
Handbook on Disaster Management for Nodal Officers (Compilation)



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Abbreviations	
ADPC	Asian Disaster Preparedness Centre
BSF	Border Security Force
CBRN	Chemical, Biological, Radiological and Nuclear Hazards
CCMNC	Cabinet Committee on Management of Natural Calamities
CCS	Cabinet Committee on Security
CISF	Central Industrial Security Force
CMG	Crisis Management Group
CRED	Centre for Research on the Epidemiology of Disasters
CRPF	Central Reserve Police Force
CSR	Corporate Social Responsibility
CWC	Central Water Commission
DAE	Department of Atomic Energy
DDMA	District Disaster Management Authority
DLNA	Damage, Loss and Needs Assessment
DM	Disaster Management
DRR	Disaster Risk Reduction
EM-DAT	Emergency Events Database
EU	European Union
FC	Finance Commission
GIS	Geographic Information System
GoI	Government of India
GSI	Geological Survey of India
HDI	Human Development Index
HLC	High Level Committee
ICG	Indian Coast Guard
IDMC	Indian Disaster Management Congress
IDNDR	International Decade for Natural Disaster Reduction
IIPA	Indian Institute of Public Administration
IMD	Indian Meteorological Department
INCOIS	India National Centre for Oceanic Information Services

IPCC	Intergovernmental Panel on Climate Change
ITBP	Indo-Tibetan Border Police
MHA	Ministry of Home Affairs
MoAFW	Ministry of Agriculture and Farmers Welfare
MoC	Ministry of Coal
MoCA	Ministry of Civil Aviation
MoD	Ministry of Defence
MoEFCC	Ministry of Environment, Forest and Climate Change
MoHFW	Ministry of Health and Family Welfare
MoM	Ministry of Mines
MoR	Ministry of Railway
MoRTH	Ministry of Road Transport and Highways
MoUD	Ministry of Urban Development
MoWR	Ministry of Jal Shakti
NCCF	National Calamity Contingency Fund
NCMC	National Crisis Management Committee
NDMA	National Disaster Management Authority
NDMP	National Disaster Management Plan
NDRF	National Disaster Response Force
NEC	National Executive Committee
NIDM	National Institute of Disaster Management
OECD	Organization for Economic Co-operation and Development
PDNA	Post Disaster Needs Assessment
PPP	Public-Private Partnership
PRI	Panchayati Raj Institute
PWD	Public Works Department
SASE	Snow and Avalanche Study Establishment
SDG	Sustainable Development Goals
SDMA	State Disaster Management Authority

SDRF	State Disaster Response Force
SEC	State Executive Committee
SOP	Standard Operating Procedures
ULB	Urban Local Body
UN	United Nations
UNDG	United Nations Development Group
UNFCC	United Nations Framework Convention on Climate Change

TERMINOLOGY ON DISASTER RISK REDUCTION(UNDRR)

Affected

People who are affected, either directly or indirectly, by a hazardous event. Directly affected are those who have suffered injury, illness or other health effects; who were evacuated, displaced, relocated or have suffered direct damage to their livelihoods, economic, physical, social, cultural and environmental assets. Indirectly affected are people who have suffered consequences, other than or in addition to direct effects, over time, due to disruption or changes in economy, critical infrastructure, basic services, commerce or work, or social, health and psychological consequences.

Annotation: People can be affected directly or indirectly. Affected people may experience short-term or long-term consequences to their lives, livelihoods or health and to their economic, physical, social, cultural and environmental assets. In addition, people who are missing or dead may be considered as directly affected.

Build back better

The use of the recovery, rehabilitation and reconstruction phases after a disaster to increase the resilience of nations and communities through integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems, and into the revitalization of livelihoods, economies and the environment.

Annotation: The term “societal” will not be interpreted as a political system of any country.

Building code

A set of ordinances or regulations and associated standards intended to regulate aspects of the design, construction, materials, alteration and occupancy of structures which are necessary to ensure human safety and welfare, including resistance to collapse and damage.

Annotation: Building codes can include both technical and functional standards. They should incorporate the lessons of international experience and

should be tailored to national and local circumstances. A systematic regime of enforcement is a critical supporting requirement for the effective implementation of building codes.

Capacity

The combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience.

Annotation: Capacity may include infrastructure, institutions, human knowledge and skills, and collective attributes such as social relationships, leadership and management.

Coping capacity is the ability of people, organizations and systems, using available skills and resources, to manage adverse conditions, risk or disasters. The capacity to cope requires continuing awareness, resources and good management, both in normal times as well as during disasters or adverse conditions. Coping capacities contribute to the reduction of disaster risks.

Capacity assessment is the process by which the capacity of a group, organization or society is reviewed against desired goals, where existing capacities are identified for maintenance or strengthening and capacity gaps are identified for further action.

Capacity development is the process by which people, organizations and society systematically stimulate and develop their capacities over time to achieve social and economic goals. It is a concept that extends the term of capacity-building to encompass all aspects of creating and sustaining capacity growth over time. It involves learning and various types of training,

but also continuous efforts to develop institutions, political awareness, financial resources, technology systems and the wider enabling environment.

Contingency planning

A management process that analyses disaster risks and establishes arrangements in advance to enable timely, effective and appropriate responses.

Annotation: Contingency planning results in organized and coordinated courses of action with clearly identified institutional roles and resources, information processes and operational arrangements for specific actors at times of need. Based on scenarios of possible emergency conditions or hazardous events, it allows key actors to envision, anticipate and solve problems that can arise during disasters. Contingency planning is an important part of overall preparedness. Contingency plans need to be regularly updated and exercised.

Critical infrastructure

The physical structures, facilities, networks and other assets which provide services that are essential to the social and economic functioning of a community or society.

Disaster

A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts.

Annotations: The effect of the disaster can be immediate and localized, but is often widespread and could last for a long period of time. The effect may test or exceed the capacity of a community or society to cope using its own resources, and therefore may require assistance from external sources, which could include neighboring jurisdictions, or those at the national or international levels.

Emergency is sometimes used interchangeably with the term disaster, as, for example, in the context of biological and technological hazards or health emergencies, which, however, can also relate to hazardous events that do not result in the serious disruption of the functioning of a community or society.

Disaster damage occurs during and immediately after the disaster. This is usually measured in physical units (e.g., square meters of housing, kilometers of roads, etc.), and describes the total or partial destruction of physical assets, the disruption of basic services and damages to sources of livelihood in the affected area.

Disaster impact is the total effect, including negative effects (e.g., economic losses) and positive effects (e.g., economic gains), of a hazardous event or a disaster. The term includes economic, human and environmental impacts, and may include death, injuries, disease and other negative effects on human physical, mental and social well-being.

For the purpose of the scope of the Sendai Framework for Disaster Risk Reduction 2015-2030 (para. 15), the following terms are also considered:

Small-scale disaster: a type of disaster only affecting local communities which require assistance beyond the affected community.

Large-scale disaster: a type of disaster affecting a society which requires national or international assistance.

Frequent and infrequent disasters: depend on the probability of occurrence and the return period of a given hazard and its impacts. The impact of frequent disasters could be cumulative, or become chronic for a community or a society.

A slow-onset disaster is defined as one that emerges gradually over time. Slow-onset disasters could be associated with, e.g., drought, desertification, sea-level rise, epidemic disease.

A sudden-onset disaster is one triggered by a hazardous event that emerges quickly or unexpectedly. Sudden-onset disasters could be associated with, e.g., earthquake, volcanic eruption, flash flood, chemical explosion, critical infrastructure failure, transport accident.

Disaster loss database

A set of systematically collected records about disaster occurrence, damages, losses and impacts, compliant with the Sendai Framework for Disaster Risk Reduction 2015-2030 monitoring minimum requirements.

Disaster management

The organization, planning and application of measures preparing for, responding to and recovering from disasters.

Annotation: Disaster management may not completely avert or eliminate the threats; it focuses on creating and implementing preparedness and other plans to decrease the impact of disasters and “build back better”. Failure to create and apply a plan could lead to damage to life, assets and lost revenue.

Emergency management is also used, sometimes interchangeably, with the term disaster management, particularly in the context of biological and technological hazards and for health emergencies. While there is a large degree of overlap, an emergency can also relate to hazardous events that do not result in the serious disruption of the functioning of a community or society.

Disaster risk

The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity.

Annotation: The definition of disaster risk reflects the concept of hazardous events and disasters as the outcome of continuously present conditions of risk. Disaster risk comprises different types of potential losses which are

often difficult to quantify. Nevertheless, with knowledge of the prevailing hazards and the patterns of population and socioeconomic development, disaster risks can be assessed and mapped, in broad terms at least.

It is important to consider the social and economic contexts in which disaster risks occur and that people do not necessarily share the same perceptions of risk and their underlying risk factors.

Acceptable risk, or tolerable risk, is therefore an important subterm; the extent to which a disaster risk is deemed acceptable or tolerable depends on existing social, economic, political, cultural, technical and environmental conditions. In engineering terms, acceptable risk is also used to assess and define the structural and non-structural measures that are needed in order to reduce possible harm to people, property, services and systems to a chosen tolerated level, according to codes or “accepted practice” which are based on known probabilities of hazards and other factors.

Residual risk is the disaster risk that remains even when effective disaster risk reduction measures are in place, and for which emergency response and recovery capacities must be maintained. The presence of residual risk implies a continuing need to develop and support effective capacities for emergency services, preparedness, response and recovery, together with socioeconomic policies such as safety nets and risk transfer mechanisms, as part of a holistic approach.

Disaster risk assessment

A qualitative or quantitative approach to determine the nature and extent of disaster risk by analyzing potential hazards and evaluating existing conditions of exposure and vulnerability that together could harm people, property, services, livelihoods and the environment on which they depend.

Annotation: Disaster risk assessments include: the identification of hazards; a review of the technical characteristics of hazards such as their location, intensity, frequency and probability; the analysis of exposure and vulnerability, including the physical, social, health, environmental and

economic dimensions; and the evaluation of the effectiveness of prevailing and alternative coping capacities with respect to likely risk scenarios.

Disaster risk governance

The system of institutions, mechanisms, policy and legal frameworks and other arrangements to guide, coordinate and oversee disaster risk reduction and related areas of policy.

Annotation: Good governance needs to be transparent, inclusive, collective and efficient to reduce existing disaster risks and avoid creating new ones.

Disaster risk information

Comprehensive information on all dimensions of disaster risk, including hazards, exposure, vulnerability and capacity, related to persons, communities, organizations and countries and their assets.

Annotation: Disaster risk information includes all studies, information and mapping required to understand the disaster risk drivers and underlying risk factors.

Disaster risk management

Disaster risk management is the application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses.

Annotation: Disaster risk management actions can be distinguished between prospective disaster risk management, corrective disaster risk management and compensatory disaster risk management, also called residual risk management.

Prospective disaster risk management activities address and seek to avoid the development of new or increased disaster risks. They focus on addressing disaster risks that may develop in future if disaster risk reduction policies are

not put in place. Examples are better land-use planning or disaster-resistant water supply systems.

Corrective disaster risk management activities address and seek to remove or reduce disaster risks which are already present and which need to be managed and reduced now. Examples are the retrofitting of critical infrastructure or the relocation of exposed populations or assets.

Compensatory disaster risk management activities strengthen the social and economic resilience of individuals and societies in the face of residual risk that cannot be effectively reduced. They include preparedness, response and recovery activities, but also a mix of different financing instruments, such as national contingency funds, contingent credit, insurance and reinsurance and social safety nets.

Community-based disaster risk management promotes the involvement of potentially affected communities in disaster risk management at the local level. This includes community assessments of hazards, vulnerabilities and capacities, and their involvement in planning, implementation, monitoring and evaluation of local action for disaster risk reduction.

Local and indigenous peoples' approach to disaster risk management is the recognition and use of traditional, indigenous and local knowledge and practices to complement scientific knowledge in disaster risk assessments and for the planning and implementation of local disaster risk management.

Disaster risk management plans set out the goals and specific objectives for reducing disaster risks together with related actions to accomplish these objectives. They should be guided by the Sendai Framework for Disaster Risk Reduction 2015-2030 and considered and coordinated within relevant development plans, resource allocations and programme activities. National-level plans need to be specific to each level of administrative responsibility and adapted to the different social and geographical circumstances that are present. The time frame and responsibilities for implementation and the sources of funding should be specified in the plan. Linkages to sustainable

development and climate change adaptation plans should be made where possible.

Disaster risk reduction

Disaster risk reduction is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development.

Annotation: Disaster risk reduction is the policy objective of disaster risk management, and its goals and objectives are defined in disaster risk reduction strategies and plans.

Disaster risk reduction strategies and policies define goals and objectives across different timescales and with concrete targets, indicators and time frames. In line with the Sendai Framework for Disaster Risk Reduction 2015-2030, these should be aimed at preventing the creation of disaster risk, the reduction of existing risk and the strengthening of economic, social, health and environmental resilience.

A global, agreed policy of disaster risk reduction is set out in the United Nations endorsed Sendai Framework for Disaster Risk Reduction 2015-2030, adopted in March 2015, whose expected outcome over the next 15 years is: “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”.

Early warning system

An integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enables individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events.

Annotations: Effective “end-to-end” and “people-centered” early warning systems may include four interrelated key elements: (1) disaster risk

knowledge based on the systematic collection of data and disaster risk assessments; (2) detection, monitoring, analysis and forecasting of the hazards and possible consequences; (3) dissemination and communication, by an official source, of authoritative, timely, accurate and actionable warnings and associated information on likelihood and impact; and (4) preparedness at all levels to respond to the warnings received. These four interrelated components need to be coordinated within and across sectors and multiple levels for the system to work effectively and to include a feedback mechanism for continuous improvement. Failure in one component or a lack of coordination across them could lead to the failure of the whole system.

Multi-hazard early warning systems address several hazards and/or impacts of similar or different type in contexts where hazardous events may occur alone, simultaneously, cascading or cumulatively over time, and taking into account the potential interrelated effects. A multi-hazard early warning system with the ability to warn of one or more hazards increases the efficiency and consistency of warnings through coordinated and compatible mechanisms and capacities, involving multiple disciplines for updated and accurate hazards identification and monitoring for multiple hazards.

Economic loss

Total economic impact that consists of direct economic loss and indirect economic loss.

Direct economic loss: the monetary value of total or partial destruction of physical assets existing in the affected area. Direct economic loss is nearly equivalent to physical damage.

Indirect economic loss: a decline in economic value added as a consequence of direct economic loss and/or human and environmental impacts.

Annotations: Examples of physical assets that are the basis for calculating direct economic loss include homes, schools, hospitals, commercial and governmental buildings, transport, energy, telecommunications infrastructures and other infrastructure; business assets and industrial plants; and production such as crops, livestock and production infrastructure. They may also encompass environmental assets and cultural heritage.

Direct economic losses usually happen during the event or within the first few hours after the event and are often assessed soon after the event to estimate recovery cost and claim insurance payments. These are tangible and relatively easy to measure.

Indirect economic loss includes microeconomic impacts (e.g., revenue declines owing to business interruption), mesoeconomic impacts (e.g., revenue declines owing to impacts on natural assets, interruptions to supply chains or temporary unemployment) and macroeconomic impacts (e.g., price increases, increases in government debt, negative impact on stock market prices and decline in GDP). Indirect losses can occur inside or outside of the hazard area and often have a time lag. As a result, they may be intangible or difficult to measure

Evacuation

Moving people and assets temporarily to safer places before, during or after the occurrence of a hazardous event in order to protect them.

Annotation: Evacuation plans refer to the arrangements established in advance to enable the moving of people and assets temporarily to safer places before, during or after the occurrence of a hazardous event. Evacuation plans may include plans for return of evacuees and options to shelter in place.

Exposure

The situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas.

Annotation: Measures of exposure can include the number of people or types of assets in an area. These can be combined with the specific vulnerability and capacity of the exposed elements to any particular hazard to estimate the quantitative risks associated with that hazard in the area of interest.

Extensive disaster risk

The risk of low-severity, high-frequency hazardous events and disasters, mainly but not exclusively associated with highly localized hazards.

Annotation: Extensive disaster risk is usually high where communities are exposed to, and vulnerable to, recurring localized floods, landslides, storms or drought. Extensive disaster risk is often exacerbated by poverty, urbanization and environmental degradation.

Hazard

A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation.

Annotations: Hazards may be natural, anthropogenic or socionatural in origin. **Natural hazards** are predominantly associated with natural processes and phenomena. **Anthropogenic hazards**, or human-induced hazards, are induced entirely or predominantly by human activities and choices. This term does not include the occurrence or risk of armed conflicts and other situations of social instability or tension which are subject to international humanitarian law and national legislation. Several hazards are **socionatural**, in that they are associated with a combination of natural and anthropogenic factors, including environmental degradation and climate change.

Hazards may be single, sequential or combined in their origin and effects. Each hazard is characterized by its location, intensity or magnitude, frequency and probability. Biological hazards are also defined by their infectiousness or toxicity, or other characteristics of the pathogen such as dose-response, incubation period, case fatality rate and estimation of the pathogen for transmission.

Multi-hazard means (1) the selection of multiple major hazards that the country faces, and (2) the specific contexts where hazardous events may occur simultaneously, cascading or cumulatively over time, and taking into account the potential interrelated effects.

Hazards include (as mentioned in the Sendai Framework for Disaster Risk Reduction 2015-2030) biological, environmental, geological, hydro-meteorological and technological processes and phenomena.

Biological hazards are of organic origin or conveyed by biological vectors, including pathogenic microorganisms, toxins and bioactive substances. Examples are bacteria, viruses or parasites, as well as venomous wildlife and insects, poisonous plants and mosquitoes carrying disease-causing agents.

Environmental hazards may include chemical, natural and biological hazards. They can be created by environmental degradation or physical or chemical pollution in the air, water and soil. However, many of the processes and phenomena that fall into this category may be termed drivers of hazard and risk rather than hazards in themselves, such as soil degradation, deforestation, loss of biodiversity, salinization and sea-level rise.

Geological or geophysical hazards originate from internal earth processes. Examples are earthquakes, volcanic activity and emissions, and related geophysical processes such as mass movements, landslides, rockslides, surface collapses and debris or mud flows. Hydrometeorological factors are important contributors to some of these processes. Tsunamis are difficult to categorize: although they are triggered by undersea earthquakes and other geological events, they essentially become an oceanic process that is manifested as a coastal water-related hazard.

Hydrometeorological hazards are of atmospheric, hydrological or oceanographic origin. Examples are tropical cyclones (also known as typhoons and hurricanes); floods, including flash floods; drought; heatwaves and cold spells; and coastal storm surges. Hydrometeorological conditions may also be a factor in other hazards such as landslides, wildland fires, locust plagues, epidemics and in the transport and dispersal of toxic substances and volcanic eruption material.

Technological hazards originate from technological or industrial conditions, dangerous procedures, infrastructure failures or specific human

activities. Examples include industrial pollution, nuclear radiation, toxic wastes, dam failures, transport accidents, factory explosions, fires and chemical spills. Technological hazards also may arise directly as a result of the impacts of a natural hazard event.

Hazardous event

The manifestation of a hazard in a particular place during a particular period of time.

Annotation: Severe hazardous events can lead to a disaster as a result of the combination of hazard occurrence and other risk factors.

Intensive disaster risk

The risk of high-severity, mid- to low-frequency disasters, mainly associated with major hazards.

Annotation: Intensive disaster risk is mainly a characteristic of large cities or densely populated areas that are not only exposed to intense hazards such as strong earthquakes, active volcanoes, heavy floods, tsunamis or major storms but also have high levels of vulnerability to these hazards.

Mitigation

The lessening or minimizing of the adverse impacts of a hazardous event.

Annotation: The adverse impacts of hazards, in particular natural hazards, often cannot be prevented fully, but their scale or severity can be substantially lessened by various strategies and actions. Mitigation measures include engineering techniques and hazard-resistant construction as well as improved environmental and social policies and public awareness. It should be noted that, in climate change policy, “mitigation” is defined differently, and is the term used for the reduction of greenhouse gas emissions that are the source of climate change.

National Platform for Disaster Risk Reduction

A generic term for national mechanisms for coordination and policy guidance on disaster risk reduction that are multisectoral and

interdisciplinary in nature, with public, private and civil society participation involving all concerned entities within a country.

Annotations: Effective government coordination forums are composed of relevant stakeholders at national and local levels and have a designated national focal point. For such mechanisms to have a strong foundation in national institutional frameworks, further key elements and responsibilities should be established through laws, regulations, standards and procedures, including: clearly assigned responsibilities and authority; building awareness and knowledge of disaster risk through the sharing and dissemination of non-sensitive disaster risk information and data; contributing to and coordinating reports on local and national disaster risk; coordinating public awareness campaigns on disaster risk; facilitating and supporting local multisectoral cooperation (e.g., among local governments); and contributing to the determination of and reporting on national and local disaster risk management plans and all policies relevant for disaster risk management.

Preparedness

The knowledge and capacities developed by governments, response and recovery organizations, communities and individuals to effectively anticipate, respond to and recover from the impacts of likely, imminent or current disasters.

Annotation: Preparedness action is carried out within the context of disaster risk management and aims to build the capacities needed to efficiently manage all types of emergencies and achieve orderly transitions from response to sustained recovery.

Preparedness is based on a sound analysis of disaster risks and good linkages with early warning systems, and includes such activities as contingency planning, the stockpiling of equipment and supplies, the development of arrangements for coordination, evacuation and public information, and associated training and field exercises. These must be supported by formal institutional, legal and budgetary capacities. The related term “readiness” describes the ability to quickly and appropriately respond when required. A **preparedness plan** establishes arrangements in advance to enable timely,

effective and appropriate responses to specific potential hazardous events or emerging disaster situations that might threaten society or the environment.

Prevention

Activities and measures to avoid existing and new disaster risks.

Annotations: Prevention (i.e., disaster prevention) expresses the concept and intention to completely avoid potential adverse impacts of hazardous events. While certain disaster risks cannot be eliminated, prevention aims at reducing vulnerability and exposure in such contexts where, as a result, the risk of disaster is removed. Examples include dams or embankments that eliminate flood risks, land-use regulations that do not permit any settlement in high-risk zones, seismic engineering designs that ensure the survival and function of a critical building in any likely earthquake and immunization against vaccine-preventable diseases. Prevention measures can also be taken during or after a hazardous event or disaster to prevent secondary hazards or their consequences, such as measures to prevent the contamination of water.

Reconstruction

The medium- and long-term rebuilding and sustainable restoration of resilient critical infrastructures, services, housing, facilities and livelihoods required for the full functioning of a community or a society affected by a disaster, aligning with the principles of sustainable development and “build back better”, to avoid or reduce future disaster risk.

Recovery

The restoring or improving of livelihoods and health, as well as economic, physical, social, cultural and environmental assets, systems and activities, of a disaster-affected community or society, aligning with the principles of sustainable development and “build back better”, to avoid or reduce future disaster risk.

Rehabilitation

The restoration of basic services and facilities for the functioning of a community or a society affected by a disaster.

Resilience

The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management.

Response

Actions taken directly before, 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.

Annotation: Disaster response is predominantly focused on immediate and short-term needs and is sometimes called disaster relief. Effective, efficient and timely response relies on disaster risk-informed preparedness measures, including the development of the response capacities of individuals, communities, organizations, countries and the international community.

The institutional elements of response often include the provision of emergency services and public assistance by public and private sectors and community sectors, as well as community and volunteer participation. “Emergency services” are a critical set of specialized agencies that have specific responsibilities in serving and protecting people and property in emergency and disaster situations. They include civil protection authorities and police and fire services, among many others. The division between the response stage and the subsequent recovery stage is not clear-cut. Some response actions, such as the supply of temporary housing and water supplies, may extend well into the recovery stage.

Retrofitting

Reinforcement or upgrading of existing structures to become more resistant and resilient to the damaging effects of hazards.

Annotation: Retrofitting requires consideration of the design and function of the structure, the stresses that the structure may be subject to from particular

hazards or hazard scenarios and the practicality and costs of different retrofitting options. Examples of retrofitting include adding bracing to stiffen walls, reinforcing pillars, adding steel ties between walls and roofs, installing shutters on windows and improving the protection of important facilities and equipment.

Risk transfer

The process of formally or informally shifting the financial consequences of particular risks from one party to another, whereby a household, community, enterprise or State authority will obtain resources from the other party after a disaster occurs, in exchange for ongoing or compensatory social or financial benefits provided to that other party.

Annotation: Insurance is a well-known form of risk transfer, where coverage of a risk is obtained from an insurer in exchange for ongoing premiums paid to the insurer. Risk transfer can occur informally within family and community networks where there are reciprocal expectations of mutual aid by means of gifts or credit, as well as formally, wherein governments, insurers, multilateral banks and other large risk-bearing entities establish mechanisms to help cope with losses in major events. Such mechanisms include insurance and reinsurance contracts, catastrophe bonds, contingent credit facilities and reserve funds, where the costs are covered by premiums, investor contributions, interest rates and past savings, respectively.

Structural and non-structural measures

Structural measures are any physical construction to reduce or avoid possible impacts of hazards, or the application of engineering techniques or technology to achieve hazard resistance and resilience in structures or systems. Non-structural measures are measures not involving physical construction which use knowledge, practice or agreement to reduce disaster risks and impacts, in particular through policies and laws, public awareness raising, training and education.

Annotation: Common structural measures for disaster risk reduction include dams, flood levies, ocean wave barriers, earthquake-resistant construction and evacuation shelters. Common non-structural measures include building

codes, land-use planning laws and their enforcement, research and assessment, information resources and public awareness programmes. Note that in civil and structural engineering, the term “structural” is used in a more restricted sense to mean just the load-bearing structure, and other parts such as wall cladding and interior fittings are termed “non-structural”.

Underlying disaster risk drivers

Processes or conditions, often development-related, that influence the level of disaster risk by increasing levels of exposure and vulnerability or reducing capacity.

Annotation: Underlying disaster risk drivers — also referred to as underlying disaster risk factors — include poverty and inequality, climate change and variability, unplanned and rapid urbanization and the lack of disaster risk considerations in land management and environmental and natural resource management, as well as compounding factors such as demographic change, non-disaster risk-informed policies, the lack of regulations and incentives for private disaster risk reduction investment, complex supply chains, the limited availability of technology, unsustainable uses of natural resources, declining ecosystems, pandemics and epidemics.

Vulnerability

The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards.

Annotation: For positive factors which increase the ability of people to cope with hazards.

The Prime Minister's 10-point Agenda on DRR:

- All development sectors must imbibe the principles of disaster risk management.
- Work towards risk coverage for all-starting from poor households to SMEs to multi-national corporations to nation states.
- Encourage greater involvement and leadership of women in disaster risk management.
- Invest in risk mapping globally. For mapping risks related to hazards like earthquakes we have accepted standards and parameters.
- Leverage technology to enhance the efficiency of our disaster risk management efforts.
- Develop a network of universities to work on disaster issues.
- Utilise the opportunities provided by social media and mobile technologies.
- Build on local capacity and initiative.
- Opportunity to learn from a disaster must not be wasted. After every disaster there are papers on lessons that are rarely applied.
- Bring about greater cohesion in international response to disasters.

1. DISASTER OVERVIEW

Disasters hurt the poor and vulnerable the most. Over the past 30 years, more than 2.5 million people and almost \$4 trillion have been lost to disasters caused by natural hazards, with global losses quadrupling from \$50 billion a year in the 1980s to \$200 billion in the last decade. The World Bank's Shock Waves: Managing the Impacts of Climate Change on Poverty report finds that almost 75% of the losses are attributable to extreme weather events, and climate change threatens to push an additional 100 million people into extreme poverty by 2030. The Bank's Unbreakable report finds that natural disasters have had large and long-lasting impacts on poverty. Population growth and rapid urbanization are driving the increase in disaster risks.

The United Nations estimates that more than two-thirds of the world's population will live in cities by 2050. The Bank's Aftershocks report explains that these trends could put 1.3 billion people and \$158 trillion in assets at risk from river and coastal floods alone. According to the Bank's Investing in Urban Resilience report, by 2030, without significant investment into making cities more resilient, natural disasters may cost cities worldwide \$314 billion each year.

Mainstreaming disaster risk management into development planning can reverse the current trend of rising disaster impact. Furthermore, when countries rebuild stronger, faster and more inclusively after disasters, they can reduce the impact on people's livelihoods and well-being by as much as 31%, potentially cutting global average losses. If countries act decisively, they can save lives and assets. However, many developing countries lack the tools, expertise, and instruments to factor the potential impacts of disasters into their investment decisions.

1.1 SOUTH ASIA OVERVIEW

Natural disasters are caused by extreme occurrences in nature for which society is unprepared. Disasters have not only disrupted the normal course of life of affected communities and countries in South Asia Region, but have also halted development efforts. Funds originally earmarked for new initiatives must be transferred to relief, response, and rehabilitation work, often crowding out new infrastructure and capital development. In the past ten years alone, it is estimated that the countries in the region have suffered from over US\$50 billion worth of damages. These figures do not include losses in informal sectors of the economy or long-term losses related to environmental and social capital, both of which are difficult to measure and often go unreported.

South Asia Region is highly exposed and highly vulnerable to the impacts of hazard events. Between 1971 and 2009, South Asia has experienced 1,017 natural disasters that meet the criteria of EMDAT. The absolute number of disasters has increased steadily starting with eight reported disasters in 1971, to more than 40 in 2009 – a fivefold increase. These events have cumulatively affected over 2 billion people and have caused over 800,000 deaths. Direct economic losses recorded over this time period amount to over US\$80 billion, a figure that does not account for substantial indirect losses. In particular, high-impact single events have caused massive damage. However, it is important to note that the frequency and intensity of the hazards have not increased. This implies that the growth in the number and impact of disasters is related to increased exposure and/or greater vulnerability to hazard events. The increase in reported disasters is driven, in large part, by a greater number of hydrometeorological events. The number of seismic events has remained relatively steady over the past 40 years, but flood and storm events have

become increasingly common despite relatively consistent rainfall patterns. The growth in the number of hydro-meteorological events is driven by the region's limited capacity to manage high rainfall and storm events and an increased concentration of assets in high risk areas. Combined, this results in a greater number of disasters and higher economic losses. In fact, South Asia is the most exposed region in the world to flooding and highly exposed to cyclones. Of the world's total population exposed to floods each year, 64 percent of them are in South Asia Region. Furthermore, within the developing world, South Asia is the second most exposed region to cyclones.

Economic losses due to disaster are also on the rise both from an increase in the number of disaster events and from an increase in the average loss associated with each disaster event coupled with a greater concentration of exposed assets. As the population grows, urbanization increases, cities become more developed, and the accumulated economic wealth that is exposed to disaster events grows. Over the past 40 years, the total infrastructure spending in South Asia Region has increased exponentially, with gross fixed capital formation being approximately 50 times greater in 2010 than it was in 1970. As a result, cities today have highly concentrated and highly valued productive assets exposed, along with significant amounts of public and private infrastructure that are not resilient to hazard events despite increased levels of development.

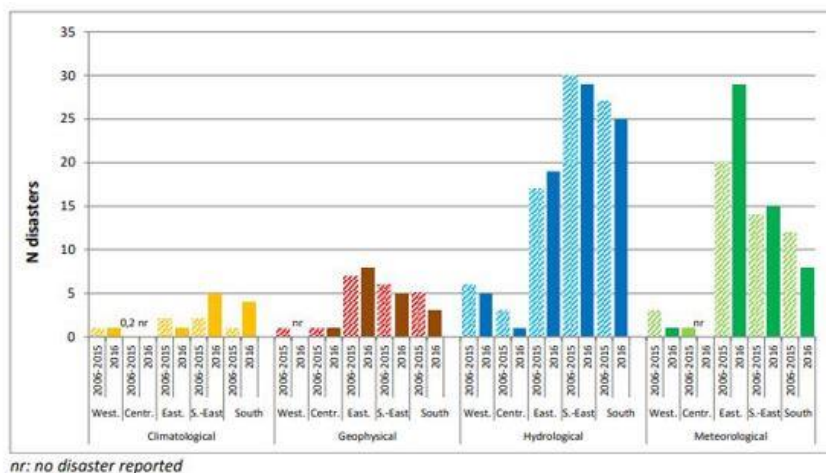
Not only have direct losses resulting from the physical destruction of assets increased, indirect losses due to natural disasters have also multiplied. Indirect losses include the broader consequences of disasters, including the interruption of business operations, a decrease in private and public revenues, widespread unemployment, and market destabilization. By their very nature, indirect losses are harder to measure than losses stemming directly from physical damage, and

only recently have processes and standards been in place in South Asia to quantify these losses. Indirect losses are spread over a larger area and can transcend local and international boundaries. Evidence to date suggests that the proportion of indirect impacts increases in larger disasters, and thus may constitute a larger fraction of total losses and damage in larger disasters than in smaller ones. The impact of hazard events varies by the type of disaster in South Asia Region. Over the past 40 years, there have only been 79 earthquake events in the region. However, these events are associated with high mortality rates due to their sudden and concentrated impact. On the other hand, flood events are the most common natural hazard in the region and affect the greatest number of people and assets, but the relative gradual onset of this natural event compared to other natural hazards results in a smaller number of human fatalities. Economic losses due to floods in South Asia are, however, especially high due to the long-term direct and indirect impact on assets and production. Relative to the size of South Asia Region's GDP, flood losses are approximately 15 times greater than losses in OECD countries. In contrast, cyclones are rapid onset and high intensity events that lead to higher fatalities but fewer damages.

Across all types of events, the human impact of disasters in South Asia Region is high. In the last 40 years, an estimated 825,000 people in South Asia Region lost their lives in natural disasters. In the past decade alone, nearly 700 million people, half of the region's population, was affected by one or more disasters. Most countries in South Asia Region are among those countries most at risk of mortality due to disasters, both on an absolute and a relative level (Absolute risk is the average annual expected mortality; relative risk describes the average annual expected number of deaths as a proportion of national population). The damages caused by natural disasters are exerting more and more pressure on

development opportunities. Public expenditure is placed under stress by the repeated need to reallocate capital budgets away from long term development planning and towards reconstruction activities in post-disaster environments. Several state governments spend significantly more on relief and damages than on their rural development programs. For example, in the state of Maharashtra, India, a single drought in 2003 and a flood in 2005 consumed more of the state budget (US\$3.5 billion) than the entire planned expenditure (US\$3.04 billion) on irrigation, agriculture, and rural development for the 2002–2007 planning period.

Number of Disasters occurred in South Asia by typologies of Disasters



Source:(CRED 2017)

With the exception of Central Asia, all Asian regions had a 2006-2015 annual average of climatological disasters. In 2016, droughts remained close to the annual average in Central and East Asia, while doubling, at least, in South-East and South Asia. In this last region, two wildfires were reported for the first time since 2006. This kind of disaster was very rarely reported in Asia in the last decade, with the exception of the Western region where one occurred in 2016. In all the Asian regions, the numbers of geophysical disasters, mainly

earthquakes, remained close to their 2006-2015 annual average, with the exception of South Asia where it was the fourth lowest since 2006. No disasters from volcanic activity were reported in 2016. Hydrological disasters are the most frequently reported disasters in all Asian regions, with the exception of East Asia where meteorological disasters are more frequent. In all regions, numbers of hydrological disasters remained close to their 2006-2015 annual average. In West and Central Asia, the numbers of storms and extreme temperature episodes decreased slightly, compared to their 2006-2015 annual average. In South Asia, in 2016, while the number of storms remained near its annual average, the number of extreme temperature episodes was below its 2006-2015 annual average, which explains the overall decrease. In South-East Asia, in 2016, the number of storms was equal to its annual average, while an extreme temperature episode was reported for the first time since 2006. In East Asia, the number of storms was, in 2016, 20% above its annual average, while the number of extreme temperature episodes was the highest since 2006 at 3.5 times higher than the annual average.

1.2 INDIA DISASTER RISK PROFILE

India is prone to all major natural hazards and has experienced the highest number of disasters in South Asia, with an increasing trend in terms of events and casualties over the past 40 years. The country is particularly exposed to earthquakes (and associated tsunamis), floods, droughts, cyclones, and landslides. About 60 percent of the landmass is prone to earthquakes of varying intensities, over 8 percent is prone to floods, 75 percent of coastline is prone to cyclones, and 68 percent of the area is susceptible to drought. Direct losses in India average 2 percent of India's GDP, and have been as high as 12 percent of central government revenues. Given its geographic diversity, the climate

ranges from arid desert, alpine tundra and glaciers in the north, to humid tropical regions in the southwest and on the islands. Situated on the Indian Plate, India is surrounded by the Arabian Sea in the southwest, (where the Lakshadweep islands are located) the Indian Ocean in the south, and the Bay of Bengal in the southeast, (which includes the two island territories of Andaman and Nicobar). The north is marked by the mountain ranges of the Himalayas, the Hindu Kush, the Patkai, and also includes the Punjab Plain. The Thar Desert lies in the west, and the forested mountain regions lie in the east. Central India includes the watershed region of the Indo-Gangetic Plain and the Great Plain.

Several recent events have led to major disasters. The 1988 Nepal-India earthquake and the 2005 Kashmir earthquake, Kerala floods 2018, cyclone FANI 2019 are few of the largest disaster events over the past 40 years. In 2004, the Indian Ocean Tsunami heavily impacted the Andaman and Nicobar Islands, as well as the eastern coastline. Floods, the greatest driver of economic loss, occur in many areas on an annual basis. For example, the monsoon rains can cause flooding in the north, northeast and south of India. In addition, extreme precipitation also leads to flash floods such as the 2005 Mumbai flooding. Cyclones are also prevalent, driven by the Inter-Tropical Convergence Zones in the Bay of Bengal and the Arabian Sea, which can have devastating impacts. Landslides are frequent in the Himalayan ranges, caused by both heavy rainfall and degraded land as a result of human interventions. Highly vulnerable populations in hazard-prone rural areas, and large urban agglomerations with hazard exposure and concentrated economic activity, make India vulnerable to natural hazards. Rural vulnerability to hazards is high, particularly flood and drought risk, and 70 percent of India's population lives in rural areas. Urban vulnerability to hazards is high given the rapid urban

growth that is characterized by concentrated economic activity, unplanned developments, and growing slum populations. High population densities not only in urban areas, but also along large rivers and coasts, compound increasing vulnerabilities.

1.3 POTENTIAL IMPACT OF CLIMATE CHANGES

The 4th assessment report of the IPCC predicts that the incidence and intensity of flood, drought, and cyclone events are going to increase in the future. The report highlights key trends for India, notably a general increase in temperature with high seasonal variations. While the total amount of monsoon rainfall is expected to change comparably little, the number of days of rain is expected to decrease, especially in the western and central parts, and the days of extreme rainfall events are likely to increase. These projections are likely to reinforce the increasing trend of disaster incidences in India.

2. AN INTRODUCTION TO DISASTER MANAGEMENT

2.1 CONCEPT AND MEANING

A disaster is a consequence of a sudden disastrous event which seriously disrupts the normal function of the society or the community to the extent that it cannot subsist without outside help. A disaster is not just the occurrence of an event such as an earthquake, flood, conflict, health epidemic or an industrial accident; a disaster occurs if that event/process negatively impacts human populations. A disaster can be defined as any tragic event stemming from events such as earthquakes, floods, catastrophic accidents, fires, or explosions. It is a phenomenon that disasters can cause damage to life, property and destroy the economic, social and cultural life of people.

Disasters combine two elements: hazard, and the vulnerability of affected people. "A disaster occurs when a hazard exposes the vulnerability of individuals and communities in such a way that their lives are directly threatened or sufficient harm has been done to their community's economic and social structure to undermine their ability to survive." Disaster is the exposure of a group of people to a hazard, leading to a serious disruption of the functioning of a society and causing human, material, economic or environmental losses which exceed the ability of the affected community or society to cope. A disaster results from a combination of hazards and vulnerability that exceeds the capacity of a society to reduce the potential negative consequences of risk. It is often described as a result of the combination of: the exposure to a hazard; the conditions of vulnerability that are present; and insufficient capacity or measures to reduce or cope with the potential negative consequences. Disaster impacts may include loss of life, injury, disease and other negative effects on human physical, mental and social

well-being, together with damage to property, destruction of assets, loss of services, social and economic disruption and environmental degradation.

To understand Disaster Management, it is necessary to understand the concepts of Vulnerability, Risk, Hazard, Capacity and Disaster that are embedded in the process of Disaster Management. These have been discussed below.

2.2 HAZARDS

Hazard may be defined as “a dangerous condition or event, that threat or have the potential for causing injury to life or damage to property or the environment.” A hazard may be any event that threatens life and property and disrupts normal life. Hazards can be both natural as well as man-made (Unnatural)(Nikhil Roy May 2016).

- **Natural Hazards:** These are extreme events caused by physical forces working on or within the earth’s surface. Examples of natural hazards include earthquakes, volcanoes, floods, cyclones, droughts etc. Because natural hazards are created by physical forces, it is not possible to stop them. However, by proper planning and policymaking, the risk to these hazards can be drastically reduced.
- **Man-Made Hazards (Unnatural Hazards):** These hazards are caused by human agencies either through negligence or for vindictive purposes. Examples of Unnatural Hazards include terrorism, fire, accidents etc. Through raising awareness, better education, and better urban and rural management, these hazards can be tackled and removed.

2.3 VULNERABILITY

Vulnerability is a very relative concept. It refers to the inability of an individual, group, society, or a nation to deal with disasters effectively. It has

been observed that when a disaster strikes any region, the people most affected are more likely to be poor, women, children, and old. These are the groups that are referred to as vulnerable. Many factors like economic, social, and political affect the capacity of people to deal with disasters. For example, low income groups are more likely to live in areas that are exposed to disaster risk and more thus more likely to bear the brunt of any such event. Conversely, when a disaster strikes, it is the poor who have a paucity of resources to deal with it. In the past, Vulnerability has been limited to physical susceptibility; however, understanding of this concept is now becoming more comprehensive, to include susceptibility, exposure, coping capacity, adaptive capacity, social inequalities, and physical, institutional, and economic weaknesses. However, Anderson and Woodrow (1990) categorize vulnerability into three areas namely:

- **Physical/ Material Vulnerability:** For example, poor people who have few physical/ material resources usually suffer more from disaster than rich people. People who are poor often live on marginal lands; they don't have any savings or insurance; they are in poor health. These factors make them more vulnerable to disaster and mean that they have harder time surviving and recovering from a calamity than people who are better off economically.
- **Social/Organizational:** Experience shows that people who have been 'marginalized' in social, economic or political terms are vulnerable to suffering from disasters whereas groups which are well organized and in which there is a high commitment to each other suffer less when catastrophe strikes. For example, deep divisions can lead to conflict and war. Conflict on resources due to poverty can also lead to violence. A

second area of vulnerability then, is the social/organizational and economic realm.

- Attitude and Motivational Vulnerability - Experience also shows that the people who do not have confidence in their ability to affect change and feel defeated by events they cannot control, are harder hit by disasters. This is in contrast to those who have a sense of their ability to bring about the changes they desire(NIDM, Basics of Disaster Management 2017).

2.4 CAPACITY

Capacity can be defined as “resources, means and strengths which exist in households and communities and which enable them to cope with, withstand, prepare for, prevent, mitigate or quickly recover from a disaster”. People’s capacity can also be taken into account. Capacities could be classified into physical and socio-economic capacities.

- Physical Capacity: People whose houses have been destroyed by the cyclone or crops have been destroyed by the flood can salvage things from their homes and from their farms. Some family members have skills, which enable them to find employment if they migrate, either temporarily or permanently.
- Socio-economic Capacity: In most of the disasters, people suffer their greatest losses in the physical and material realm. Rich people have the capacity to recover soon because of their wealth. In fact, they are seldom hit by disasters because they live in safe areas and their houses are built with stronger materials. However, even when everything is destroyed, they have the capacity to cope up with it. Hazards are always prevalent, but the hazard becomes a disaster only when the frequency or likelihood of a hazard and the vulnerability of the community increases the risk of being severely affected.

2.5 RISK

Risk is a measure of the expected losses (deaths, injuries, property, economic activity etc.) due to a hazard of a particular magnitude occurring in a given area over a specific time period. A community/locality is said to be at 'risk' when it is exposed to hazards and is likely to be adversely affected by its impact. Thus, Disaster risk can be explained most simply as the function of a specific hazard, physical exposure of elements at risk and human vulnerability. A fundamental principle of strategic disaster management is recognizing that risk and trying to minimize it. Risk management comprises risk assessment and analysis, and the implementation of strategies and specific actions to control, reduce and transfer risks. It is widely practiced by organizations to minimize risk in investment decisions and to address operational risks such as those of business disruption, production failure, environmental damage, social impacts and damage from fire and natural hazards.

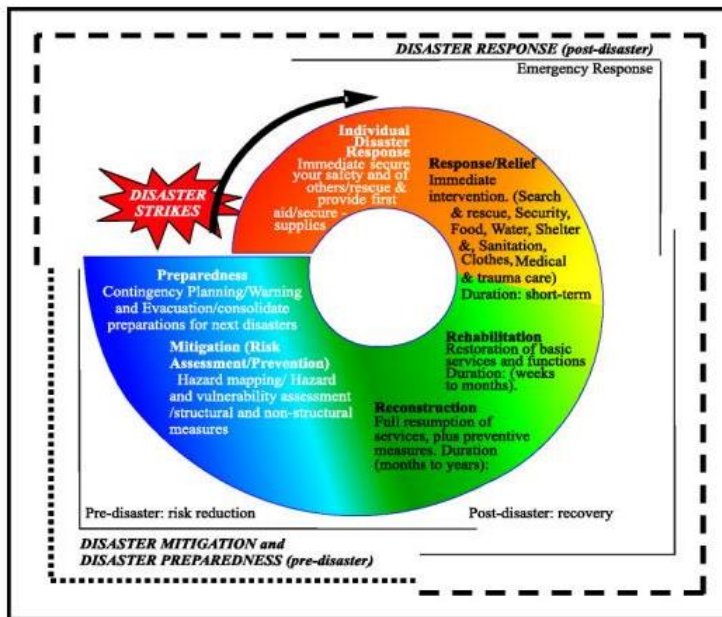
A disaster is a calamitous, distressing, or ruinous effect of a disastrous event which seriously affects or disrupts (or threaten to disrupt) the critical functions of a community, society or system, for a period long enough to significantly harm it or cause its failure. It is beyond the capability of the local community to overcome it. The stricken community needs extraordinary efforts to cope with it, often with outside help or international aid. It is a situation resulting from an environmental phenomenon or armed conflict that produce stress, personal injury, physical damage, and economic disruption of great magnitude.

2.6 DEFINITION AND CONCEPT

Disaster management includes sum total of all activities, programs and measures which can be taken up before, during and after a disaster with the purpose of avoiding, reducing the impact or recovering from its losses.

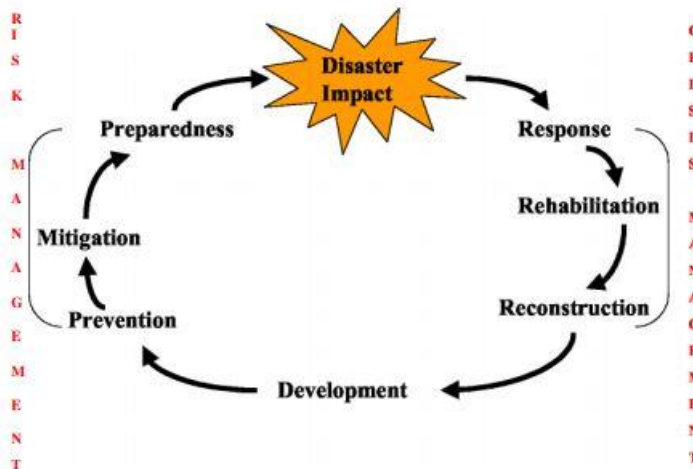
According to Kelly (1996), "Disaster management" can be defined as the range of activities designed to maintain control over disaster and emergency situations and to provide a framework for helping those who are at risk to avoid or recover from the impact of the disaster. This include preparedness before disaster, response and recovery i.e. rebuilding and supporting society. Disaster management aims to reduce, or avoid, the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery. The Disaster management cycle illustrates the ongoing process by which governments, businesses, and civil society plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after adisaster has occurred. Appropriate actions at all points in the cycle lead to greater preparedness, better warnings, reduced vulnerability or the prevention of disasters during the next iteration of the cycle. The complete disaster management cycle includes the shaping of public policies and plans that either modify the causes of disasters or mitigate their effects on people, property, and infrastructure.

Disaster Risk Management includes sum total of all activities, programs and measures which can be taken up before, during and after a disaster with the purpose to avoid a disaster, reduce its impact or recover from its losses. The three key stages of activities that are taken up within disaster risk management are as follows



- Before a disaster (pre-disaster). Pre-disaster activities those which are taken to reduce human and property losses caused by a potential hazard. For example, carrying out awareness campaigns, strengthening the existing weak structures, preparation of the disaster management plans at household and community level, etc. Such risk reduction measures taken under this stage are termed as mitigation and preparedness activities.
- During a disaster (disaster occurrence). These include initiatives taken to ensure that the needs and provisions of victims are met and suffering is minimized. Activities taken under this stage are called emergency response activities.
- After a disaster (post-disaster). There are initiatives taken in response to a disaster with a purpose to achieve early recovery and rehabilitation of affected communities, immediately after a disaster strike. These are called as response and recovery activities.

The Disaster management cycle diagram highlights the range of initiatives which normally occur during both the Emergency response and Recovery stages of a disaster. Some of these cut across both stages (such things as coordination and the provision of ongoing assistance); whilst other activities are unique to each stage (e.g. Early Warning and Evacuation during Emergency Response; and Reconstruction and Economic and Social Recovery as part of Recovery). This diagram works best for relatively sudden-onset disasters, such as floods, earthquakes, bushfires, tsunamis, cyclones etc., but is less reflective of slow-onset disasters, such as drought, where there is no obviously recognizable single event which triggers the movement into the Emergency Response stage.



The mitigation and preparedness phases occur as disaster management improvements are made in anticipation of a disaster event. Developmental considerations play a key role in contributing to the mitigation and preparation

of a community to effectively confront a disaster. As a disaster occurs, disaster management actors, in particular humanitarian organizations, become involved in the immediate response and long-term recovery phases. The four disaster management phases illustrated here do not always, or even generally, occur in isolation or in this precise order. Often phases of the cycle overlap and the length of each phase greatly depends on the severity of the disaster.

- Mitigation - Minimizing the effects of disaster. Examples: building codes and zoning; vulnerability analyses; public education.
- Preparedness - Planning how to respond. Examples: preparedness plans; emergency exercises/training; warning systems.
- Response - Efforts to minimize the hazards created by a disaster. Examples: search and rescue; emergency relief.
- Recovery - Returning the community to normal. Examples: temporary housing; grants; medical care.

To analyze the scope of disaster management in the revised context, it should be studied the cycle of the phenomenon. Disasters are as old as human history but the dramatic increase and the damage caused by them in the recent past have become a cause of national and international concern. Over the past decade, the number of natural and manmade disasters has climbed inexorably.

2.7 IMPORTANCE AND RELEVANCE OF DISASTER MANAGEMENT IN THE PRESENT ENVIRONMENTAL SCENARIO

Over the past 20 years disasters have affected 4.4 billion people, caused \$2 trillion of damage and killed 1.3 million people. These losses have outstripped the total value of official development assistance in the same period. Natural disasters disproportionately affect people living in developing countries and

the most vulnerable communities within those countries. Over 95 per cent of people killed by natural disasters are from developing countries(Elizabeth Ferris 2013). In developing countries, the incidence of natural disasters, the impact of climate changes and the management of the natural environment strongly influence the rate of development progress. In the decade 1990-2000, an average of about 4344 people lost their lives and about 30 million people were affected by disasters every year. The loss in terms of private, community and public assets has been astronomical. At the global level, there has been considerable concern over natural disasters. Even as scientific and material progress is made, the loss of lives and property due to disasters has not decision. In fact, the human toll and economic losses have mounted. It was in this background that the Nations General Assembly, in 1989, declared the decade 1990-2000 as the International Natural Disaster Reduction with the objective to reduce loss of lives and property and restrict economic damage through concerted international action, especially in developing countries.

India has been traditionally vulnerable to natural disasters on account of its unique geo-climatic conditions. Floods, droughts, cyclones, earthquakes and landslides have been recurrent phenomena. About 60% of the landmass is prone to earthquakes of various intensities; over 40 million hectares is prone to floods; about 8% of the total area is prone to cyclones and 68% of the area is susceptible to drought. Over the past couple of years, the Government of India has brought about a paradigm shift in approach to disaster management. The new approach proceeds from the conviction that develop cannot be sustainable unless disaster mitigation is built into the development process. Another stone of the approach is that mitigation has to be multi-disciplinary spanning across all sectors. The new policy also emanates from the belief that investments in mitigation are much cost effective than expenditure on relief and rehabilitation.

Disaster management occupies an important place in this country's policy framework as it is poor and the under-privileged who are worst affected on account of calamities/disasters. In recent years, there has been a shift in emphasis, from response and recovery to strategic risk management and reduction, and from a government-centered approach to decentralized community participation.

3.TYPOLOGIES OF DISASTERS

3.1 NATURAL HAZARDS

An indicative list of the natural hazards as identified by NDMA has been summarized below.

FAMILY	MAIN HAZARD	SECONDARY HAZARD	INDIAN STATES/REGIONS AFFECTED
Geo-Physical	Earthquake	Landslide Fire Liquefaction Surface Displacement Tsunami	58.6 % of the landmass of India is prone to earthquakes of moderate to very high intensity
	Volcano	Surface Displacement Ash Fall, Lahar Pyroclastic Flow Landslide Fire Tsunami	Barren Island in the Andamans is the only confirmed active volcano
Hydrological	Flood	Avalanche	Over 40 million hectares/ 12% of land
	Landslide	Coastal Erosion	

	Wave Action	Coastal Flood Debris Flow, Mud Flow Rock Fall Flash Flood Flood Hydrological Wave Action	is prone to floods and river erosion
Meteorological	Hazard caused by short-lived, micro to meso scale extreme weather and atmospheric conditions that may from minutes to days	Cyclone, Storm Surge, Tornado, Convective Storm, Extratropical Storm, Wind, Cold Wave, Extreme Temperature, Fog, Frost, Freeze, Hail, Heat-wave, Lightning, Heavy Rain, Sand Storm, Dust Storm, Snow, Ice, Winter Storm, Blizzard, Cloud burst	Out of the 7,516 km long coastline of India, close to 5,700 km is prone to cyclones and tsunamis.
Climatological		Drought, Extreme hot/	5,11,300 sq.km of the landmass of India is

		cold conditions, Forest/Wildfire, Fires, Glacial Lake Outburst, Subsidence	drought prone. 50% of forests in India are prone to wildfires. All the states bordering the Himalayas are prone to Glacial Lake Outburst
Biological		Epidemics: viral, bacterial, parasitic, fungal, prion infections, insect infestations, Animal stampedes	Almost the entire country is prone to various epidemics. In 2018, there are cases of Nipah Virus, cases of dengue, cases of chikungunya, cases of Zika Virus, Avian Influenza, Japanese Encephalitis and cases of swine flu across India were reported

3.2 HUMAN INDUCED HAZARDS

According to the NDMP, increasing levels of urbanization and industrialization within identified high risk zones has increased the overall vulnerability of populations to disasters. The key hazards leading to a possible disaster that can be attributed to human activity are: Chemical, Biological, Radiological and Nuclear Hazards (CBRN); Terrorism, Violence, Conflict and Fire.

Other hazards include accidents, poor planning and construction, over-population or overcrowding, environmentally insensitive practices and so on. Human induced hazards may be identified using the following approaches:

- Records with local emergency responders, such as fire departments, police departments, local hospitals and medical facilities and records within the site or precinct of previous events, caused due to human intervention
- Local area maps highlighting nearby industries, nuclear plants, possible sources of contamination, sources of pollution, sources of ignition and so on
- Socio-economic mapping and other demographic information of the precinct to identify any potential sources of conflict among different interest groups or potentially volatile situations(NDMA, National Disaster Management Guidelines for Cultural Heritage Sites and Precincts September, 2017).

Definition

***Famines** may be defined as a persistent failure in food supplies over a prolonged period. It is a phenomenon in which a large percentage of the populations of a region or country are so undernourished and that death by starvation becomes increasingly common. A famine weakens body resistance and leads to increases in infectious diseases, especially cholera, dysentery, malaria, and smallpox. Famine is associated with naturally-occurring crop failure due to draught and pestilence and artificially with war and genocide.*

***Drought** is lack or insufficiency of rain for an extended period of months or years when a region notes a deficiency in its water supply. Generally, this occurs when a region receives consistently below average precipitation. It*

can have a substantial impact on the ecosystem and agriculture of the affected region.

A **flood** is an overflow of water that submerges land, producing measurable property damage or forcing evacuation of people and vital resources. Floods are caused due to heavy rainfall and the inadequate capacity of rivers to carry the high flood discharge. Floods develop slowly as rivers swell during an extended period of rain. A flood occurs when water overflows or inundates land that is normally dry. Mostly it happens when rivers or streams overflow their banks.

Cyclones are strong winds that are formed over the oceans. The term "cyclone" refers to all classes of storms with low atmospheric pressure at the center, are formed when an organized system of revolving winds, clockwise in the Southern Hemisphere, anti-clockwise in the Northern Hemisphere, develops over tropical waters.

A **hurricane** is a huge storm. It is a powerful, spiraling storm that begins over a warm sea, near the equator and accompanied by fierce winds, flash floods, mudslides and huge waves. It is a low pressure, large scale weather system which derives its energy from the latent heat of condensation of water vapor over warm tropical seas.

An **earthquake** is a sudden motion or trembling of the ground crust caused by the collision of tectonic plates resulting in the abrupt displacement of rock masses. Earthquakes result from the movement of one rock mass past another in response to tectonic forces underneath the earth's surface.

Volcanoes result when magma rises, pushes through a weakness in the Earth's crust, and spills out onto the surface, devastating anything in its path. The superheated rock is not the only danger, however. Far below the earth's surface, volcanic gasses are dissolved in the magma. As the magma rises, it begins to cool down, and gas bubbles begin to form. This makes the magma less dense than the surroundings, causing it to rise faster.

Pyroclastic flow is high speed ejection of hot gasses and debris can travel in excess of 80 kilometers per hour and usually averages between 200 and

700 degrees Celsius. Not only does the pyroclastic flow travel too fast to be outran, but it will incinerate everything in its path. pyroclastic

3.3 SCALES OF DISASTERS

The scale of the disaster is an important factor to assess the degree of preparedness and vulnerability. The disaster situations can be categorized into three ‘levels’: L1, L2, and L3. The period of normalcy, L0, should be utilized for disaster risk reduction activity.

- Level-L1: The level of disaster that can be managed within the capabilities and resources at the District level. However, the state authorities will remain in readiness to provide assistance if needed.
- Level-L2: This signifies the disaster situations that require assistance and active mobilization of resources at the state level and deployment of state level agencies for disaster management. The central agencies must remain vigilant for immediate deployment if required by the state.
- Level-L3: This corresponds to a nearly catastrophic situation or a very large-scale disaster that overwhelms the State and District authorities.

4. INSTITUTIONAL FRAMEWORK

4.1 EVOLUTION OF DISASTER MANAGEMENT IN INDIA

Disaster management in India has evolved from an activity-based reactive setup to a proactive institutionalized structure; from single faculty domain to a multi-stakeholder setup; and from a relief-based approach to a ‘multi-dimensional pro-active holistic approach for reducing risk’. The beginnings of an institutional structure for disaster management can be traced to the British period following the series of disasters such as famines of 1900, 1905, 1907 & 1943, and the Bihar-Nepal earthquake of 1937. Over the past century, the disaster management in India has undergone substantive changes in its composition, nature and policy.

4.2 DISASTER MANAGEMENT DURING BRITISH ADMINISTRATION AND POST-INDEPENDENCE

During the British administration, relief departments were set up for emergencies during disasters. Such an activity-based setup with a reactive approach was functional only in the post disaster scenarios. The policy was relief-oriented and activities included designing the relief codes and initializing food for work programs. Post-Independence, the task for managing disasters continued to rest with the Relief Commissioners in each state, who functioned under the Central Relief Commissioner, with their role limited to delegation of relief material and money in the affected areas. Every five-year plan addressed flood disaster under “Irrigation, Command Area Development and Flood Control”. Until this stage, the disaster management structure was activity-based, functioning under the Relief Departments.

4.3 EMERGENCE OF INSTITUTIONAL ARRANGEMENT IN INDIA

A permanent and institutionalized setup began in the decade of 1990s with set up of a disaster management cell under the Ministry of Agriculture, following the declaration of the decade of 1990 as the 'International Decade for Natural Disaster Reduction' (IDNDR) by the UN General Assembly. Following series of disasters such as Latur Earthquake (1993), Malpa Landslide (1994), Orissa Super Cyclone (1999) and Bhuj Earthquake (2001), a high-powered Committee under the Chairmanship of Mr. J.C. Pant, Secretary, Ministry of Agriculture was constituted for drawing up a systematic, comprehensive and holistic approach towards disasters. There was a shift in policy from an approach of relief through financial aid to a holistic one for addressing disaster management. Consequently, the disaster management division was shifted under the Ministry of Home Affairs in 2002 vide Cabinet Secretariat's Notification No. DOC.CD-108/2002 dated 27/02/2002 and a hierarchical structure for disaster management evolved in India.

4.4 ORGANISATION AND STRUCTURE OF DISASTER MANAGEMENT

The Disaster Management Division is headed by Joint Secretary (DM) in MHA, who is assisted by three Directors, Under Secretaries, Section Officers, Technical Officer, Senior Economic Investigator consultants and other supporting staff. The upper echelon of the structure consists of Secretary (Border Management), Home Secretary, Minister of State in charge and the Home Minister.

4.5 DISASTER MANAGEMENT FRAMEWORK

Shifting from relief and response mode, disaster management in India started to address the issues of early warning systems, forecasting and monitoring setup for various weather-related hazards. A structure for flow of information, in the form of warnings, alerts and updates about the oncoming hazard, also emerged within this framework. A multi-stakeholder High powered group was setup by involving representatives from different ministries and departments. Some of these ministries were also designated as the nodal authorities for specific disasters. Following a High-Powered Committee Report on Disaster Management for establishment of a separate institutional structure for addressing disasters and enactment of a suitable law for institutionalizing disaster management in the country, a multi-level links between these ministries and the disaster management framework have emerged.

4.6 PRESENT STRUCTURE FOR DISASTER MANAGEMENT IN INDIA

The institutional structure for disaster management in India is in a state of transition. The new setup, following the implementation of the Act, is evolving; while the previous structure also continues. Thus, the two structures co-exist at present. The National Disaster Management Authority has been established at the center, and the SDMA at state and district authorities at district level are gradually being formalized. In addition to this, the National Crisis Management Committee, part of the earlier setup, also functions at the Centre. The nodal ministries, as identified for different disaster types of function under the overall guidance of the Ministry of Home Affairs (nodal ministry for disaster

management). This makes the stakeholders interact at different levels within the disaster management framework.

Within this transitional and evolving setup, two distinct features of the institutional structure for disaster management may be noticed. Firstly, the structure is hierarchical and functions at four levels – center, state, district and local. In both the setups – one that existed prior to the implementation of the Act, and other that is being formalized post-implementation of the Act, there have existed institutionalized structures at the center, state, district and local levels. Each preceding level guides the activities and decision making at the next level in hierarchy. Secondly, it is a multi-stakeholder setup, i.e., the structure draws involvement of various relevant ministries, government departments and administrative bodies.

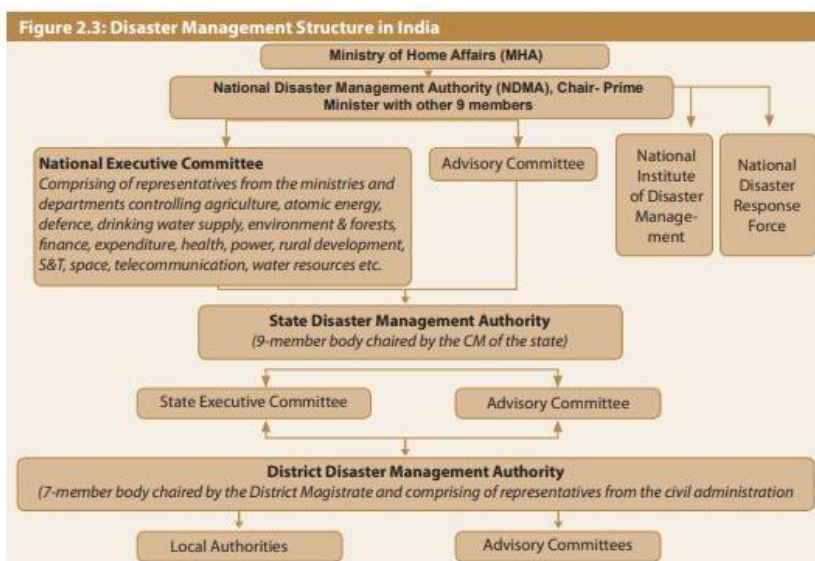
4.7 DISASTER MANAGEMENT ACT, 2005

This Act provides for the effective management of disaster and for matters connected therewith or incidental thereto. It provides institutional mechanisms for drawing up and monitoring the implementation of the disaster management. The Act also ensures measures by the various wings of the Government for prevention and mitigation of disasters and prompt response to any disaster situation. The Act provides for setting up of a National Disaster Management Authority (NDMA) under the Chairmanship of the Prime Minister, State Disaster Management Authorities (SDMAs) under the Chairmanship of the Chief Ministers, District Disaster Management Authorities (DDMAs) under the Chairmanship of Collectors/District Magistrates/Deputy Commissioners. The Act further provides for the constitution of different Executive Committee at national and state levels. Under its aegis, the National Institute of Disaster

Management (NIDM) for capacity building and National Disaster Response Force (NDRF) for response purpose have been set up. It also mandates the concerned Ministries and Departments to draw up their own plans in accordance with the National Plan. The Act further contains the provisions for financial mechanisms such as creation of funds for response, National Disaster Mitigation Fund and similar funds at the state and district levels for the purpose of disaster management. The Act also provides specific roles to local bodies in disaster management.

Further the enactment of 73rd and 74th Amendments to the constitution and emergence of local self- government, both rural and urban, as important tiers of governance, the role of local authorities becomes very important. The DM Act, 2005 also envisages specific roles to be played by the local bodies in disaster management.

Legal - Institutional Framework: A legal institutional framework developed based on the provision of the Act across the country, in vertical and horizontal hierarchical and in the federal setup of country for appreciation of response mechanism which has been put in place.



Source: (MHA 2011)

4.8 NATIONAL LEVEL INSTITUTIONS

4.8.1 NATIONAL EXECUTIVE COMMITTEE (NEC)

A National Executive Committee is constituted under Section 8 of DM Act, 2005 to assist the National Authority in the performance of its functions. NEC consists of Home Secretary as its Chairperson, ex-officio, with other Secretaries to the Government of India in the Ministries or Departments having administrative control of the agriculture, atomic energy, defense, drinking water supply, environment and forest, finance (expenditure), health, power, rural development science and technology, space, telecommunication, urban development, water resources. The Chief of Integrated Defense Staff, of the Chiefs of Staff Committee, ex-officio, is also its Members.

NEC may as and when it considers necessary constitute one or more sub-committees for the efficient discharge of its functions. For the conduct of NEC,

Disaster Management National Executive Committee (Procedure and Allowances) Rules, 2006 has been issued. NEC has been given the responsibility to act as the coordinating and monitoring body for disaster management, to prepare a National Plan, monitor the implementation of National Policy etc. vide section 10 of the DM Act.

4.8.2 NATIONAL DISASTER MANAGEMENT AUTHORITY (NDMA)

The National Disaster Management Authority (NDMA) was initially constituted on May 30, 2005 under the Chairmanship of Prime Minister vide an executive order. Following enactment of the Disaster Management Act, 2005, the NDMA was formally constituted in accordance with Section-3(1) of the Act on 27th September, 2006 with Prime Minister as its Chairperson and nine other members, and one such member to be designated as Vice-Chairperson.

MANDATE OF NDMA

The NDMA has been mandated with laying down policies on disaster management and guidelines which would be followed by different Ministries, Departments of the Government of India and State Government in taking measures for disaster risk reduction. It has also to laid down guidelines to be followed by the State Authorities in drawing up the State Plans and to take such measures for the management of disasters, details of these responsibilities are given as under :- (a) Lay down policies on disaster management; (b) Approve the National Plan; (c) Approve plans prepared by the Ministries or Departments of the Government of India in accordance with the National Plan; (d) Lay down guidelines to be followed by the State Authorities in drawing up the State Plan;

(e) Lay down guidelines to be followed by the different Ministries or Departments of the Government of India for the purpose of integrating the measures for prevention of disaster or the mitigation of its effects in their development plans and projects; (f) Coordinate the enforcement and implementation of the policy and plan for disaster management; (g) Recommend provision of funds for the purpose of mitigation; (h) Provide such support to other countries affected by major disasters as may be determined by the Central Government; (i) Take such other measures for the prevention of disaster, or the mitigation, or preparedness and capacity building for dealing with the threatening disaster situation or disaster as it may consider necessary; (j) Lay down broad policies and guidelines for the functioning of the National Institute of Disaster Management.

COMPOSITION OF NDMA

Besides the nine members nominated by the Prime Minister, Chairperson of the Authority, the Organizational structure consists of a Secretary and five Joint Secretaries including one Financial Advisor. There are 10 posts of Joint Advisors and Directors, 14 Assistant Advisors, Under Secretaries and Assistant Financial Advisor and Duty Officer along with supporting staff. Further, Recruitment Rules have been notified as (a) National Disaster Management Authority, Group- 'C' posts Recruitment Rules, 2009. (b) National Disaster Management Authority (Group 'A') Recruitment Rules, 2009. Under Section 7 (1) of DM Act an Advisory Committee with 12 Members has been constituted during 2007.

4.9 NATIONAL INSTITUTE OF DISASTER MANAGEMENT (NIDM)

BACKGROUND

In the backdrop of the International decade for Natural Disaster Reduction (IDNDR), a National Centre for Disaster Management was established at the Indian Institute for Public Administration (IIPA) in 1995. The Centre was upgraded and designated as the National Institute of Disaster management (NIDM) on 16th October 2003. It has now achieved the status of a statutory organization under the Disaster Management Act, 2005. Section 42 of Chapter VII of the Disaster Management Act, 2005 entrusts the institute with numerous responsibilities, namely to develop training modules, undertake research and documentation in disaster management, organize training programs, undertake and organize study courses, conferences, lectures and seminars to promote and institutionalize disaster management, undertake and provide for publication of journals, research papers and books.

MANAGEMENT STRUCTURE

The Union Home Minister is the President of the Institute. It was constituted on 23rd February, 2007 and has a general body of forty-two members comprising of secretaries of various ministries, departments of the Union Government and heads of national level scientific, research and technical organizations. In terms of Section 42(4) of the Disaster Management Act, 2005 vide order dated 3rd May, 2007, the Government also constituted a 14-member Governing Body of the Institute.

ORGANIZATIONAL STRUCTURE

NIDM is headed by an Executive Director along with the faculty and staff. The Institute has six academic divisions

- Governance and Inclusive DRR Division
- Disaster Response and Recovery Division
- Geo-Meteorological Risk Management Division
- Resilient Infrastructure Division
- CBRN and Cyber-Risk Division
- Environmental Disaster Risk Management Division

TRAINING PROGRAMS OF NIDM

The different formats in which training is imparted by NIDM include:

(i) Face-to-face training: NIDM conducts both in-campus and off-campus training programs. In-campus programs are conducted in the premises of the Institute while the off-campus programs are conducted mostly in state capitals, at the premises of the Administrative Training Institutes. It conducts as many as 92 training programs on diversified themes of disaster management, with many new programs added continually. The participants of these programs are usually middle and senior level government officers nominated by the state governments and concerned ministries and departments of the Government of India. The programs constitute class room lectures and presentations, field visits, group exercises, panel discussions etc.

(ii) Web- based training: In collaboration with World Bank Institute, Washington, the Institute conducts on-line training programs on basic and specialized subjects on disaster management. The courses are open to all interested persons with a token charge of 1500 for the basic course of one and half months and 1000 for specialized courses of one-month duration to cover the cost of reading materials, postage etc. Every participant is expected to take part in on-line discussions. The successful candidates are awarded certificates signed jointly by the NIDM and WBI. The institute has online training programs on Comprehensive Disaster Risk Management Framework and nine specialized online programs on Community Based Disaster Risk Management, Climate Change and Disaster Management, Risk Sensitive Land Use Planning, Financial Strategies, Damage and Loss Assessment, Gender and Disaster, Risk Assessment, Earthquake Risk Management and Safe Cities have been organized.

(iv) Self-study courses: The Institute is in the process of launching web-based training courses on various themes such as basics of disaster management, earthquake, flood, cyclone, disaster management for civil defense volunteers, public health workers, school children and community preparedness, which anyone from anywhere at any time can log on. The aim of such courses is to create interest and raise the level of awareness of people regarding disaster management and in some cases supplement the existing class room based training programs.

(v) India Disaster Management Congress: NIDM has taken the lead in organizing the India Disaster Management Congress (IDMC) on the pattern of India Science Congress to bring together scientists, scholars and practitioners from diverse disciplines on the same platform. The first such Congress was

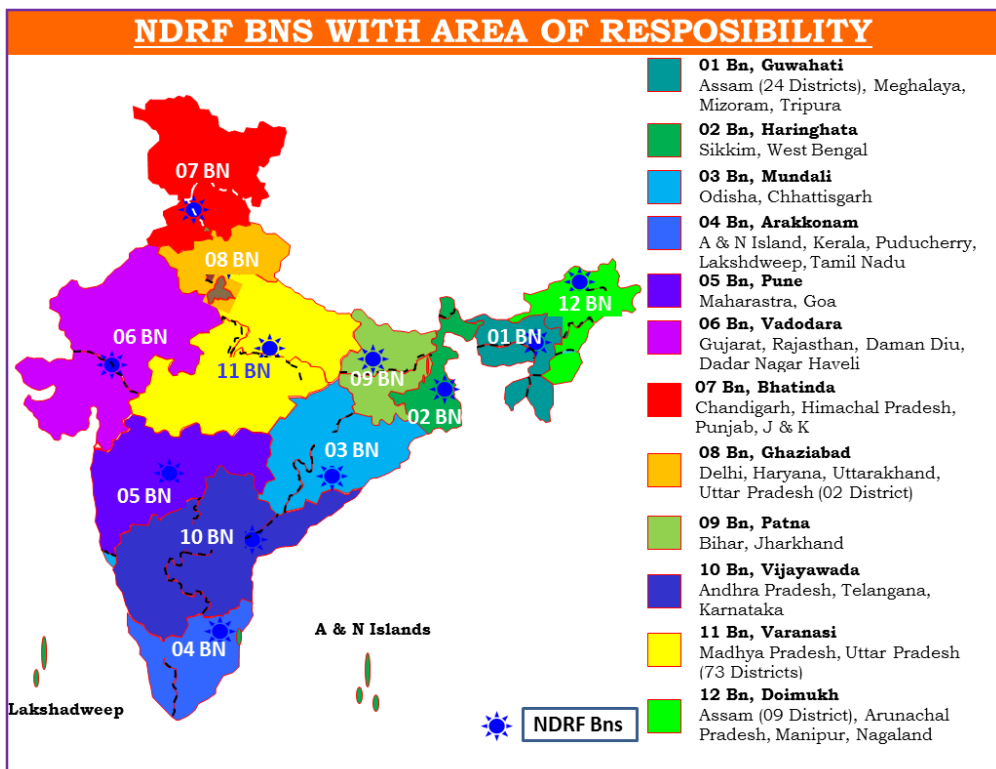
held in November 2006 which was inaugurated by Hon'ble Prime Minister of India. The Institute organized the Second India Disaster Management Congress in November 2009. The congress had twenty-six thematic sessions around twelve different thematic clusters where over 300 technical papers were presented. The congress is later merged into National Platform of DRR.

4.10 NATIONAL DISASTER RESPONSE FORCE (NDRF)

CONSTITUTION AND ROLE OF NDRF

The National Disaster Response Force (NDRF) has been constituted under Section 44 of the DM Act, 2005 by up-gradation/conversion of eight standard battalions of Central Para Military Forces i.e. two battalions each from Border Security Force (BSF), Indo-Tibetan Border Police (ITBP), Central Industrial Security Force (CISF) and Central Reserve Police Force (CRPF) to build them up as a specialist force to respond to disaster or disaster like situations.

At present, National Disaster Response Force consist of 12 battalions, three each from the BSF and CRPF and two each from CISF, ITBP and SSB. Each battalion have 18 self-contained specialist search and rescue teams of 45 personnel each including engineers, technicians, electricians, dog squads and medical/paramedics. The total strength of each battalion is 1,149. All the 12 battalions have been equipped and trained to respond natural as well as man-made disasters. Battalions are also trained and equipped for response during chemical, biological, radiological and nuclear (CBRN) emergencies.



Source: NDRF Website

4.11 STATE LEVEL INSTITUTIONS

4.11.1 STATE EXECUTIVE COMMITTEE (SEC)

The Act envisages establishment of State Executive Committee under Section 20 of the Act, to be headed by Chief Secretary of the state Government with four other Secretaries of such departments as the state Government may think fit. It has the responsibility for coordinating and monitoring the implementation of the National Policy, the National Plan and the State Plan as provided under section 22 of the Act.

4.11.2 STATE DISASTER MANAGEMENT AUTHORITY (SDMA)

The DM Act, 2005 provides for constitution of SDMAs and DDMA in all the states and UTs. At the State level, the SDMA, headed by the Chief Minister, will lay down policies and plans for DM in the State. It will, inter alia approve the State Plan in accordance with the guidelines laid down by the NDMA, coordinate the implementation of the State Plan, recommend provision of funds for mitigation and preparedness measures and review the developmental plans of the different Departments of the State to ensure the integration of prevention, preparedness and mitigation measures.

4.12 STATE DISASTER RESPONSE FORCE (SDRF)

The states/UTs have also been advised to set up their own Specialist Response Force for responding to disasters on the lines of National Disaster Response Force vide Ministry of Home Affairs letter dated 26th July 2007 and 8th March, 2011. The Central Government is providing assistance for training of trainers. The state governments have been also advised to utilize 10 percent of their State Disaster Response Fund and Capacity Building Grant for the procurement of search and rescue equipment and for training purposes of the Response Force.

4.13 DISTRICT LEVEL INSTITUTIONS

4.13.1 DISTRICT DISASTER MANAGEMENT AUTHORITY (DDMA)

Section 25 of the DM Act provides for constitution of DDMA for every district of a state. The District Magistrate/ District Collector/Deputy Commissioner heads the Authority as Chairperson besides an elected representative of the

local authority as Co-Chairperson except in the tribal areas where the Chief Executive Member of the District Council of Autonomous District is designated as Co-Chairperson. Further in district, where Zila Parishad exist, its Chairperson shall be the Co-Chairperson of DDMA. Other members of this authority include the CEO of the District Authority, Superintendent of Police, Chief Medical Officer of the District and other two district level officers are designated by the state Government.

The District Authority is responsible for planning, coordination and implementation of disaster management and to take such measures for disaster management as provided in the guidelines. The District Authority also has the power to examine the construction in any area in the district to enforce the safety standards and also to arrange for relief measures and respond to the disaster at the district level.

4.14 INSTITUTIONAL FRAMEWORK FOR METROPOLITAN CITIES

In the larger cities (say, with population exceeding 2.5 million), the recommendation of the second Administrative Reforms Commission has suggested that the Mayor, assisted by the Commissioner of the Municipal Corporation and the Police Commissioner to be directly responsible for Crisis Management. It has now been accepted by the Government.

4.15 HIERARCHICAL STRUCTURE OF AUTHORITY AND COMMITTEE

In this structure, National Disaster Management Authority is the authority for formulation of policy and guidelines for all disaster management work in the country. The state authorities further lay down the guidelines for departments

of the state and the districts falling in their respective jurisdictions. Similarly, district authorities direct the civil administration, departments and local authorities such as the municipalities, police department and civil administration. The State Executive Committees are responsible for execution of the tasks envisaged by the authorities. The structure thus discussed is summarized.

4.16 CENTRAL GOVERNMENT

In accordance with the provisions of the Act, the Central Government will take all such measures, as it deems necessary or expedient, for the purpose of DM and will coordinate actions of all agencies. The Central Ministries and Departments will take into consideration the recommendations of the State Government Departments while deciding upon the various pre-disaster requirements and for deciding upon the measures for prevention and mitigation of disaster. It will ensure that the Central Ministries and Departments integrate measures for the prevention and mitigation of disasters into their developmental plans and projects, make appropriate allocation of funds for pre-disaster requirements and take necessary measures for preparedness and to effectively respond to any disaster situation or disaster. It will have the power to issue directions to NEC, State Governments/SDMAs, SECs or any of their officers or employees, to facilitate or assist in DM, and these bodies and officials shall be bound to comply with such directions. The Central Government will extend cooperation and assistance to the State Governments as required by them or otherwise deemed appropriate by it. It will take measures for the deployment of the Armed Forces for disaster management. The Central Government will also facilitate coordination with the UN Agencies, International Organizations and Governments of Foreign Countries

in the field of disaster management. The Ministry of External Affairs in coordination with the Ministry of Home Affairs (MHA) will facilitate external coordination/cooperation.

4.17 ROLE OF CENTRAL MINISTRIES AND DEPARTMENTS

As disaster management is a multidisciplinary process, all Central Ministries and Departments will have a key role in the field of disaster management. The nodal Ministries and Departments of the GoI (i.e., the Ministries of Agriculture, Atomic Energy, Civil Aviation, Earth Sciences, Environment & Forests, Home Affairs, Health, Mines, Railways, Space, Water Resources etc.) will continue to address specific disasters as assigned to them.

NATIONAL CRISIS MANAGEMENT COMMITTEE (NCMC)

The NCMC, comprising high level officials of the GoI headed by the Cabinet Secretary, will continue to deal with major crises which have serious or National ramifications. It will be supported by the Crisis Management Groups (CMG) of the Central nodal Ministries and assisted by NEC as may be necessary. The Secretary, NDMA may be a member of this Committee.

STATE GOVERNMENTS

The primary responsibility for disaster management rests with the States. The institutional mechanism put in place at the Centre, State and District levels will help the States manage disasters in an effective manner. The Act mandates the State Governments inter alia to take measures for preparation of Disaster Management Plans, integration of measures for prevention of disasters or mitigation into development plans, allocation of funds, establishment of early

warning systems, and to assist the Central Government and other agencies in various aspects of Disaster Management.

DISTRICT ADMINISTRATION

At the District level, DDMAs will act as the District planning, coordinating and implementing body for disaster management and will take all measures for the purposes of disaster management in the District in accordance with the guidelines laid down by NDMA and SDMA.

4.18 INTERFACE BETWEEN THE MINISTRIES FOR DISASTER MANAGEMENT

The interface between stakeholders and the disaster management framework is permanent, backed by legislative measures, decisions, such as those taken for establishment of the bodies and committees for managing disasters and the government orders to execute these decisions. These decisions or measures direct the composition of the structure by identifying the stakeholders to be involved in the disaster management framework. The role to be performed by each stakeholder is in the evolving stage and needs to be defined within different SOPs. Thus, while the involvement of stakeholders in the interface is mandated and permanent, the nature of interface is guided by the expertise or relevance of the stakeholder to the disaster management framework.

The expertise-based interfaces emerge when the stakeholders serve as ‘service providers’ to the disaster management framework. For instance, the institutions under Ministry of Earth Sciences and Ministry of Water Resources, that is, Indian Meteorological Department (IMD) and Central Water Commission (CWC) respectively, provide information on the weather and climatic parameters and the potential hazards and threats to the nodal management

authority. Further, these organizations are involved with disaster planning activities – flood zonation and flood plain management in case of CWC, and hazard mapping and database generation in case of IMD. The organizations and institutions under the Department of Space provide research and technical support by monitoring the weather elements and facilitating satellite-based communication, and also undertaking activities such as land use mapping and hazard zoning.

The Disaster Risk Reduction (DRR) should be seen as an integral part of environment (climate change also) and development. The impending risk analysis should be done in the light of disasters and possible threat of high intensity disasters due to climate change. Accordingly, mitigation and adaptation programs should be developed. The mitigation plan should address the issues of structural and non-structural interventions along with the fiscal and monetary tools (for DRR & adaptation) for pre and post disaster planning. If this is mainstreamed, sustainable development can be attained and miseries of the people could be minimized. The top down and bottom up institutional linkages for policy formulation and programs execution would be interdependent with each other.

4.19 CABINET COMMITTEE ON MANAGEMENT OF NATURAL CALAMITIES (CCMNC) AND THE CABINET COMMITTEE ON SECURITY (CCS)

CCMNC had been constituted to oversee all aspects relating to the management of natural calamities including assessment of the situation and identification of measures and programs considered necessary to reduce its impact, monitor and suggest long-term measures for prevention of such calamities, formulate and recommend programs for public awareness for building up society's resilience

to them. The CCS deals with issues related to defense of the country, law and order and internal security, policy matters concerning foreign affairs that have internal or external security implications, and economic and political issues impinging on National security.

4.20 HIGH LEVEL COMMITTEE (HLC)

In the case of calamities of severe nature, Inter-Ministerial Central Teams are deputed to the affected States for assessment of damage caused by the calamity and the amount of relief assistance required. The Inter-Ministerial Group (IMG), headed by the Union Home Secretary, scrutinizes the assessment made by the Central Teams and recommends the quantum of assistance to be provided to the States from the National Calamity Contingency Fund (NCCF). However, assessment of damages by IMG in respect of drought, hailstorm and pest attack will continue to be headed by the Secretary, Ministry of Agriculture and Cooperation. The HLC comprising the Finance Minister as Chairman and the Home Minister, Agriculture Minister, and Deputy Chairman of the Planning Commission as members approves the Central assistance to be provided to the affected States based on the recommendations of the IMG. The constitution and composition of HLC may vary from time to time. The Vice Chairman, NDMA will be a special invitee to the HLC.

4.21 MANAGEMENT OF DISASTERS IMPACTING MORE THAN ONE STATE

At times, the impact of disasters occurring in one State may spread over to the areas of other States. Similarly, preventive measures in respect of certain disasters, such as floods, etc., may be required to be taken in one State, though the impact of their occurrence may affect another. The administrative hierarchy

of the country is organized into National, State and District level administrations. This presents some difficulties in respect of disasters impacting more than one State. Management of such situations calls for a coordinated approach, which can respond to a range of issues quite different from those that normally present themselves, before, during and after the event. NDMA will encourage identification of such situations and promote the establishment of mechanisms on the lines of Mutual Aid Agreement for coordinated strategies for dealing with them by the States, Central Ministries and Departments and other agencies concerned.

5. FINANCIAL ARRANGEMENTS

Financing the Relief Expenditure Financial assistance in the wake of natural calamities is provided in accordance with the schemes of relief funds. These schemes are based on the recommendations of the successive Finance Commissions. While the budgetary provision of these relief funds is dealt with by Ministry of Finance, the processing of request of the state government for these funds is done by the Ministry of Home Affairs (DM Division).

5.1 NATIONAL DISASTER RESPONSE FUND (NDRF)

Section 46(1) of DM Act 2005 provides for constitution of NDRF for meeting any threatening disaster management situation or disaster. Accordingly, DM Division issued notification for the constitution of NDRF on 28th September 2010. The Finance Ministry has also issued guidelines to the state for operation of NDRF.

5.2 STATE DISASTER RESPONSE FUND(SDRF)

Section 48 (1) of Disaster Management Act 2005 provides for constitution of State Disaster Response Fund (SDRF) by the state Governments. The Ministry of Home Affairs has issued the guidelines to the state for operation of SDRF. Allocations to the State Relief Funds have been made based on the recommendations of the successive Finance Commissions. While allocating the funds to various states for a period of five years the factors considered include the expenditure incurred by the state government on relief operations during the last about 10 years, vulnerability of the state to natural disasters and economic status of the state.

5.3 ADDITIONAL FINANCIAL ASSISTANCE

Over and above the provisions of the SDRF, funding is provided from the NDRF in the wake of calamities of severe nature. On receipt of the memorandum from the affected states, an Inter-Ministerial Central Team comprising of representatives of the central ministries/ departments is constituted and its report after examination by the Inter-Ministerial Group (IMG) headed by Home Secretary is placed before the High-Level Committee (HLC) for their consideration and approval of funds from NDRF.

5.4 MONITORING OF EXPENDITURE FROM RELIEF FUNDS

The Ministry of Home Affairs oversees the operations of SDRF and monitors its compliance with these guidelines. A format for monitoring the relief expenditure in accordance with the extant items and norms of assistance has been prescribed. A web based computerized tracking system has also been developed for monitoring the relief expenditure. The Accountant General of the State maintains the accounts of the SDRF. The Comptroller & Auditor General of India audits SDRF every year.

5.5 RECOMMENDATIONS OF THE FOURTEENTH FINANCE COMMISSION

In regard to grants for disaster management, fourteenth finance commission has adopted the procedure of the XIII FC and used past expenditures on disaster relief to determine the state disaster response fund corpus. While making recommendations, XIV FC have taken note of the additional responsibility cast on states and their district administrations under the disaster management act.

XIV FC has also taken note of the location-specific natural disasters not mentioned in the notified list, which are unique to some states.

5.6 STATUTORY PROVISIONS

Financing Prevention, Mitigation and Preparedness

The provisions relating to funding of prevention, mitigation and preparedness are listed below:

- i. section 6 (g) provides that NDMA may recommend provision of funds for the purpose of mitigation;
- ii. section 18 (f) provides that SDMA may recommend provision of funds for mitigation and preparedness measures;
- iii. section 35 (c) provides that the central government may ensure appropriate allocation of funds for prevention of disaster, mitigation, capacity-building and preparedness by the ministries or departments of the government of India;
- iv. section 36 (e) provides that the ministries or departments of government of India shall allocate funds for measures for prevention of disaster, mitigation, capacity-building and preparedness;
- v. section 38 (d) provides that the state government may allocate funds for measures for prevention of disaster, mitigation, capacity-building and preparedness by the departments of the government of the state in accordance with the provisions of the state plan and the district plans;

- vi. section 39 (c) provides that the departments of the state government shall allocate funds for prevention of disaster, mitigation, capacity- building and preparedness

ALLOCATION BY MINISTRIES AND DEPARTMENTS

section 49 provides for allocation of funds by ministries and departments. it states that:

(1) every ministry or department of the government of India shall make provisions, in its annual budget, for funds for the purposes of carrying out the activities and programs set out in its disaster management plan.

(2) the provisions of sub-section (1) shall, *mutatis mutandis*, apply to departments of the government of the state.”

PROVISIONS IN THE ACT FOR DISASTER RISK REDUCTION

Some of the statutory provisions incorporated in the National Disaster Management Act for mainstreaming DRR and financing thereof are reproduced below.

- i. section 6 (i) provides that the NDMA may take such other measures for the prevention of disaster, or the mitigation, or preparedness and capacity building for dealing with the threatening disaster situation or disaster as it may consider necessary;
- ii. section 18 (2) (g) provides that the SDMA may review the development plans of the different departments of the state and ensure that prevention and mitigation measures are integrated therein;

- iii. section 22 (2)(b) provides that the SEC may examine the vulnerability of different parts of the state to different forms of disasters and specify measures to be taken for their prevention or mitigation;
- iv. section 23 (4) (b) provides that the state plan shall include measures to be adopted for prevention and mitigation of disasters;
- v. section 23 (4) (c) provides that the state plan shall include the manner in which the mitigation measures shall be integrated with the development plans and projects;
- vi. section 23 (4) (d) provides that the state plan shall include, capacity-building and preparedness measures to be taken;
- vii. section 30 (2) (iv) provides that the district authority may ensure that the guidelines for prevention of disasters, mitigation of its effects, preparedness and response measures as laid down by the national authority and the state authority are followed by all departments of the government at the district level and the local authorities in the district;
- viii. section 30 (2) (xiii) provides that the district authority may facilitate community training and awareness programs for prevention of disaster or mitigation with the support of local authorities, governmental and non-governmental organizations;
- ix. section 30 (xiv) provides that the district authority may set up, maintain, review and upgrade the mechanism for early warnings and dissemination of proper information to public;
- x. section 31 (3) (b) provides that the district plan shall include the measures to be taken, for prevention and mitigation of disaster, by

- the departments of the government at the district level and local authorities in the district;
- xi. section 32 (a) provides that every office at the district level shall prepare a plan setting out:
- provisions for prevention and mitigation measures as provided for in the district plan and as is assigned to the department or relevant agency;
 - provisions for taking measures relating to capacity-building and preparedness as laid down in the district plan;
 - the response plans and procedures, in the event of, any threatening disaster situation or disaster;
- xii. section 35(2) (b) provides that the central government may ensure the integration of measures for prevention of disasters and mitigation by ministries or departments of the government of India into their development plans and projects;
- xiii. section 36 (b) provides that every ministry/ department of government of India shall integrate into its development plans and projects, the measures for prevention or mitigation of disasters in accordance with the guidelines laid down by the national authority;
- xiv. section 37 (1) (a) mandates all the ministries and departments of government of India to prepare a disaster management plan inter alia specifying:
- the measures to be taken by it for prevention and mitigation of disasters in accordance with the national plan;
 - the specifications regarding integration of mitigation measures in its development plans in accordance with the guidelines of the national authority and the national executive committee;

- xv. section 38 (2) (e) provides that the state government may ensure integration of measures for prevention of disaster or mitigation by the departments of the government of the state in their development plans and projects;
- xvi. section 38 (2) (f) provides that the state government may integrate in the state development plan, measures to reduce or mitigate the vulnerability of different parts of the state to different disasters;
- xvii. section 39 provides that the departments of state government shall integrate into its development plans and projects, the measures for prevention of disaster and mitigation;
- xviii. section 40 (1) (a) (ii) mandates all department of the state to prepare a disaster management plan that shall integrate strategies for the prevention of disaster or the mitigation of its effects or both with the development plans and programs by the department.

5.7 IMPLEMENTATION OF DRR– FINANCIAL ASPECTS

PLAN SCHEMES

The primary mechanism for funding DRR related schemes and projects in India is through plan schemes at central and state level. Various nodal ministries play a key role in disaster management as far as specific disasters are concerned. these nodal ministries as well as other ministries and departments have dedicated schemes, aimed at disaster prevention, mitigation, capacity building, etc. within their particular domain. Existing examples include the scheme of MHA for strengthening of fire and emergency services, financial assistance to ATIs other training institutions for disaster management, integrated coastal zone management programs of MoEFCC, and flood management and flood

forecasting programs of MoWR. The DoS has a disaster management support programs and MoES has a project on tsunami and storm surge warning system. NDMA is implementing an important world bank funded project for cyclone risk mitigation. The national cyclone risk mitigation project encompasses cyclone forecasting tracking and warning systems, capacity building and structural measures. Apart from this, many of the schemes, which are implemented by various ministries/ departments, have embedded DRR components, as for example, those implemented by the MoEFCC. There are many other programs that improve societal resilience, which is a critical component of DRR, such as the national rural health mission, Mahatma Gandhi employment guarantee scheme, and the urban development's urban renewal mission. Outlay for reconstruction activities are normally embedded in the plan schemes of the union government to ensure that "building back better" is in consonance with the approved programs. Post Disaster reconstruction work is funded by the Union Government through increased outlay for the on-going infrastructure projects in the region and providing more untied grant to the affected state. The Centre/state may also utilize funds from international agencies for specific intervention in a particular region in the form of an externally aided project.

FLEXI FUNDS AS A PART OF CENTRALLY SPONSORED SCHEMES

As per department of expenditure, ministry of finance, O.M no. 55(5)/pf-ii/2011 dated 6.1.14, all central ministries shall keep at least 10 percent of their plan budget for each CSS as flexi-fund (except for schemes which emanate from a legislation or schemes where the whole or a substantial proportion of

the budgetary allocation is flexible. States may use the flexi-funds for the CSS to meet the following objectives:

- a) provide flexibility to states to meet local needs and requirements within the overall objective of each program or scheme;
- b) pilot innovations and improve efficiency within the overall objective of the scheme and its expected outcomes;
- c) undertake mitigation /restoration activities in case of natural calamities in the sector covered by the CSS

The utilization of flexi-funds for mitigation/restoration activities in the event of natural calamity must be in accordance with the broad objectives of the CSS. It is possible to combine flexi-fund component across schemes within the same sector but the flexi-funds of a CSS in a particular sector however, shall not be diverted to fund activities/schemes in another sector. The flexi-funds constitute a source of funding for mitigation activities within overall objectives of the particular CSS(s) under which they are allocated and this would still leave a gap in terms of funding purely mitigation related projects especially those addressing cross cutting themes that cover multiple sectors.

EXTERNALLY AIDED PROJECTS

Besides the fund which are available through plan and non-plan schemes, efforts have also been made by the Centre to mobilize the resources from external funding agencies for vulnerabilities assessment, capacity development, institutional strengthening of response mechanism and mitigation measures etc. The central government would continue to support

states for reconstruction and rehabilitation in the aftermath of major disasters through aid from word bank and other such external funding agencies.

RISK TRANSFER AND INSURANCE

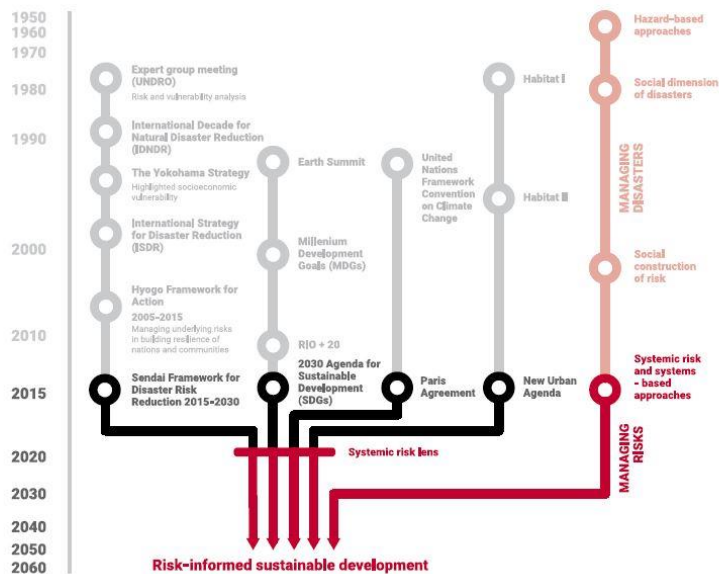
As of now government of India is acting as a self-insurer for the purpose of maintaining relief funds (National Disaster Response Fund and State Disaster Response Fund). The funds are monitored by MHA in consultation with ministry of finance. The amount committed for state disaster response fund is invested by the union in government securities. MHA has issued guidelines in consultation with ministry of finance for the maintenance and encashment of the securities as and when required. However, need for projects or risk transfer instruments by private agencies is also acknowledged by the government. The corresponding policy changes and fund requirement is to be deliberated in detail in consultation with the IRDA, insurance sector and other stakeholders.

5.8 CONCLUSION

While the post disaster relief and reconstruction are resource intensive, the government has taken care to ensure that there are established financial mechanisms available both at the state and central level to address the resource requirements for such eventualities. The present scheme of state disaster response fund (SDRF) and national disaster response fund (NDRF) are based on the recommendation of 13th finance commission. For disasters needing central support over and above the SDRF, the processing of the request of the state government for support from the government of India is done by ministry of home affairs (DM division) while the budgetary provisions for the relief funds is dealt with by the Ministry of Finance. It is to be noted that the funds have also been allocated for strengthening of disaster management institutions,

capacity development of stakeholder's, prevention & mitigation and the response mechanism. Efforts are also underway to ensure that the mitigation and prevention of disaster are also given adequate importance by utilizing these funds so that the impact of the disasters is minimized.

6. GLOBAL AGREEMENT IN DISASTER MANAGEMENT IN 2015



Source: (UNISDR 2019)

6.1 SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION 2015

The Sendai Framework is the global blueprint and fifteen-year plan to build the world's resilience to natural disasters. The Sendai Framework for Disaster Risk Reduction 2015- 2030 outlines seven clear targets and four priorities for action to prevent new and reduce existing disaster risks:

THE FOUR PRIORITIES OF ACTION:

- Understanding disaster risk;
- Strengthening disaster risk governance to manage disaster risk;
- Investing in disaster reduction for resilience; and
- Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

The Sendai Framework aims to achieve 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 over the next 15 years. It was adopted at the Third United Nations World Conference on Disaster Risk Reduction in Sendai, Japan in 2015.²³ The Sendai Framework is the successor instrument to the Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters.

THE SEVEN GLOBAL TARGETS:

- Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality rates in the decade 2020- 2030 compared to the period 2005-2015.
- Substantially reduce the number of affected people globally by 2030, aiming to lower average global figure per 100,000 in the decade 2020 -2030 compared to the period 2005-2015.
- Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030.

- Substantially reduce disaster damage to critical infrastructure and disruption 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 to 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 the people by 2030.

6.2 PARIS AGREEMENT – COP 21, 2015

At COP 21 in Paris, on 12 December 2015, Parties to the UNFCCC reached a landmark agreement to combat climate change and to accelerate and intensify the actions and investments needed for a sustainable low carbon future. The Paris Agreement builds upon the convention and – for the first time – brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. As such, it charts a new course in the global climate effort.

The Paris Agreement's central aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. Additionally, the agreement aims to increase the ability of countries to deal with the impacts

of climate change, and at making finance flows consistent with a low GHG emissions and climate-resilient pathway. To reach these ambitious goals, appropriate mobilization and provision of financial resources, a new technology framework and enhanced capacity-building is to be put in place, thus supporting action by developing countries and the most vulnerable countries, in line with their own national objectives. The Agreement also provides for an enhanced transparency framework for action and support.

The Paris Agreement requires all Parties to put forward their best efforts through “nationally determined contributions” and to strengthen these efforts in the years ahead. This includes requirements that all Parties report regularly on their emissions and on their implementation efforts. There will also be a global stocktake every 5 years to assess the collective progress towards achieving the purpose of the agreement and to inform further individual actions by Parties. The Paris Agreement opened for signature on 22 April 2016 – Earth Day – at UN Headquarters in New York. It entered into force on 4 November 2016, 30 days after the so-called “double threshold” (ratification by 55 countries that account for at least 55% of global emissions) had been met. Since then, more countries have ratified and continue to ratify the Agreement, reaching a total of 125 Parties in early 2017.

Some of the key aspects of the Agreement are set out belowInvalid source specified.:

- ***Long-term temperature goal*** (Art. 2) – The Paris Agreement, in seeking to strengthen the global response to climate change, reaffirms the goal of limiting global temperature increase to well below 2 degrees Celsius, while pursuing efforts to limit the increase to 1.5 degrees.
- ***Global peaking and 'climate neutrality'*** (Art. 4) – To achieve this temperature goal, Parties aim to reach global peaking of greenhouse gas emissions (GHGs)

as soon as possible, recognizing peaking will take longer for developing country Parties, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of GHGs in the second half of the century.

- **Mitigation** (Art. 4) – The Paris Agreement establishes binding commitments by all Parties to prepare, communicate and maintain a nationally determined contribution (NDC) and to pursue domestic measures to achieve them. It also prescribes that Parties shall communicate their NDCs every 5 years and provide information necessary for clarity and transparency. To set a firm foundation for higher ambition, each successive NDC will represent a progression beyond the previous one and reflect the highest possible ambition. Developed countries should continue to take the lead by undertaking absolute economy-wide reduction targets, while developing countries should continue enhancing their mitigation efforts, and are encouraged to move toward economy-wide targets over time in the light of different national circumstances.
- **Sinks and reservoirs** (Art.5) –The Paris Agreement also encourages Parties to conserve and enhance, as appropriate, sinks and reservoirs of GHGs as referred to in Article 4, paragraph 1(d) of the Convention, including forests.
- **Voluntary cooperation/Market- and non-market-based approaches** (Art. 6) – The Paris Agreement recognizes the possibility of voluntary cooperation among Parties to allow for higher ambition and sets out principles – including environmental integrity, transparency and robust accounting – for any cooperation that involves internationally transferal of mitigation outcomes. It establishes a mechanism to contribute to the mitigation of GHG emissions and support sustainable development, and defines a framework for non-market approaches to sustainable development.
- **Adaptation** (Art. 7) – The Paris Agreement establishes a global goal on adaptation – of enhancing adaptive capacity, strengthening resilience and

reducing vulnerability to climate change in the context of the temperature goal of the Agreement. It aims to significantly strengthen national adaptation efforts, including through support and international cooperation. It recognizes that adaptation is a global challenge faced by all. All Parties should engage in adaptation, including by formulating and implementing National Adaptation Plans, and should submit and periodically update an adaptation communication describing their priorities, needs, plans and actions. The adaptation efforts of developing countries should be recognized

- ***Loss and damage*** (Art. 8) – The Paris Agreement recognizes the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage. Parties are to enhance understanding, action and support, including through the Warsaw International Mechanism, on a cooperative and facilitative basis with respect to loss and damage associated with the adverse effects of climate change.
- ***Finance, technology and capacity-building support*** (Art. 9, 10 and 11) – The Paris Agreement reaffirms the obligations of developed countries to support the efforts of developing country Parties to build clean, climate-resilient futures, while for the first time encouraging voluntary contributions by other Parties. Provision of resources should also aim to achieve a balance between adaptation and mitigation. In addition to reporting on finance already provided, developed country Parties commit to submit indicative information on future support every two years, including projected levels of public finance. The agreement also provides that the Financial Mechanism of the Convention, including the Green Climate Fund (GCF), shall serve the Agreement. International cooperation on climate-safe technology development and transfer

and building capacity in the developing world are also strengthened: a technology framework is established under the Agreement and capacity-building activities will be strengthened through, inter alia, enhanced support for capacity building actions in developing country Parties and appropriate institutional arrangements. Climate change education, training as well as public awareness, participation and access to information (Art 12) is also to be enhanced under the Agreement.

- ***Climate change education, training, public awareness, public participation and public access to information*** (Art 12) is also to be enhanced under the Agreement.
- ***Transparency*** (Art. 13), ***implementation and compliance*** (Art. 15) – The Paris Agreement relies on a robust transparency and accounting system to provide clarity on action and support by Parties, with flexibility for their differing capabilities of Parties. In addition to reporting information on mitigation, adaptation and support, the Agreement requires that the information submitted by each Party undergoes international technical expert review. The Agreement also includes a mechanism that will facilitate implementation and promote compliance in a non-adversarial and non-punitive manner, and will report annually to the CMA.
- ***Global Stocktake*** (Art. 14) – A “global stocktake”, to take place in 2023 and every 5 years thereafter, will assess collective progress toward achieving the purpose of the Agreement in a comprehensive and facilitative manner. It will be based on the best available science and its long-term global goal. Its outcome will inform Parties in updating and enhancing their actions and support and enhancing international cooperation on climate action.
- ***Decision 1/CP.21*** also sets out a number of measures to enhance action prior to 2020, including strengthening the technical examination process,

enhancement of provision of urgent finance, technology and support and measures to strengthen high-level engagement. For 2018 a facilitative dialogue is envisaged to take stock of collective progress towards the long-term emission reduction goal of Art 4. The decision also welcomes the efforts of all non-Party stakeholders to address and respond to climate change, including those of civil society, the private sector, financial institutions, cities and other subnational authorities. These stakeholders are invited to scale up their efforts and showcase them via the Non-State Actor Zone for Climate Action platform. Parties also recognized the need to strengthen the knowledge, technologies, practices and efforts of local communities and indigenous peoples, as well as the important role of providing incentives through tools such as domestic policies and carbon pricing.

6.3 SUSTAINABLE DEVELOPMENT GOALS (SDG), 2015

6.3.1 DRR INTEGRATION

Disaster risk reduction cuts across different aspects and sectors of development. There are 25 targets related to disaster risk reduction in 10 of the 17 SDGs, firmly establishing the role of disaster risk reduction as a core development strategy. The SDGs through the lens of building resilience and reducing disaster risk and draws attention to measures that can contribute to the implementation and achievement of each goal. The section also highlights the correlation between the SDGs and its target actions with the priorities for action and targets of the Sendai Framework.

Goal 1: End poverty in all its forms

Everywhere Building disaster resilience is critical to achieving the goal of eradicating extreme poverty. As one of the key drivers of disaster risk, given

the way it creates and aggravates economic and social vulnerability, poverty has significantly contributed to the growth in risk conditions which further limit the progress of sustainable development. Evidence suggests that the impacts of disasters undermine hard-earned development gains in both developing and developed countries, potentially dragging the poor and most vulnerable even deeper into poverty. By 2030, there could be 325 million people trapped in poverty and exposed to the full range of natural hazards and climate extremes particularly in sub-Saharan Africa and South Asia. This suggests an urgent need to build and strengthen the resilience of poor communities to prevent future disaster events from pulling more people into poverty and to protect their livelihoods and assets to help them recover.

Target 1.5, which relates to building the resilience of the poor, further strengthens the position of disaster risk reduction as a core development strategy for ending extreme poverty. To achieve this goal and target, Sendai Framework proposes for the promotion and development of social safety nets linked with livelihood enhancement programs in order to ensure resilience of household and communities to disasters. Strengthening the design and implementation of inclusive policies and social safety-net mechanisms through community involvement is equally important.

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Natural hazards are a cause of global food insecurity and hunger, particularly when they compound existing economic vulnerability. Large shocks and extensive risks destroy agricultural assets and infrastructure, causing serious damage to the livelihoods and food security of millions of small farmers, pastoralists and fishers in many developing countries. Often, people depend on agriculture for their livelihoods and face increasing exposure to disaster risk

which can trap them in a cycle of food insecurity and poverty. The high impact of disaster and climate risk on agriculture calls for enhanced mainstreaming of disaster risk reduction and climate adaptation strategies within the agriculture sector.

Target 2.4 supports the immediate need to advance actions in mainstreaming disaster risk reduction and climate adaptation into agriculture sector planning and investments in order to promote resilient livelihoods, food production and ecosystems. In the context of the Sendai Framework, relevant actions including strengthening productive assets such as livestock, working animals, tools and seeds are required to achieve this goal and target. Agricultural practices also need to be modified in order to adapt to the projected changes in climate conditions as well as the increasing disaster risk. Sustainable and productive agriculture systems, including farm technologies and practices such as crop diversification to adjust to new temperature and precipitation patterns, changing livestock breeding practices and shifting grazing patterns, developing and managing climate resilient food production systems, developing and using drought and flood-tolerant crop varieties and adopting water and soil moisture conservation measures are just a few examples that could help prevent, mitigate and reduce disaster and climate risk.

Goal 3: Ensure healthy lives and promote well-being for all at all ages

People's health and wellbeing are often affected as a result of disasters and other emergencies. Major risks to public health are raised by diseases, injuries, psychosocial effects and disabilities linked to extreme weather and climate-related hazardous events. Moreover, damages to health facilities not only cost lives, but also disrupt health systems, facilities and services, leaving many without access to health care in times of emergency and longer-term implications through lost preventative care (such as vaccinations and prenatal).

Promoting resilient health systems can significantly contribute to building the capacities and resilience of communities to cope and recover from the impacts of disasters.

Target 3.d, which relates to strengthening early warning and risk reduction of national and global health risks presents an opportunity to further actions to promote resilient health systems. This target in particular is complemented by the outcome of Sendai Framework which has placed strong emphasis on the resilience of health systems and integration of disaster risk reduction into health care provision at all levels. At least four of the seven targets in the Sendai Framework are directly linked to health, focusing on reducing mortality and injuries, improving people's well-being, early warning and promoting the safety of health facilities and hospitals. All these contribute to helping people lead more resilient lives. Some of the implementation strategies highlighted in the Sendai Framework include enhancing the resilience of national health systems by integrating disaster risk management into primary, secondary and tertiary health care, especially at the local level, developing the capacity of health workers to understand disaster risk and applying and implementing disaster risk reduction approaches in health work, and promoting and enhancing training capacity in the field of disaster medicine. The Sendai Framework also calls for the inclusion of people with life-threatening and chronic disease in the design of policies and plans to manage risks before, during and after disasters.

Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Education plays a crucial role in reducing vulnerability and building community resilience to disaster risks. Damage and destruction of schools by disasters not only leads to the loss of children's and teacher's lives but also

wastes valuable public investment in social infrastructure and interrupts education, with lifelong implications. In order to progress this goal, schools should incorporate disaster-resistant structures and adapt to local risks. Resilient schools not only provide space for learning and development but can also serve as centers to coordinate response and recovery efforts and as emergency shelters. Knowledge and awareness of natural hazards also has the potential to influence behavioral change on how people can best protect their lives, properties and livelihoods, thereby contributing to disaster resilience.

Target actions 4.7 and 4.a, focusing on building and upgrading education facilities and promoting education for sustainable development, contribute significantly to resilience-building in the education sector. In order to progress these target actions, implementation needs to consider promoting disaster risk knowledge at all levels including in professional education and training as recommended by the Sendai Framework. Utilizing campaigns, social media and community mobilization can also be instrumental in promoting and strengthening public education and awareness in risk reduction.

Goal 5: Achieve gender equality and empower all women and girls

Women and girls worldwide are more exposed than men and boys to disaster risk, suffering higher rates of mortality, morbidity and significant damage to their livelihoods. More than 100 million women and girls are affected by the impacts of disasters every year due to gender inequalities associated with socio-economic and cultural traditions as well as their limited access to information. However, women and girls also have much potential to reduce disaster risk and build community resilience. They are highly capable of taking care of themselves and other people in the community in the wake of disasters. Women's active participation in disaster risk reduction has also proven effective, particularly in building leadership, sharing local knowledge and

traditions as well as developing capacity for risk reduction. Despite the absence of an action target that emphasizes strengthening the role of women and girls in the context of disaster risk reduction, it is evident that this is critical to achieving the goal of gender equality and empowerment and building disaster resilience of communities. The Sendai Framework underline women's participation is critical to effectively managing disaster risk and designing, resourcing and implementing gender-sensitive disaster risk reduction policies, plans and programs. Adequate capacity building measures are needed to empower women for preparedness as well as build their capacity for alternate livelihood means in post-disaster situations.

Goal 6: Ensure availability and sustainable management of water and sanitation for all Sustainable water management is critical to addressing disaster vulnerability and strengthening the resilience of communities to water-related hazards. Water-related disasters such as floods, droughts, hurricanes, storm surges and landslides account for approximately 90 percent of disaster events worldwide. Ongoing population growth in flood-prone areas and increased agricultural development on marginal lands will further increase exposure and vulnerability to such risks. Robust and sustainable management of water resources will significantly contribute to reducing the impacts of water-related hazards and strengthen efforts to mainstream disaster risk reduction strategies into water management.

Target 6.6, which relates to protecting and restoring water-related ecosystems, will significantly contribute to strengthening the resilience of communities to water-related hazards. This target also indirectly provides an opportunity to mainstream ecosystem-based approaches for disaster risk reduction and further highlight their value as a win-win and no regrets solution to the increasing disaster and climate risks underlined in the Sendai Framework. Some of the

implementation strategies suggested by the Sendai Framework include mainstreaming disaster risk assessment, mapping and management into rural development planning and management of rivers, coastal flood plain areas, drylands, wetlands and all other areas prone to droughts and flooding, including through the identification of areas that are safe for human settlement and at the same time preserving ecosystem functions that help reduce risks.

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all.

Billions of dollars invested in energy infrastructure are lost to disasters each year, causing significant social and economic disruptions. Over the years, there has been a significant increase in the number of energy infrastructure installed and growing incentives for clean energy development. And while this growth drives the progress of cities and economies around the world, the size of electricity networks has exposed more of this foundational infrastructure to hurricanes, earthquakes, droughts and floods. In addition, disaster risk reduction measures applied by energy sector are often managed in isolation from the broader disaster risk reduction efforts, thereby threatening to undermine overall progress on resilience. As in the case of building resilient infrastructure, measures to achieve the energy goal require strengthening and promoting the resilience of new and existing critical infrastructure to ensure they remain safe, effective and operational during and after disasters in order to provide life-saving and essential services. Some measures to consider include building better from the start to withstand hazards through proper design and construction; retrofitting and rebuilding; nurturing a culture of maintenance; and taking into account economic, social, structural, technological and environmental impact assessments.

Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Investing in disaster risk reduction and resilience is imperative to secure economic growth and development. Developed and developing countries alike have achieved significant economic progress over the years, yet the threat of increasing disaster risk raises uncertainties about their economic stability. This is due to the growing exposure of economic assets and people to hazards such as earthquakes, floods, hurricanes and drought, which magnifies disaster risk. Global average annual losses from disasters are forecast to increase from US\$260 billion in 2015 to US\$ 414 billion by 2030. Trillions of dollars of new business investment will also pour into hazard-exposed regions, largely determining the future of disaster risk. Given the current trends in disaster impacts and increased exposure of economic assets to risk, the integration of disaster risk reduction and resilience into the economic and development strategies of both the public and private sectors should be a priority in order to achieve this goal. At the macro-economic level, losses incurred from disasters by the private and public sector, including destruction or loss of assets, capital and infrastructure, can have a negative toll on employment, economic activity and growth for many years after a disaster event. In addition, global supply chains have become increasingly interconnected so that when a disaster occurs, the impacts can ripple across countries and regions. For example, the 2011 Thailand flooding caused major global supply chain disruption resulting in material shortages, production interruption and worldwide price increases of electronic products. The Great East Japan earthquake and tsunami in 2011 left the global auto industry reeling for several months. This implies that appropriate investment in disaster risk reduction is needed to reduce economic losses globally and maximize development potential.

Measures to achieve this goal as outlined in the Sendai Framework include promoting mechanisms for disaster risk transfer and insurance, risk-sharing and retention and financial protection for both public and private investment. Other areas include increasing business and protection of livelihoods and productive assets throughout supply chains and integrating disaster risk management into business models and practices. The Sendai Framework also calls for the integration of disaster risk reduction considerations and measures into financial and fiscal instruments.

Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Infrastructure, such as road, power, communications and water networks, and health and primary education facilities, is a basic requirement of a competitive economy. When infrastructure fails during a disaster event, it can interrupt vital services and threatens the sustainability of large and small businesses. For example, power failures may disrupt water supply and transport during hurricanes. The destruction of a bridge in a flash flood may isolate a local smallholder farm, workshop or restaurant from markets and suppliers for days. Some businesses, particularly small and medium enterprises, could face the risk of bankruptcy due to the lack of cash flow or reserves to be resilient. Estimates suggest that by 2030, annual investment requirements for infrastructure development are likely to total about US\$53 trillion, an average of 2.5 percent of world GDP.

Targets 9.1 and 9.a related to developing sustainable and resilient infrastructure development are vital not only to protect existing infrastructure but also future infrastructure investments. With the current trend of increasing disaster risk, it is vital for any economy to ensure that critical infrastructure is resilient to the impacts of disaster and climate risks. Infrastructure systems that

have the ability to anticipate, absorb, adapt to and or rapidly recover from a disruptive hazardous event are considered resilient. This includes structural and non-structural measures such as flood control systems, protective embankments, seawall rehabilitation, building codes, retrofitting of buildings, risk-sensitive planning, hazard mapping and disaster risk financing. In order to progress these targets and goal, the Sendai Framework recommends strengthening disaster resilient public and private investments through structural, nonstructural and functional disaster risk prevention and reduction measures in critical facilities, in particular schools and hospitals and other physical infrastructure. It also encourages the revision of existing or the development of new building codes, standards, and rehabilitation and reconstruction practices at the national or local levels. It also calls for the promotion of proper design and construction, including the use of the principles of universal design and the standardization of building materials; retrofitting and rebuilding; and nurturing a culture of maintenance of new infrastructure development.

Goal 10: Reduce inequality within and among countries

Disasters may exacerbate social inequalities. For example, they can widen the economic divide between men and women, as evident after Hurricane Katrina in 2005 where women's average income increased by 3.7 percent from 2005 to 2007 while men's incomes increased by 19 percent. The poorest populations are almost always the most vulnerable to disasters, with precarious livelihoods, lack of safety nets and economic buffers and living in high-risk environments where disasters occur frequently. Inequalities in the distribution of rights, resources and power which prevent equitable risk-sharing add to the increase in disaster risk. As is the case of Goal 1 on ending poverty in all its forms everywhere, achieving this goal could substantially contribute to building the

resilience of poor populations. To achieve this goal, the Sendai Framework proposes a comprehensive risk reduction approach to development. Among the measures that it suggests are the promotion and creation of social safety nets linked with livelihood enhancement programs, in order to ensure resilience of household and communities to disasters. Strengthening the design and implementation of people-centered, inclusive policies and social safety-net mechanisms through community involvement is equally important.

Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable

The world is increasingly becoming urban; population growth and urbanization are projected to reach more than two-thirds of the world's population. Increasing population density can lead to creation of risk, especially when urbanization is rapid, poorly planned and occurring in a context of widespread poverty. Furthermore, the growing concentrations of people and economic activity in most cities are seen to overlap with areas of high-risk exposure. Estimates suggest that by 2050, the urban population exposed to cyclones will increase from 310 million to 680 million while exposure to major earthquake risks will increase from 370 million to 870 million. Urban development investment is also set to increase from US\$7.2 trillion in 2011 to US\$12 trillion by 2020. The exposure of urban assets to sea level rise and flooding could reach US\$35,000 billion by the 2070s which is ten times more than the current levels. With 60 percent of what will be urban in 2030 still to be built, urban growth presents an unparalleled opportunity to reduce disaster risk in cities by reflecting resilience and disaster risk reduction in policy, planning, design and investment decisions over future urban development, and to avoid past development mistakes. Action targets under this goal (11.1, 11.3, 11.4, 11.5, 11.b and 11.c) focusing on upgrading urban slums, integrated urban planning,

reducing social and economic impacts of disaster risk, building the resilience of the urban poor, adopting and implementing urban policies in line with the Sendai Framework and building sustainable and resilient urban infrastructure are strategic opportunities to ensure increase capacity to support cities, protect current and future development prospects and build safer, more resilient cities throughout the world. Measures to achieve these targets and goal, as outlined in the Sendai Framework, require mainstreaming of disaster risk assessments into land-use policy development and implementation, including urban planning, land degradation assessments and informal and non-permanent housing, and the use of guidelines and follow-up tools informed by anticipated demographic and environmental changes. Empowerment of local authorities through regulatory and financial means to work and coordinate with civil society, communities and indigenous peoples and migrants in disaster risk management at the local level is also needed. Mobilizing effective global and regional campaigns such as the “Making Cities Resilient: my city is getting ready!” campaign is also instrumental to strengthen public awareness and education, promote a culture of disaster prevention, resilience and responsible citizenship, generate understanding of disaster risk and support mutual learning and experience sharing.

Goal 12: Ensure sustainable consumption and production patterns

The absence of proper waste management strategies and approaches influence the increase in disaster risk. The indiscriminate dumping of solid waste may cause flooding which could also damage critical infrastructure such as solid waste systems, triggering more sewage overflows. In addition, waste generated after a disaster event such as debris from collapsed buildings and infrastructure may contain toxic or hazardous components that could cause serious environmental and health impacts. Inefficient disaster waste management also

affects livelihoods and recovery efforts, with potentially far-reaching implications for the economy. Although target actions under this goal are not specific to disaster risk reduction, the sound management of chemicals and substantial reduction in waste generation can significantly contribute to reducing disaster risk. However, more needs to be done to strengthen integration of sustainable waste management into disaster response and recovery and building back better.

Goal 13: Take urgent action to combat climate change and its impacts Climate change magnifies disaster risk and increases the cost of disasters. Through changing temperatures, precipitation and sea levels, amongst other factors, global climate change is modifying hazard levels and exacerbating disaster risks in different sectors and countries. Since 1980, weather-related hazards have accounted for 74% (US\$2.6 trillion) of total reported losses, 87% (18,200) of total disasters, and 61% (1.4 million) of total lives lost. The number of weather-related hazards has tripled, and the number of people living in flood-prone areas and cyclone-exposed coastlines doubled. The trend is expected to continue to increase. For example, in the Caribbean, climate change will contribute an additional US\$1.4 billion to expected annual losses by 2050xxvi. As risks become further amplified by increasing climate variability and change, higher losses and impacts in the future are expected, which would certainly undermine current and future development efforts. Investing in disaster risk reduction is a precondition for developing sustainably in a changing climate. Target actions under this goal, focusing on strengthening resilience and adaptive capacity, capacity building and integrating climate change measures into policies and plans, awareness raising on climate adaptation and early warning (Targets 13.1 to 13.3 and 13.a to 13.b) provide opportunities to strengthen the integration between disaster and climate resilience to protect

broader development paths at all levels. This goal and targets could also influence the provision of long-term financing for addressing disaster and climate risk, needed to optimize implementation and bring about transformative change. In order to achieve these targets and the overall goal, the Sendai Framework recommends to strengthen disaster risk modeling, assessment, mapping, monitoring and multi-hazard early warning systems; promote the conduct of comprehensive surveys on multi-hazard disaster risks and the development of regional disaster risk assessments and maps, including climate change scenarios; and maintain and strengthen in situ and remotelysensed earth and climate observation. The Sendai Framework also calls for the integration of disaster risk reduction measures into multilateral and bilateral development assistance programs related to climate change adaptation.

Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development

More than half of the world's population lives within 100 kilometers of the coastlines, a figure which could rise to three quarters by the year 2020. Marine resources and associated coastal ecosystems contribute significantly to national economies and provide a wide range of services to communities, including food sources, livelihoods as well as shoreline protection against storm surges, floods, sea level rise, tsunami and other coastalrelated hazards. Along with natural hazards, improper development and the degradation of marine and coastal ecosystems pose threats to coastal communities and often lead to creation of risk by removing the benefits that ecosystems provide, further exposing people and properties to the impacts of natural hazardous events.

Target action 14.2, focusing on the sustainable management and protection as well as strengthening resilience of marine and coastal ecosystems, can

contribute to reducing disaster risk and increase in demand for healthy marine and coastal ecosystems. Through this demand, marine and coastal efforts may be more socially and economically acceptable. Moreover, coastal and marine protection can be further enhanced through management plans that factor risk-reducing elements into their design – for example through investing in coastal mangroves or protecting vital coral reefs.

The Sendai Framework explicitly seeks to account for the environmental damages caused by disasters – in many cases damages are attributable to the removal of disaster waste and to impacts associated with recovery and reconstruction planning that have by-passed existing environmental legislation. The looming collapse of global fisheries as a hazard with far-reaching consequences should also be considered by disaster risk managers adopting a truly multi-hazard perspective. Finally, the science and observing systems that support analysis of coastal hazards (storm surge, tsunami and El Nino variations) significantly add to the data and knowledge base available to managers of coastal and marine ecosystems. As is the case for terrestrial ecosystems, the Sendai Framework proposes a number of priority actions for implementation, including mainstreaming disaster risk assessment, mapping and management into rural development planning and management of coastal flood plain areas, among others; supporting trans-boundary cooperation for the implementation of ecosystem-based approaches with regard to shared resources, such as within river basins and along coastlines; and encouraging the establishment of mechanisms and incentives to ensure high levels of compliance with existing laws and regulations addressing land use, environmental and resource management.

Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land

degradation and halt biodiversity loss. Ecosystem degradation erodes the resilience of communities and nations and exposes them to increased risks of and impacts from disasters. From desertification and degradation of drylands to the destruction of coastal forests and wetlands, the loss of biodiversity and ecosystem services often translates into increased disaster risk, losses and slower recovery, in urban and rural areas alike. Drivers of degradation such as land conversion for urban growth, unsustainable agriculture and infrastructure as well as extractive industries and pollution are well understood. Conversely, ecosystem protection and restoration offer sustainable and cost-effective solutions for disaster risk reduction. Preliminary estimates put global annual losses to ecosystem services as high as US\$190 billion. Protecting, restoring and sustainably using ecosystems are critical in this regard. Target actions 15.1 to 15.4 and 15.9, focusing on managing and restoring forests, combating land degradation and desertification, conserving mountain ecosystems and their biodiversity and integrating ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies, all contribute to resilience building. These targets are also in line with the Sendai Framework's focus on building environmental resilience through the inclusion of ecosystems in risk analysis and planning. As per marine ecosystems, the Sendai Framework proposes similar priority actions for their terrestrial equivalents -- mountains, rivers, coastal flood plain areas, drylands and wetlands, among others.

Goal 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels Disasters and conflict are mutually reinforcing. Weak state structures and social systems in conflict-affected countries are likely to affect the ability of people and communities to respond to disaster risks, as well

as increase the likelihood of stresses and shocks turning into a disaster. At the same time, extreme weather events and other natural hazards can exacerbate the challenges that people and communities already face during conflict situations and may create new risks. Conflict and disasters damage and destroy livelihoods, safety nets, health and infrastructures, which perpetuates vulnerabilities that put people and communities at risk, further entrenching poverty and inequality. For example, the result of the long-standing conflict in Somalia has led to a weak government response to drought or flooding. If there were no conflict in Somalia, it is conceivable that both the state and community institutions would be better able to cope with the natural hazards, thereby avoiding a disaster altogether. Many developing countries experience the impacts of both disasters and conflict. Reports show that more than 50% of people affected by natural hazardous events, from 2005 to 2009, have lived in fragile and conflict-affected contexts. In order to progress this goal, it is imperative that disaster risk reduction and response is incorporated into target actions in order to strengthen the resilience of people and communities in conflict-affected countries and in the aftermath of disasters.

Goal 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development

The success of the 2030 Agenda for Sustainable Development, particularly the SDGs, depends on its effective implementation. To be effective, the implementation must ensure wide participation of stakeholders including NGOs, civil society and the private sector, who have been instrumental in the progress achieved so far in sustainable development. This was seen at the Third UN World Conference on Disaster Risk Reduction in March 2015, where over 600 commitments were made by stakeholders as part of the implementation of the Sendai Framework. It will be important to ensure these commitments are

consistent and coherent with partnerships and initiatives in the post-2015 development agenda. Opportunities for partnership building are presented in the implementation of both the outcome document and the Sendai Framework. Successful partnerships can potentially bring out competence and experience-sharing as well as build synergies between different target actions which can be cost-effective in the long term. These partnerships can substantially contribute to or complement efforts to achieve the SDGs.

7. POST DISASTER DAMAGE AND NEED ASSESSMENT

In the aftermath of disasters, affected countries need to invest significant resources to address recovery needs. These should be guided by a comprehensive assessment that estimates damages and losses, and identifies the needs of the affected population. The *Post Disaster Needs Assessment (PDNA)* is the first step towards developing a holistic recovery programs that promotes equity and inclusion. The PDNA is an exercise led by the government and supported by UN agencies, the World Bank, and the European Union. UNDP coordinates on behalf of the UN system and has supported more than 15 PDNAs in the last three years. These assessments – carried out in the aftermath of earthquakes, cyclones, floods and droughts – have formed the basis for governments and other stakeholders to develop recovery plans and allocate required resources.

The Government of India, through the Ministry of Home Affairs (MHA) and National Disaster Management Authority (NDMA) and with the assistance of National Institute of Disaster Management (NIDM) has developed the Post Disaster Needs Assessment (PDNA) Tools for India under National Cyclone Risk Mitigation Project assisted by the World Bank. The objective of these tools is to establish a standardized mechanism based on scientific approach for conducting post disaster needs assessment for recovery and reconstruction. The newly developed tools are based on the existing damage assessment system in India and an internationally-accepted methodology, which has been used worldwide and adopted by the United Nations Development Group (UNDG), the European Union (EU) and the World Bank (WB), which signed a joint declaration in 2008 on Post-Crisis Assessments and Recovery Planning.

The tools have been prepared with the technical assistance of the Asian Disaster Preparedness Center (ADPC). The PDNA India tools have three parts as follows;

1. PDNA India Handbook
2. PDNA India Manual
3. PDNA India SoP

7.1 RATIONALE FOR THE INDIAN PDNA TOOL

The Post Disaster Needs Assessment (PDNA) has been adapted for India, on the basis of best current international practices and customized to local conditions, which will enable the comprehensive and scientific assessment of recovery and reconstruction needs on the basis of a thorough analysis of disaster effects and impacts. This methodology should not be seen as a replacement or substitute for the existing approach which States use for the development of the Relief Memorandum. It should be noted that the methodology treats recovery and reconstruction following a disaster as a separate and additional area of disaster management, while building resilience to future events. To undertake this new methodology, a core team of sector specialists from State and National levels must be trained. In this way, the burden of work of the Revenue Commissioners will not be increased.

A thorough analysis has been made of the strengths and weaknesses of the existing system for estimation of disaster effects and impacts and of recovery and reconstruction needs assessment in India.

This analysis, conducted in light of current international practices, reveals that the existing system in India may be described as relief-centered. While the existing system is efficient in defining the amounts of relief assistance to be provided to affected population in accordance to previously-defined criteria, and enables the prompt disbursing, such assistance to disaster-affected people, it does not enable the comprehensive and systematic estimation of overall disaster impact nor the scientific estimation of recovery and reconstruction needs and the estimation of financial requirements for such purpose. The data collected for such response assessments is insufficient to enable a full and scientific analysis of the consequences of the disaster on living conditions, quality of life and on the socio-economic development of those who are affected. As a result, recovery is left almost exclusively to the initiative and the capacity of each affected person and takes an unnecessarily long time, thus frustrating people's aspirations and delaying their return to normal levels of wellbeing.

In addition, relief assistance at the present time is only provided to part of the affected population – i.e. mostly to the poorer strata of the affected population – and not all affected sectors of the economy are included, which is not conducive to a prompt recovery. Furthermore, the amounts of response assistance are clearly insufficient for affected families to enable them to rebuild their destroyed assets; in the absence of other sources of capital for reconstruction, people resort to rebuild their homes and other assets applying lower standards of quality and using inadequate construction materials and disaster risk – rather than being reduced – is increased after disasters.

Sectors of economic activity under private ownership are not included in the existing system of disaster assessment, apparently because it is assumed that they have sufficient savings and/or insurance to meet post-disaster requirements. This assumption is evidently only partially valid since not every enterprise – especially small to medium size companies – has such a capacity and insurance is only held by one out of seven such entities. Leaving out such large portions of the economy – and it is to be remembered that publicly-owned activities represent only 20 per cent of all activities in the economy – further limits recovery efforts and have a negative bearing on people's livelihoods, since many jobs are under the purview of the private sector that is unable to recover promptly. Households thus lose employment and income for a longer time after disasters.

Data on disaster effects, collected on the basis of the existing system, is insufficient to enable a full analysis of disaster impact in macro-economic and macro-social terms, despite the fact that India has an excellent database on socioeconomic indicators. Thus, assessments do not include an examination of social and economic disaster impact, which may be used as the basis for defining needs for recovery and disaster-resilient reconstruction.

Analyses conducted under the India PDNA study reveals that overall socio-economic growth in the country and in the disaster-affected States is hindered by the impact of disasters. In many cases, gross domestic production slows down and the State and Central government fiscal position deteriorates after disasters in view of disaster-induced diminishing tax receipts and increased expenditures. At the personal or household level, disasters induce significant reductions in income through losses in employment and livelihoods, increase

costs of living due to scarcity and inflation, thereby worsening quality of life and human development.

Therefore, there is a need for India to be more recovery-and reconstruction-oriented and the government should be more concerned about achieving a prompt and all-inclusive recovery as well as disaster-resilient reconstruction that involves reduction of disaster risk. This does not require that the government should assign financial resources to cover private sector needs; it only means that the government (at Central and State levels) should endeavor to assess disaster impact for the entire economy and society so that both public and private sectors may (simultaneously and in a concerted fashion) define and finance recovery and reconstruction after disasters.



8. DISASTER AND DEVELOPMENT

Looking at disasters and development as a whole, one must consider the role essential development can play in managing disasters as they affect “society’s capacity—both in preparedness and recovery”. Many factors can impede the process of integrating disasters and development. Rapid growth and poor re-development can create challenges and increase disaster risk in vulnerable communities. These issues create a need for a shift from perfecting response and recovery to looking at the benefits of disaster development in the early stages of mitigation and preparedness. Risk reduction and environmental management, in this sense, play a key role in developing policies that sustain communities.

Unsustainable development strategies are key reasons for increased cost of disasters. Impact of climate change and global environmental challenges necessitate a perspective that integrates disaster and development. A need for integrating perspective was also recognized by the United Nations Millennium Development Goals by placing sustainable development as critical for disaster risk reduction. To support the connection between disaster and development, researchers also stress the importance of creating participatory and collaborative processes, allowing civil society to engage in and take responsibility in disaster risk management and sustainable development.

In order to make progress in the development stages of disaster reduction, interdisciplinary studies must occur to develop better risk reduction strategies and until policies reflect this need, communities will potentially remain vulnerable and weak. It is important to create a participatory process, allowing civil society to engage in and take responsibility in disaster risk management.

Participatory actions provide opportunities for a wide range of actors to interact and share knowledge. This process, it is hoped, will bring about connections between environmental knowledge and risk reduction. The holistic approach to integrating disaster with development has been emphasized and practiced by policymakers and public managers of local communities.

The idea of integrating disaster and development to understand their relationship is relatively new. The interdependent (and blurred) relationship between disasters and development is extremely complex and requires new strategies to address both. Disaster recovery efforts should include sustainable development perspectives with an aim of vulnerability reduction. Disaster and development concepts were not used together with the hazard perspectives before the 1970s. Vulnerability reduction perspective gained some influence in the field during 1980s and 1990s when vulnerability perspectives and disaster development were used together. Similar to disaster vulnerability reduction perspectives, disaster resiliency perspectives that focus on sustainable development and disaster risk reduction have also been emphasized in recent years.

8.1 MAINSTREAMING OF DISASTER RISK REDUCTION IN DEVELOPMENTAL STRATEGY

Prevention and mitigation contribute to lasting improvement in safety and should be integrated in the disaster management. The Government of India has adopted mitigation and prevention as essential components of their development strategy. Accordingly, the Tenth Five Year Plan document has a detailed chapter on disaster management. The plan emphasizes the fact that development cannot be sustainable without mitigation being built into the developmental process.

Mainstreaming DRR involves incorporating disaster risk reduction into development policy and practice. It means radically expanding and enhancing disaster risk reduction so that it becomes normal practice, fully institutionalized within an agency's relief and development agenda. Mainstreaming has three purposes:

(a) To make certain that all the development programs and projects that originate from or are funded by an agency, are designed with evident consideration for potential disaster risks and to resist hazard impact,

(b) To make certain that all the development programs and projects that originate from or are funded by an agency, do not inadvertently increase vulnerability to disaster in all sectors: social, physical, economic and environment,

(c) To make certain that all the disaster relief and rehabilitation programs and projects that originate from or are funded by an agency are designed to contribute to developmental aims and to reduce future disaster risk.

Mainstreaming DRR into the developmental plans is an important mandate of the Disaster Management Act 2005. Integration of disaster risk reduction measures into ongoing flagship programs of Government of India is being used as an entry point for mainstreaming DRR in development plans. Steps for ensuring the incorporation of DRR into various ongoing programs\plans are as follows:

(a) Identification of key programs/projects of Government of India,

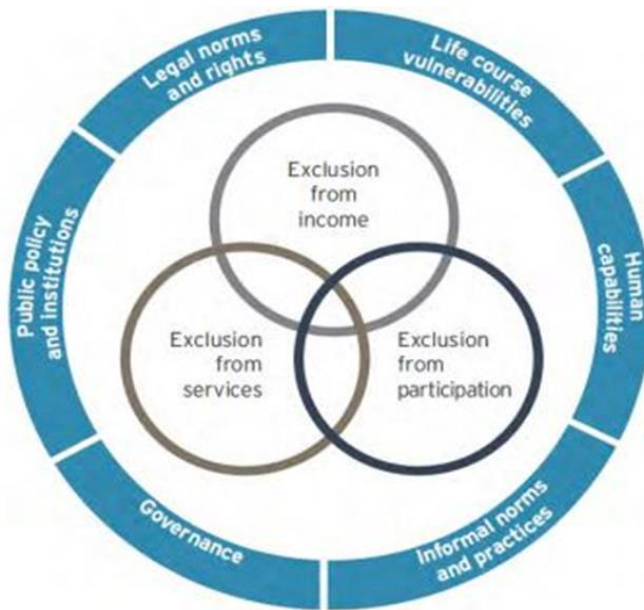
- (b) Identification of entry points within the programs for integration of DRR (structural, nonstructural and other mitigation measures) at various levels viz. national, state and district levels,
- (c) Close coordination with concerned departments such as State Planning Commission and Finance Department for promoting DRR measures into development plans and policies,
- (d) Advocacy for allocation of dedicated budget for DRR within the departmental plans,
- (e) Preparation of guidelines for integration of disaster risk reduction measures into development plans of various departments at the district and sub-district levels

9. LEAVING NO ONE BEHIND

The disaster causes damage, casualties and disruption. It occurs as a result from the combination of hazard, vulnerability and capacity. Vulnerability is therefore a key concept in DRR, which goes beyond exposure to a hazard, to include physical, social, economic and environmental factors. Worldwide, some countries tend to be disproportionately impacted by disasters, and the same applies at regional and community level. Indeed, facing the same hazard, some individuals will face more losses, injuries or death. They will have less capacity to anticipate, cope with, resist and recover from the impact. They will be more ‘‘vulnerable’’, presenting greater disaster risk. They are known as the “most-at-risk groups”. The concept of differential vulnerability means that different populations face different levels of risk and vulnerability. The sources of vulnerability are multiple and quite diverse, they can include characteristics such as socioeconomic status, gender, age, physical and mental health status, disability, ethnicity, religion, etc.

Inclusive DRR is responding to: Marginalized groups being more likely to suffer from disasters; Disasters exacerbating vulnerabilities and social inequalities; Vulnerable groups being excluded from DRR decision-making, thus making them even more vulnerable to the impact of disasters. Considering that particularly excluded groups (based on age- gender and disability) are at higher risk to disasters. Inclusive DRR is “an effort to reduce vulnerabilities of the most excluded ones and to increase their capacities to reduce the risks”. Inclusive DRR is also the recognition of the right of these groups to benefit from and participate in Disaster Risk Reduction strategy.

Social exclusion is a key concept to understand why individuals and groups are more vulnerable, looking at their exclusion from income, exclusion from participation, and/or exclusion from services. Because of this, most-at-risk groups tend to be excluded from DRR decision-making and practices, thus making them even more vulnerable to the impacts of disaster, more likely to need support before, during and after the disaster, and less likely to cope with it. Also, disasters exacerbate vulnerabilities and social exclusion. The degree of social exclusion, based on the human development model, will be influenced by the interaction between personal factors (intrinsically) and environmental factors (extrinsically). External factors can include poor living conditions, inadequate infrastructure, lack of income diversification and limited access to basic services, especially education and information, discrimination and negative attitudes, etc. Personal factors can include self-confidence of the person, health condition, mobility perspective and communication limitation to understand and communicate, etc. Social exclusion then needs to be tackled looking both at the individual and environmental level, and remembering that while DRR aims to reduce vulnerabilities and increase capacities, it shouldn't be forgotten that most-at-risk groups do have capacities, potential and can highly contribute to DRR efforts.



THE 4 DIMENSIONS OF INCLUSION IN DRR

Inclusive DRR is a broad concept. When addressed in depth it is hard to pin down, as many aspects speak to the quality of inclusion. The four dimensions outlined below, when working together, have been found to strengthen Inclusive DRR projects and activities and DRR actors. These four dimensions allow both to analyze and assess inclusion at any given time, and to assess change throughout longer term evolutions:

- Ensuring the full and meaningful participation in decision making of all at risk groups (based on age- gender and disabilities) and individuals in identifying and reducing risk.
- Promoting diversity (of people, risks barriers, sectors and level of intervention).
- Appreciating and encouraging tailored approaches in link with “do not harm” ethics and “leaving no one behind”.
- Contributing to resilience for everyone by removing barriers that keep excluded people out.

10. SLOW ONSET DISASTER- DROUGHT AND FOOD SECURITY

Most discussion of slow-onset disasters concentrates on one hazard: drought. It can take months or sometimes years for the results of drought to become disastrous, in the form of severe water and food shortages and, ultimately, famine. Drought is not the only relevant hazard, though. Pollution of the environment can also be considered a slow-onset disaster, particularly in cases of growing concentrations of toxic wastes, which may build up over years. Human activities that degrade the environment and damage ecosystems – deforestation for instance – also contribute to disasters. Their cumulative impact may not be felt for decades, although the hazards that they make more likely, such as flash-floods and landslides, may be sudden-onset events. To some extent, the distinction between slow- and rapid-onset disasters is artificial. Hazards certainly can be categorized in this way. Disasters, on the other hand, are the product of hazards and human vulnerability to them. The socio-economic forces that make people vulnerable may act quickly or slowly, but in most disasters, it is likely that long-term trends will be more influential. When viewed in this light, it could be argued that all disasters are slow-onset. This Good Practice Review argues for a long-term, holistic approach towards managing risk that also breaks down the distinction between slow- and rapid onset disasters.

Why then have a separate chapter on slow-onset disasters? There are two related reasons. First, because real-life disaster management often does distinguish between rapid- and slow-onset events. The approaches that have been developed for dealing with slow-onset hazards such as drought may differ from those used against other hazards. The documentation of such work is

generally much better here than in other disasters, and there is a greater volume of high-quality research and analysis. The second reason is that, in the management of drought and food security, and in environmental renewal initiatives, development agencies play a much more significant role than they do in sudden-onset disasters. This may offer lessons about how to get the development community more involved in disaster management generally. Mitigation of drought and food security is more advanced than mitigation of many other types of disaster in integrating livelihood issues with disaster management, adopting participatory and community-level approaches, and building upon indigenous knowledge, coping strategies and appropriate technologies.

10.1 DROUGHT AND FOOD SECURITY

More than 70m people died in famines during the twentieth century. There have been many major, high-profile food crises over the past 30 years. Most have been in Africa. Many have been triggered by drought, but other hazards including floods, harsh winter weather and diseases that affect crops and livestock can also act as triggers. Natural hazards are only one factor in food crises. Political, economic and social factors, including conflict, can be powerful contributors. The macro-economic policies of governments and international agencies have played a considerable role in creating food insecurity and famine.

There is no fixed yardstick for measuring food security. It depends on people being able to buy food or obtain it in other ways, such as in exchange for their services (e.g. labor) or borrowing from members of their extended family or community. This, in turn, depends on them having sufficient income, savings

and other material assets, skills or social connections to obtain food. It also depends on external factors such as the price of food in the market. Control of the supply and distribution of food is another important dimension. Some members of a household have little influence over how food is distributed. Children depend on the food they are given by adults. Male children and adults often get more food than females. Providing adequate food for elderly family members may not be a priority when times are hard. Sometimes decisions about food distribution are made on the basis of economic rationality – for instance, a family member who brings in a regular wage may get priority – but power relationships and cultural practice are also influential.

Although the causes of food insecurity include political, social and economic factors, natural hazards, especially drought, remain important.

Scientists and geographers distinguish between three kinds of drought:

1. Meteorological drought is when rainfall drops below a certain level.
2. Hydrological drought involves a reduction in water resources such as rivers, lakes and underground water: this too is the result of lower rainfall, but it may take some time to be felt, and in the case of river systems may be the result of a drop in rainfall far away from the area in question.
3. Agricultural drought is the impact of the other two kinds on crop yields. Whilst it is obvious that places that receive little rainfall are drought prone, drought can also occur where rain is normally sufficient. A few weeks with little or no rain at a critical time of the year for crop growth can be devastating, even if the rest of the year is not dry. The important point is whether the amount

of rainfall is sufficient for agriculture, livestock and other human needs at the time in question. Drought's impact is felt on different geographical scales. Climatic conditions can vary widely within a country. At local level, changes in land use can have a significant impact on watersheds, and hence the amount of water available through run-off or from rivers and ponds.

Seasonal food insecurity is normal in many poor households, which suffer from a hungry period shortly before the harvest, as food gathered from the previous harvest runs out. This problem is known as 'chronic' food insecurity, as opposed to one-off food shortages, which are classified as 'transitory' food insecurity. When food insecurity is acute and prolonged, it can lead to starvation and finally to famine (famine is where there is a significant increase in sickness and death rates resulting from starvation and associated factors). The descent into acute food shortage and thence into famine can take weeks, months or even years. Except where conflict is a major contributing factor, famine should not be seen as inevitable because of the range of measures available at all levels to improve food security and strengthen livelihoods in the long term. Take, for example, the mitigation strategies used by communities to protect themselves against drought and the food insecurity that results from it. These can be divided into two main types: agricultural and non-agricultural.

- Agricultural mitigation strategies are measures to maintain crop and livestock production. They include sowing again after a crop has been ruined by drought, sowing alternative crops, or moving livestock to other locations.
- Non-agricultural mitigation strategies include seeking off-farm employment in the locality or elsewhere, eating seeds or roots that were saved to be sown in

the next growing season, reducing the amount of food consumed, eating wild food such as berries and roots, postponing social functions such as weddings, using up savings and selling assets (such as livestock, household goods and personal possessions), buying on credit, borrowing money or calling in favors from communities and kin. Families only sell their livelihood assets when they have to, which is when other methods such as growing alternative crops or finding alternative employment are insufficient. Sale of assets is a good indicator of how severe the consequences of drought are. Poor families, those with small landholdings and the landless, are the first to resort to such methods. Only when all else has failed will whole families and communities migrate in search of food.

The severity of a food crisis can therefore be judged by looking at food and livelihood coping strategies as well as at food supplies. Food insecurity among a particular population is likely to be acute if:

- People experience a large reduction in their major source of food and are unable to make up the difference through new strategies.
- The prevalence of malnutrition is abnormally high for the time of year, and this cannot be accounted for by health or care factors.
- A large proportion of the group is using marginal or unsustainable coping strategies.
- People are using coping strategies that are damaging their livelihoods in the longer term or incur some other unacceptable cost such as acting illegally or immorally – stealing, for instance.

The most effective way to protect communities against food insecurity and famine resulting from drought is to strengthen these diverse mitigation strategies well in advance, especially those that enable them to preserve their

productive assets, such as animals, seeds and tools. Despite this, most external intervention is still in response to drought, not in helping to create more drought-resistant communities. Moreover, it often comes at a late stage, when communities are in crisis and may already be destitute, having been forced to dispose of productive assets. Typical interventions in such circumstances are to provide food, seeds, fertilizer, animals and agricultural equipment to replace that which has been used or sold, and to lend money. Where a crisis has become acute, with widespread starvation and migration, aid agencies' interventions focus on emergency response, especially feeding and health care. Food-for-work and cash-for-work schemes are also common responses. The boundary between disaster preparedness and response is blurred in food crises, because they can develop over such a long period. Some would argue that an emergency begins when hungry people are forced to dispose of their livelihood assets; others put it at the point where destitute, starving people leave their homes to beg for food, or even where large numbers begin to die of starvation.

11. NATIONAL EARLY WARNING SYSTEM

11.1 CENTRAL AGENCIES DESIGNATED FOR NATURAL HAZARD-SPECIFIC EARLY WARNINGS

The GoI has designated specific agencies to monitor the onset of different natural disasters, set up adequate Early Warning Systems (EWS), and disseminate necessary warnings/ alerts regarding any impending hazard, for all those hazards where early warning and monitoring is possible with the currently available technologies and methods. These agencies provide inputs to the MHA, which will issue alerts and warnings through various communication channels. The agencies responsible for EWS will maintain equipment in proper functioning order and conduct simulation drills to test their efficacy.

CENTRAL AGENCIES DESIGNATED FOR NATURAL HAZARD-SPECIFIC EARLY WARNINGS

HAZARD	AGENCIES
Avalanches	Snow and Avalanche Study Establishment (SASE)
Cyclone	India Meteorological Department (IMD)
Drought	Ministry of Agriculture and Farmers Welfare (MoAFW)

Earthquake	India Meteorological Department (IMD)
Epidemics	Ministry of Health and Family Welfare (MoHFW)
Floods	Central Water Commission (CWC)
Landslides	Geological Survey of India (GSI)
Tsunami	India National Centre for Oceanic Information Services (INCOIS)

On their part, the relevant State Government and district administration shall disseminate such alerts and warnings on the ground through all possible methods of communications and public announcements.

11.2 ROLE OF CENTRAL AGENCIES/ DEPARTMENTS

The National Emergency Operations Centre (NEOC) will act as the communication and coordination hub during this phase and it will maintain constant touch with early warning agencies for updated inputs. It will inform State Emergency Operations Centre (SEOC) and District Emergency Operations Centre (DEOC) through all the available communication channels and mechanisms. The DM Division of the MHA will communicate and coordinate with designated early warning agencies, various nodal Ministries, and State Governments. It will mobilize reinforcements from the NDRF, Armed Forces and the CAPFs and put together transportation plans for moving resources. The NDMA will support the overall coordination of response as per needs of MHA. The NDMA will be providing general guidance, and take

decisions for the deployment of the NDRF. The NDRF will be deployed as required depending on the request from State Government. They will keep the force in operational readiness at all times.

11.3 COORDINATION OF RESPONSE AT NATIONAL LEVEL

At the national level, the Central Government has assigned nodal responsibilities to specific Ministries for coordinating disaster-specific responses. The NEC will coordinate response in the event of any threatening disaster situation or disaster. The State Government will activate the IRTs at State, District, or block level and ensure coordination with the SEOC. The SDMA will provide the technical support needed to strengthen the response system. It is essential that the first responders and relief reach the affected areas in the shortest possible time. Often, there are inordinate delays due to real constraints imposed by the location, nature of disaster and, most regrettably, due to inadequate preparedness. In many situations, even a delay of six to twelve hours will prove to be too late or unacceptable. To make matters worse, relief tends to arrive in a highly fragmented or uncoordinated form with multiple organizations acting independently of each other without a cohesive plan, without mechanisms to avoid overlaps and without proper prioritization of different aspects of relief such as shelter, clothing, food, or medicine. From an operational perspective, the challenges are similar across most hazards. The NDMA has formulated IRS Guidelines for the effective, efficient, and comprehensive management of disasters. The implementation of NDMA's IRS Guidelines by the States will help in standardization of operations, bring clarity to the roles of various departments and other agencies, which are common to most disaster response situations.

CENTRAL MINISTRIES FOR COORDINATION OF RESPONSE AT NATIONAL LEVEL

DISASTER	NODAL MINISTRY/ DEPT./ AGENCY
Biological Disasters	Min. of Health and Family Welfare (MoHFW)
Chemical Disasters and Industrial Accidents	Min. of Environment, Forests and Climate Change (MoEFCC)
Civil Aviation Accidents	Min. of Civil Aviation (MoCA)
Cyclone, Tornado, and Tsunami	Min. of Home Affairs (MHA)
Disasters in Mines	Min. of Coal; Min. of Mines (MoC, MoM)
Drought, Hailstorm, Cold Wave and Frost, Pest Attack	Min. of Agriculture and Farmers Welfare (MoAFW)
Earthquake	Min. of Home Affairs (MHA)
Flood	Min. of Home Affairs (MHA)
Forest Fire	Min. of Environment, Forests and Climate Change (MoEFCC)
Landslides and Avalanche	Min. of Home Affairs (MHA)
Nuclear and Radiological Emergencies	Dept. of Atomic Energy, Min. of Home Affairs (DAE, MHA)

Oil Spills	Min. of Defence/Indian Coast Guard (MoD/ICG)
Rail Accidents	Min. of Railways (MoR)
Road Accidents	Min. of Road Transport and Highways (MoRTH)
Urban Floods	Min. of Urban Development (MoUD)

The state and district administration shall identify sites for establishment of various facilities as mentioned in the IRS guidelines such as Incident Command Post, relief camp, base, staging area, camp, and helipad, for providing various services during the response. The state and local administration must widely disseminate and publicize information about these arrangements as mandated in the SDMP and DDMP. Since disaster response operations are multifaceted, time sensitive, extremely fast-moving, and mostly unpredictable, it requires rapid assessment, close coordination among several departments, quick decision-making, fast deployment of human resources and machinery as well as close monitoring. In order to prevent delays and to eliminate ambiguities with regard to chain of command, the SDMP and DDMP must clearly spell out the response organization as per IRS. These plans must clearly identify the personnel to be deputed for various responsibilities in the IRT at various levels of administration along with proper responsibility and accountability framework. Provision for implementation of unified command in case of involvement of multiple agencies such as Army, NDRF, CAPF, and International Urban Teams Search and Rescue must be spelt out in the SDMP.

From time to time, the DM plan must be tested and rehearsed by carrying out mock exercises.

11.4 RESPONDING TO REQUESTS FOR CENTRAL ASSISTANCE FROM STATES

Catastrophic disasters like earthquakes, floods, cyclones and tsunami result in a large number of casualties and inflict tremendous damage on property and infrastructure. The Government of India has established a flexible response mechanism for a prompt and effective delivery of essential services as well as resources to assist a State Government or Union Territory severely hit by a disaster. Disaster management is considered as the responsibility of the State Governments, and hence the primary responsibility for undertaking rescue, relief and rehabilitation measures during a disaster lies with the State Governments. The Central Government supplements their efforts through logistic and financial support during severe disasters as requested by the State Governments. Responding to such emergencies stretches the resources of district and State administration to the utmost and they may require and seek the assistance of Central Ministries/ Departments and agencies like the NDRF, Armed Forces, CAPF, and Specialized Ministries/ Agencies.

11.5 CORPORATE SOCIAL RESPONSIBILITY (CSR) AND PUBLIC-PRIVATE PARTNERSHIP (PPP)

Historically, the corporate sector has been supporting disaster relief and rehabilitation activities. However, the involvement of corporate entities in disaster risk reduction activities is not significant. Corporate entities should redefine their business continuity plan to factor in hazards, risks and vulnerabilities. They should also create value in innovative social investments

in the community. PPP between the Government and private sector would also be encouraged to leverage the strengths of the latter in disaster management. The NDMA and SDMA's need to network with the corporate entities to strengthen and formalize their role in the DM process for ensuring safety of the communities.

11.6 APPROACH TO RESPONSE

APPROACH

Prompt and effective response minimizes loss of life and property. A caring approach for the special needs of vulnerable sections is also important. The existing and the new institutional arrangements need to ensure an integrated, synergized and proactive approach in dealing with any disaster. This is possible through contemporary forecasting and early warning systems, fail-safe communication and anticipatory deployment of specialized response forces. A well-informed and prepared community can mitigate the impact of disasters.

11.6.1 ROLE OF THE NEC

The NEC will coordinate response in the event of any threatening disaster situation or disaster. While disaster specific guidelines will be formulated by NDMA, NEC may give directions to the concerned Ministries/Departments of the GoI, the State Governments and the State Authorities regarding measures to be taken by them in response to any specific threatening disaster situation or disaster.

11.6.2 ROLE OF THE NODAL AND OTHER CENTRAL MINISTRIES AND DEPARTMENTS

For various types of disasters, the nodal Ministry concerned will chart out detailed Response Plans which will be integrated into the National Response Plan. The NEC may coordinate response in the event of any threatening disaster situation or disaster.

ROLE OF STATE, DISTRICT AND LOCAL AUTHORITIES

It is the primary responsibility of the State Governments/SDMAs to monitor and assess any developing situation and keep the NDMA and NEC apprised of the same. They will also be responsible to constantly evaluate their own capabilities to handle that situation and project the anticipated requirements for the Central resources well in time. Inter-state assistance and cooperation will be encouraged. The States/ UTs will also be responsible to develop their own response potential progressively and complete the process at the earliest. This will comprise training and equipping of State response forces, community preparedness, training and creation of response caches at the District level. District level preparations will provide the cutting edge to all response activities. Local authorities, PRIs and ULBs will play a significant role in the entire process, particularly in response and rescue operations, relief and rehabilitation, awareness generation and disaster preparedness, restoration of livelihood options and coordination with NGOs and civil society.

STANDARD OPERATING PROCEDURES (SOPS)

All Central Ministries, State Governments, District Authorities and other stakeholders will prepare SOPs in consonance with the National and State Plans. SOPs will be prescribed for activities like search and rescue, medical assistance and casualty management evacuation, restoration of essential services and communication at disaster sites, etc. The other important activities are provision of food, drinking water, sanitation, clothing and management of relief camps. Detailed SOPs will also be devised by all concerned for dispatch, receipt and deployment of Central resources.

INFORMATION AND MEDIA PARTNERSHIP

During disaster situation, the dissemination of accurate information through electronic and print media is very important. Regular press briefing by trained disaster management officials is essential. Training in information management and accurate reporting will be undertaken at all levels.

ROLE OF NODAL OFFICERS IN THE MINISTRIES

- To draft and implement the Disaster Management Strategies for the specific disaster.
- To maintain the database of available resources for Disaster Management.
- To build the capacity of the department through training, awareness and equipments.
- To conduct the Post Disaster Needs Assessment
- To draft and execute long term recovery.
- To develop office and sector disaster management plan.

12. CASE STUDY

12.1 2018 KERALA FLOOD

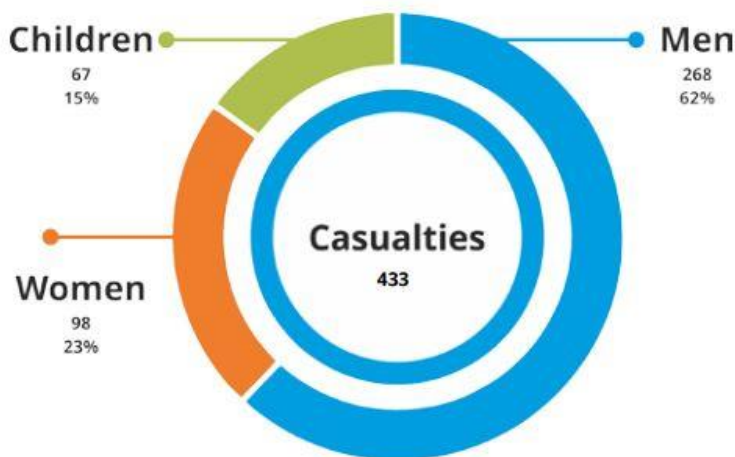
Background Kerala, with a population of over 3.3 crore, is globally recognized for its impressive achievements in human development. Within India, Kerala ranks first among Indian states on the Human Development Index (HDI). In 2015–16, Kerala was among the top five Indian states in terms of per capita state domestic product and among the top four in terms of growth in per capita income. Many other human development indicators for Kerala are at par with those of developed countries. For instance, the state reported a literacy rate in 2011 of 94% (as against the national average of 73%), life expectancy at birth between 2011–15 of 75.2 years (the highest among Indian states and higher than the national average of 68.8 years), and an infant mortality of 10 per thousand live births (the lowest among Indian states). The state also reported the lowest proportion of population below the poverty line (7%) as against the national average of 22%. In 2015–16, 94% of households had access to improved drinking water sources, 98% of them were using improved sanitation facilities, and 99% of the households had electricity. Human development has also been more equitable in Kerala than in other Indian states. For instance, Kerala is placed first among states in inequality adjusted HDI which indicates the least loss of HDI on account on inequality.

Kerala, however, is highly vulnerable to natural disasters and the changing climatic dynamics given its location along the sea coast and with a steep gradient along the slopes of the Western Ghats. The Kerala State Disaster Management Plan identifies 39 hazards categorized as naturally triggered hazards (natural hazards) and anthropogenically triggered hazards (anthropogenic hazards). Kerala is also one of the most densely populated

Indian states (860 persons per square kilometers) making it more vulnerable to damages and losses on account of disasters. Floods are the most common of natural hazard in the state. Nearly 14.5% of the state's land area is prone to floods, and the proportion is as high as 50% for certain districts. Landslides are a major hazard along the Western Ghats in Wayanad, Kozhikode, Idukki, and Kottayam districts. Seasonal drought-like conditions are also common during the summer months. Kerala experienced 66 drought years between 1881 and 2000. Dry rivers and lowering water tables in summer have led to water scarcity both in urban and rural areas. Other major natural hazards are lightning, forest fires, soil piping, coastal erosion, and high wind speed. The state also lies in seismic zone III.

DISASTER EVENT

Between June 1 and August 18, 2018, Kerala experienced the worst ever floods in its history since 1924. During this period, the state received cumulative rainfall that was 42% in excess of the normal average. The heaviest spell of rain was during 1-20 August, when the state received 771mm of rain. The torrential rains triggered several landslides and forced the release of excess water from 37 dams across the state, aggravating the flood impact. Nearly 341 landslides were reported from 10 districts. Idukki, the worst hit district, was ravaged by 143 landslides.



Source: (Government of Kerala 2018)

According to latest reports of the state government, 1,259 out of 1,664 villages spread across its 14 districts were affected.⁹ The seven worst hit districts were Alappuzha, Ernakulam, Idukki, Kottayam, Pathanamthitha, Thrissur, and Wayanad, where the whole district was notified as flood affected. The devastating floods and landslides affected 5.4 million people, displaced 1.4 million people, and took 433 lives (22 May–29 August 2018)

IMMEDIATE RESPONSE AND RELIEF OPERATIONS

The state government responded swiftly with rescue and relief operations and saved many lives by rapidly mobilizing the following national forces:

- Kerala Fire and Rescue Services: 4,100 individuals and the entire rescue equipment deployed
- National Disaster Response Force (NDRF): 58 teams, 207 boats
- Army: 23 columns, 104 boats

- Navy: 94 rescue teams, one medical team, nine helicopters, two fixed wing aircrafts and 94 boats
- Coast Guard: 36 teams, 49 boats, two helicopters, two fixed wing and 27 hired boats
- Air Force: 22 helicopters from Air Force and 23 fixed wing aircrafts
- Central Reserve Police Force: 10 teams
- Border Security Force: Two companies and one water vehicle team.

In addition, the fishing community of the state rendered phenomenal voluntary assistance towards search and rescue in the flood affected areas. Nearly 669 boats that went out with 4,537 fishermen are estimated to have saved at least 65,000 lives.

The Government of India announced an additional assistance of INR 600 crore (USD 85 million)¹⁰ which included ex gratia payment of INR 2 lakh (USD 2,800) per person to the next kin of the deceased and INR 50,000 (USD 700) per head to those seriously injured. The Ministry of Rural Development sanctioned an additional INR 1,800 crore (approximately USD 260 million) under the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) for 2018–19 for 5.5 crore person days of work. Relief assistance was provided to people in camps including immediate food supplies (rice, wheat, and pulses), drinking water, kerosene and other life-saving items. Food packets and assistance of INR 10,000 per family to clean inundated houses were also disbursed.

The devastating floods and landslides caused extensive damage to houses, roads, railways, bridges, power supplies, communications networks, and other infrastructure; washed away crops and livestock and affected the lives and

livelihoods of millions of people in the state. Early estimates by the government put recovery needs at about USD 3 billion; however, it was felt that a comprehensive assessment of damage, loss, and needs would amount to much more.

LONG TERM RECOVERY PLAN

NAVA KERALAM:

Building a Green and Resilient Kerala Nava Keralam is the government's vision of converting the crisis into an opportunity by more explicitly embedding the idea of building a green and resilient Kerala into the Approach Paper to the Thirteenth Five-Year Plan, the Disaster Management Policy, the State Water Policy, and the Gender Equity and Women's Empowerment Policies of Kerala.

The recovery policy framework for building a Green Kerala committed to: (i) the Chief Minister's vision of a Nava Keralam (New Kerala), and (ii) the concept of 'build back better and faster' rests on four pillars:

- Pillar 1: Integrated water resources management (IWRM)
- Pillar 2: Eco-sensitive and risk-informed approaches to land use and settlements
- Pillar 3: Inclusive and people centred approach
- Pillar 4: Knowledge, innovation, and technology

PILLAR 1: INTEGRATED WATER RESOURCES MANAGEMENT

At its core, IWRM calls for internalizing the themes of ‘room for the river’ and ‘living with water’. It emphasizes cross-disciplinary coordination of water, land, and related resources in a river basin, watershed or catchment to achieve long-term sustainability. With IWRM in place, it is possible to make proper plans for water safety and water security based on actual and planned land use resulting in multiple basin plans. Coordinated land and water use demands inter-sectorality at the level of policy, planning, and implementation. IWRM aims to break existing inter-sectoral barriers to establish a holistic framework for coordination. This is in line with the State Water Policy’s directive to ‘revamp the present piecemeal approach, which is mostly based on engineering solutions. River basin management with a ‘room for the river’ approach emphasizes ecological conservation and restoration. This approach aims to lower flood levels in the rivers by increasing the wet areas of the rivers, giving them more room and space. Upstream river basin management with a focus on the conservation of forests assumes particular significance as all the short, fast-flowing, monsoon-fed rivers originate in the Western Ghats that have witnessed serious forest degradation. Equally important is the issue of coastal zone management. An important prerequisite for IWRM is the availability of sufficient and reliable data and state of art hydrological models to support environmental and social impact assessments including mitigating measures to arrest environmental deterioration. This needs to be accompanied by a process of citizen education and democratic dialogue, such that the need for integrated water resource planning is communicated and appreciated at all levels. Recommendations for recovery center around protecting natural river flows and giving room to the river—concepts that inform the citizen education

programs. Preparation of basin-wide master plans linking upstream, and downstream zones should be prioritized.

PILLAR 2: ECO-SENSITIVE AND RISK-INFORMED APPROACHES TO LAND USE AND SETTLEMENTS

An eco-sensitive and risk-informed approach needs to ensure that buildings are reconstructed using disaster resilient techniques, at the right location, away from flood plains and slopes. According to the Kerala State Disaster Management Policy, physical reconstruction must take into account the hazards of the particular location, resources and capacities people involved in the rebuilding, and the adoption of designs that offer resilience against floods, cyclones, earthquakes, and droughts.¹⁴ Additionally, for designing ‘green buildings’ to make Kerala a green state, it needs to capitalize on its experience and capacity to deploy alternative construction technologies with low carbon footprint including expertise drawn from Laurie Baker, Habitat Technology Group, Centre of Science and Technology for Rural Development (COSTFORD), People’s Movement for Sustainable Architecture, and government sponsored Nirmiti. The reconstruction of houses and public building using appropriate technologies offers a major opportunity for the skilling and green job creation in the sector. It is recommended that an Integrated Strategic Environmental Assessment be applied to mitigate the negative impact of the surge in construction activities. This approach developed by the UN Environment has been implemented during the post-conflict reconstruction of Sri Lanka and the post-disaster reconstruction of Nepal.

PILLAR 3: INCLUSIVE AND PEOPLE-CENTERED APPROACH

The recovery strategy for Nava Keralam will be premised on comprehensive vulnerability mapping (including inter-sectional vulnerabilities) to inform all stages of disaster recovery. During the recent rescue and relief operations, the extreme vulnerabilities of the elderly and persons with disabilities in the state became conspicuous. It was realized that the requirements of excluded groups need to be prioritized across all aspects of disaster mitigation and resilience building—early warning systems, relief operations, design and construction of buildings and community infrastructure, psycho-social interventions, livelihood enhancement measures and so on. Mechanisms should be instituted for including the socially excluded in all aspects of the recovery strategy. Additional livelihood opportunities should be offered to women while simultaneously reducing their care burden by extending the working hours of anganwadi centers and setting up day care homes for the elderly. It is recommended that the MGNREGS be used to fill in the livelihood deficit in the aftermath of the floods. Furthermore, there should a focus on re-skilling of women and workers from scheduled castes and tribes, so as to engage them in climate resilient agricultural work and natural resource protection under the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) 2005. Men and women should be given joint title deeds for the newly constructed homes and proactive measures should be taken to include people who are conventionally excluded by the state’s social security programs such as migrant workers and transgenders. Strengthening the Grama Sabha, concurrent monitoring social audit and redress of grievances should be made an integral part of all programs aimed at recovery.

PILLAR 4: KNOWLEDGE, INNOVATION, AND TECHNOLOGY

Knowledge, innovation, and the appropriate technology are vital in addressing the sustainable development and climate change challenges that Kerala faces. The Kerala floods illustrated the potential of information technology in both rescue and relief operations. The web-based application keralarescue.in as well as the use of social media including WhatsApp by voluntary groups and government officials helped to identify victims, camp locations, requirements in the camps, volunteer registration, and facilitate both rescue and relief operations. In many locations, these WhatsApp locations functioned as virtual ‘control rooms’. Social media was also used to mobilize thousands of volunteers for one-time cleaning operations. Web-based applications were also used to assess damages to houses and buildings (Rebuild Kerala app), forming the basis for compensation packages, as well as to mobilize financial resources for recovery through the Chief Minister’s Disaster Relief Fund portal. Information technology can also be used to re-coup lost documents, geo-tag beneficiaries, conduct social audits and help with redress of grievances. The magnitude of the floods and landslides has underscored the need for research and knowledge generation activities. While downstream conditions hampered discharge of water, flooding was also a result of inappropriate human interventions in the middle and upper parts of river basins. There is a need therefore, for research on the role of deforestation, quarrying, unscientific road construction, slope modification, sand mining from river beds, construction on stream channels, narrowing and blocking of drainage channels and so on, in aggravating landslides and flooding. Such research outcomes can inform land-use maps for recovery and reconstruction projects, in particular road construction, location of hospitals and schools, and also for regular development planning. The availability of state-of-the-art geographic

information system (GIS) technologies facilitates the creation of such maps, as well as in their dissemination to local government agencies. Given Kerala's decentralized governance architecture, there is a need to enhance the knowledge base of local government with such maps, at appropriate scales, to improve understanding at the micro-level of the interconnectedness of risk factors and their cumulative impact. This understanding also needs to be imparted to citizens through gramasabhas and other forums. The student community and the youth, who proved their ability to respond to the crisis, need to be roped in as agents of knowledge generation and dissemination. Knowledge generation and effective dissemination can help in early warning and risk information communication to the last mile. Knowledge generation and innovation also assume critical importance in the production of green technologies particularly in the context of housing and sanitation, as well as in expanding the scope of livelihood activities that carry a low carbon footprint (Government of Kerala 2018).

PRIORITY ACTIONS AREAS TO BUILD A GREEN AND RESILIENT KERALA:

- Reviewing Land Use Patterns
- Changing Consumption Patterns
- Sustainable Building Guidelines
- Maximize Use of Solar Energy
- Green Technology Centers
- Environment and Natural Resource Managers
- Integrate Solid Waste Management Centers
- Greening the Tourism Sector
- Creating Green Jobs
- Climate Change Resilience

The people of Kerala have demonstrated extraordinary resilience in coping with the unprecedented disaster. The state has also demonstrated the power of public action in dealing with the aftermath of the floods. The potential exists for Kerala to tap the wealth of its traditional knowledge, the wealth of green ideas, the minds of its diaspora, and the spirit of volunteerism to demonstrate cost-effective ways of ensuring equitable and sustainable development. The disaster presents a new opportunity for Kerala to lead the world in establishing a green and resilient state.

12.2 CYCLONE FANI IN ORISSA 2019

ODISHA AT A GLANCE

The state of Odisha, with a population of 4.2 crore (3.4% of India's population), is the eighth largest state in India comprising 4.7% of the Indian landmass. There are 30 districts in the state and 83% of the total population lives in rural areas which comprise 6,801 Gram Panchayats and 51,349 villages. The state has only 17% of the total population living in urban areas. There are five municipal corporations, 45 municipalities, 60 notified area councils and two industrial towns in the state. Agriculture is the backbone of the state economy and about 62% population of Odisha still depends in varying degrees on agriculture sector for its livelihood. Although the percentage of people living below the poverty line in Odisha has gone down from 57% in 2004–05 to around 33% in 2011–12, it remains well above the national average of around 22%. The districts in the south and west of Odisha have a very high level of poverty. One of the major concerns of the state has been very adverse human development and socio-economic indicators for Scheduled Tribes (ST) and Scheduled Castes (SC), who together constituted 39.9% (ST- 22.8% and SC-

17.1%) of the total state population in 2011. Due to its geographic and socio-economic condition, Odisha is highly prone to disasters. Its location on the east coast of India makes it one of the six most cyclone prone areas in the world, the coast of Odisha having the highest vulnerability in terms of cyclone landfall. In the last century, out of the 1019 cyclonic disturbances in the Indian subcontinent, 890 were along the eastern coast, and of these, 260 cyclonic disturbances had their landfall along the Odisha coast. The cyclones which hit the state in the last two decades are the 1999 super cyclone, Phailin 2013 and Titli 2018. There are ten major river systems in Odisha which cause flooding at regular intervals. Out of a total geographical area of 15,571 lakh hectares, 1.40 lakh hectares are prone to floods. Vulnerability to flash floods, landslides, earthquakes and tsunami is also high.

Disaster Event

The Fani, a rare summer cyclone, hit the Odisha coast close to Puri on 3 May 2019 between 0800 and 1000 hours. As reported by Indian Meteorological Department (IMD), the maximum sustained surface wind speed of 175–180 kilometers per hour (kmph) gusting to 205 kmph was observed during landfall at Satpada. Although human casualties were relatively low when compared to the Super Cyclone of 1999, cyclone Fani left 64 dead, affecting about 16.5 million people in over 18,388 villages in 14 of the 30 districts in the state. Puri, Khurda, Cuttack, Jagatsinghpur, and Kendrapara remain the five most affected districts. Due to the cyclone, power, telecommunication infrastructure, and road services were severely affected. Major roads were blocked due to the uprooted trees, road signages and damaged culverts with complete power outage in several parts of the state for almost two days. High wind speed also resulted in catastrophic damage to houses (about 3.62 lakh dwellings in all),

leaving many homeless. Damage to agriculture, fisheries, and livestock has also been considerable. As per the estimate of the Department of Environment and Forestry, 21.9 lakh trees were uprooted or damaged across the state, including urban and rural areas as well as sanctuaries.

PREPAREDNESS TO RESPONSE AND IMMEDIATE RELIEF OPERATIONS

Upon receiving the early warnings from IMD, both national and state machinery geared up to assess the level of preparedness for an effective response after the landfall. Government of Odisha evacuated close to 1.55 million people towards 9,177 shelters including the 879 multipurpose cyclone/flood shelters and other safe shelters like schools and public buildings. About 25,000 tourists were evacuated from vulnerable areas by mobilizing 23 special trains and 18 buses. All fishing activities were suspended two days prior to the landfall. The government organized massive awareness campaigns to inform people about the basic cyclone dos and don'ts. Twenty Odisha Disaster Rapid Action Force (ODRAF) units, 335 Fire Service units and 25 units of the National Disaster Response Force (NDRF) were deployed in the coastal districts for search and rescue operations. Volunteers were mobilized to support the local administration and the community in evacuation, distribution of relief, and shelter management. Instructions were issued to all the line departments to make adequate arrangements to provide immediate life-saving assistance to the affected people after the cyclone. District and Block Emergency Operation centers were activated 24×7 with deployment of senior government officials at the district level. Nearly 4.5 lakh polythene sheets (temporary shelter materials) were pre-positioned at district/ sub-district levels and 1.5 lakh kept ready for air-dropping after the cyclone. Nearly 600 pregnant women were shifted to

MaaGruhas/ delivery points before the landfall. To ensure food security in the aftermath of the cyclone, food grains were pre-positioned at the fair price shops for distribution among beneficiaries under targeted public distribution system (TPDS). To ensure safety, prior inspections of anganwadicentres (AWCs), food stocks and essential items were carried out. Control rooms were set up for distribution of food supplies at district as well as block levels and the progress closely monitored by the state. Food supplies were also pre-positioned in child care institutions (CCIs), shelter homes, cyclone shelters, and schools to ensure food availability to the community during the cyclone. Take-home ration and eggs were distributed to pregnant women, lactating mothers, and children less than 3 years of age by 1 May 2019. Ministry of Home Affairs (MHA) sanctioned an advance financial assistance of INR 340.87 crore to the Odisha government based on the decision of the National Crisis Management Committee (NCMC).

RELIEF AND RESCUE OPERATIONS

Immediately after the landfall, a massive rescue and response operation was launched. Sixty teams from NDRF, 18 units of ODRAF and 585 fire teams came into action. Nearly 45,000 volunteers were mobilized to carry out relief operations. Eastern Naval Command of the Indian Navy also supported the state government in rescue and relief operations. About 10,000 food packets were airdropped. More than 6,000 free kitchens were opened to serve hot cooked meals with the help of the local panchayats and self-help groups (SHGs). Within 48 hours major roads were cleared and power supply restored within two weeks in the major towns of Puri and Bhubaneswar. Technicians were mobilized from the neighboring states of Andhra Pradesh and West Bengal to restore the power and telecommunication services in the state. A

special package was announced by the Chief Minister of Odisha on 5 May 2019 with focus on food security, housing, livelihood assistance, environment management and additional monetary assistance. Government of Odisha also submitted an interim memorandum to the Government of India seeking assistance of INR 17,000 crore (USD 2,427 million). The Chief Minister of Odisha emphasized that coastal Odisha needs funds to the tune of INR 10,000 crore for building disaster-resilient power infrastructure. Similarly, an allocation of INR 7,000 crore (USD 999 million) was requested for building disaster-resilient, affordable houses. The state government also demanded a special allotment under the Pradhan Mantri AwasYojna (PMAY) with increased support from the center (90:10 funding ratio, i.e., 90% funding by central government and 10% by state government). Disaster Effects and Impact Housing, power, telecommunication, agriculture, livestock, fisheries, and livelihoods were the most affected sectors. The assessment estimates the total damage to be worth INR 16,465 crore (USD 2,352 million) and total loss to be worth INR 7,712 crore (USD 1,102 million). The estimated recovery needs are INR 29,315 crore (USD 4,188 million).

WAY FORWARD TO A RESILIENT ODISHA

The Government of Odisha has received international acclaim for significantly reducing the loss of lives from nearly 10,000 in the Super Cyclone to less than a hundred in the recent cyclones Phailin and Fani. While the goal of zero mortality is close to realization, the economic losses in livelihoods and infrastructure have been increasing. The combined economic losses of INR 40,4474 crore (USD 5.7 billion) from recent cyclones, Phailin, Titli, and Fani demonstrates the need for the government to establish a strong framework of disaster risk governance and integrate the principle of resilience in every area

of development planning and recovery process to achieve a substantial reduction in the economic losses. It is important to recognize that reducing economic losses due to these disasters is critical to reducing poverty and vulnerability in Odisha. It requires a continuous support for recovery as well as improving the quality of housing and infrastructure through better building standards and regulations. A recovery programs is the right context for bringing these long-term changes and improving resilience at the household, community, and state levels. As per the latest data available, the Cyclone Fani Damage, Loss and Needs Assessment (DLNA) estimates the costs of recovery to be INR 29,315 crore (USD 4.1 billion). As part of the recovery process, the Government of Odisha has emphasized the need for building resilience across all sectors in the state. The narrative for building a resilient Odisha also resonates with civil society groups and development partners including the United Nations, World Bank, and Asian Development Bank. The strategy for building a Resilient Odisha is a based on three pillars: Resilient Housing, Resilient Livelihoods, and Resilient Infrastructure. These pillars are elaborated below:

Resilient Housing: The cyclone hit the housing sector the hardest, damaging nearly 3.62 lakh units of houses across the 14 districts. Th e high damage to the housing stock can be attributed to two factors, the first is the quality of houses and the second is poor quality of construction. The total recovery needs are estimated to be INR 8,996 crore (USD 1,285 million) which include resilient and ‘build back better’ features. Cyclone reconstruction is an opportunity to incrementally replace all the housing stock and provide safe and affordable housing to reduce the human and economic costs in recurrent cycles of disaster. The key strategy is owner-driven reconstruction done through massive capacity building and skills training in disaster-resilient construction technologies. The

owners will be assisted through 99 housing facilitation centers, each staffed by a technical team of three engineers/ architects supported by three technical assistants. The team would work over a duration of 18 months alongside house owners, masons, and carpenters to oversee training and construction and certify its structural worthiness. Alternative and environmentally sustainable construction materials for house construction will have to be explored. Reconstruction of houses of households headed by women, PwDs, the elderly and low-income individuals will be prioritized with the objective of providing safe shelter for all vulnerable people within five years. The reconstruction of all houses would significantly contribute to the resilience of households and communities.

Resilient Livelihoods: Accelerating economic growth commensurate with growth in employment and livelihood opportunities has been one of the key objectives of Odisha's economic policy. These are regarded as policy imperatives for inclusive development and reversing poverty. Despite achieving impressive reduction in poverty in the last decade, from 58% to 33%, there is still a significant percentage of people (33%) living below the poverty line. Extreme weather events such as Fani have a detrimental impact on the livelihoods and coping capacities of people, particularly the extremely vulnerable groups reliant upon a single source of income and social protection schemes. The major sectors of the economy are extremely vulnerable to changes in weather patterns and impact of climate change, and among them fisherfolk, small farmers, sharecroppers, and the people in the tourism sector are severely hit by the repeated cyclones. In the short term it would be necessary to replace all livelihoods-related assets of people, with cash assistance and interest subvention to support the recovery of small businesses.

Using the MGNREGS, the state can support restoration and creation of livelihood assets.

In the long run, it is important to assist businesses to move from the informal to formal sector to qualify for insurance coverage, credit assistance and better-quality services. A group insurance for all MSMEs is recommended to encourage better coverage with reduced premium. The tourism sector can provide significant opportunities for employment in the state. A large skill upgradation program will prepare youth to enter the sector. Social protection schemes make critical contribution to a broader disaster recovery effort by aiding disaster-affected households to protect their immediate well-being and helping them to recover more quickly. For example, the instant cash provided to the affected population post-Fani helped households in purchasing basic household items essential to resume economic activity. The existing social protection schemes can be made more effective through top-ups to beneficiaries who are pre-enrolled in an existing safety net program. An expansion of social protection schemes maybe considered to add additional eligible people. An integrated package of support to vulnerable households through safe housing, supplementary income source and expanded social protection schemes will insulate them from the effects of disasters. In recovery, restoration of livelihoods and skills-building of women should be a priority. Women's SHGs engaged in handicrafts and cottage industries and service sector employment should be supported with cash grants and soft loans to help them resume economic activities. Women's participation in the economy should be encouraged through necessary skills and credit to diversify their livelihoods. Financial independence of women improves household resilience significantly.

Resilient Infrastructure: Infrastructure needs across all sectors are estimated to be more than INR 21,000 crore (USD 3 billion). The housing and power sectors have the highest needs among all sectors, followed by the stock of public buildings. Repair and reconstruction of all infrastructure works in the 14 affected districts has already begun, especially in the power sector, given its critical importance in restoring services and economic activities. A total of 6,441 public buildings, suffered damage worth about INR 539 crore (USD 78 million). The immediate priority should be that of securing damaged buildings, removal of debris and repair to make them functional. In the process of repair, efforts should be made to enhance the resilience of sloping roofs, doors and windows, compound walls and other associated elements like water tanks. In future, for all upcoming building stock should be made cyclone (and multi-disaster) resilient with a focus on detailing the designs of door and windows, water tanks, piping, solar panels, and AC units. Special care should be taken in terms of sizing, location, design specifications, and construction supervision. Large glass windows, glass and aluminum panels need to be designed in manner that could withstand wind speeds. Tree planted in compounds of public buildings should be of species that are able to withstand high wind speeds and should be planted at a distance from the building so that falling trees do not cause damage.

Additionally, the approach should be to create comprehensive inventory and database of all public buildings in current use and under construction and recommend steps to prevent and reduce future damage. Buildings should be prioritized based on usage and a phased plan should be developed to repair, retrofit and reconstruct the buildings. Guidelines need to be prepared to protect public buildings and assets in cyclone-affected districts. Buildings that can function as evacuation centers need to be equipped with communications,

power supply, water, and food. In addition to public buildings, other structures like embankments, roads, power supply and telecommunication infrastructure need to be evaluated in the light of the recent cyclone. Designs and technical specifications for all these structures need to be improved for hazard-resistance and capacity to provide uninterrupted services during disasters. A gradual and incremental approach to upgrading all the services to disaster-resilient standards may be undertaken. As the government continues to invest in infrastructure for economic growth, it is important to invest in making the assets multi-hazard-resistant.

Principles of Recovery: The process of recovery in the state of Odisha will be guided by the following principles aimed at improving the quality of recovery, emphasizing social inclusion, and promoting resilience of all sectors. These guiding principles are articulated below:

- Recognizing the differential impact of the cyclone on people, the recovery will prioritize the needs of the most vulnerable, which include PwD, women-headed households, fisherfolk, slum dwellers, artisans, scheduled caste communities, and people in extreme poverty.
- Recovery interventions should be based on the principle of gender equity with a specific orientation towards investing in women's capacities to contribute to the recovery process. The SHG groups established through Mission Shakti may be further capacitated to take up nontraditional reconstruction jobs including construction of public works and higher paid skilled jobs to build their resilience.
- Recovery should be risk-informed and disaster-resilient. This can be done through establishing project approval processes which ensure that

locations, designs and construction of all public and private infrastructure are multi-hazard-resilient.

- Nature based solutions (NBS) should be promoted in recovery, using environmentally safe and locally produced materials, establishing coastal belt plantations as opposed to concrete infrastructure-based solutions. The reconstruction of infrastructure will take environmental risks into consideration and will be undertaken in a manner prevents further degradation.
- Recovery will build on international best practices bringing in ideas and approaches that proved to be sustainable and resilient; at the same it should promote vernacular designs, traditional building craftsmanship, and the work of its artisans and weavers to retain Odisha's cultural identity.
- Recovery should be a collective effort, using the resources and expertise of the government and the civil society, the development partners and the private sector.
- Recovery should be implemented in a transparent manner and all the information related to recovery must be available in the public domain and be widely disseminated, using means of communication that are accessible to the affected communities. Frequent monitoring and third-party audits will be conducted to provide quality assurance to works undertaken through government and private parties in recovery (World Bank 2019).

CONCLUSION

It is important to recognize that recovery is an effort that goes beyond humanitarian assistance, leads to rebuilding assets and livelihoods, improves

government services, and builds resilience at all levels. Recovery should, therefore, be organized as a distinct effort, targeting people who are heavily affected by cyclone FANI. At the same time, the government should upgrade public buildings, services and infrastructure facilities so that they can withstand future disasters. However, while the government must lead the recovery effort, it need not be an only government-centered effort. It should be supported by all segments of society and economy—civil society organizations (CSOs), NGOs, private sector and international development partners. A more inclusive and collective recovery effort would help the state reach out to all the affected areas and communities and reduce the burden on the state. People are active participants in recovery, and the government must create enabling conditions for their active participation and contribution. A sustained recovery effort would bring accelerated development to Odisha. It would bring in more investment, skills and regulations which create more opportunities. Recovery should, therefore, be taken as an opportunity for building resilience, meeting the Sustainable Development Goals, and improving the well-being of the people.

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HAZARDS MAP OF INDIA

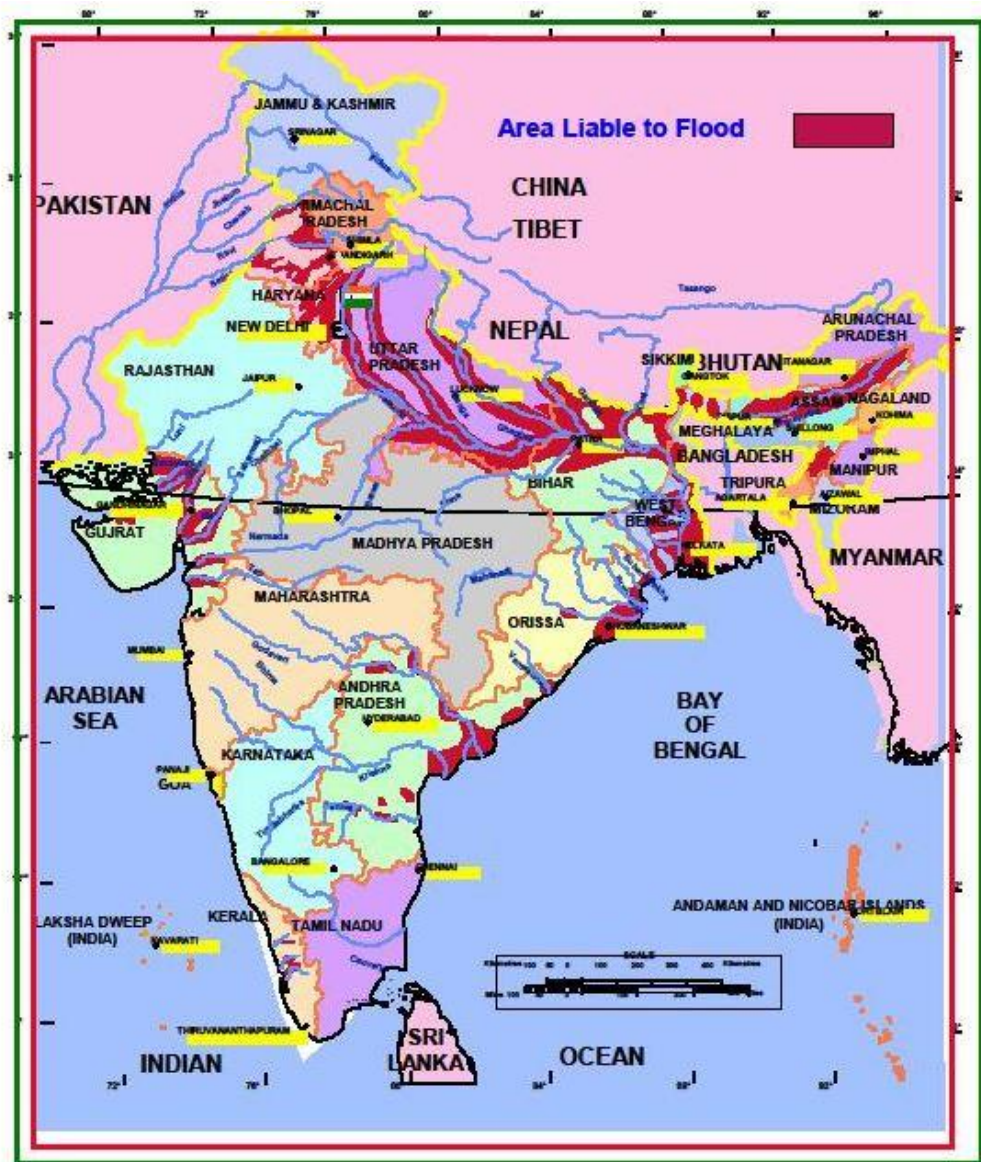


Figure 1 Flood Hazard Map(National Disaster Management Authority)

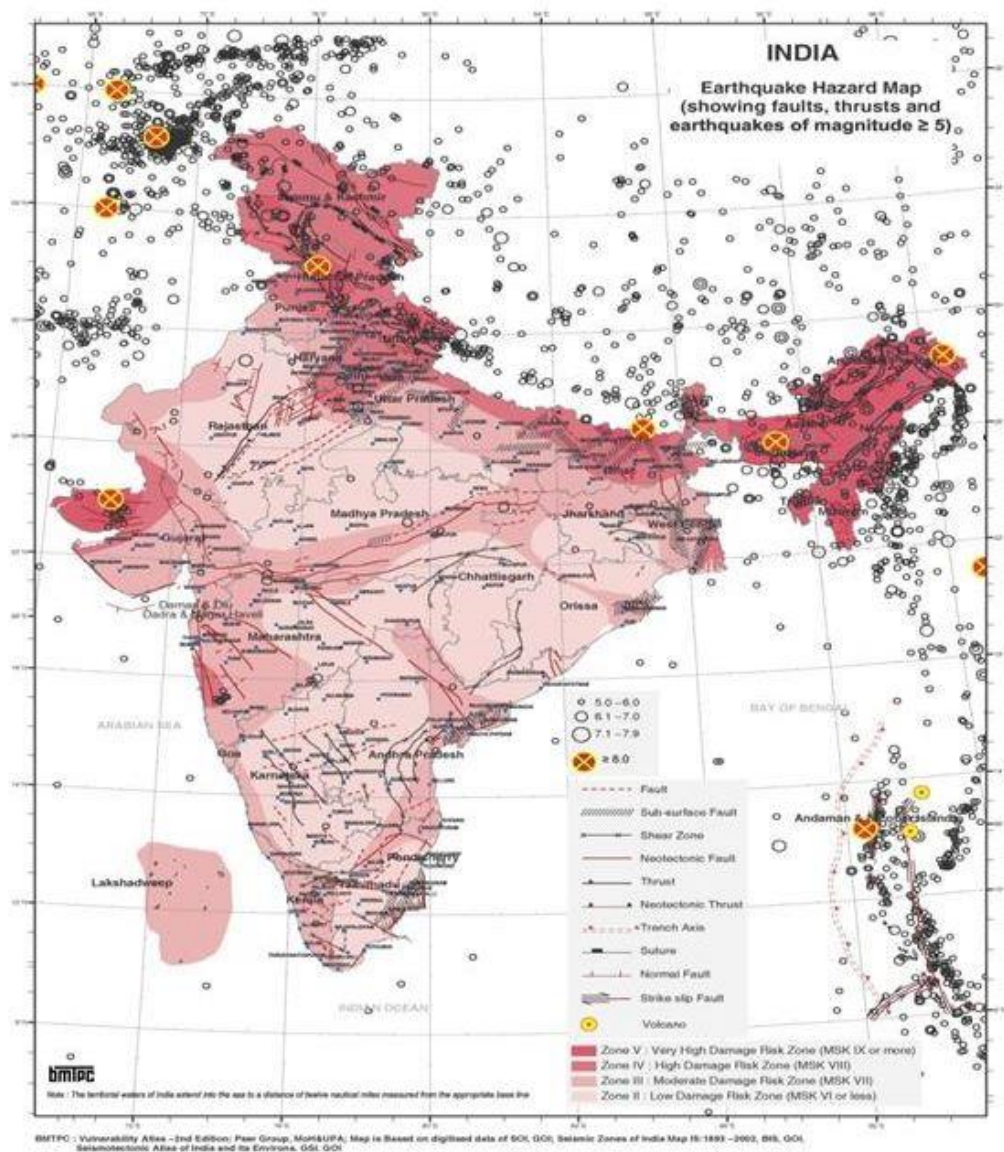


Figure 2 Earthquake Hazard Map

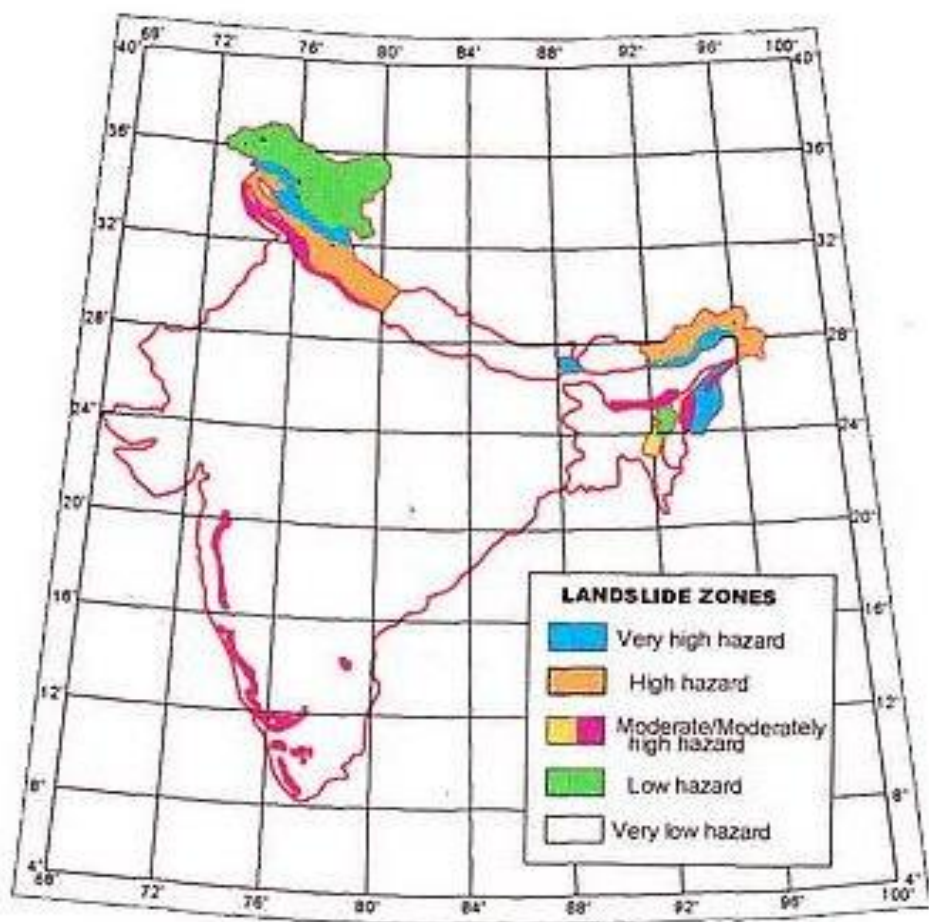


Figure 3 Landslide Hazard Map

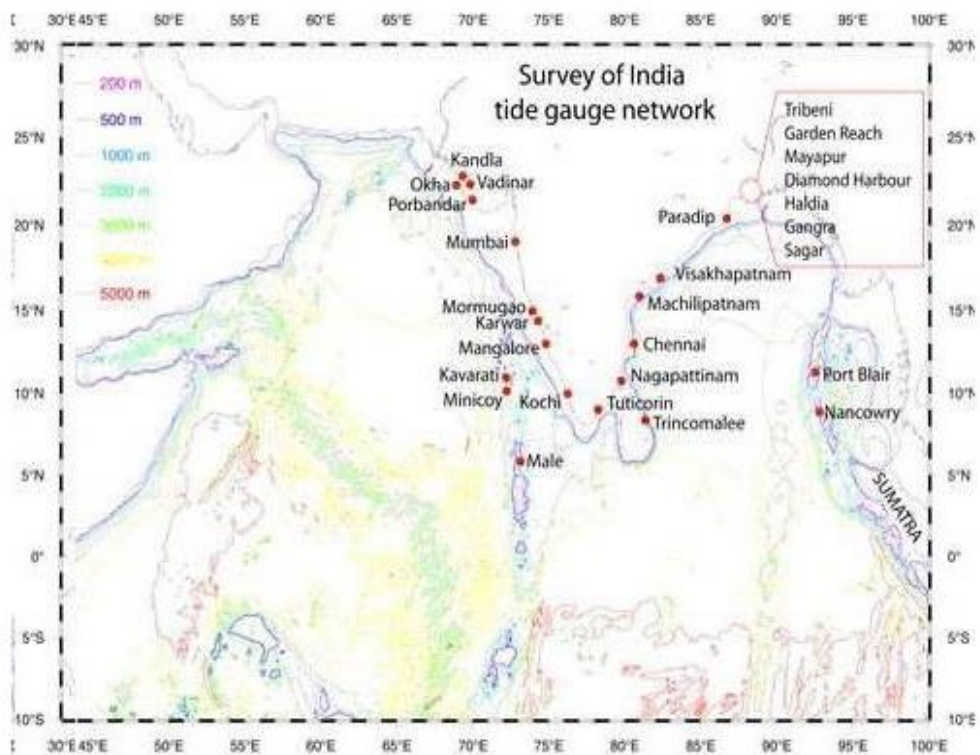


Figure 4 Tsunami Hazard Map

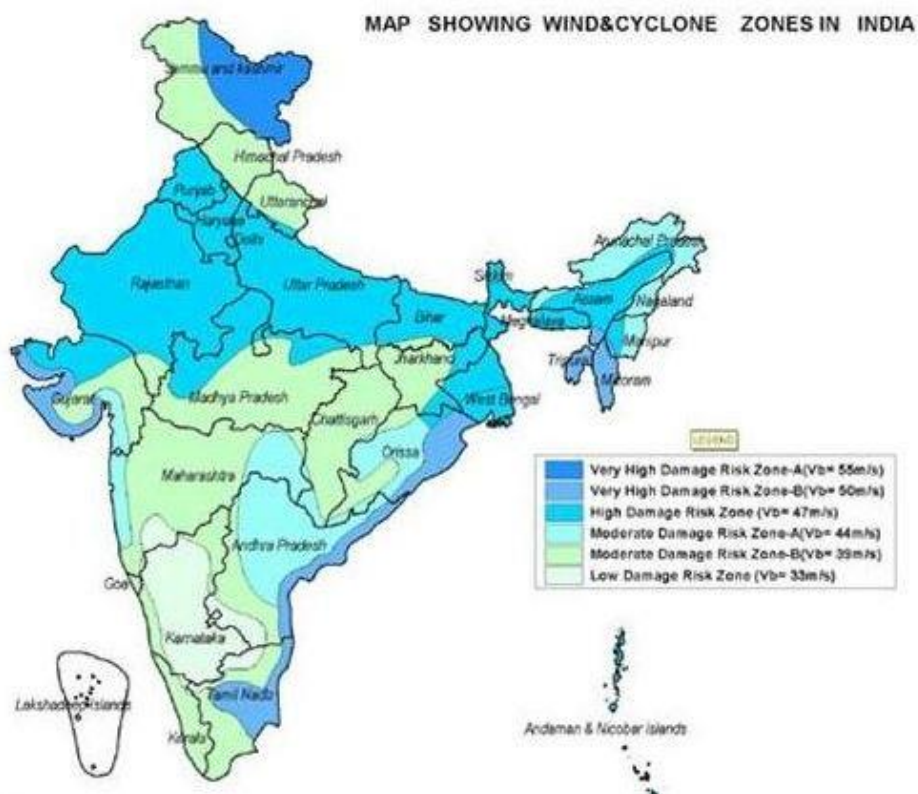


Figure 5 Wind & Cyclone Hazard Map

ANNEXURE	
IMPORTANT WEBSITE:	
NATIONAL AGENCIES	
NIDM	https://nidm.gov.in/
NDMA	https://ndma.gov.in/en/
NDRF	http://www.ndrf.gov.in/
UN AGENCIES	
APCTT	http://www.apctt.org/
FAO	http://www.fao.org/india/en/
IFAD	https://www.ifad.org
ILO	https://www.ilo.org/newdelhi/
IMF	https://www.imf.org/
IOM	https://www.iom.int/countries/india
MGIEP	https://mgiep.unesco.org/
UNAIDS	https://www.unaids.org
UNDP	http://www.in.undp.org/
UNDSS	https://www.un.org/undss
UNESCO	http://www.unesco.org/new/en/newdelhi/home
UNESCAP	https://www.unescap.org/country/india
UNEP	https://in.one.un.org

UNFPA	https://india.unfpa.org
UNICEF	https://unicef.in/
UNIDO	https://www.unido.org
UNODC	https://www.unodc.org/
UN Women	https://asiapacific.unwomen.org
UNHABITAT	http://unhabitat.org/india/
UN Volunteers	https://www.unv.org
WFP	https://www.wfp.org/countries/india
WHO	https://www.who.int/countries/ind/en/
NATIONAL INSTITUTES	
Guru Gobind Singh Indraprastha University - New Delhi	http://www.ipu.ac.in/
Anna University - Chennai	https://www.annauniv.edu/
IASE University - Rajasthan	http://www.iaseuniversity.org.in/
Indira Gandhi National Open University (IGNOU) - New Delhi	http://www.ignou.ac.in/
The Global Open University - Nagaland	https://nagaland.net.in/
Tata Institute of Social Sciences - Mumbai	https://www.tiss.edu/

MS University - Vadodara	https://www.msubaroda.ac.in/
Devi Ahilya University - Indore	https://www.dauniv.ac.in/
Indian Institute of Ecology and Environment (IIEE) - New Delhi	http://www.ecology.edu/
Sikkim Manipal University - Gangtok	https://smu.edu.in
Nalanda Open University - Patna	http://www.nalandaopenuniversity.com/
National Institute of Disaster Management - New Delhi	https://nidm.gov.in/
Disaster Management Institute - Bhopal	http://www.dmibhopal.nic.in/
Disaster Mitigation and Management Centre - Dehradun	http://dmmc.uk.gov.in/
Geological Survey of India - Kolkata	https://www.gsi.gov.in
National Civil Defence College - Nagpur	http://ncdcnagpur.nic.in/
National Information Centre of Earthquake Engineering IIT Kanpur	https://www.nicee.org/
Alagappa University - Chennai	https://alagappauniversity.ac.in/

DO'S AND DON'TS FOR MAJOR HAZARDS

CYCLONE SAFETY TIPS

Do's and Don'ts

1. BEFORE CYCLONE

- Ignore rumours, Stay calm, Don't panic
- Keep your mobile phones charged to ensure connectivity; use SMS
- Listen to radio, watch TV, read newspapers for weather updates
- Keep your documents and valuables in water-proof containers
- Prepare an emergency kit with essential items for safety and survival
- Secure your house; carry out repairs; don't leave sharp objects loose
- Keep cattle/animals unties to ensure their safety

Fishermen Should

- Keep a radio set with extra batteries handy
- Keep boats/rafts tied up in a safe place
- Don't venture out in the sea

2. DURING AND AFTER CYCLONE

A) If Indoors

- Switch off electrical mains and gas connection
- Keep doors and windows shut
- If your house is unsafe, leave early before the onset of a cyclone
- Listen to radio; rely only on official warnings
- Drink boiled/chlorinated water

B) If Outdoors

- Do not enter damaged buildings
- Watch out for broken electric poles and wires, and other sharp objects
- Seek a safe shelter as soon as possible



Be smart Be prepared

EARTHQUAKE SAFETY TIPS

HOW TO STAY SAFE

Dos

- Drop to the ground and take cover by getting under a sturdy table or any other furniture; hold on until shaking stops



- If there is no shelter near you, cover your face and head with your arms and crouch at a corner inside a building

- Stay away from glass, windows, doors and walls, and anything that could fall

- Stay in bed if you are there when earthquake strikes. Protect your head with a pillow



Don'ts

- Do not stand close to buildings, trees, street-lights and utility wires



- Do not stop under buildings, trees, overpasses and utility wires if in a vehicle

- Do not take roads, bridges or ramps damaged by quake

- If trapped under debris, do not light a match



- Do not move about or kick up dust

- Try not to shout as you may inhale dust; knocking or tapping is better

FLOOD SAFETY TIPS

BEFORE



STAY INFORMED
ON LOCAL NEWS



PREPARE AN EMERGENCY
BAG WITH FOOD, DRUGS,
DOCUMENTS,
FLASHLIGHT, PET ITEMS



KNOW HOW TO EVACUATE
AND SAFE
ALTERNATIVE ROUTES



LEAVE BEFORE FLOODING
STARTS



IN FLOOD PRONE AREAS:
KEEP USEFUL ITEMS AT
HOME (SANDBAGS,
LADDER, ROPE...)

DURING THE FLOOD



DISCONNECT
ELECTRICITY AND GAS



DON'T WALK OR DRIVE
IN FLOOD WATER



GET TO A HIGHER
GROUND



FOLLOW
EVACUATION ORDERS



FREE CATTLE
AND LEAD ANIMALS TO
A SAFER PLACE

AFTER



AVOID CONTACT WITH
FLOOD WATER
AND SWIMMING



DON'T TOUCH
POWER LINES



DON'T GO HOME OR TO
DISASTER AREAS UNTIL
IT IS DECLARED SAFE



COMMUNICATE
TO YOUR FAMILY THAT
YOU ARE SAFE



WHEN BACK HOME:
CLEAN AND DISINFECT
SURFACES AND ITEMS

HEATWAVE SAFETY TIPS

HEATWAVE : DO'S AND DONT'S



Avoid alcohol, tea, coffee and carbonated soft drinks, which dehydrates the body.



Wear lightweight, light-coloured, loose, and porous cotton clothes.



Use ORS lemon water, buttermilk, etc. which helps to re-hydrate the body.



Avoid going out in the sun, especially between 12.00 noon and 3.00 p.m.



Drink water as often as possible



Avoid high-protein food and do not eat stale food.



Use protective goggles, umbrella/hat, shoes or slippers while going out in sun.



Use fans, damp clothing and take bath in cold water frequently



TSUNAMI SAFETY TIPS



BEFORE:

-  Know if your local area could be struck by a tsunami.
-  Talk with your family and prepare an emergency plan.
-  Identify safe places close to your home and school - a place which is at least one kilometre inland or 35 metres above sea level.



DURING:

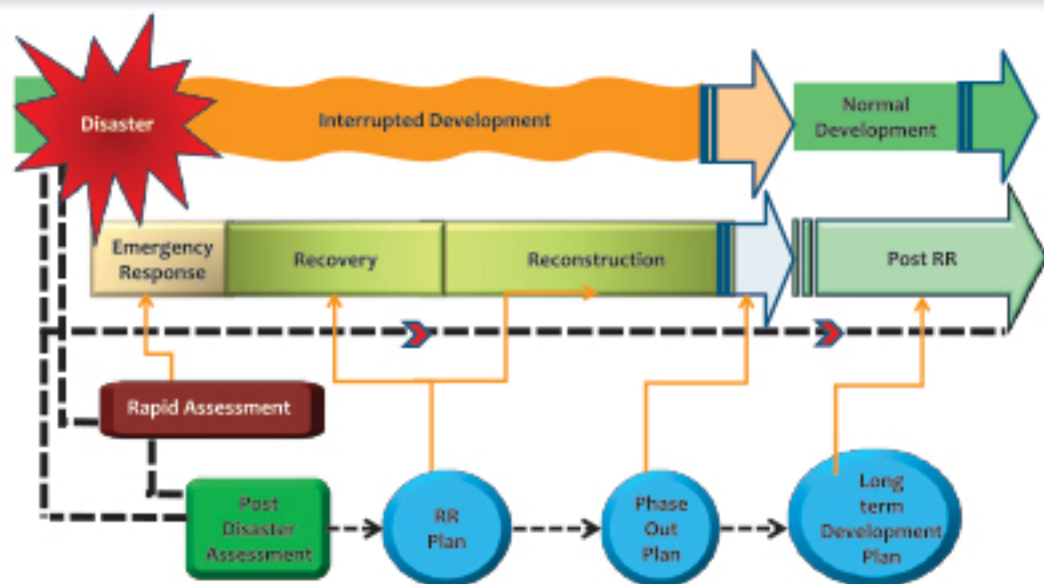
-  Stay calm.
-  Leave the area immediately if you are on the beach or near a river when a strong earthquake occurs. Move quickly but safely.
-  Go at least one kilometre inland or 35 metres above sea level.
-  Don't go to a river or beach to watch the waves come in if a warning has been issued.



AFTER:

-  Stay calm
-  Listen to and follow instructions from adults or the radio.
-  If you can, help others who may need it.

Disaster : Challenge for Development Investment



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