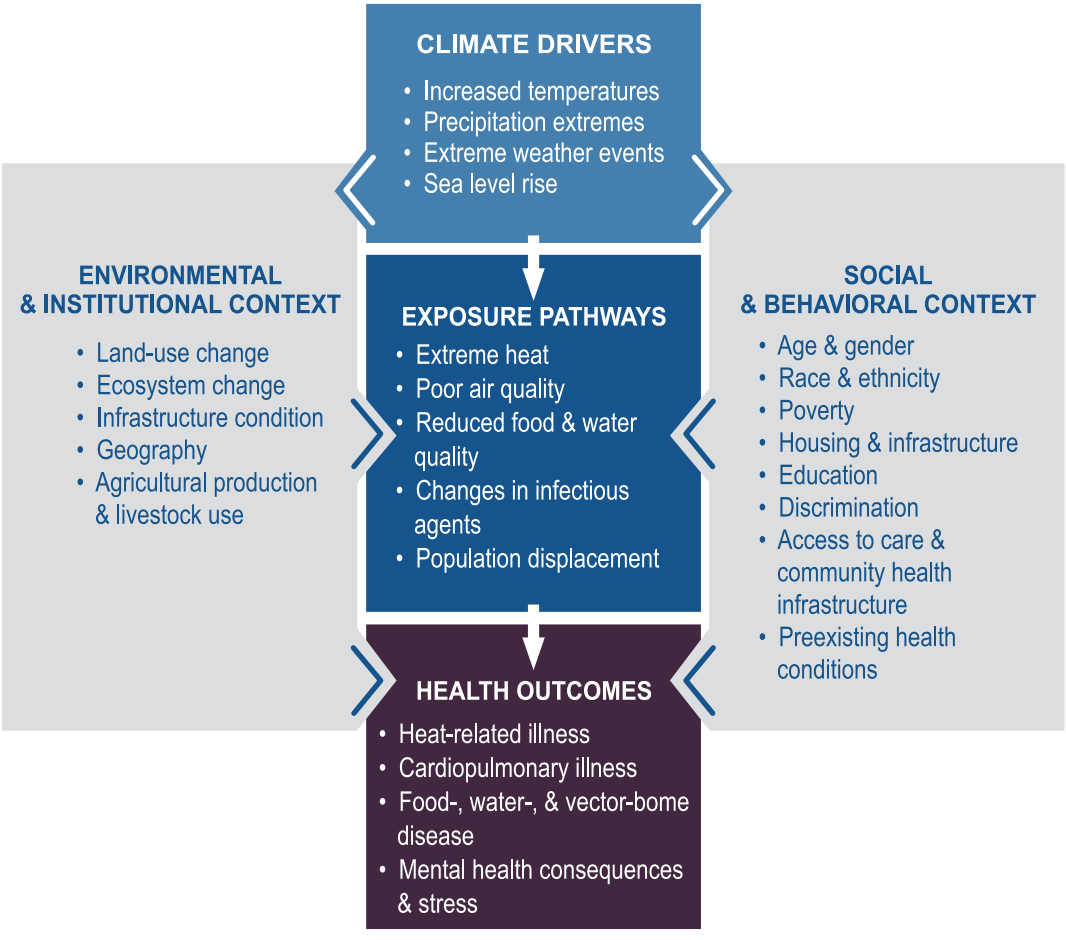



Figure 3: Conceptual diagram illustrating the exposure pathways by which climate change affects human health.

At the end of this learning module, the participant will be able to:

- Explain the main approaches to address climate change and global warming
- Learn basic terms and causes of climate change
- Learn basic terms and concepts of disaster risk in the context of climate change
- Analyse relationship between climate change, disaster risks and development at global and national level
- Understand the consequences of climate change and disasters on human health
- To measure the health effects and pattern of diseases occurred post disasters

There are 3 learning units delineated to draw this module. The titles of learning units are enlisted below:

LU (a) Understanding climate change: An overview

LU (b) Environmental change: key driver of climatic and disaster risk

LU (c) Consequences of climate change and disasters on health

## Learning objectives

The key objectives of this module are the following:

- To describe environment and climate change - its causes, effects and consequences
- To explain the main approaches to address climate change and global warming
- To describe key regional and national climate change initiatives
- To describe the impacts of climate change on human health and environment at global and national level
- To analyse relationship between climate change, disasters and related health diseases

## Duration

- The time duration in total delineated to this module is 1 day (6 hours). Each module will have 4 sessions
- Each session will be of 90 minutes

## Methodology

The training methodology will include:

- Lecture/ PowerPoint presentations
- Case studies related to climate change
- Audio/Videos on climate change
- Question-answer sessions
- Group discussions and exercises

## Resources Required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- A collection of relevant films
- Stationeries: White board, Marker, Writing pad

## Guidance

- Punctuality of participants during the sessions
- Experience sharing from participants, trainers/faculty and course coordinators is important to start from and finally arriving at a common learning point
- Response of the participants, their discipline etc. need to be shared during this information round
- Table top exercises and quiz sessions suggested during the discussion round

## Recommended Readings


- Balbus, J., A. Crimminutes, J.L. Gamble, D.R. Easterling, K.E. Kunkel, S. Saha, and M.C. Sarofim, 2016: Ch. 1: Introduction: Climate Change and Human Health. The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. U.S. Global Change Research Program, Washington, DC, 25-42. http://dx.doi.org/10.7930/J0VX0DFW
- Chan, E. Y. Y., Man, A. Y. T., & Lam, H. C. Y. (2019). Scientific evidence on natural disasters and health emergency and disaster risk management in Asian rural-based area. British medical bulletin, 129(1), 91.

- IPCC. 2014. Climate Change 2014: Fifth Assessment Report.
- WHO Climate Change and Human Health Atlas. 2012. http://who.int/globalchange/publications/atlas/en/
- WHO. 2013 Protecting Health from Climate Change: Vulnerability and Adaptation Assessments
- UNCC Report, 2017, Climate Change Impacts Human Health
- Field, C. B., Barros, V., Stocker, T. F., & Dahe, Q. (Eds.). (2012). Managing the risks of extreme events and disasters to advance climate change adaptation: special report of the intergovernmental panel on climate change. Cambridge University Press.
- Gupta, A.,K, and Nair, S.,S, (2012) Environmental Extremes Disaster Risk Management Addressing Climate Change, National Institute of Disaster Management, New Delhi.
- Asian Development Bank (2015). Water-related disasters and disaster risk management in the People's Republic of China, Mandaluyong City, Philippines.
- UN-Water Policy Brief, Climate Change and Water, Sweden, September 2019
- UN-Water, Tran boundary Waters: Sharing Benefits, Sharing Responsibilities (Geneva, 2008).
- WHO report, 2006. Communicable diseases following natural disasters Risk assessment and priority interventions, Programme on Disease Control in Humanitarian Emergencies Communicable Diseases Cluster.

  https://www.who.int/diseasecontrol_emergencies/guidelines/CD_Disasters_26_06.pdf

# LU 1.1: Understanding Climate Change: An Overview

## Context and description

Facing the impacts of climate change is a key challenge of this century – not only for governments, but also for communities and businesses. Due to its geographic characteristics and its socio-economic conditions, India is one of the most vulnerable countries to climate change. Rising temperatures, changes in rainfall patterns, rising sea levels and more frequent and more intense extreme weather events such as floods, droughts or cyclones can already be observed, and are projected to intensify in the future. These impacts affect the fundamentals of India's natural environment, with strong repercussions for its society and economy.

This session focuses on the conceptual understanding between environment, climate change and disasters and its impacts on the health. The fact that the Earth has warmed over the last century is unequivocal. Human influence has been the dominant cause of the climate change and global warming. Climate breakdown creates immediate impacts on human and natural systems. This learning unit includes several terminologies and concepts related to climate change. The main purpose of this session is to introduce basic climate change understanding and form a base to discuss the issues further as well will also be used to assess knowledge of the participants on basic climate change.

## Learning objectives

- To learn basic terms and causes of climate change
- To know issues of climate change at global and national level
- To learn about inter-linkages between climate change and extreme weather events

## Methodology

- Lecture and Power point presentation
- Audio/Videos on climate change
- Question-answer session
- Discussion

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- A collection of relevant films

## Guidance

The basic overview of climate change needs to be explained and the Indian states prone to different extreme events need to be shown to the participants within the presentation/ lecture.

## Duration

Duration allotted to this session is 90 minutes.

## Recommended readings


- IPCC. 2014. Climate Change 2014: Fifth Assessment Report.
- WHO. 2013 Protecting Health from Climate Change: Vulnerability and Adaptation Assessments
- SREX-IPCC Report, Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation, Special Report of the Intergovernmental Panel on Climate Change
- Gupta, A.,K, and Nair, S.,S, (2012) Environmental Extremes Disaster Risk Management Addressing Climate Change, National Institute of Disaster Management, New Delhi.

# LU 1.2:
# Environmental Change: Key Driver of Climatic and Disaster Risks

## Context and description

Various researches indicate that the Earth's climate is changing at a rate that has exceeded most scientific forecasts. Many families and communities have already started to suffer from disasters and the consequences of climate change, which has forced them to leave their homes in search of a new beginning. Over the last few decades, extreme weather events such as severe drought, floods, cyclones etc., resulted in acute humanitarian needs. Natural disasters have always claimed a heavy toll on human life and caused enormous economic damage. Climate change is expected to exacerbate health problems that already pose a major burden to vulnerable population. Natural hazard map of India is shown in Figure 4.

From increasingly frequent heat waves and intense storms to sea level rise and biodiversity loss, climate change is already impacting societies across the world, providing an uncomfortable preview of an unstable climate future. Climate change is an existential threat as it risks disrupting the remarkably stable temperatures that have allowed human civilization to flourish over the past 16,000 years. Certain groups like children, the elderly, pregnant women, other indigenous and rural populations are more susceptibility to climate-sensitive health impacts. Many developing countries in Asia, Africa, Latin America and Pacific Islands, are facing the impacts of climate change on food security, particularly in relation to floods and drought.

This session discusses about the environment and climate change which acts as a key driver of various disaster risks. The purpose of this session is to assess knowledge base of the participants on different terminologies of climate change, its impacts, disasters, vulnerability, adaptation, mitigation, risks, etc. to bring them on a common ground.

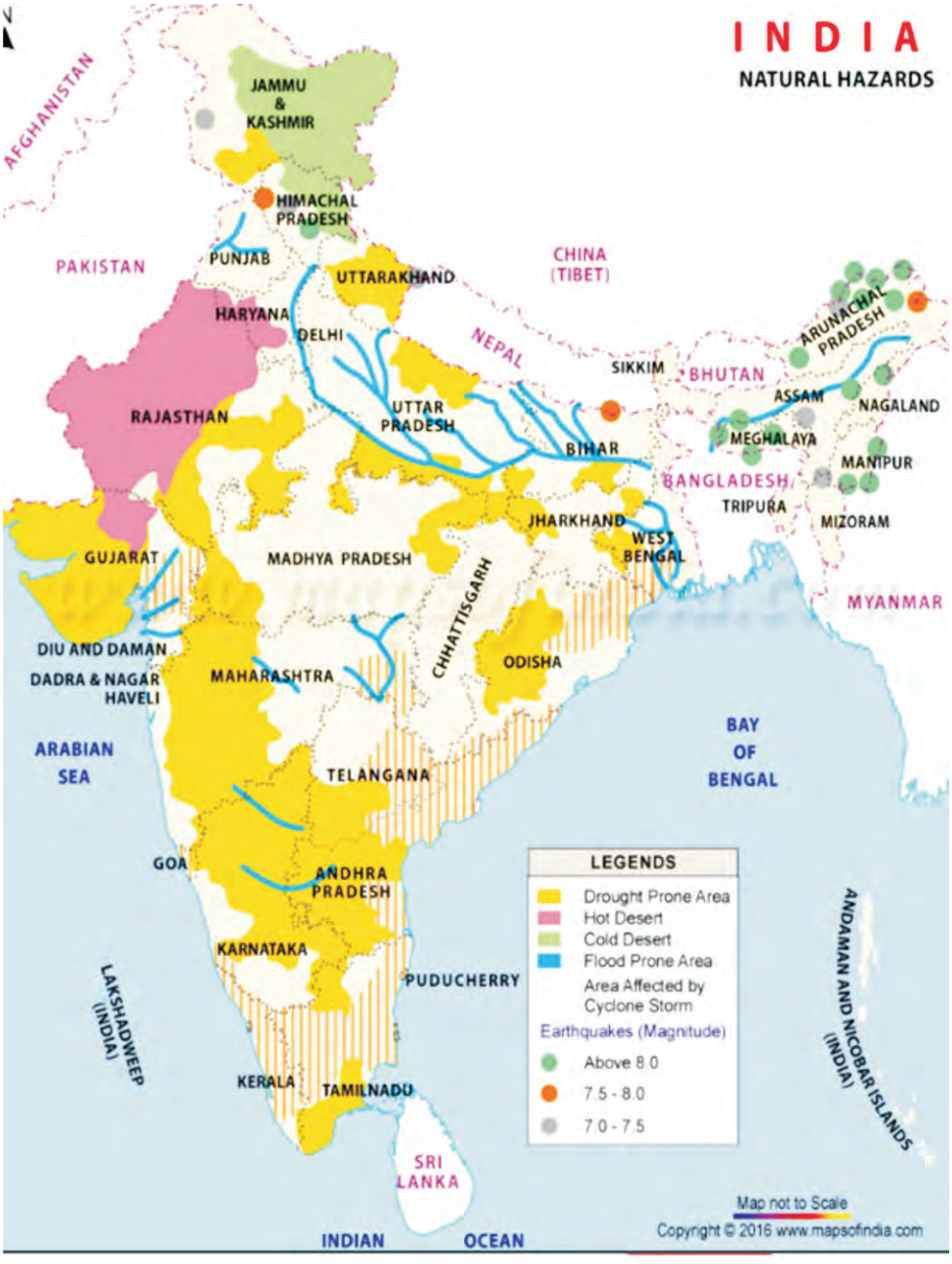



Figure 4.: Natural hazard map of India

## Learning objectives

- To learn basic terms and concepts of disaster risk in the context of climate change
- To analyse relationship between climate change and disasters
- To know issues of climate change, disaster risks and development at global and national level

## Methodology

- Lecture and Power point presentation
- Audio/Videos on climate change
- Question-answer session
- Case study presentation and Discussion

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- Markers and A collection of relevant films

## Guidance

- It is important for trainers to develop a conceptual understanding of major disasters like floods, drought, heat and cold waves episodes and its linkages with extreme weather events when they are getting introduced to various terms.
- Articles and case study material/hand-outs from the recommended readings can be given as references
- Also recommended to provide articles on major disasters, Indian weather and develop an analytical framework for trainees to understand the concept

## Duration

Time allotted to this session is 180 minutes (90 minutes each session).

## Recommended Readings


- IPCC. 2014. Climate Change 2014: Fifth Assessment Report.
- SREX-IPCC Report, Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation, Special Report of the Intergovernmental Panel on Climate Change
- Gupta, A.K, and Nair, S.S, (2012) Environmental Extremes Disaster Risk Management Addressing Climate Change, National Institute of Disaster Management, New Delhi.
- Asian Development Bank (2015) Water-related disasters and disaster risk management in the People's Republic of China, Mandaluyong City, Philippines.
- UN-Water Policy Brief, Climate Change and Water, Sweden, September 2019
- UN-Water, Tran boundary Waters: Sharing Benefits, Sharing Responsibilities (Geneva, 2008).
- Kishore, J. (2014) A Dictionary of Public Health. New Delhi: Century Publications

# LU 1.3: Consequences of Climate Change and Disasters on Health

## Context and description

Climate change affects the social and environmental determinants of health - clean air, safe drinking water, sufficient food and secure shelter - for instance changing the severity and frequency of health problems already existing in that area, creating unanticipated health problems in places where they have not previously occurred, disturbing food-producing ecosystem and increasing the frequency of extreme weather events. Figure 5 depicts the impacts of climate change on human health in the United States. Climate change affects all regions around the world including India. Polar ice shields are melting and the sea is rising. In some regions extreme weather events and rainfall are becoming more common while others are experiencing more extreme heat waves and droughts. These impacts are expected to intensify in the coming decades. Many poor developing countries are among the most affected. People living there often depend heavily on their natural environment and they have the least resources to cope with the changing climate. Climate change is already having an impact on health. There has been an increase in the number of heat-related deaths in some regions and a decrease in cold-related deaths in others. As per the WHO report, 2018, climate change is expected to cause approximately 2,50,000 additional deaths per year, from malnutrition, vector-borne diseases, diarrhoea and heat stress between 2030 and 2050. Similarly, the sectors that rely strongly on certain temperatures and precipitation levels such as agriculture, forestry, energy and tourism are particularly affected.

Nutritious food is a basic necessity of life, and failure to obtain sufficient calories, macro and micronutrients can also result in various diseases and even death. Food can also be a source of foodborne diseases, resulting from eating spoiled food or food contaminated with microbes, chemical residues or toxic substances. The potential effects of climate change on foodborne diseases, nutrition, and security are mostly indirect, but on a global scale, can result in large numbers of populations affected.

Climate change is expected to affect air quality through several pathways, including production of allergens and increase regional concentrations of ozone,

fine particles, and dust, which in turn can trigger a variety of reactions including chest pains, coughing, throat irritation, and congestion, as well as reduce lung function and cause inflammation of the lungs.

This session focuses on understanding the consequences of climate change and disasters and its impacts on human health. This learning unit also includes several terminologies, case studies and concepts related to climate change and disasters.

## Learning objectives

- To learn various consequences of climate change and disasters on human health
- To analyse the health risks and diseases post disaster assessment
- To measure the health effects and pattern of diseases occurred post disasters

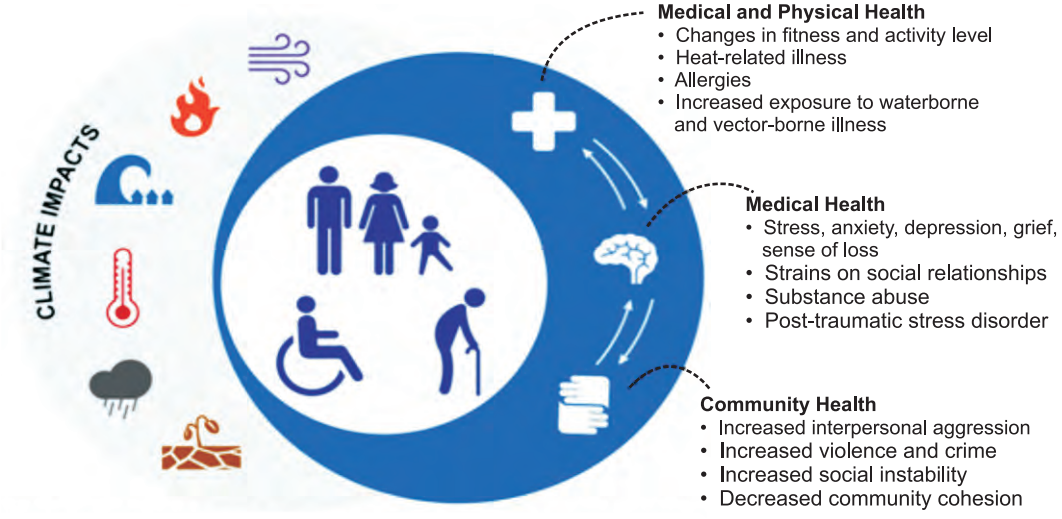



Figure 5: The impacts of climate change on human health in the United States: A scientific assessment (Source: USGCRP, 2016)

## Methodology

- Lecture and Power point presentation
- Question-answer session
- Case study simulation (preferably based on film)

- Experience sharing
- Group exercises
- Discussions

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- Markers
- A collection of relevant films

## Guidance

- This learning unit includes knowledge sharing sessions on various health effects of climatic change and methods to assess them in hospital and community settings.
- Articles and case study material/hand-outs from the recommended readings can be given as references

## Duration

Duration allotted to this session is 90 minutes.

## Recommended Readings

WHO Climate Change and Human Health Atlas. 2012. http://who.int/globalchange/publications/atlas/en/

WHO. 2013 Protecting Health from Climate Change: Vulnerability and Adaptation Assessments

UNCC Report, 2017, Climate Change Impacts Human Health

UN-Water, Tran boundary Waters: Sharing Benefits, Sharing Responsibilities (Geneva, 2008).

WHO report, 2006. Communicable diseases following natural disasters Risk assessment and priority interventions, Programme on Disease Control in Humanitarian Emergencies Communicable Diseases Cluster. https://www.who.int/diseasecontrol_emergencies/guidelines/CD_Disasters_26_06.pdf



## Module 2:
# Disasters, Health Dimensions and Policy

*Source: Photo by National Cancer Institute on Unsplash*

# MODULE 2:
# DISASTERS, HEALTH DIMENSIONS AND POLICY

## Context and description of the session

Impact of climate change can be seen almost all over the globe in the form of erratic precipitation causing floods and droughts, high/low temperature causing heat/cold wave and other extreme weather events like cyclone, dust/sandstorm etc. These events are likely to intensify and become more frequent with time (IPCC, 2007). Extreme events are already having a major impact on human health, injury, deaths, livelihood loss, environmental damage and reduction in economic performance of the nation. The poor, children, elderly and individuals with existing medical conditions are more vulnerable. The significant public health impact is majorly due to the lack of understanding of how climate change is linked with these events. Early warning, public health preparedness and timely response can prevent most of the health consequences due to extreme events. Health impact exacerbates as extreme events disrupts basic infrastructure including public health facilities, transportation and communication and it obstructs normal functionality (power supply, water supply, food, etc).

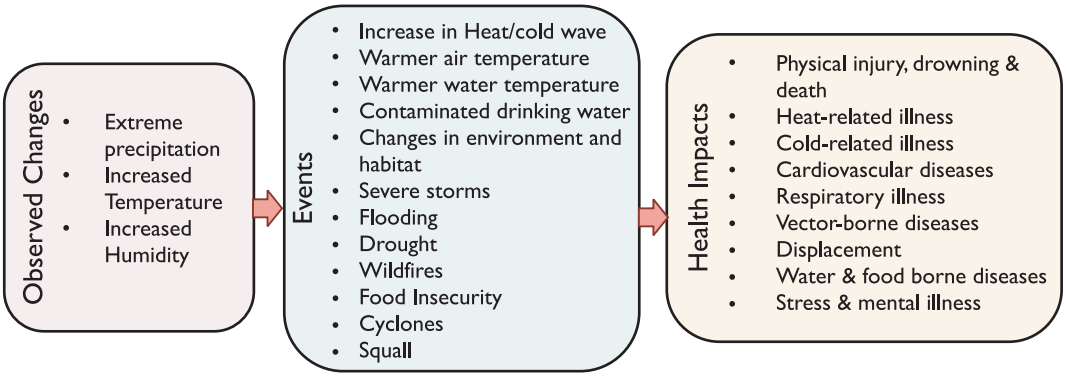



Figure 6: Health Impacts due to extreme events caused by climate change

At the end of this learning unit, the participant will be able to:

- Enumerate the various extreme events caused due to climate change
- Understand the health implications of various extreme events

- Enlist major national and sub-national laws, policies and programmes related to climate change and health
- Understand the importance of mainstreaming of health sector into developmental plans

There are 3 learning units delineated to draw this module. The first and second learning unit is further divided in 3 and 2 sub units respectively.

The titles of learning units and its corresponding sub units are enlisted below:

1. Extreme events, Disasters and Health Dimensions
   i. Hydro-meteorological disasters (Flood, Drought, Cyclone)
   ii. Temperature related disasters (Heat wave, Cold wave) and Wind related disasters (Dust/Sandstorm)
2. Legal, policy and institutional implications
   i. Climate change and health adaptation strategy and national/ sub-national health action plans
   ii. Adaptation and resilience through health-related policies, legislations and programmes
3. Group Activity: Interactive discussion on mainstreaming health sector into developmental plans

## Learning objectives

The key objectives of this module are following:

- To provide brief on the health implication of various extreme events
- To enumerate the laws, policies and programmes for climate related disaster and health issues
- To discuss about the importance of integration of health sector into development plans

## Duration

The time duration in total delineated to this module is 1 day (6 hours).

## Methodology

The training methodology will include:

- Lecture/Power Point Presentations
- Short films on various extreme disasters due climate change and health problems
- Perception check questionnaire (or Q&A)
- Group exercises /Experience sharing
- Discussion

## Resources Required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- A collection of relevant films
- Stationeries: White board, Marker, Writing pad

## Trainers' tips

The trainer should encourage the participants to actively involve and share their experiences of dealing with such kind of experiences on field. The Trainer must have updated list of information prior to the sessions and customization of the sessions can be undertaken based on the type of participants.

## Recommended Readings


- Gupta, A. K & Nair, S. (2012). Environmental Extremes Disaster Risk Management- Addressing Climate change. National Institute of Disaster Management, New Delhi.
- Bell,J. E. Brown, C. L. Conlon, K. Herring, S. Kunkel, K. E. Lawrimore, J. Luber, G. Schreck, C. Smith, A. & Uejio. C. (2018). Changes in extreme events and the potential impacts on human health, Journal of the Air & Waste Management Association, 68:4, 265-287, https://doi.org/10.1080/10962247.2017.1401017

# LU 2.1:
# Extreme Events, Disasters and Health Dimensions

## 2.1.1: Hydro-Meteorological Disasters (Flood, Drought, Cyclone)

### Context and description

Hydro-meteorological disasters are caused by extreme meteorological and climate events like floods, cyclones, hurricanes, tornadoes, etc. In this unit we will be focusing only on floods, cyclones and droughts.

### Flood

Many states in India are prone to floods. The major states prone to floods include Uttar Pradesh, Uttarakhand, Bihar, Jharkhand, Assam, West Bengal and Odisha.Floods can have immediate impact (injury, infection, infectious diseases and death) as well as long-term impact (property loss, displacement, psychological impact, etc.) on human health. Elderly, children, individual with disability, poor and those suffering from chronic illness are the most vulnerable population. The health impact due to flood can be categorized into direct and indirect impact (Figure 7). Direct impact includes drowning and injuries during the flood evacuation and cleaning of debris. Destruction to the high voltage wires can cause electric shocks. Floodwater is a good breeding ground for mosquitoes and other disease causing pathogen that can cause infectious diseases like malaria, gastrointestinal infection, cholera, diarrhea, etc. Indirect impact is caused due to disruption of basic lifeline facilities like food and water supply, water quality, healthcare facilities, telecommunication services, etc. Disease outbreaks area a common threat in relief camps post flood due to poor sanitation and water quality.

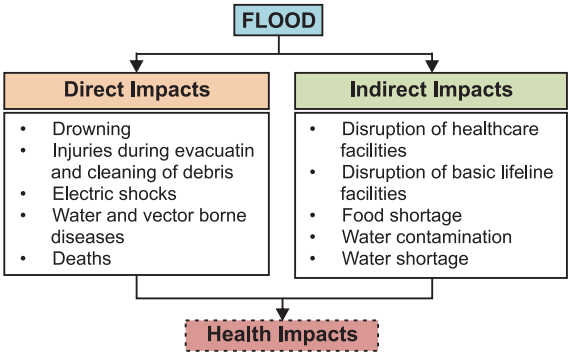



Figure 7: Direct and Indirect impact on health due to floods

To reduce and alleviate the health impact due to flood multi-sectoral involvement is necessary for successful execution of preventive measures like early warning systems, flood plains management, improving land use, building of flood embankments, flood preparedness campaigns, selective relocation of the victims and emergency telecommunication service. Ensured provision of basic amenities including clean drinking water, food, shelter, healthcare facilities during and after flood to assist the affected people.

## Drought

Drought is a slow-onset phenomenon caused due to rainfall deficit leading to prolonged dry period in natural climate cycle. It has a long-term effect on environment, economy, livelihood and public health. Drought has a complex health impact (Figure 8) which may extend to risks related to childbirth like low birth weight. Droughts have damaging effect on human health as it seldom occurs with other disasters like heat wave, wildfires and dust/sandstorms. It has major direct health impacts due to reduced water availability for households, agriculture and businesses, water contamination and increased probability of pathogen breeding in stagnant environments leading to illnesses like diarrhoea, cholera, typhoid fever, malnutrition and even deaths. The atmospheric conditions during droughts become conducive to storms that increase the concentration of particulate matter in air causing respiratory illnesses and chronic exposure to such conditions may cause cardiovascular diseases.

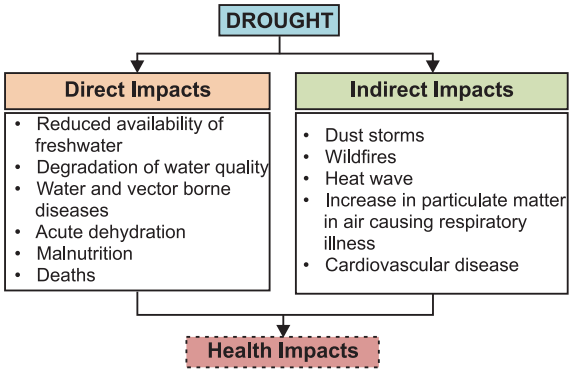



Figure 8: Direct and Indirect impact on health due to droughts

Suggestive health emergency responses like food supplementation, disease and epidemic surveillance, proper coordination in emergency healthcare mechanism early warning systems can reduce the health impact due to droughts (Figure 9).

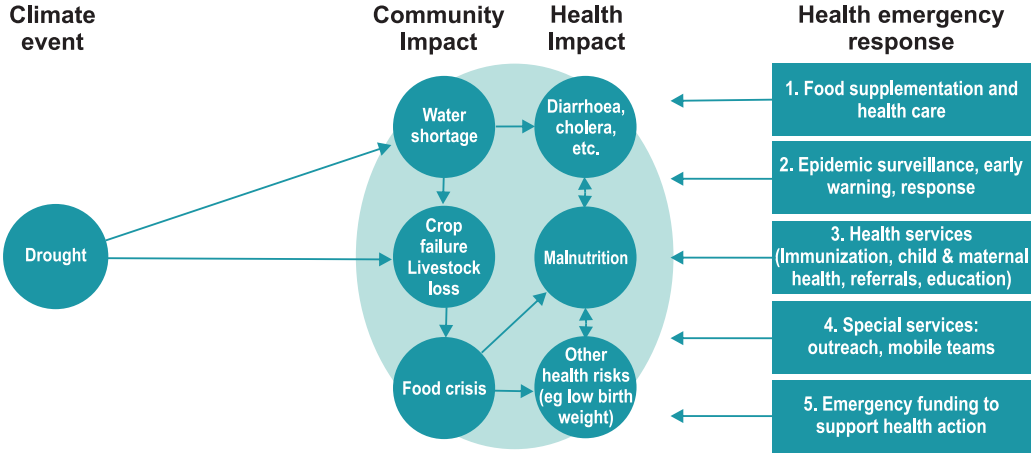



Figure 9: Possible areas for community and public health response during drought (Source: Atlas of Health & Climate, WMO/WHO, 2012)

## Cyclone

Cyclonic events can cause injuries, short/ long-term psychological trauma and asphyxiation due to collapsing of buildings and strong wind (Figure 10). Due to the damage to live wires and high voltage poles electric shocks may happen. Water borne and vector transmitted disease can occur due to change in physical environment and poor sanitation/hygiene in relief camps. Indirect impact due to damage of crops food shortages are likely to remain event after receding of cyclonic storm. The strong wind can break the water supply pipelines and the storage tanks thus contaminating the drinking water source.

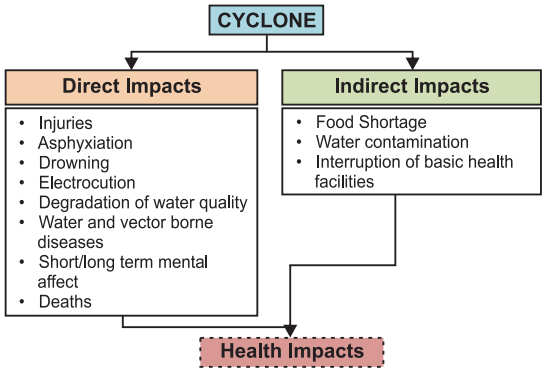



Figure 10: Direct and indirect impact on health due to cyclone

## Learning objectives

- To understand both direct and indirect health implication due to hydro-meteorological disasters (Flood/Drought/Cyclone)
- To understand the preparedness and mitigation strategies to manage health issues

## Methodology

- Lecture/ Power point presentations
- Case studies related to extreme events and health impacts
- Audio/Videos on extreme events and health impacts
- Question-answer sessions
- Group discussions and exercises

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- A collection of relevant films

## Guidance

The basic overview of floods/droughts/ cyclones needs to be explained and the Indian states prone to these extreme events need to be shown to the participants within the presentation/ lecture.

## Duration

90 minutes

## Recommended readings


- Grayman, W. M. (2011). Water-related disasters: A review and commentary, Frontiers of Earth Science, 5(4), 371-377.
- Asian Development Bank (2015). Water-related disasters and disaster risk management in the People's Republic of China, Mandaluyong City, Philippines.

- Erian, W., Bassem, K., Naji A. and Sanaa I. (2014). Effects of Drought and Land Degradation on Crop Losses in Africa and the Arab Region with Special Case Study on: Drought and Conflict in Syria.
- Erian, W., B. Katlan and O. Babah (2011). Drought Vulnerability in the Arab Region. Case Study - Drought in Syria. Ten Years of Scarce Water (2000 – 2010). Arab Center for the Studies of Arid Zones and Dry Lands and Secretariat of the International Strategy for Disaster Reduction. https://reliefweb. int/sites/reliefweb.int/files/resources/Full_Report_3074.pdf.

# LU 2.1.2:
# Temperature related Disasters (Heat/Cold wave) and Wind related Disasters (Dust/Sandstorm)

## Context and description

Various extreme climatic events are causing the increase in direct and indirect risks to human health and the recent increase in temperature induced health impact is drawing everyone's concern. Studies have found that extremely high and cold temperature triggers the onset of heart illnesses and cardiovascular events like myocardial infarction causing deaths. Cold-related health impacts are studied less than heat-related health impacts. It is difficult to have a standard definition of heat and cold wave as it depends on many other climate factors that vary from place to place or region to region. Example, an extreme event in for Delhi would likely be seen as normal in Odisha. Population groups that are particularly vulnerable to extreme temperature events include the elderly; infants and children; people with chronic diseases or physical or mental limitations; and those with a lower socioeconomic status, such as the homeless.

## Heat wave

Heat wave is a combined effect of multiple factors like temperatures, humidity, wind, etc. According to the Indian Meteorological Department, when the normal temperature of the area is less than or equal to 40°C, departure of 5°C-6°C from normal is considers and heat wave and departure of 7°C or more is known as severe heat wave. Whereas when the normal temperature of the area is more than 40°C, departure of 4°C-5°C is considered as heat wave and departure of 6°C or more from normal is considered as severe heat wave.

Heat wave can have devastating health impact resulting in heat cramps, heat exhaustion, heat strokes, heat syncope, dehydration and even death. It can also aggravate existing medical conditions like pulmonary conditions, renal conditions and cardiovascular disorders. Children, elderly, person with existing medical condition, homeless and outdoor workers are the most vulnerable. The severity of impact of heat depends on factors like age, level of acclimatization, fitness and health, duration of exposure to direct sunlight. The Indirect effect of heat wave is increased air pollution causing respiratory illness.

Heat wave is a silent disaster whose impact can be controlled when timely measures are taken. Strengthening of early warning system, community preparedness, urban planning to avoid formation of Urban Heat Island and measures like cool roof systems must be promoted.

## Cold wave

The definition of cold wave varies depending on the region or the climatic zone. According to IMD, when the normal minimum temperature of a station is more than or equal to 10 °C, a departure of -5 °C to -6 °C from normal is considered a cold wave and departure of -7°C or less is considered as severe cold wave. Whereas when the normal minimum temperature of a station is <10 °C, a departure of -4°C to -5°C from normal is considered a cold wave and departure of -6°C is declared as a severe cold wave.

Cold waves can have significant health impact depending on the duration of the cold spell and compounding effect of weather factors like air quality, humidity and wind. It can result in respiratory diseases (Asthma, COPD, Infections), cardiovascular diseases (Myocardial infarction, cerebrovascular accidents, Coronary heart diseases), Cold Urticaria, Chilblains, Psoriasis, Atopic Dermatitis, etc. Cold-related conditions can lead to injuries due to slips and falls. Hospital and emergency services, mental health services, community health facilities is likely to function inefficiently due to cold weather thus delaying medical aids. Many of the impacts can be prevented by individual actions like wearing warm clothing, consumption of hot drinks/meals and ensuring warm indoor conditions for vulnerable individuals. On large scale early warning systems, awareness programmes, risk assessments, assisting vulnerable groups, etc. can reduce its impact on health.

## Dust/Sandstorms

Dust/Sandstorms are natural events that blow fine sand particles, dirt with its strong wind speed. It can have undesirable health conditions particularly to the infants, children, elderly, person with heart problems, diabetes and respiratory conditions like asthma, bronchitis, emphysema. Inhaling fine dust particles can go deep into the lungs and cause severe health problems and even irritation to the eyes.

Exposure to dust storm may trigger allergic reactions, asthma, breathing problems, itchy/ burning eyes, redness of eyes, throat and skin irritation, coughing/sneezing, etc. Prolonged exposure can lead to chronic breathing difficulties, lung problems and cardiovascular diseases.

Indirect impact of dust storms on health is by reduced air quality and visibility.

## Learning objectives

- To build a detailed understanding of both direct and indirect health implication due to temperature (Heat/Cold wave) and wind related extreme events (Dust/Sandstorms).
- To understand the preparedness and mitigation strategies to manage health issues

## Methodology

- Lecture/ Power point presentations
- Case studies related to extreme events and health impacts
- Audio/Videos on extreme events and health impacts
- Question-answer sessions
- Group discussions and exercises

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- A collection of relevant films

## Guidance

The overview of Heat/ Cold wave and dust/sandstorm needs to be explained in global and Indian context. The Indian states prone to these extreme events need to be shown to the participants within the presentation/ lecture.

## Duration

Duration allotted to this session is 90 minutes.

## Recommended readings


- Cheng, X. & Su, H. (2010). Effects of climatic temperature stress on cardiovascular diseases. European Journal of Internal Medicine. 21.164-167. https://doi.org/10.1016/j.ejim.2010.03.001
- Guleria, S. and Gupta, A.K. (2018). Heat Wave in India Documentation of State of Telangana and Odisha (2016). National Institute of Disaster Management, New Delhi. Pages 124


## Optional


- Mahapatra, B. Walia, M & Saggurti, N. (2018). Extreme weather events induced deaths in India 2001-2014: Trends and differentials by region, sex and age group. Weather and Climate Extremes 21 (2018) 110-116. https://doi.org/10.1016/j.wace.2018.08.001

# LU 2.2:
# Policy, Legislations and programmes

## 2.2.1: Climate change and health adaptation strategy and national/ sub-national health action plans

### Context and description

The government formed a number of health programmes until date. These health programmes were functioning parallel to each other however with the launch of NRHM (National Rural Health Mission), 2005, decentralized approach was adopted with ASHA (Accredited Social Health Activists) workers was appointed which boasted the public health sector. ASHA workers are an important link between health system and the community.

The National Health Policy (NHP) aims at achieving universal health coverage and delivering affordable preventive and rehabilitative healthcare. NHP 2002 recognized the need of a disaster management plan for standardized coping mechanism during calamities. India was one of the first countries to have formulated a National Disaster Management Plan (2005) as a signatory to Sendai Framework for DRR. It was framed with the objective to achieve substantial reduction of disaster risks and disruption of services. In the same year the National Disaster Management Authority (NDMA) under the Ministry of Home Affairs (MHA) to manage economic, environmental and developmental issues relating to disasters. NDMA published severed guidelines for disaster management, medical preparedness, mass casualty management for various disasters including earthquakes, tsunamis, Floods, Urban floods, Cyclones, Drought, Landslides, Nuclear emergency, chemical disasters, heat wave, thunderstorm/lightning/ squall/dust storm/hailstorm, psychosocial support and mental health services in disasters, hospital safety, disability inclusive DRR, etc.

Many of the legislations/policies and programmes are cross cutting and integration has to be done amongst them. Few of the legislations/policies and programmes are enlisted below. The list is indicative and the trainers may add more according to them.

- Environment Protection Act, 1986
- National Water Policy, 2012
- National Action Plan on Climate Change, 2008 (12 Missions)
- Factories Act, 1987
- Air (Prevention & Control of Pollution) Act, 1981
- Water (Prevention& Control of Pollution) Act, 1974
- Public Liability Insurance Act, 1991
- Biomedical Waste Management Act, 1986
- National Environment Policy, 2006
- National Urban Sanitation Policy, 2008
- National Disaster Management Policy, 2009
- National Disaster Management Act, 2005
- National Health Policy 2017
- Smart City Mission, 2015
- Swatch Bharat Mission, 2014

Some of the programmes for communicable diseases are:

- National Vector Borne Disease Control Programme (NVBDCP)
- Integrated Disease Surveillance Program (IDSP)

For non-communicable diseases are:

- National Mental Health Programme (NMHP)
- National Programme for Control and Treatment of Occupational Diseases

For maternal, child and adolescent health care are:

- The Reproductive, Maternal, New-born, Child and Adolescent Health (RMNCH+A)
- Mid-Day Meal Programme, etc.

## Learning objectives

- To enlist the national/sub-national government laws, policies and programmes for the management of health impact due to extreme events
- To describe/explain some of the major programmes
- To understand the synergy between environment, disaster and health related policies/programmes
- Check the participant's existing knowledge on initiatives taken by the government

## Methodology

- Lecture/ Power point presentations
- Audio/Videos on extreme events and health impacts
- Question-answer sessions
- Group discussions and exercises

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- Stationeries: Writing pad, white-board. marker

## Guidance

Before starting the session, a small group/individual exercise can be conducted to enlist the known national/ sub-national programmes/policies/laws to check the participants existing knowledge and awareness. This exercise will help in making the session more interactive.

## Duration

90 minutes

## Recommended Readings


- Kishore, J. (2019). National Health Programmes of India: National Polices and legislations related to health. New Delhi: Century publications.
- Krishnana, S and patnaik, I. (2018). Health and Disaster management in India. National Institute of Public Finance and Policy, New Delhi, working paper No. 241. Accessed at: https://www.nipfp.org.in/publications/working-papers/1836/

# LU 2.2.2:
# Adaptation and Resilience through Health-Related Policies, Legislations And Programmes

## Context and description

Resilience is the system ability to absorb, adjust, accommodate and recover the impact of an event in a timely and efficient manner, ensuring the restoration or improvement of vital basic structures and functions. With the guidelines issued by NDMA many states have already prepared action plans for extreme events with adaptation options and strategies to reduce the health impact particularly for extreme events such as heat waves, floods and windstorms.

The legislations play significant role in changing the health adaptation and resilience. Example: In various heat wave prone states, as a mitigation measure government tend to change the office timings to reduce the health impacts and during the episodes of air pollution in Delhi, health emergency was declared and schools and colleges were shut for some days as a mitigation measure.

## Learning objectives

- To understand the role of policies/legislations and programmes in health adaptation and resilient healthcare setting
- To understand the implementation mechanism of policies/legislations and programmes in health adaptation and resilient healthcare setting
- To understand the importance of integration of various policies/ legislations and programmes in health adaptation and resilient healthcare setting

## Methodology

- Lecture/ Power point presentations
- Question-answer sessions
- Group discussions and exercises

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement including Data projector and slide changer

## Guidance

A short interactive exercise of perception/experience sharing by participants on the existing legislations, policies, programmes and what can be improved in the future, can make the session interesting.

## Duration

60 minutes

## Recommended Readings


- Adger, W. N., Brown, K., Nelson, D. R., Berkes, F., Eakin, H., Folke, C., & Ruitenbeek, J. (2011). Resilience implications of policy responses to climate change. Wiley Interdisciplinary Reviews: Climate Change, 2(5), 757-766.

# LU 2.3:
# Group Activity: Interactive discussion on Mainstreaming Health Sector into Developmental Plans

## Context and description

It is known that climate change is inducing more extreme events which becomes a disaster when there is any live loss/ property loss. The mindless development plans without proper planning is exacerbating climate-induced disasters due to GHG emissions and phenomenon like Urban Heat Island (UHI). These extreme events are a major issue and obstruction to the health sector leading to increased number of mortality and morbidity. Disaster, health and development are closely linked with each other which is why emphasis must be given to mainstreaming of health sector with development plans. Mainstreaming means institutionalizing of the processes in planning and policy implementation. This can be achieved by building institutional capacity about its importance and need of the hour.

## Learning objectives

To understand the importance of mainstreaming of health sector into developmental planning

## Methodology

- Question-answer sessions
- Group discussions and exercises
- Experience/knowledge sharing

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer

## Guidance

The participants can be divided into a group of 2-3 based on the number. Each group shall be provided with topics and key points to be discussed under it. A group presentation has to be made at the end to deliver the outcome of the discussion.

Topics for discussion can be:

- Current gap in mainstreaming of health sector with development plans
- Importance of mainstreaming of health sector with development plans
- In which area/sector action is needed? Cases/examples may be referred

## Duration

60 minutes divided into 25 minutes of group discussion, 25 minutes of group presentation and 10 minutes of question and answer session.



## Module 3:
# Climate and Weather Sensitive Diseases and Outbreaks

*Source: Photo by NOAA on Unsplash 2*

# Module 3:
# Climate and Weather Sensitive Diseases and Outbreaks

## Context and description of the session

This session deals with climate sensitive diseases, especially those that are prone to outbreaks post disasters associated with climate change, and pose imminent threats to public health. These diseases include various water borne, food borne and vector borne diseases. It also describes case studies related to outbreaks of infectious diseases that have taken place post disasters such as the tsunami or flash floods.

This session also highlights how climate change is expected to increase issues associated with occupational health, compromise on the health and productivity of industrial workers exposed to the environment and also pose challenges for ensuring the safety of outdoor workers.

Further, this module describes the challenges human health faces consequent to changes in animal health. Climate change is continuously impacting animal health as well, and is increasing opportunities for man – animal interactions which has increased the occurrence of zoonotic diseases.

Disaster Risk reduction is then introduced in this session, and participants have to review the SAPCC of their respective states. They then need to identify lacunae in their SAPCC with respect to the health sector and through a group activity suggest measures to fill those gaps in the plans.

There are four learning units (LU) delineated to draw this module:

LU a) Climate change and disaster related outbreak/ epidemics

LU b) Occupational health & safety with relation to climate change

LU c) One Health: Climate change, animal health and human health

LU d) Understanding DRR and review of SAPCCs with respect to Climate related Health Implications

## Learning objectives

At the end of this learning unit, the participant will be able to:

- To identify diseases prone to outbreaks consequent to climate change and related disasters.
- To describe the impact of climate change on occupational and industrial health
- To familiarize oneself with climate change related zoonotic diseases and its implication on human health.
- To understand the concept of DRR and review their SAPCC in the context of disaster related health issues and suggests measures to integrate health sector in it.

## Duration

The time duration in total delineated to this module is 1 day (6 hours), divided into 4 structured Learning Units of 90 minutes each.

## Methodology

The training methodology will include:

- Lecture/Power Point Presentations
- Short films on various extreme disasters due climate change and health problems
- Perception check questionnaire (or Q&A)
- Group exercises /Experience sharing
- Discussion

## Resources Required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- A collection of relevant films
- Stationeries: White board, Marker, Writing pad
- Flip chart, post-its

## Trainers' tips

- The trainer should keep attempting to break the monotony of the session by showing relevant video clippings or animations in between the power-point presentation.
- The trainer should keep the audience engaged by asking them questions, or encouraging them to share their personal experiences.

# LU 3.1:
# Climate Change and Disaster related Outbreak/ Epidemics

## Learning objectives

- To define disease outbreak and epidemic
- To identify climate sensitive diseases that are prone to outbreaks following different types of disasters.
- To describe measures for prevention and control of outbreaks post disasters.

## Methodology

- Lecture/ Power point presentations
- Case studies related to disease outbreaks following disasters
- Audio/Videos on extreme events and health impacts
- Question-answer sessions
- Group discussions and exercises

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- White board, different colored markers
- White chart paper on soft boards, different colored post-its (Optional)

## Duration

- 90 minutes

## What are Epidemics and Outbreaks ?

An Epidemic is 'the occurrence in a community or region of a group of illness of similar nature, clearly in excess of normal expectancy.' An 'outbreak' is the term used “for a situation when disease or health events occur at a greater frequency than normally expected within a specified period and place.” In essence, an

outbreak and an epidemic are essentially the same phenomenon, however with the term 'outbreak' a greater sense of urgency is conveyed, and the term 'epidemic' is generally used when a wide geographical area or a large population is involved.

The number of cases needed to define an epidemic varies according to the infectious agent, the size, type and susceptibility of population exposed, the time and place of occurrence. There are three ways to define an outbreak:

1. Occurrence of a number of cases or events greater than two standard deviations than normally occurs in the same place and during the same period in the past 3-5 years. An example would be climate change induced temperature and humidity conditions favouring the breeding of Anopheles mosquito and multiplication of the malarial parasite in the vector. This could lead to an increase in the number of malaria cases, the magnitude of which constitutes an outbreak.
2. A cluster of cases of the same diseases occurs that can be linked to the same exposure. A cluster means an aggregation of two or more cases which is not necessarily more than expected.

Following a disaster, this scenario is more likely, where clustering of cases is witnessed, consequent to exposure to a common source of infection, like contaminated water, or overcrowding post displacement.

3. A single case of a disease that has never occurred before or might have a significant implication for public health and merits an investigation. Climate change and related disasters can lead to the emergence of new pathogens, or exposure to unprecedented vectors resulting in new diseases. A single such case would also constitute an epidemic.

In the event of climate change related outbreaks, different diseases can identify with any of the three above mentioned definitions.

## Tips for trainers

As the participants would be familiar with the names of various food borne, water borne and vector borne diseases so far, ask them to name diseases they think have epidemic potential. As they enumerate diseases, write them on the white board with different coloured markers.

Put up three white chart papers, one saying floods, the others cyclones, third heat and cold wave. Ask the participants to come forward and enlist under each chart, which disease is likely to spread after which type of calamity.

Alternatively, participants can be given post it's on which the names of different diseases are already written, and they can be asked to place the correct disease on the chart labelled with the appropriate disaster.

## Outbreak prone diseases

Table 1. Summary of outbreak prone disease post disasters.

| WATERBORNE DISEASES: SUMMARY | | | | |
|---|---|---|---|---|
| **Disease** | **Clinical Features** | **Incubation Period** | **Diagnosis** | **Treatment** |
| Cholera | profuse watery diarrhoea, vomiting | 2 hrs - 5 days | direct microscopic observation of V. cholerae in stool | rehydration therapy; antimicrobials |
| Leptospirosis | sudden onset fever, headache, chills, vomiting, severe myalgia | 2 - 28 days | Leptospira-specific IgM serological assay | penicillin, amoxicillin, doxycycline, erythromycin, cephalosporins |
| Hepatitis | jaundice, abdominal pain, nausea, diarrhoea, fever, fatigue and loss of appetite | 15 - 50 days | serological assay detecting anti-HAV of anti-HEV IgM antibodies | supportive care; hospitalize/ barrier nursing for severe cases; monitoring of pregnant women |
| Bacillary dysentery | malaise, fever, vomiting, blood and mucous in stool | 12 - 96 hrs | suspect if bloody diarrhea, confirm by isolation of organism | nalidixic acid, ampicillin; hospitalise seriously ill or malnourished; rehydration |
| Typhoid fever | sustained fever, headache, constipation | 3 - 14 days | culture from blood, rapid antibody tests, bone marrow, bowel fluids; | ampicillin, trimethoprim-sulfamethoxazole, ciprofloxacin |

| VECTORBORNE DISEASES: SUMMARY | | | | |
|---|---|---|---|---|
| **Disease** | **Clinical Features** | **Incubation Period** | **Diagnosis** | **Treatment** |
| Malaria | fever, chills, sweats, head and body aches, nausea and vomiting | 7 - 30 days | parasites on blood smear observed using a microscope; rapid diagnostic assays if available | chloroquine, sulfadoxine-pyrimethamine |
| Dengue | sudden onset severe flu- like illness, high fever, severe headache, pain behind the eyes, and rash | 4 - 7 days | Serum antibody testing with ELISA or rapid dot-blot technique | intensive supportive therapy |
| Japanese encephalitis | quick onset, headache, high fever, neck stiffness, stupor, disorientation, tremors | 5 - 15 days | serological assay for JE virus IgM specific antibodies in CSF or blood (acute phase) | intensive supportive therapy |
| Yellow fever | fever, backache, headache, nausea, \vomiting; toxic phase-jaundice, abdominal pain, kidney failure | 3 - 6 days | serological assay for yellow fever virus antibodies | intensive supportive therapy |

| DIRECT CONTACT DISEASES: SUMMARY | | | | |
|---|---|---|---|---|
| **Disease** | **Clinical Features** | **Incubation Period** | **Diagnosis** | **Treatment** |
| Pneumonia | cough, difficulty breathing, fast breathing, chest indrawing | 1 - 3 days | Clinical presentation; culture respiratory secretions | co-trimoxazole, chloramphenicol, ampicillin, |
| Measles | rash, high fever, cough, runny nose, red and watery eyes; serious post-measles complications (5-10% of cases) - diarrhea, pneumonia, croup | 10 - 12 days | generally made by clinical observation | supportive care; nutrition/ hydration; vitamin A; control fever; antibiotics in complicated cases |
| Bacterial meningitis | Sudden onset fever, rash, neck stiffness; altered consciousness; bulging fontanelle in <1 yrs of age | 5 - 15 days | Examination of CSF - elevated WCC, protein; gram negative diplococci | Penicillin, ampicillin, chloramphenicol, ceftriaxone, cefotaxime, co-trimoxazole; diazepam for seizures |
| Tetanus | difficulty swallowing, lockjaw, muscle rigidity, spasms | 3 - 21 days | entirely clinical | immune globulin |

*Source: Lemonick DM. Epidemics After Natural Disasters. AJCM*

## Group Exercise

Divide participants into groups based on different types of disasters. Ask them to brainstorm for ten minutes regarding what measures they will take to prevent disease outbreaks. If more groups are present, they can be asked to describe what steps they can take in case outbreak has occurred. After ten minutes, the group leader summarizes at-least five key measures. The trainer should keep noting them on the white board or flip chart.

## Participants' experiences

Trainers should also invite participants to share their first-hand experience (if any) on handling post disaster disease outbreaks.

### Preventive measures

| Prevention and control of infectious diseases following natural disasters | Water-borne diseases | | | Air-borne/droplet diseases | | | | Vector-borne diseases | | Contamination from injury/wound | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Diarrhea (cholera; dysentery; others)* | *Leptospirosis* | *Hepatitis* | *ARI/pneumonia/ influenza* | *Measles* | *Meningococcal meningitis* | *TB* | *Malaria* | *Dengue fever* | *Tetanus* | *Cutaneous mucormycosis* |
| Site planning | ✓ | | | ✓ | ✓ | ✓ | | | | | |
| Clean water | ✓ | | | | | | | | | | |
| Good sanitation (e.g., excreta disposal) | ✓ | | ✓ | | | | | | | | |
| Solid waste management | | | | | | | | ✓ | ✓ | | |
| Water and food hygiene | ✓ | | ✓ | | | | | | | | |
| Nutrition and supplements | | | | ✓ | ✓ | | ✓ | | | | |
| Vaccination | | | | | ✓ | | | | | | |
| Vector control | | | | | | | | ✓ | ✓ | | |
| Personal hygiene (e.g., hand washing) | ✓ | | ✓ | ✓ | | | ✓ | | | | |
| Personal protection | | ✓ | | ✓ | | | | ✓ | ✓ | | |
| Insecticide-treated nets | | | | | | | | ✓ | | | |
| Isolation of the sick | | | | ✓ | | | ✓ | | | | |
| Prophylactic treatment | | | | | | | | ✓ | | | |
| Wound/injury care | | | | | | | | | | ✓ | ✓ |
| Health education | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Disease management/treatment and or supportive care (follow national guidelines) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Specific communicable diseases applicable to the preventive and control measure given.
ARI: Acute respiratory infection.

Table 2.Prevention and control checklist of recorded infectious diseases following natural disasters.

*Source: Kouadio et al. Infectious diseases following natural disasters: prevention and control measures*

| Syndrome | Threshold level |
|---|---|
| Acute watery diarrhoea (suspect Cholera) | 5 cases age group 5 years and above |
| Bloody diarrhoea (suspect Shigellosis) | 5 cases or 1.5 times the baseline* |
| High vector density (Malaria, Dengue) | 1.5 times the base line |
| Fever and Rash (Suspect Measles) | **One case each** |
| Acute hemorrhagic fever (Suspect Dengue Hemorrhagic Fever) | |
| Acute fever with altered sensorium (Suspect Japanese Encephalitis) | |
| Acute fever with renal involvement (Suspect Leptospirosis) | |
| Acute fever with painful lymph nodes (Plague) | |
| Acute Jaundice (suspect Hepatitis A & E) | |
| Acute flaccid paralysis in a child (suspect Poliomyelitis) | |
| Neonatal tetanus | |
| Meningitis | 2 cases of similar illness |
| Fever of unknown origin | 1.5 times the base line |
| Other communicable diseases | 1.5 times the base line |

Table 3. Syndrome and Alert Threshold Level for Immediate Response

*Source: NIDM. DRR and Health*

## Tips for trainers

At the end of the session, ask the participants about myths and facts related to post disaster outbreaks (Table 4). (If time permits)

| MYTH | REALITY |
|---|---|
| Foreign medical volunteers with any kind of medical background are needed. | 1. The local population almost always covers immediate lifesaving needs.<br>2. Only skills that are not available in the affected country may be needed.<br>3. Few survivors owe their lives to outside teams. |
| Any kind of assistance is needed, and it's needed now ! | 1. A hasty response not based on impartial evaluation only contributes to chaos.<br>2. Unrequested goods are inappropriate, burdensome, divert scarce resources, and more often burned than separated and inventoried.<br>3. Not wanted, seldom needed - used clothing, OTC, prescription drugs, or blood products; medical teams or field hospitals. |
| Epidemics and plagues are inevitable after every disaster. | 1. Epidemics rarely ever occur after a disaster.<br>2. Dead bodies will not lead to catastrophic outbreaks of exotic diseases.<br>3. Proper resumption of public health services will ensure the public's safety (e.g. immunizations, sanitation, waste disposal, water quality, and food safety).<br>Caveat: Criminal or terror-intent disasters require special considerations. |
| Disasters bring out the worst in human behavior. | 1. While isolated cases of antisocial behavior exist, the majority of people respond spontaneously and generously. |
| The community is too shocked and helpless to respond. | 1. Many find new strengths.<br>2. Cross-cultural dedication to common good is most common response to natural disasters.<br>3. Thousands volunteer to rescue strangers and sift through rubble after earthquakes from Mexico City, California, and Turkey.<br>4. Most rescue, first aid, and transport are from other casualties and bystanders. |

Table 4. Myths and Facts related to Post Disaster Disease Outbreaks.

*Source: Lemonick DM. Epidemics after Natural Disasters. AJCM*

## Recommended readings


- Lemonick DM. Epidemics After Natural Disasters. American Journal of Clinical Medicine® Fall 2011 Volume Eight, Number Three. Available from https://www.aapsus.org/wp-content/uploads/ajcmsix.pdf
- Smith WA. Tsunami in South Asia. What is the risk of post-disaster infectious disease outbreaks? Annals Academy of Medicine. November 2005. Volume 34. No. 10 Available from http://www.annals.edu.sg/pdf/34VolNo10200511/V34N10p625.pdf
- Kouadio et al. Infectious diseases following natural disasters: prevention and control measures. Expert Rev. Anti Infect. Ther. 10(1), 95-104 (2012). Available from https://i.unu.edu/media/unu.edu/ publication/20293/koffis-publication-2012.pdf
- Case study: Pal S, Juyal D, Sharma M, Kotian S, Negi V, Sharma N. An outbreak of hepatitis A virus among children in a flood rescue camp: A post-disaster catastrophe. Indian J Med Microbiol 2016;34:233-6. Doi: 10.4103/0255 -0857.180354
- Kishore J. National Health Programs of India: National Policies and legislations related to Health. New Delhi: Century Publications 2019.

# LU 3.2:
# Occupational Health and safety with respect to climate change

## Learning objectives

- To understand the impact and different pathways through which climate change affects occupational health.
- To identify occupational groups more vulnerable to the impact of climate change.
- To describe measures to promote safety of health workers and mitigate the effect of climate change.

## Methodology

- Lecture/ Power point presentations
- Question-answer sessions
- Group discussions and exercises

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- White board, markers and duster

## Duration

- 90 minutes

## Background and context

Occupational health in India is often a marginalized domain as almost 99% of the workforce is in the informal sector, where the application of protective bylaws and regulations are a challenge in itself. Climate change can increase the severity and frequency of occupational and industrial hazards, and further lead to the emergence of unprecedented risks. Also, different groups of workers are vulnerable to the health effects of climate change consequent to their exposure to the environment, their place, timing and type of work. It is important to

understand and mitigate these risks, hazards and reduce the vulnerabilities in order to not only safeguard the workers' health, but also prevent loss of productivity. Experts from the George Washington University have identified six hazard zones for employees that can be directly attributed to climate change (Figure 11) These zones can affect workers employed outdoors or indoors, both, and cover a wide spectrum of occupations:




Figure 11. How climate change threatens occupational health

## Tips for trainers

As you project or enlist the six different types of hazards, ask participants to enumerate different professional and working groups from the Indian scenario

*Source: Applebaum et al. 2016*

that exemplify each category. The same professional groups may fall into different hazard groups also.

Some examples are given below:

| Heat | Extreme Weather | Pathogens and VBD | Workplace violence | PAH | Ozone |
|---|---|---|---|---|---|
| Laborers | Military | Farmers | Police | Tanning and leather industry | Similar to heat and extreme weather |
| Auto-drivers | Para-military | Wood cutters | tars | Dyes and textile industries | |
| Construction workers | Police | Dairy owners | | Thermal power | |
| Glass blowers | Other rescue workers | Animal husbandry | | Coal based industries | |
| Rickshaw pullers | Doctors | Fisheries | | Furnace | |
| Furnace workers | | Military | | | |
| Miners | | | | | |
| Electroplaters | | | | | |
| Other workers in industries where excess heat is generated | | | | | |

Further, ask participants to enumerate the different health effects and diseases that each of these hazards may lead to, thereby working out pathways of impact. Highlight issues of mental stress, impaired decision making, loss of productivity and increased incidence of accidents and injuries at the workplace.

Describe the importance of occupational safety measures such as climate-friendly and safe constructions; sustainable modes of provision of renewable energy, and water; reduction or safe management of hazards and access to reliable occupational health services. Further discuss the preventive measures like conducting new research, identifying the number of workers exposed etc. as enlisted in Figure 12 and 13.

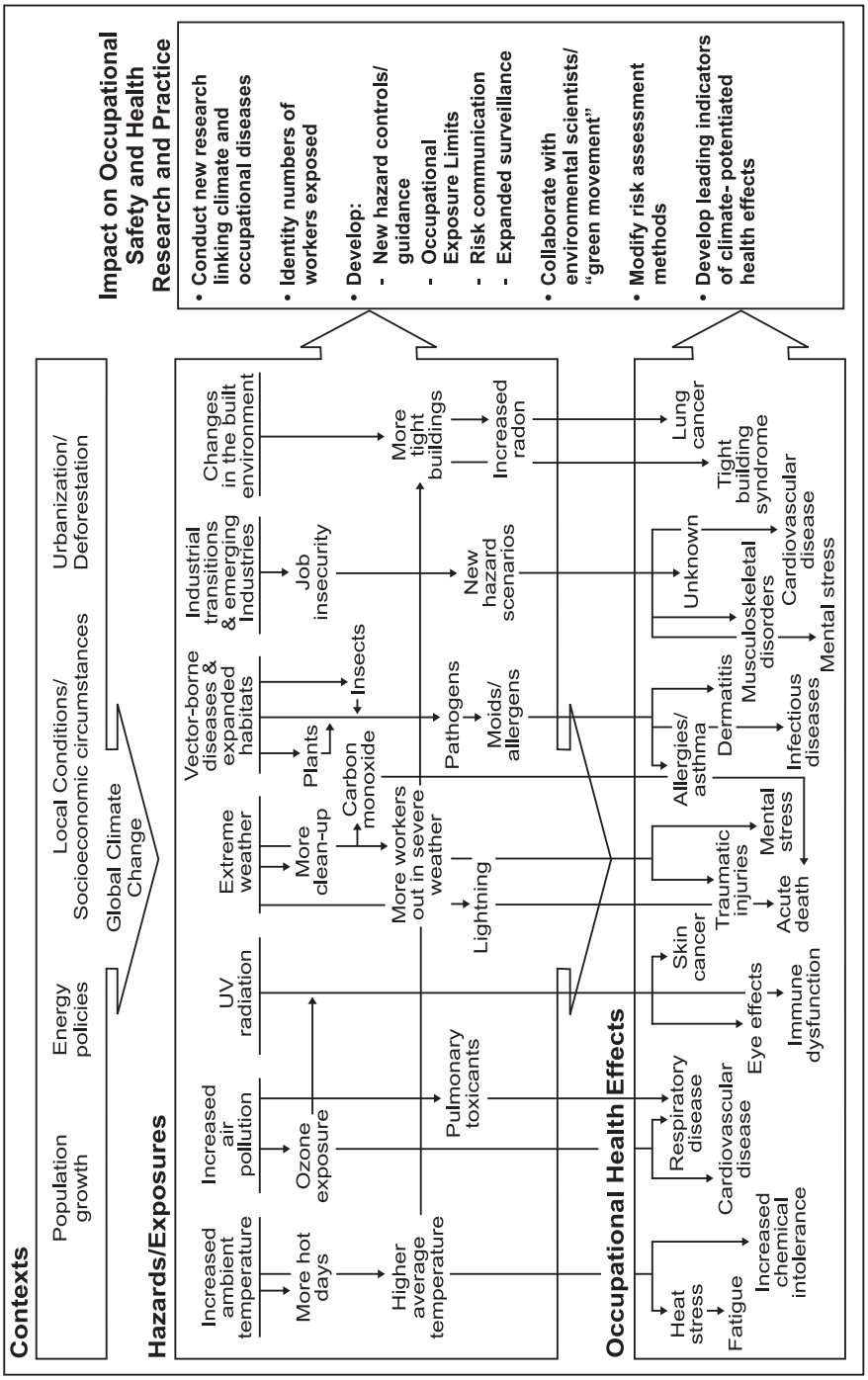



Figure 12: Conceptual framework depicting pathways through which climate change affects occupational health; and measures for occupational safety. Source: NIOSH

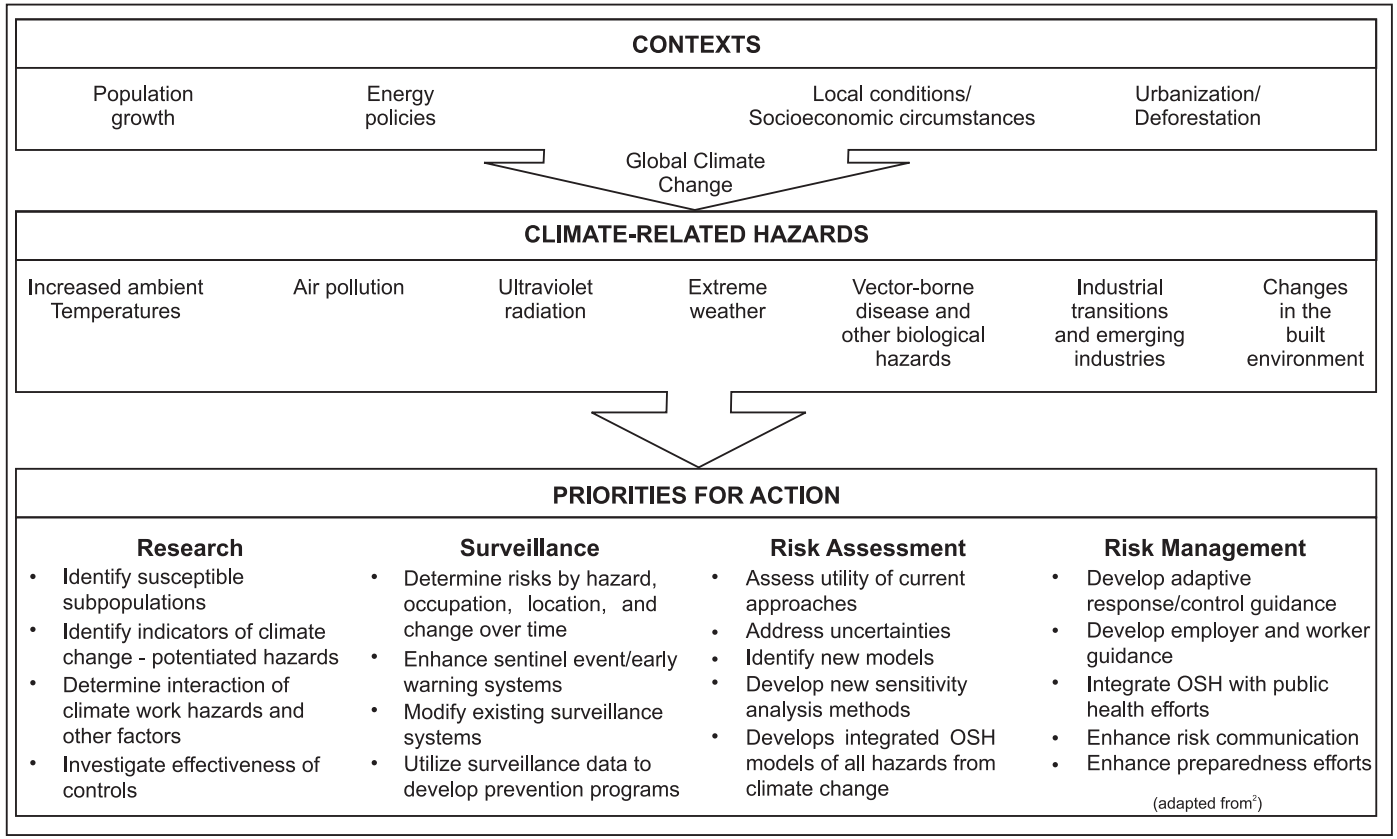



Figure 13 Priorities for action to address climate-related occupational safety and health hazards
Source: Schulte et al. 2016

## Recommended reading


- Applebaum KM, Graham J, Gray MG, LaPuma P, McCormick SA, Northcross A et al. An Overview of Occupational Risks from Climate Change. Curr Envir Health Rpt 2016. DOI 10.1007/s40572-016-0081-4
- Schulte P, Bhattacharya A, Butler C, Chun H, Jacklitsch B, Jacobs T, Kiefer M, Lincoln J, Pendergrass S, Shire J, Watson J, Wagner G. Advancing the framework for considering the effects of climate change on worker safety and healthJ Occup Environ Hyg. 2016. 13(11): 847-865.

# LU 3.3:
# One Health: Climate Change, Animal Health and Human Health

## Learning objectives

- To identify the zoonotic and other animal diseases that are a threat to human health.
- To introduce the concept of One Health.
- To describe the interplay of climate change, animal health and human health

## Methodology

- Lecture/ Power point presentations
- Case study video exemplifying one health
- Audio/Videos on zoonotic diseases and one health
- Question-answer sessions
- Group discussions and exercises

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- A collection of relevant videos

## Duration

90 minutes

## Zoonoses

Human health is not inseparable from the health of the flora and fauna among which they thrive and are dependent on for their survival. As the climate is changing, so are there alterations in the interactions between man and animals.

The WHO defines zoonosis as 'any disease or infection that is naturally transmissible from vertebrate animals to humans.' Zoonoses can be bacterial, viral, or parasitic, or may involve other unconventional agents as well. Zoonoses not only constitute a public health problem, but also hamper the efficiency of food production from animal sources, as well as impact the economy and trade of animal products.

In India, the major zoonoses include Rabies, Leishmaniasis, plague, leptospirosis, echinococcosis, Rickettsial diseases, Toxoplasmosis, Taeniasis and cysticercosis, Brucellosis, Arboviral infections, Listeriosis and Anthrax. Apart from these, Nipah virus, Ebola, Zika virus disease and Crimean Congo Haemorrhagic Fever are also re-emerging threats that are associated with animal and human interaction.

Animal and insect bites, scorpion stings and snake bites are also important conditions that cause trauma and injury to humans.

### Group exercise: 15 minutes

Trainers should give a brief overview of the mode of transmission of these zoonoses. Divide the participants into groups and provide chart-papers and markers to each group. Ask them to brainstorm on how climate change is altering or aggravating the human animal interaction and resulting in increase in these zoonoses.

Also give each group a different climate related disaster and ask them to enlist what zoonoses or related animal conditions can increase following that disaster and why. Ask each group to present their discussion / flowchart.

## Climate Change and Animal Health

Climate change has resulted in alterations in the quality of all environmental elements- the air, soil and water. This has led to gradual changes in the composition of biodiversity, and inter-related keys in the food chain. The extinction of many species, loss of natural habitat, increased occurrence of disasters such as floods, cyclones, forest fires all have impacted animal health.

Animals, who are the host and key transmission agents in several diseases of public health importance for humans as discussed in the previous section undergo lifecycle changes in response to the changing climate themselves. It is important

to understand that changes in host distribution, their availability, habits, interaction with humans and host density are all relevant factors influencing disease transmission. These are particularly relevant after displacements of both man and animals following natural disasters.

Pathogens, hosts, vectors and disease agents may not only find access to new territories, or adopt more aggressive habits, but may also evolve to develop resistant traits and change their host species preferences.

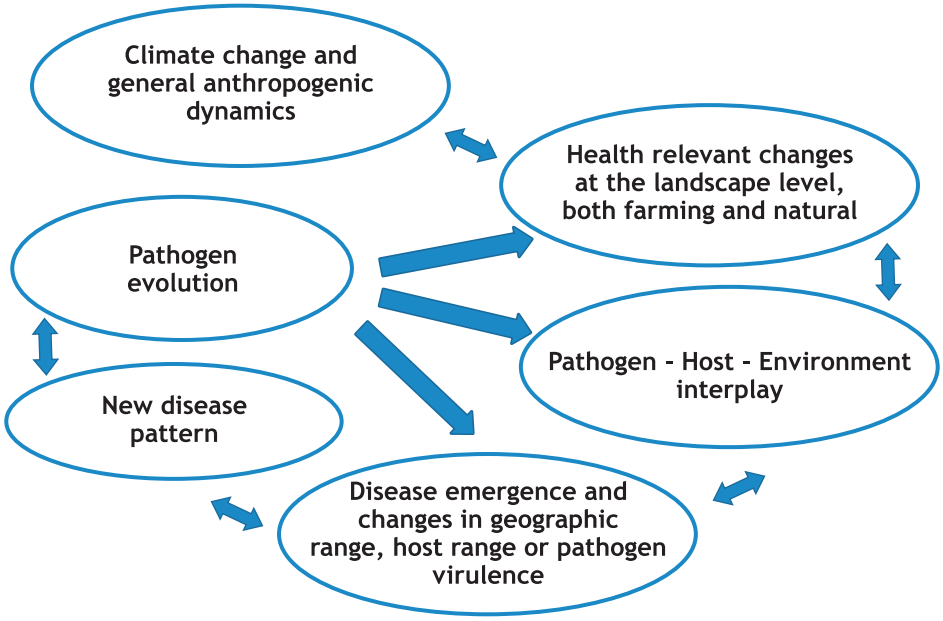



Figure 14. Pathogen Host Interaction

*Source: Juan Labroth. Climate change and animal health. FAO*

## One Health Approach

The cost of controlling health problems that emerge and spread from animals to humans are multifold if viewed and handled in isolation. A more cost-effective approach is the recognition of this interdependence between animal, human and environmental sectors and implement integrated strategies to combat it.

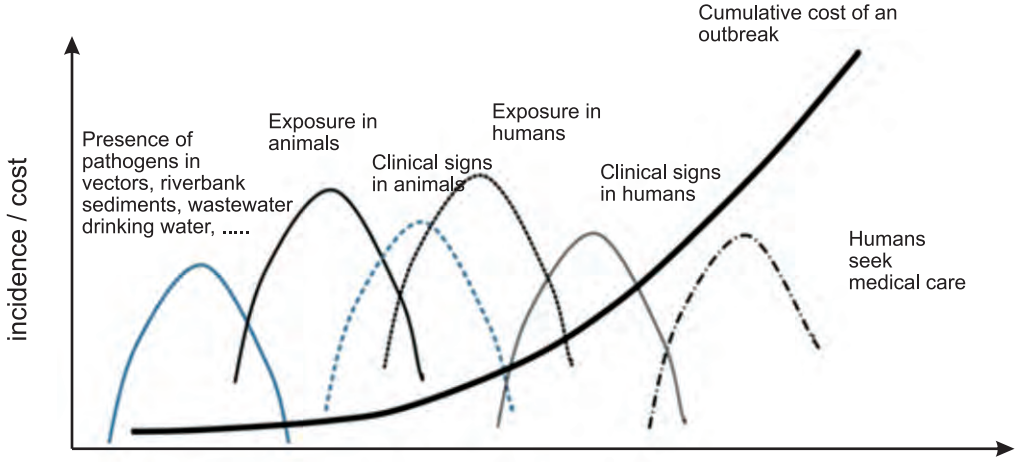



Figure 15: Schematic relationship of time to detection of an emerging pathogen and its cumulative cost of control. (Adapted and expanded from World-Bank 2012)

Source: Zinsstag et al. 2018

According to the WHO, 'One Health is an approach to designing and implementing programmes, policies, legislation and research in which multiple sectors communicate and work together to achieve better public health outcomes.' The One Health approach (Figure 16) is critical today to:

- Ensure food safety.
- Control zoonoses (diseases that can spread between animals and humans, such as flu, rabies and Rift Valley Fever),
- Combat antibiotic resistance (when bacteria change after being exposed to antibiotics and become more difficult to treat.




Figure 16. One Health Approach

*Source: US Centre for Disease Control and Prevention*

## Tips for trainers: Videos- 20 minutes

Play the video by CDC to summarize the concept on one health. https://www.youtube.com/watch?v=TG0pduAYESA

To break the monotony of lectures, play the TedX videos describing some case studies of how animal and human health is related: https://www.youtube.com/watch?v=weXJBFai5Os

https://www.youtube.com/watch?v=_xMbxLjn37w&t=630s

## Recommended reading


- Zoonotic Diseases of Public Health importance. Zoonosis division. National Center of Disease Control. Available from https://ncdc.gov.in/WriteReadData/l892s/File618.pdf
- Patz, J. A., & Hahn, M. B. (2012). Climate Change and Human Health: A One Health Approach. One Health: The Human-Animal-Environment Interfaces in Emerging Infectious Diseases, 141-171. doi:10.1007/82_2012_274

# LU 3.4:
# Understanding DRR and Review of SAPCCs with focus on Health Implications

## Learning objectives

- To understand the concept of DRR and a brief overview of the Sendai framework
- To describe opportunities for integration of health sector with DRR
- To critically review the SAPCC and identify gaps related to the role of health sector

## Methodology

- Lecture/ Power point presentations
- Audio/Videos on DRR and Sendai Framework
- Question-answer sessions
- Group discussions and exercises

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- Hand-outs of SAPCC/SAPCCHH of different states

## Duration

90 minutes

## What is Disaster Risk Reduction (DRR) ?

According to the UN office for Disaster Risk Reduction (DRR), DRR is the 'concept and practice of reducing disaster risks through systematic efforts to analyse and reduce the causal factors of disasters.' Reducing exposure to hazards, lessening vulnerability of people and property, wise management of land and the environment, and improving preparedness and early warning for adverse events are all examples of disaster risk reduction.

## Tips for trainers

To help participants understand the term DRR and orient them to the Sendai Framework for DRR, play the following videos available on UNDRR website:

https://www.youtube.com/watch?time_continue=95&v=iugLHrcs_fM&feature=emb_logo

Sendai framework: https://www.youtube.com/watch?v=izpDdnaSxN0

ISDR

ionweb.net/go/sfdrr
xg

# Chart of the Sendai Framework for Disaster Risk Reduction 2015-2030

## Scope and purpose

The present framework will apply to the risk of small-scale and large-scale, frequent and infrequent, sudden and slow-anset disasters, caused by natural or manmade hazards as well as related environmental, technological and biological hazards and risks. It aims to guide the multi-hazards management of disaster risk in development, at all levels as well as within and across all sectors.

## Expected outcome

The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries

## Goal

Prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience

## Targets

| | | | | | | |
|---|---|---|---|---|---|---|
| Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality between 2020-2030 compared to 2005- | Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100.000 between 2020-2030 compared to 2005-2015 | Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 203o | Substantially reduce disaster damage to critical infrastructure and disduption of basic services, among them health and educational facilities, including through developing their resilience by 2030 | Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020 | Substantially enhance international cooperation of developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030 | Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2020 |

## Priorities for Action

There is a need for focused action within and across sections by States at local, national regional and global levels in the following four priority areas

**Priority 1**
Understanding disaster risk

**Priority 2**
Strengthening disaster risk governance to manage disaster risk

**Priority 3**
Investing in disaster risk reduction for resilience

**Priority 4**
Enhancing disaster preparedness for effective response, and to Build Back Better in recovery, rehabilitation and reconstruction

### Now ask the participants:

- Does the health sector have any role to play in DRR?
- If no, re-emphasize that everyone is a stakeholder in DRR. Further clarify concept of DRR.
- When all participants have agreed, randomly assign the following levels of health care to each group: Sub-centre, Primary Health Centre, Community Health Centre, District hospital, Medical College
- Ask groups to brainstorm for ten minutes and identify three - five critical areas per health care facility towards their role in DRR.

## Disaster Risk Reduction (DRR) in Health sector

According to the NIDM module on integration of DRR in Health sector, the following are among measures that can be implemented to mainstream disaster reduction activities in public health issues management:

- Adopting a multi-hazard approach to disaster risk management that includes epidemics and other biological hazards;
- Re-orienting the current focus on post-epidemic response towards the culture of prevention in managing health effects of disasters;
- Integrating health concerns in hazard control measures, such as health implications of large open flood control water channels;
- Developing strategies for epidemic preparedness and emergency action;
- Developing integrated monitoring systems that include early detection of epidemics based on epidemiological data, early warning system based on meteorological data, and long-range forecasting;
- Integrating health information collection and monitoring in general vulnerability information systems, such as environmental information systems;
- Monitoring and addressing long-term factors of vulnerability to epidemics, such as health care entitlement, immunity status, nutrition level, sexual behaviour, land use patterns, population movement, and status of routine control.

## Recommended reading

- NIDM. Mainstreaming disaster risk reduction into health: Strategies, methodologies and tools. July 2012. Available from: https://nidm.gov.in/pdf/pubs/DRR-health.pdf
- Vineet Kumar 2018, Coping with Climate Change: An Analysis of India's State Action Plans on Climate. Change, Centre for Science and Environment, New Delhi
- SAPCC- Odisha, Punjab, Rajasthan, Tripura

## Discussion forum

- Groups are given SAPCC of different states and are given 30 minutes to critically review it. Then each group identifies gaps and suggests measures to integrate health sector in it.
- Trainers should keep moving about among groups to keep all members of the group engaged in participation of discussion



## Module 4:

# Risk, Vulnerability & Impact Assessment: Integrating DRR in Health Sector

*Source: Freepik.com*

# Module 4:
# Risk, Vulnerability & Impact Assessment: Integrating DRR in Health Sector

## Context and description of the session

There is growing evidence that global climate is changing and will have effects on the health and well-being of people across the world. Changing climate and consequent rise in disaster risks has resulted in people getting more exposed to more extreme weather events. These environmental changes pose risks to human well-being and health with an increased vulnerability to suffer from injuries, emotional stress, epidemic, and loss of life, destruction of houses, possessions, livestock and livelihood getting disrupted. For countries across the globe, adapting to the impacts of changing climate will necessitate assessing and strengthening existing capacity and applying new approaches and techniques for examining the risks associated with changing climate. It will require assessments to be carried out to evaluate the risk of climate change and impacts it may have on human health outcomes from future disasters to enable policy-makers and decision-makers to plan for measures, strategies and policies to cope with climate change.

At the end of this learning module, the participant will be able to:

- Describe vulnerability of health, resources and systems in the context of changing climate
- Explore different type of vulnerabilities that exist: Environment vulnerability, economic vulnerability, health vulnerability
- Learn about different methodologies, techniques and templates used for needs and vulnerability assessment
- Understand post disaster and need assessment in the health sector
- Understand the impact posed by increasing vulnerability on health
- Learn about adaptive capacity assessment in the context of changing climate

There are 4 learning units delineated to draw this module. The titles of learning units and its corresponding sub units are enlisted below:

1. Vulnerability of health, systems and resources: Health impact and adaptive capacity assessment in relation to climate change
2. Health Risk and Vulnerability Assessment: Environment vulnerability, economic vulnerability, health vulnerability
3. Post-disaster and Need Assessment (PDNA) in Health Sector: Impact and Needs
4. Group exercise: Vulnerability Assessment exercise for participants

## Learning Objectives

The key objectives of this module are following:

- To provide brief on what vulnerability of health, resources and systems is in the context of changing climate and explore different type of vulnerabilities that exist
- To discuss different methodologies, techniques and templates used for assessment
- To understand post disaster and need and impact assessment in the health sector

## Duration

The time duration in total delineated to this module is 1 day (6 hours). Hence, the Module will take 1 day to complete it.

## Methodology

The training methodology will include:

- Lecture/Power Point Presentations
- Short films on different type of assessments
- Experience sharing
- Discussion
- Group exercise involving case studies for conducting different type of assessments

## Resources Required

- Training hall/ class room with suitable capacity and fixers
- Audio-visual Arrangement
- Data projector and slide changer
- A collection of relevant films
- Stationeries: White board, Marker, Writing pad
- Assessment templates used by different organisations

## Trainers' tips

- Ensure punctuality and interest of participants during the sessions
- Encourage experience sharing from participants, trainers/faculty and course coordinators for arriving at a common learning point
- Response of the participants, their discipline etc. need to be shared during this information round
- Keep presentations short by using less text and more of photographs, figures etc.

# LU 4.1:
# Vulnerability of Health, Systems and Resources: Health Impact and Adaptive Capacity Assessment in Relation to Climate Change

## Context and description

In recent years, with an increase in the frequency, magnitude and extent of climate change related disasters, there has been a rise in problems being faced by people. Disasters significantly impact people's physical as well as mental health affecting their recovery and restoration to pre disaster time. Disasters threaten not only the population of a country but can also result in rapid loss of development gains and failure of emergency responses. Many disasters in the past have seen the lifeline health infrastructure like hospitals, clinics, ambulances, manpower getting affected. This affects the capacity of the local people to treat the people without external help. Some disasters also affect the availability of ambulances, equipment and facilities to provide timely treatment to people. For handling disasters and health security, public healthcare system should retain/develop a certain excess capacity in terms of health infrastructure, human resources, and technology which can be mobilized in times of crisis. Mass casualty management protocols and emergency response protocols at all levels should be developed for timely response.

Vulnerability assessments have increasingly been used to identify climate change impact hotspots and to provide input for adaptation and development planning at local, national and regional levels. Vulnerability assessments serve various purposes: in the initial planning phase they aim at identifying climate change impacts and prioritising adaptation options. If vulnerability assessments are repeated on a regular basis using the same methodology, they can serve as a valuable tool for monitoring and evaluating the effectiveness of adaptation as they would show whether we have indeed succeeded in reducing vulnerability. Following an analytical framework which defines vulnerability according to its exposure, sensitivity and adaptive capacity, figure 17 shows a series of regional assessments carried out in Australia to identify key impacts and vulnerability for strategically significant regions. Figure shows adaptive responses developed to reduce identified vulnerabilities within each region.




| Vulnerability criterion | Findings |
|---|---|
| Exposure | Increased sea and land surface temperatures and an increase in the number and severity of storms and cyclones are likely. |
| Sensitivity | Both the Great Barrier Reef and the Wet Tropics are very sensitive to changes in temperature; an increase of as little as 2°C could have devastating effects. Increased storm surges and cyclone intensity could cause serious damage to Cairns, with potential for property damage and loss of life. |
| Adaptive capacity | Autonomous adaptive capacity of natural biological system is low. |
| Adverse implications | The Great Barrier Reef and the Wet Tropics are high profile and popular tourist attractions and World Heritage Areas. Tourism accounts for 16.3% of employment in Tropical North Queensland. |
| Potential to benefit | There is considerable scope to increase the resilience of natural systems by reducing other stresses. Settlements could benefit from attention to urban and natural disaster management planning. |

Source: adapted from the Department of the Environment and Heritage, Australian Greenhouse Office, Australian Government, 2005. Available at

Figure 17. Vulnerability assessment for the Calms- Great Barrier Reef Region, Australia

Source: Assessing Climate Change Impacts and Vulnerability, UNFCCC

## Learning objectives

- To provide brief on what vulnerability of health, resources and systems is in the context of changing climate
- To understand key concepts, uses and attributes of vulnerability assessment
- To learn about preparing the vulnerability assessment
- To learn about adaptive capacity assessment in the context of changing climate

## Methodology

- Lecture/ Power point presentations
- Case studies & Audio/Videos
- Question-answer sessions
- Group discussions and exercises

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- A collection of relevant films

## Trainers' Tips

- Ensure punctuality and interest of participants during the sessions
- Encourage experience sharing from participants, trainers/faculty and course coordinators for arriving at a common learning point
- Response of the participants, their discipline etc. need to be shared during this information round
- Keep presentations short by using less text and more of photographs, figures etc.

## Duration

90 minutes

## Recommended Readings


- Sari Kovats, Ebi, K. L., & Menne, and B. (2003). Methods of assessing human health vulnerability and public health adaptation to climate change.
- GIZ (2017). The Vulnerability Sourcebook Concept and guidelines

# LU 4.2:
# Health Risk and Vulnerability Assessment: Environment vulnerability, Economic vulnerability, Health vulnerability

## Context and description

The impact of the disaster can be immediate and localized, but is generally widespread. The effects may test or exceed the capacity of a community or society to cope and may require external assistance. Large-scale disasters put the environmental and economic viability of environmentally vulnerable countries at risk. The devastating impact of recent climate change and related disasters has put the spotlight on the wide-ranging consequences of environmental vulnerability in developed as well as developing countries. Vulnerability varies significantly within a community and over time. The economic impact of climate change is set to increase over the next century, along with the growing frequency and intensity of climate-related disasters. The impact depends upon the economic status of individuals and communities with the marginalized sections bearing the brunt due to lack of resources to protect themselves from being negatively impacted by disasters. With changing climate and disasters, natural resource depletion and resource degradation have become key aspects of environmental vulnerability. For instance, wetlands are sensitive to increasing salinity from sea water, and pollution from storm water runoff containing agricultural chemicals, eroded soils, etc. putting environment at high risk.

Health vulnerability to climate is significant as is defined as a function of sensitivity, which includes the extent to which health, or the natural or social systems on which health outcomes depend, are sensitive to changes in weather and climate and the characteristics of the population, such as its demographic structure; exposure to the climate-related hazard as well as adaptation measures and actions in place to reduce the burden of a specific adverse health outcome.

## Learning objectives

- To understand Health Risk and Vulnerability Assessment
- To explore different type of vulnerabilities that exist: Environment vulnerability, economic vulnerability, health vulnerability

## Methodology

- Lecture/ Power point presentations
- Audio/Video/photograph based quiz/activity to identify different type of vulnerabilities
- Question-answer sessions & Group discussion

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio-visual Arrangement
- Data projector and slide changer
- A collection of relevant films

## Trainers' Tips

- Ensure punctuality and interest of participants during the sessions
- Encourage experience sharing from participants, trainers/faculty and course coordinators for arriving at a common learning point
- Response of the participants, their discipline etc. need to be shared during this information round
- Keep presentations short by using less text and more of photographs, figures etc.

## Duration

90 minutes

## Recommended Readings


- CARE. (2014). Vulnerability assessment and adaptation planning.
- CGE Training Materials for Vulnerability and Adaptation Assessment Chapter 2 Vulnerability and Adaptation Frameworks. (n.d.).
- GIZ (2017). The Vulnerability Sourcebook Concept and guidelines

# LU 4.3:
# Post-disaster and Need Assessment (PDNA) in Health Sector: Impact and Needs

## Context and description

The Post-Disaster Needs Assessment (PDNA) is an internationally accepted methodology for determining the physical damage of the healthcare setting, economic losses, and costs of meeting recovery needs after a climate change related disaster. It pulls together information about health infrastructure and assets, delivery of health services (including access to and changes in demand for services), health governance processes and vulnerability and health risks of the affected population and the resulting early and long-term recovery needs and priorities. PDNAs are based on mixed assessment methods, as there is no single source or single method that can provide all the necessary information. The main sources for the PDNA are key informants, for example, from the MoHFW and development partners, focus group discussions with stakeholders and relevant experts, health facility-based information systems, observations, complemented by surveys of health facility performance and population-based surveys.

An integrated approach involves taking the standard damage and loss assessment methodology and including a recovery strategy that puts special emphasis on the human condition. Building back better refers to the concept that recovery and reconstruction should not only aim at restoring the health system to its pre-disaster condition, but also should address underlying vulnerabilities that may have contributed to the extent of the disaster's effects. Building back better aims to strengthen the resilience of the health system and communities so that they can better manage future disasters and their risks to the health sector. Care must be taken to ensure a gender balance of the assessment team. Table 4 given below summarizes the main effects of a disaster on the health system and recovery and reconstruction needs, including suggestions for ways to build back better.

| Disaster effect | | Health Recovery and reconstruction needs | |
|---|---|---|---|
| | | Restore pre-disaster conditions | Building back better |
| Infrastructure and assets | Partial or full destruction of health infrastructure and assets. | Establish temporary health structures and possible mobile health units.<br>Reconstruct and repair destroyed and/or damaged health infrastructure, replace assets lost. | Ensure all infrastructures are hazard resilient.<br>Modernize and rationalize the health network. |
| Service delivery, access and demand | • Reduced availability of health services and disrupted procurement of pharmaceuticals.<br>• Reduced access to and possible increased demand for health services delivery. | • Restore capacity to deliver health services and procure pharmaceuticals<br>• Provide additional capacity in availability of services to meet increased and possible new demands for services.<br>• Ensure equitable access to health service delivery and ensure utilisation of services, in particular for pre-existing and new vulnerable groups by reducing old and new barriers for access and utilisation. | • Address possible pre-existing constraints in capacity and performance of service delivery.<br>• Adapt the health workforce and availability of pharmaceuticals<br>• Reduce pre-existing and new inequities in access to health services. Improve utilisation and reduce barriers for access, taking into account reduced ability to pay. |
| Governance | • Effects on capacity of the health authorities to manage service delivery, including community participation and capacity to manage the response and recovery process. | • Restore governance role for service delivery of health authorities at national and subnational level, including community participation.<br>• Manage the response and recovery process and coordination mechanisms, within the health sector and between different sectors.<br>• Support health information management and early warning systems. | • Strengthen governance role of national health authorities to better manage equitable service delivery and disaster risks, based on a disaster risk management capacity assessment, including health information management and early warning systems. |
| Risks | • Effects on pre-existing risks to health, new health risks caused by the disaster and effect on the health status of the affected population. | • Conduct targeted health pro-motion and disease prevention interventions to control and mitigate impact of pre-existing and new risks to health, reduce excess/avoidable morbidity and mortality caused by the disaster. | • Reduce vulnerabilities and risks to health and support community resilience.<br>• Introduce longer term disaster risk reduction interventions, based on more detailed vulnerability and risk assessment and mapping. |

Table 5. Disaster Effects, recovery and reconstruction needs including building back better.

*Source: PDNA Guidelines Volume B, GFDRR, World Bank, WHO*

The analytical matrix given above (Table 5) provides a standardised and systematic protocol for collection and analysis of assessment data based on the best available data, evidence and/or professional judgments.

## Learning objectives

- To understand what constitutes Post-disaster and Need Assessment in Health Sector
- To understand the significance and ways of building back better
- To discuss different techniques used by organisations for impact and needs assessment

## Methodology

- Lecture/ Power point presentations
- Interactive quiz
- Audio/Videos on assessment conducted by different organisations
- Question-answer sessions
- Group discussion

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio-visual Arrangement
- Data projector and slide changer
- A collection of relevant films
- Assessment templates used by different organisations

## Trainers' Tips

- Ensure punctuality and interest of participants during the sessions
- Encourage experience sharing from participants, trainers/faculty and course coordinators for arriving at a common learning point
- Response of the participants, their discipline etc. need to be shared during this information round
- Keep presentations short by using less text and more of photographs, figures etc.

## Duration

90 minutes

## Recommended Readings

- PDNA Guidelines (www.gfdrr.org)
- NIDM Guidelines (www.nidm.gov.in)
- International Recovery Platform (www.recoveryplatform.org )
- World Health Organisation (www.who.int )

# LU 4.4:
# Group Exercise: Vulnerability assessment exercise for participants

## Context and description

The group exercise will give participants an opportunity to build a common understanding about vulnerability and apply the skills they have gained through the sessions to actually do the assessment in group of 4-5 people. Group will develop Vulnerability Causal Flow Chart to describe the vulnerability as a function of exposure, sensitivity and adaptive capacity. More details are given under guidance. The participants will present findings and challenges faced to the entire group through PowerPoint presentation/flip charts by the end of the session. Cross questions from participants will be encouraged to evaluate their learning outcomes about assessment methods.

## Learning objectives

To learn about climate change impact and assessment by engaging in conducting similar exercises through group activities

## Methodology

- Question-answer sessions & Group discussions
- Experience/knowledge sharing

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- Material: Flip charts and markets

## Guidance

The participants can be divided into group of 4-5 based on the number. Each group shall be provided with case studies on vulnerability assessment. On this basis of this, participants need to develop the vulnerability causal flow chart showing elements of exposure, sensitivity and adaptive capacity. A group presentation has to be made at the end to deliver the outcome of the discussion.

## Duration

60 minutes divided into 25 minutes of separate group discussions, 25 minutes of group presentation and 10 minutes of question and answer session.

## Recommended Readings

- PDNA Guidelines Volume B, GFDRR, World Bank, WHO




## Module 5:
# Health System and Health Resources: Adaptation and Resilience

*Source: Photo by Anna Shvets from Pexels*

# Module 5:
# Health System and Health Resources: Adaptation and Resilience

## Context and description of the module

This module aims to familiarize the participants with the public health care delivery system of the country. It seeks to sensitize the participants towards the existing health care scenario, its strengths, weaknesses, opportunities and threats. Further in the light of climate change and related disasters, it highlights the increased burden that the health system is likely to face unless adaptation measures are put in place.

The second session introduces the National Health Adaptation Plan (NHAP) to the participants, its goals and objectives, and briefs them about the role of various stakeholders and the roadmap towards building a climate resilient health system in the country.

There are two learning units (LU) delineated to draw this module:

a) Current Health Care Scenario- Health care delivery system of the country & SWOT analysis of the health system

b) National Health Adaptation Plan for Climate change related disasters (NHAP-CCD)

In the end, participants are expected to draw up and present their own action plan for implementation in their respective institutions and organizations.

## Learning objectives

At the end of this learning unit, the participant will be able to:

- To understand the health care delivery system of the country.
- To describe the existing challenges faced by the health system, and the expected challenges due to climate change related disasters.
- To familiarize oneself with the NHAP-CCD, its goals, objectives and strategies.
- To understand the coordination mechanism in the implementation of health adaptation plans.

- To develop an action plan for implementation in their own institution or system.

## Duration

The time duration in total delineated to this module is 1 day (6 hours), divided into 2 structured Learning Units of 90 minutes each.

Further a semi-structured group/ individual activity is planned which is expected to consume 90-120 minutes.

The last session of the workshop with the remaining 45 minutes shall be used to solve doubts, reiterate key points, reaffirm commitment, conduct the post-test and take feedback for the entire workshop.

## Methodology

The training methodology will include:

- Lecture/Power Point Presentations
- Short films on health care system of the country.
- Perception check questionnaire (or Q&A)
- Group exercises /Experience sharing
- Discussion

## Resources Required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- A collection of relevant films
- Stationeries: White board, Marker, Writing pad
- Notes on the NHAP-CCD / State health

## Trainers' tips

The trainer should keep attempting to break the monotony of the session by showing relevant video clippings or animations in between the power-point presentation. The trainer should keep the audience engaged by asking them questions, or encouraging them to share their personal experiences.

# LU 5.1:
# Current Health Scenario

## 5.1.1 Health care delivery system of the country

### Learning objectives

- To identify levels of health care and their model of delivery system in country.
- To appreciate various health care systems.
- To know the Indian Public Health Standard (IPHS) standards for health care delivery system.

### Methodology

- Lecture/ Power point presentations
- Case studies related to disease outbreaks following disasters
- Audio/Videos on extreme events and health impacts
- Question-answer sessions
- Group discussions and exercises

### Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- White board, different colored markers
- White chart paper on soft boards, different colored post-its (Optional)

### Duration

- 90 minutes

## Levels of Health Care

Health care is a multitude of services rendered to individuals or communitites by the agents of health services and or professional for purpose of promoting, restoring and maintaining health. As per WHO, health care is an integrated care containing promotive, preventive and curative elements that bear the longitudinal association with an individual, extending from womb to tomb, and continuing in the state of health as well as disease."

For this, in India three levels of health care (or three tier system) has been described namely, primary, secondary and tertiary:

Primary level of care is the first point of contact of individuals or families with health system. Here mainly primary care is provided. Primary care as defined by WHO is is essential health care made universally accessible to individuals and acceptable to them, through their full participation and at a cost the community and country can afford. This level is closest to people and is capable of dealing with most of the health problems. This is usually provided by the subcenters and primary health centers.

Secondary level of care is relatively more complex than primary care level. This is intermediate between Primary and tertiary level of care. Community health center, block level or colony hospitals and district hospitals are providing secondary level of care.

Tertiary level of care is more specialized and most complex among the three levels. Specialized humanresource and facilities are required to deliver this. Medical colleges, and speciality hospitals are providing tertiary level of care.

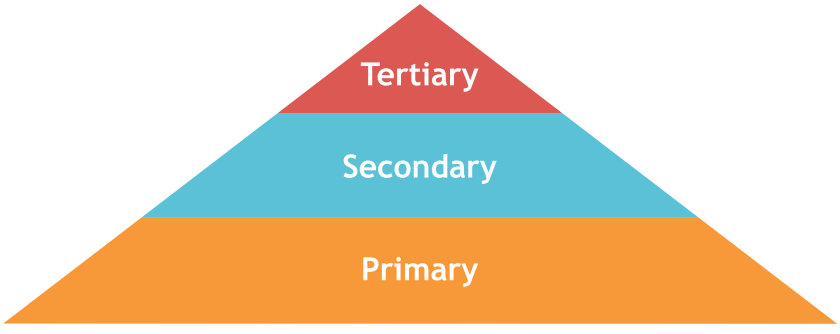



Figure 18. Level of Health Care

Primary health care is provided at community level through sub centres and Primary health centres.Accredidated Social Health Activists (ASHAs), Village health guides, Auxilary Nurse Midwives (ANMs), dais, Health workers male, malaria or DOTS workers are the main service providers at this level.

CHCs and district hospitals Are providing secondary level of care where specialists of medicine, surgery, obstetric & Gynecology, and pediatrict are available here and more complex health problems are dealt here.

Tertiary level care is provided at state or regional level hospitals and apex centres. Highly specialized workforce is available here to provide curative services. In medical colleges all type of departments are available where beside healthcare provision, teaching and training of udnergraduate and postgraduate medical students are also carried out.

These three levels of health care are connected through referral and follow-up mecahnisms.

## Indian Public health Standards (IPHS)

In 2005, a major revolution occurred in health care of India. National Rural Health Mission (NRHM) was put into place which undertook major initiatives to improve the health of the country and fulfill the targets of National Health Policy 2002.

One of the key objectives of NRHM was to improve the quality of services in public health sector so that utilization rates can be improved. To make health care services effective, accountable and economical, IPHS were established for quality management and quality assurance under NRHM. IPHS are a set of standards provided for SCs, PHCs, CHCs etc. They define minimum requirements of building, manpower, instruments and equipment, drugs and other facilities for various delivery systems. These were designed to help in monitoring and improving the services provided by these facilities. Currently revised IPHS for the year 2012 are in place.

As per these IPHS, one SC should cater to a population of 5000 or in hilly and tribal areas it should cater to a population of 3000. It will be manned essentially by one ANM and one Multipurpose Workers (MPW) male.

For PHCs, the norms set under IPHS are a population of 30,000 or in hilly and tribal areas it should be 20,000. It will essentially be manned by one medical officer, 1

health assistant male and one female, 3 staff nurses, 1 pharmacist, 1 lab technician along with other supporting staff.

The CHCs should cater to a population of 80,000 to 1.2 lakhs and should have 30 beds. There should be at least 1 general surgeon, 1 physician, 1 obstetrician and gynecologist, 1 pediatrician, 1 anesthetist, 1 dental surgeon, 6 GDMOs, along with 2 AYUSH doctors. Other support manpower like nurses, pharmacists are also required.

### Tips for trainers

Participants can be given examples of health problems (with pictures) related to climate change and associated disasters, and they can be asked at which level they can be dealt with and which require referral to higher level.

For examples:

- Dengue Fever occurring after an unusual rainfall event- this can be dealt with at PHC level
- Cyclone resulting in severe injury to a hand – might need surgical intervention at tertiary level.
- A malnourished child suffering from severe dehydration post floods- secondary level management.

## Health Care Systems

Health services are delivered through health care systems. These involve organizational matters. They constitue management sector. These systems are country specific as countries differ in socio-economic and political context.

In India, health care is delivered through five major sectors. This includes public health sector, private sector, indigenous system of medicine, voluntary health agencies and national health programmes.

In public health sector, primary health care is provided through SCs and PHCs. Public health sector also includes hospitals and centers like CHCs, DHs, specialized hospitals etc. This sector also envisages health insurance schemes like CGHS and ESI. Other agencies like defense services and railways are also included in public health sector only.

Private sector, on the other hand, is composed of nursing homes, clinics, private hospitals, clinical establishments etc. Ayurveda, Siddha, Unani, homeopathy, Yoga and Naturopathy come under indigenous system of medicine. Now these indigenous system of medicines are available in both public and private sector.

Many voluntary agencies like Rotary foundation are working in area of health.

A multitude of national health programmes are also functioning for various diseases for example National Anti-Tuberculosis Program, National Vector Borne Disease Control Program etc.

## Recommended Readings


- K. Park. Textbook of Preventive and Social Medicine. 25th edition. Chapter 23. Health care of the Community. Pune, India.
- National Health Mission. Indian Public Health Standards revised guidelines 2012. Ministry of health and family welfare. Government of India, New Delhi, India. Available from https://nhm.gov.in/index1.php?lang=1&level=2&sublinkid=971&lid=154
- Kishore J. National Health programs of India: National Policies and Legislations related to health. New Delhi: Century Publications 2019.

### 5.1.2 SWOT analysis of the health system

#### Learning objectives

- To do the SWOT analysis of the health care system.
- To identify the upcoming challenges for health care system due to climate change.

#### Methodology

- Lecture/ Power point presentations
- Case studies related to increasing incidence of various diseases due to climate change
- Audio/Videos on extreme events and health impacts
- Question-answer sessions
- Group discussions and exercises

#### Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- White board, different colored markers
- White chart paper on soft boards, different colored post-its (Optional)

#### Duration

90 minutes

#### SWOT analysis of health system

SWOT analysis involves strengths, weakness, opportunities and threats of a system or program. For health care system, similar analysis can be performed.

Various strengths of our health system are:

- Multiple levels of health care and their delivery systems- This acts as gatekeeping mechanism with specialized and complex care available at higher level.

- Different sectors involved in health care thereby providing patients a variety of options. Makes health care more patient centric.
- Formulation of IPHS which helps in quality management and effective health care delivery.
- Different cadres of health care workers available and they work as health team for achievement of common goals.

Weaknesses of health system are:

- Deficient infrastructure, human resource at all levels- Less than 10% SCs and about 11% PHCs meet the IPHS norms.
- Wide urban rural divide in provisions of health care.
- Low budgetary allocation- Less than 2.0% of GDP is spent on health care in India.

Opportunities for health system are:

- Increasing use of technology- This can lead to increasing health literacy which can further the efficient utilization of health care services.

Threats for health system are:

- Increasing burden of non-communicable diseases due to demographic transition.
- Increasing levels of pollution- It is also adding to the burden of communicable and non-communicable diseases.
- Increasing catastrophic expenditures on health.

## Tips for trainers

The participants can be asked to mention other strengths, weakness, opportunity and threats as per their judgment. As they enumerate these, write them on the white board with different colored markers. Ways to overcome those threats and utilization of opportunities can be suggested by participants.

## Challenges for Health Care System due to Climate Change

Apart from these existing weakness and threats, climate change will pose additional challenges to health system as it lacks resilience.

It has been estimated that rise in temperature by 2-3°C globally will lead to increase in burden of vector borne diseases like dengue and malaria by up to 5%. India is aiming to eliminate malaria. But the efforts might face challenge due to climate change impact. Dengue outbreaks in Southern India, in metropolitan cities can be attributed to urbanization and haphazard construction. With climate change, there can be an increasing trend in burden of diseases.

Morbidity due to diarrhea might increase by 10% as per WHO estimates. Water scarcity leading to poor hygienic and sanitation facilities can be a reason for the same. Diarrhea is amongst the top 5 killers of under 5 age children globally. With increase in diarrhea, the dream of reducing under 5 mortality can't be fulfilled.

Due to decrease in crop yield, malnutrition is going to pose a serious threat to health of children and it can be the largest impact of climate change on health. With about 40% of Indian children suffering from stunting and around 25% from wasting and underweight as per NFHS-4, further deterioration in nutritional status due to climate change can have devastating effects.

Relationship between climate change and mental health is being explored through various researches. Due to draughts, water scarcity, farmers are committing suicides. Migration can have its impacts on mental health. The psychological consequences of climate related disasters are varied and range from anxiety to Post Traumatic Stress Disorder (PTSD).

Disasters have increased in frequency and severity which can also be attributed partly to climate change. With this, additional morbidities and mortalities will take place.

Air pollution is itself emerging as a disaster. It is adding to burden of various non-communicable diseases like cancers, arthritis and other inflammatory disorders.

All this is going to increase the burden on health care system. Also it has been anticipated that these changes will affect the low and middle income countries most including India.

## Participants' experiences

Trainers should also invite participants to share their experience (if any) on increasing climate change related diseases in their areas or institutions. They can describe how the morbidity pattern has changed over past 2 decades. Participants can also share if they have experienced any disaster and whether they think it is due to climate change or not or whether climate change has aggravated the effects of disaster.

## Tips for trainers

At the end of the session, ask the participants to mention other diseases whose distribution can be affected in future due to climate change, apart from already mentioned above.

## Recommended reading and case study


- Statistics Division, Ministry of Health & Family Welfare, Government of India. Rural Health Statistics 2017-18. Available from: https://nrhm-mis.nic.in/Pages/RHS2018.aspx?RootFolder=%2FRURAL%20HEALTH%20STATISTICS%2F%28A%29%20RHS%20-%202018&FolderCTID=0x01200057278FD1EC909F429B03E86C7A7C3F31&View=%7B09DDD7F4-80D0-42E3-8969-2307C0D97DDB%7D
- World Health Organization. Health Emergency and Disaster Risk Management Fact Sheets December. Health Emergency and Disaster Risk Management overview. WHO. Available from https://www.who.int/hac/techguidance/preparedness/who-factsheet-overview-december2017.pdf
- World Health Organization. Climate change and human health. Climate change adaptation to protect human health. Global project overview. WHO. Available from https://www.who.int/globalchange/projects/adaptation/en/
- World Health Organization. Climate change and health. WHO. Available from https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health

# LU 5.2:
# The National Health Adaptation Plan for climate change related disasters

## Learning objectives

- To understand the components of National Health Adaptation Plan for climate change related disasters.
- To appreciate the coordination mechanisms for implementation of HAP.
- To know how to prepare health adaptation plan for an institution.

## Methodology

- Lecture/ Power point presentations
- Question-answer sessions
- Group discussions and exercises

## Resources required

- Training hall/ class room with suitable capacity and fixers
- Audio visual Arrangement
- Data projector and slide changer
- White board, markers and duster

## Duration

90 minutes

## Components of National Health Adaptation Plan (NHAP) for Disaster Related Illnesses (DRI)

After orienting the participants to the health care delivery system, demystifying climate change, understanding the health challenges that climate change and related disasters pose on the health system, the participants will now be oriented on how the health system should adapt to the changing scenario.

For this, they should be briefed about the Goals, objectives and strategies of the NHAP for DRI.

## 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.

The NHAP proposes a seven-pronged strategic approach to achieve its goal of developing a climate change resilient health system (Figure 19)

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.

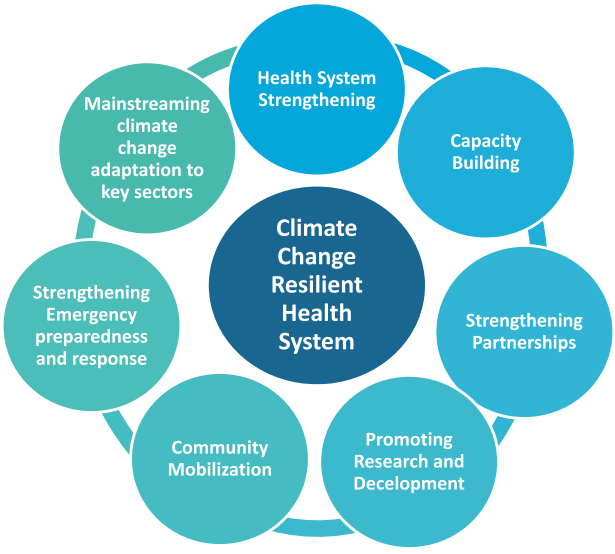



Figure 19. Seven Pronged Strategic Approach Proposed in NHAP for DRI

Table 6. Proposed Interventions and Indicators under the NHAP for DRI:

| INTERVENTIONS | INDICATORS |
|---|---|
| **Safe And Resilient Health Care Facilities at All Levels** | • Proportion of existing health facilities upgraded to "Disaster resilient Safe Health facilities." (as per NDMA guidelines<br>• Number of new safe and resilient health facilities established. (according to IPHS and NDMA norms) |
| **Promoting Climate Resilient Subset Facilities.** | • Proportion of health facilities equipped with:<br>✓ Alternative power back up.<br>✓ WaSH facilities as per WHO standard.<br>✓ Capacity to handle BMW during disaster.<br>✓ Alternative telecommunication systems |
| **Promoting Resource Efficiency** | • Proportion of health facilities with solar or other renewable energy source.<br>• Proportion of green health facilities<br>• Proportion of health facilities with rainwater harvesting |
| **Implementation of Guidelines and SOPs for Safe and Resilient Health Care Facilities** | • Implementation of IPHS guidelines<br>• Development of institute specific SoPs for resilient subset facilities |
| **Capacity Building of Professionals From Health and Allied Sectors** | • Proportion of policy makers, administrators, and health managers sensitized to climate change and health adaptation.<br>• Proportion of medical and paramedical workers trained in management climate related illnesses.<br>• Proportion of disaster management and environment professionals trained to integrate health adaptation issues of climate change.<br>• Number of training programs held for target groups under preceding indicators.<br>• Number of training modules developed. |
| **Strengthening Database and MIS** | • Proportion of states and districts with integrated database and MIS.<br>• Proportion of state and districts with trained manpower for integrated data management |

| INTERVENTIONS | INDICATORS |
|---|---|
| **Encouraging Research and Development on Health And Climate Change** | • Number of research projects related to climate change and health adaptation.<br>• Number of institutions involved with research related to climate change and health.<br>• Number of compendiums, case studies developed and research papers published related to climate change and health. |
| **Building Community Resilience** | • Proportion of ASHA workers and ANMs sensitized towards climate change and its health effects.<br>• Number of community volunteers trained in developing health resilience.<br>• Number of CBOs, NGOs and RWAs sensitized towards climate change and health effects. |
| **Sensitizing Pharmaceutical and Biomedical Industry** | Number of sensitization sessions conducted for pharmaceutical and industrial organizations. |
| **Enhancing Health Emergency Response** | Proportion of RRTs at state and district level trained to manage health effects of climate change and related disasters. |
| **Mainstreaming Climate Change Related Health Resilience Into Key Sectors** | Number of departments and ministries that have incorporated climate change and health related aspects in their program implementation plans. |

## Tips for trainers

With the introductory background to planning cycle and various terms used, participants can be asked to formulate their own state / district / institutional health adaptation plans for climate change related disasters.

Participants from similar groups should be clubbed together.

They need to identify:·

- Existing resources
- Gaps and opportunities

- Timelines
- Internal and external Co-ordination mechanisms.
- Budget allocations.
- Manpower roles and responsibilities.

On the basis of this information, they should prepare an outline of the action plan for their institutional / district/ state.

Few willing participants may be asked to present their plans and the trainer can comment on the same.

## Coordination mechanisms for implementation of NHAP for DRI

Intersectoral action as defined by WHO, refers to actions affecting health outcomes undertaken by sectors outside the health sector, not necessarily in collaboration with health sector. Coordination implies integrated group efforts to achieve common goals. Contradictory or opposing strategies of different sectors might prevent successful implementation of HAP.

On the other hand, coordinated efforts can improve effectiveness, are more efficient and gains made can be sustained over time. To address the complex challenges and issues related to disasters, this coordination is required between different levels of government, between different ministries and between various stakeholders.For health adaptation plan different sectors which will be involved includes health sector, municipal corporations, road and transport sector, education, water supply and sanitation, public health engineering sector, agriculture and animal husbandry, industrial sector, media and communication sector and law and order sector. This list is only an indicative of possible sectors that needs to be coordinated with health sector. It might include other sectors as well.

Various mechanisms for coordination between these sectors need to be looked for. HAP should be formulated with consultation from maximum possible sectors. The roles and responsibilities of each and every sector in implementation of HAP should be documented and circulated to all. Joint training programs can be organized for them. Mock drills and table top exercises should be held at district, state and national level with all the sectors involved. All sectors should contribute to building a resilient health care infrastructure for climate change related disasters.

## EXERCISE: Localizing NHAP for District level

### Group exercise:

15 minutes for discussion overall,

and 5 - 7 minutes for demonstration per group

and 3- 5 minutes for debriefing per group

Participants should be randomly divided into 4 groups. Each group would be assigned one state, and they would be asked to draft a health adaptation plan for that region based on the risk and vulnerability analysis and the disaster history of that area.

- Disaster History of the area
- Health implications of those disasters
- Available resources
- Roles and responsibilities of different departments
- Co-ordination between different sectors
- Flow of information
- Their knowledge about health adaptation
- Mitigating gaps and making use of opportunities

| State | Scenario |
|---|---|
| **Odisha** | There has been a prediction and warning of severe cyclone that is expected after 72 hours. |
| **Bihar** | Unexpected heavy rainfall has resulted in flooding in the urban areas. |
| **Delhi** | IMD has forecasted that next month the summer will be exceptionally hot amounting to heat wave. |
| **Maharashtra** | Severe summer has led to drought and water scarcity, leading to WaSH challenges. |

## Tips for trainers

- Trainers may ensure that equal heterogeneity is present within all groups, so that there is a balanced representation of all stakeholders.
- Trainers may try to provide resources related to the health scenarios, maps, data, and demographic profiles of the states in the hypothetical scenarios.
- Trainers may appreciate the efforts of all participants and should try to encourage equal participation and contribution by all members.

# About the CECR and HER-CAP Project

## Centre of Excellence on Climate Resilience (CECR)

The National Institute of Disaster Management (NIDM) was constituted under an Act of Parliament with a vision to play the role of a premier institute for capacity development in India and the region. Under the Disaster Management Act 2005, NIDM has been assigned nodal responsibilities for human resource development, capacity building, training, research, documentation and policy advocacy in the field of disaster management. Both as a national Centre and then as the national Institute, NIDM has performed a crucial role in bringing disaster risk reduction to the forefront of the national agenda. The Institute believes that disaster risk reduction is possible only through promotion of a "Culture of Prevention" involving all stakeholders. The Institute works through strategic partnerships with various ministries and departments of the central, state and local governments, academic, research and technical organizations in India and abroad and other bi-lateral and multi-lateral international agencies. NIDM provides Capacity Building support to various National and State level agencies in the field of Disaster Management & Disaster Risk Reduction. The Institute's vision is to create a Disaster Resilient India by building the capacity at all levels for disaster prevention and preparedness.

## HER-CAP Project

NIDM in collaboration with WHO India has implemented the project “Health Adaptation and Resilience: Advancing Strategic Knowledge and Capacities” (HER-CAP). Under this project, the following documents have been drafted.

- National Health Adaptation Plan for disasters related illnesses' for Ministry of Health and Family Welfare.
- Training Manual on 'Health Adaptation and Resilience to Climate Risks'.
- A compendium of case studies on 'Climate Change related Disasters and Health Resilience'.
- Four Policy briefs on Regional Issues and Opportunities for Health System Resilience to Climatic Disasters. (For North, East & North-East, West and South Region of India).

- Along with this, four thematic papers on key areas are as follows:
  - Temperature related disasters: Heat and Cold Wave – Implications for Health Adaptation and Resilience.
  - Water related disasters: Floods and Drought - Implications for Health Adaptation and Resilience.
  - Air Pollution and Health: Special Focus on Air Quality Emergencies.
  - Disaster Waste Management and Health Risk Reduction.

Resilient India - Disaster Free India

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ISBN No.: 978-93-82571-53-7