

1.7. Vulnerability Profile of India

1.7.1 India has been vulnerable, in varying degrees, to a large number of natural, as well as, human-made disasters on account of its unique geo-climatic and socio-economic conditions. It is highly vulnerable to floods, droughts, cyclones, earthquakes, landslides, avalanches and forest fires. Out of 35 states and union territories in the country, 27 of them are disaster prone. Almost 58.6 per cent of the landmass is prone to earthquakes of moderate to very high intensity; over 40 million hectares (12 per cent of land) are prone to floods and river erosion; of the 7,516 km long coastline, close to 5,700 km is prone to cyclones and tsunamis; 68 per cent of the cultivable area is vulnerable to drought and hilly areas are at risk from landslides and avalanches. A multi-hazard map of India may be seen in Figure 1.8.

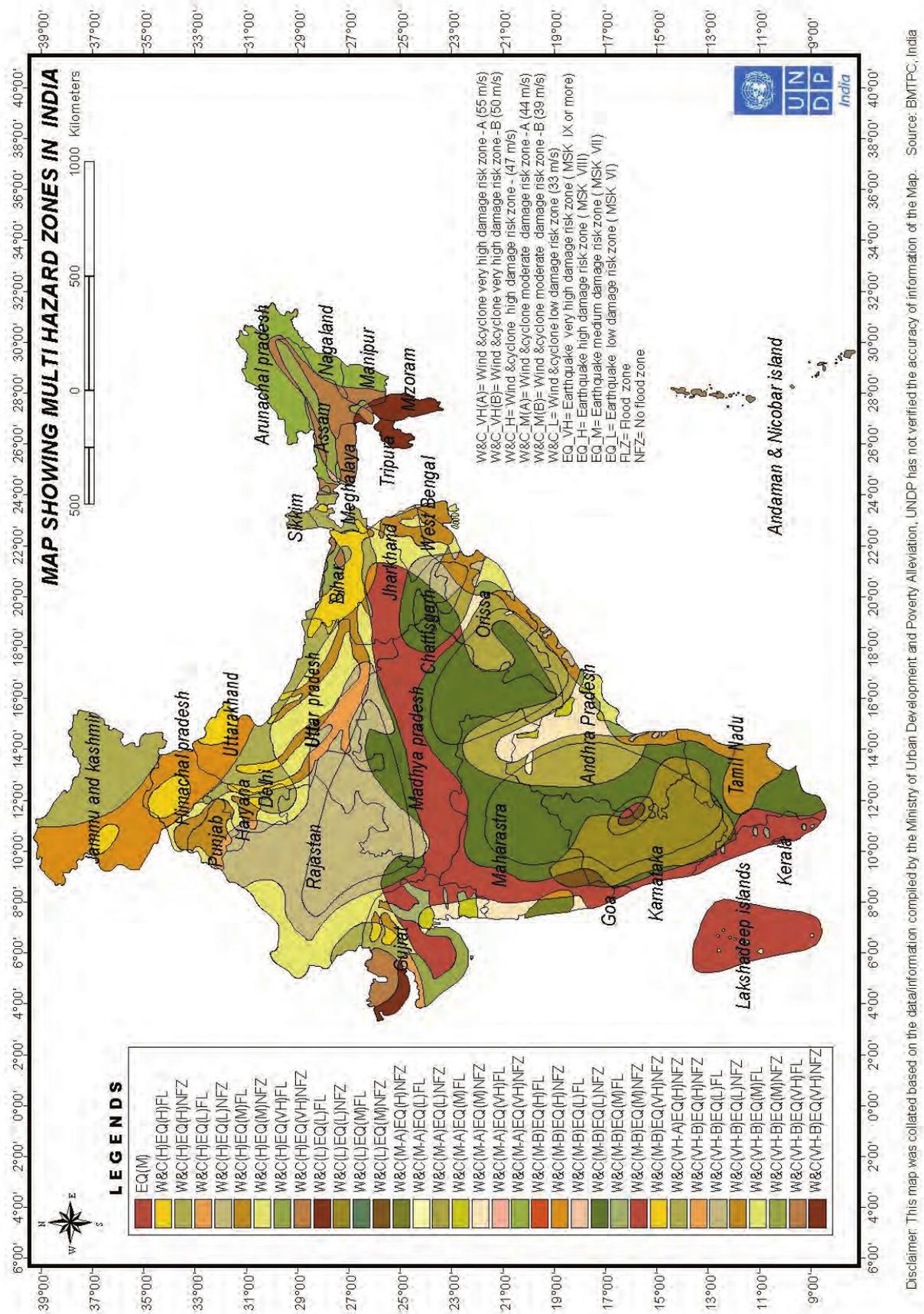
Hazard Profile of India

- (a) India is one of the ten worst disaster prone countries of the world. The country is prone to disasters due to number of factors; both natural and human induced, including adverse geo climatic conditions, topographic features, environmental degradation, population growth, urbanisation, industrialization, non scientific development practices etc. The factors either in original or by accelerating the intensity and frequency of disasters are responsible for heavy toll of human lives and disrupting the life supporting system in the country.

The basic reason for the high vulnerability of the country to natural disasters is its unique geographical and geological situations. As far as the vulnerability to disaster is concerned, the five distinctive regions of the country i.e. Himalayan region, the alluvial plains, the hilly part of the peninsula, and the coastal zone have their own specific problems. While on one hand the Himalayan region is prone to disasters like earthquakes and landslides, the plain is affected by floods almost every year. The desert part of the country is affected by droughts and famine while the coastal zone susceptible to cyclones and storms.

- (b) The natural geological setting of the country is the primary basic reason for its increased vulnerability. The geo-tectonic features of the Himalayan region and adjacent alluvial plains make the region susceptible to earthquakes, landslides, water erosion etc. Though peninsular India is considered to be the most stable portions, but occasional earthquakes in the region shows that geo- tectonic movements are still going on within its depth.
- (c) The tectonic features, characteristics of the Hiamalya are prevalent in the alluvial plains of Indus, Ganga and Brahmaputra too, as the rocks lying below the alluvial pains are just extension of the Himalayan ranges only. Thus this region is also quite prone to seismic activities. As a result of various major river systems flowing from Himalaya and huge quantity of sediment brought by them, the area is also suffering from river channel siltation, resulting into frequent floods, especially in the plains of Uttar Pardesh and Bihar.
- (d) The western part of the country, including Rajasthan, Gujarat and some parts of Maharashtra are hit very frequently by drought situation. If Monsoon worsens the situation spreads in other parts of the country too. The disturbance in the pressure conditions over oceans, results into cyclones in coastal regions. The geo tectonic movements going on in the ocean floor make the coastal region prone to tsunami disaster too.
- (e) The extreme weather conditions, huge quantity of ice and snow stored in the glaciers etc. are other natural factors which make the country prone to various forms of disasters.
- (f) Along with the natural factors discussed in the preceding text, various human induced activities like increasing demographic pressure, deteriorating environmental conditions,

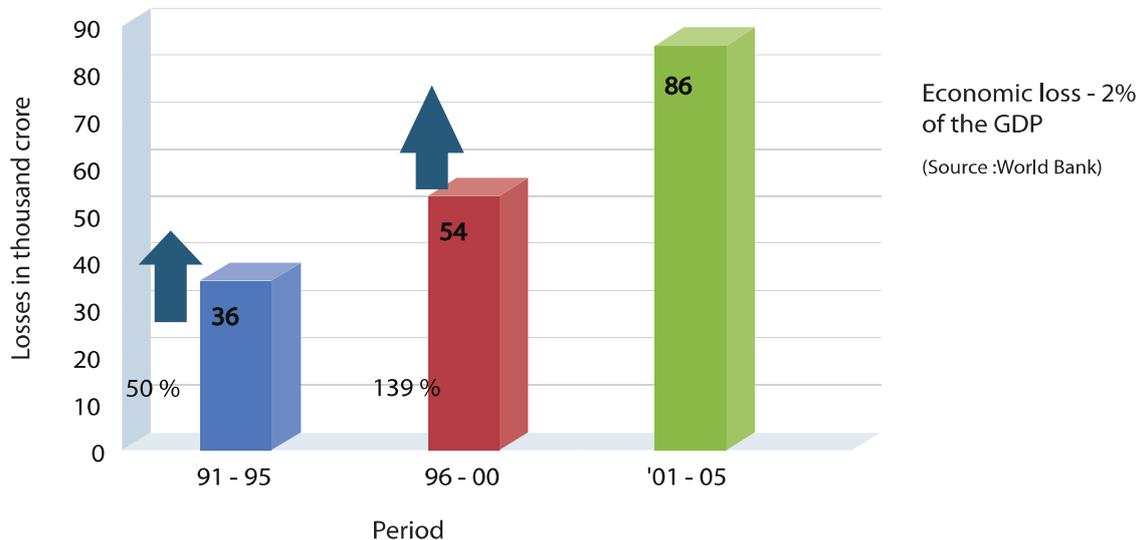
Figure 1.8 : Multi Hazard Map of India



Source: DM unit, UNDP, India

deforestation, unscientific development, faulty agricultural practices and grazing, unplanned urbanisation, construction of large dams on river channels etc. are also responsible for accelerated impact and increase in frequency of disasters in the country.

Figure 1.9: INDIA - Losses due to Disasters



Source: NDMA

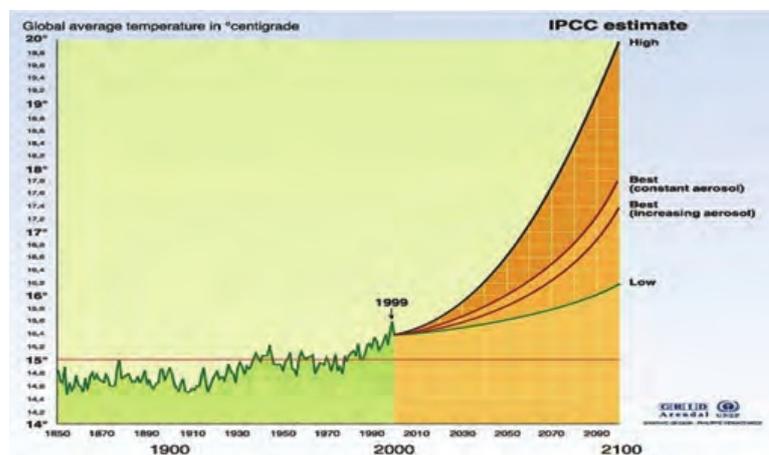
Losses due to disasters have been shown in Figure 1.9. It shows that economic loss is accounted for 2% of the GDP due to disasters as per the study of the World Bank.

1.7.2 Vulnerability to disasters or emergencies of Chemical, Biological Radiological and Nuclear (CBRN) origin has increased on account of socio-economic development. Heightened vulnerabilities to disaster risks can be related to expanding population, urbanization and industrialization, development within high-risk zones, environmental degradation and climate change.

During the last two decades of the 19th century (1982-2001), natural disasters in India had claimed a total death toll of around 1, 07,813 people (on an average more than 5,390 death toll every year). As mentioned above, India with its extended coast line is exposed to five to six tropical cyclones on an average, both from the Arabian Sea and Bay of Bengal annually.

1.7.3 **Climate Change:** This is evident from the increase in the global average air and ocean temperatures, precipitation and extreme rainfall, widespread melting of snow and ice, storms/storm surges/coastal flooding and rising global mean sea level, as recorded in the fourth Assessment Report of Intergovernmental Panel on Climate Change (IPCC) Figure 1.10. Climate change is expected to increase the

Figure 1.10: IPCC estimates of climate change



Source: IPCC

frequency and intensity of current extreme weather events and give rise to new vulnerabilities with differential spatial and socio-economic impacts on communities. The unprecedented increase is expected to have severe impacts on the hydrological cycle, water resource, droughts, flood, drinking water, forest and ecosystems, sea level/coastal area losses of coastal wetlands and mangroves, food security, health and other related areas. The impact would be particularly disastrous for developing countries, including India and further degrade the resilience of poor, vulnerable communities, which make up between one quarter and one half of the population of the most Indian cities.

1.7.4 Reason for concern: There is clear evidence that the observed change in surface temperature, rainfall, evaporation and extreme events and climate change is a significant environmental challenge. The main impact of global climate change will be felt due to changes in climate variability and weather extremes. Observations during the last decade and projections indicate that extreme events i.e. heat waves, cold waves, more floods, more droughts, more intense cyclones and flash floods will increase. Extreme rainfall has substantially increased over large areas, particularly over the west coast and west central India. There is thus an urgent need for a paradigm shift in disaster management, especially under changing climate.

1.7.5 Poverty and disaster vulnerability: Poverty and risk to disasters are inextricably linked and mutually reinforcing. The poor section of the society is worst affected in case of disaster. The situation further aggravates due to the compulsion of the poor to exploit environmental resources for their survival, increasing the risk and exposure of the society to disasters, in particular those triggered by flood, drought and landslides. Poverty also compels the poor to migrate and live at physically more vulnerable locations, often on unsafe land and in unsafe shelters. These inhabitations of the poor at such locations are either due to the fact that there is no other land available at reasonable cost or it is close to the employment opportunities. The inhabitations of the poor people on marginal land are prone to all types of disasters. The type of construction of these houses further deteriorates the condition. These dwellings made up of low cost material without giving much consideration to technical aspect are easy targets of various hazards.

1.8. Climate Profile⁵

1.8.1 India is home to an extraordinary variety of climatic regions, ranging from tropical in the south to temperate and alpine in the Himalayan north. The nation's climate is strongly influenced by the Himalayas and the Thar deserts. For the purpose of identification of drought prone areas by Central Water Commission (CWC) the criteria adopted was that "drought is a situation occurring in an area when the annual rainfall is less than 75 percent of normal in 20 percent of the years examined. Any block or equivalent unit where 30 percent or more of the cultivated area is irrigated is considered to have reached a stage, which enables it to sustain a reasonable protection against drought". A study rainfall data from 1875 to 1998 indicated the percentage area of the country affected by moderate and severe drought. It may be noted that during the complete 124 year period there were three occasions i.e. 1877, 1899 and 1918 when percentage of the country affected by drought was more than 60 percent).

1.8.2 In the span of 124 years, the probability of occurrence of drought was found maximum in Rajasthan (25 %), Saurashtra & Kutch (23%), followed by Jammu & Kashmir (21%) and Gujarat (21%) region. The drought of 1987 in various parts of the country was of "unprecedented intensity" resulting in serious crop damages and an alarming scarcity of drinking water.