



CLIMATE CHANGE AND DISASTER MANAGEMENT IN INDIA

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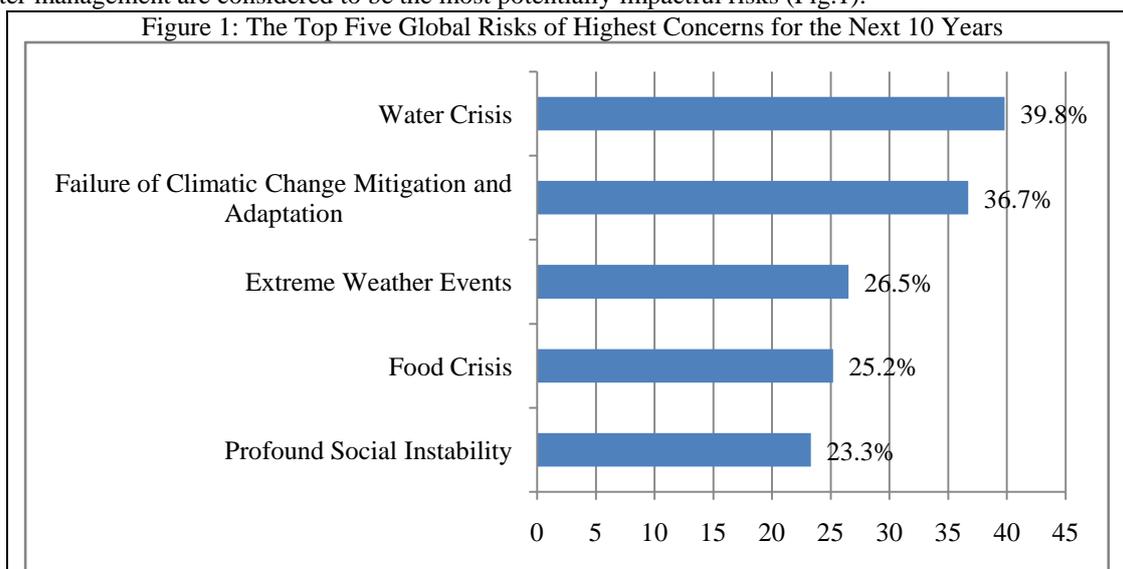
Abstract:

India is faced with the challenge for sustaining rapid economic growth while addressing the threat posed by climate change. The Indian subcontinent is among the world's most disaster prone area. Almost 85 percentage of India's area is vulnerable to one or multiple hazard. India is caught in the middle of debates on historical emission cuts, legally binding commitments for emission reduction and an effective and efficient 'co-benefits' approach to address climate change. The Indian development process is guided by the aspiration of making India prosperous and progress on the path of "Development without Destruction". Hence it is of utmost importance to mainstream the climate change mitigation and adaptation into the overall development plans of the Country. In this paper an attempt has been made to highlight the extreme climatic condition in India and policies adopted for disaster management.

Key Words: Climate Change in India, Extreme Heat, Rainfall Pattern, Endemism, Vector Borne Diseases, Disaster Management Act and Policies.

1. Introduction:

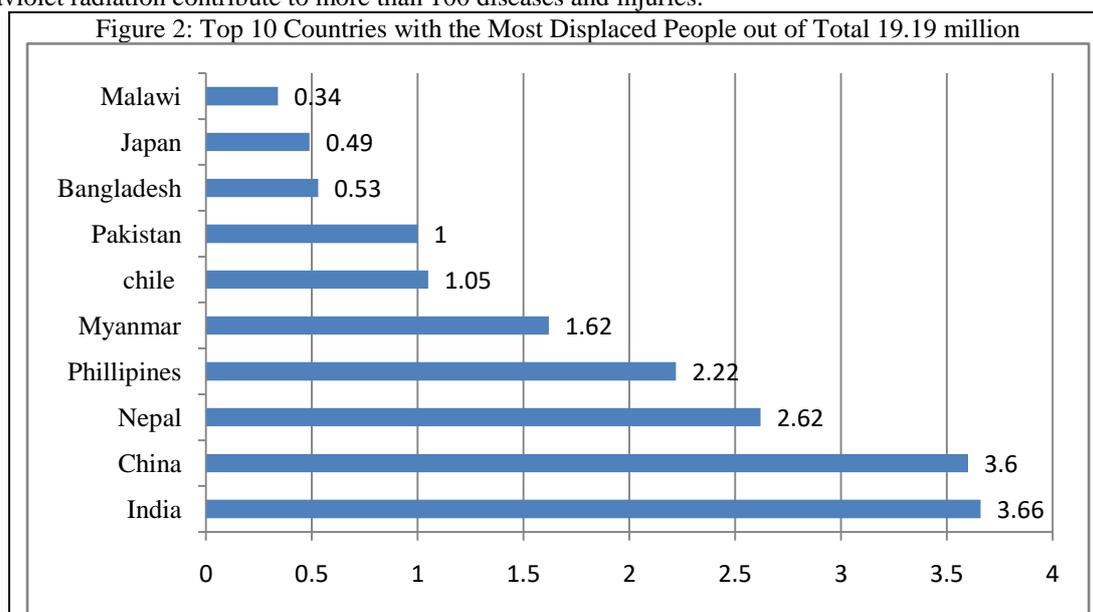
Earth's Climate is undergoing noteworthy natural changes for centuries. According to IPCC (2007), climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period typically decades or longer. Climate change may be due to natural internal processes or external forces, or to persistent anthropogenic changes in the composition of the atmosphere or in land use. As per the World Bank, though climate change affects all, it is expected to hit developing countries the hardest. Its potential effects on temperatures, precipitation patterns, sea levels, and frequency of weather related disasters pose risks for agriculture, food and water supplies. Current weather extremes, such as storms, floods and droughts, are becoming more frequent and intense, affecting millions of people across the world. Climate change is threatening global water and food security, agriculture supply chains and many coastal cities. A new world bank report shows that climate change has a power to push more than 100 million people back in to poverty over the next fifteen years. As per the report by World Economic forum on Global risks, prepared with the inputs from 750 experts around the world, they project environmental risks such as failure of climatic change mitigation and adaptation, water crisis, bio-diversity loss, ecosystem collapse and water management are considered to be the most potentially impactful risks (Fig.1).



Source: Global Risks Perception Survey 2015, World Economic forum

The report by World Health Organisation states that an estimated 12.6 million people died as result of living or working in an unhealthy environment-nearly one in four of total global death, accounts for this says

WHO. Environmental risk factors, such as air, water and soil pollution, chemical exposures, climate change, and ultraviolet radiation contribute to more than 100 diseases and injuries.



Source: Global report on Internal Displacement (GRID)

Natural disasters have forced a total of 27.8 million people out of their homes in 127 countries (Fig.2). Of the total displaced population 19.9 million, nearly 71 percent were affected by natural hazards and India is on the topmost position with the most vulnerabilities.

2. Research Problem:

Indian climate is the most unpredictable one with a wide range of weather condition across a vast geographical scale and varied topography. The monsoonal and other weather patterns in India can be widely unstable; floods, droughts, cyclones and other natural disasters have displaced or ended millions of human lives. The unpredictable climate change, its frequency, severity and its impacts on Indian Economy is a serious topic in academic discussion. Ongoing and future vegetative changes, current sea level rising, alleviant inundation of India's low-lying coastal area are other impacts. Present study is an attempt to integrate climate change and prevalence of natural disasters in India and policies and practices to manage and mitigate the climate induced disasters.

3. Review of Literature:

Enormous studies have been conducted on climate change and disaster management. Yin (1949) was the first to link the process of monsoon onset to the displacement of westerly troughs to the north of the Himalayan periphery. The inter-annual monsoon rainfall variability in India leads to large-scale droughts and floods, resulting in a major effect on Indian food grains production (Parthasarathy and Pant, 1985; Selvaraju, 2003) and on the economy of the Country (Gadgil *et al.*, 1999; Kumar and Parikh, 1998). Hingane *et al.*, (1985); Kumar and Hingane (1988); Kumar and Parikh (1998); Gadgil and Dhorde (2005); and Ramakrishna (2007) studied from time to time on temperature variability across the country. Pant and Kumar (1997) have shown that there has been an increasing trend of mean annual temperature over India broadly consistent with the global trend and magnitude at the rate of 0.57°C/100 years. Rainfall variability, Monsoon events and periodicities were studied by Rajeevan (2001); Pai and Rajeevan (2007); Raju *et al.*, (2008). The Indian monsoon rainfall is highly influenced by atmospheric factors such as sea surface temperature variations (Gosami *et al.*, 2006). Studies related to changes in rainfall over India have shown that there is no statistically significant trend in the all India rainfall (Mooley and Parthasarathy, 1984; Thapliyal and Kulshrestha, 1991). Study of Sarkar and Thapliyal (1988) and Srivastava *et al.*, (1988) indicated no trend in all India summer monsoon rainfall. Rajeevan (2001) reviewed the status problems and future prospects of long range forecasts of Indian summer monsoon. Many studies carried out for the Country indicated that rice and wheat yields could decline considerably with climate change (Sinha and Swaminathan, 1991; Aggarwal and Kalra, 1994; Mall and Singh, 2000; Pathak *et al.*, 2003).

4. Objectives of the Study:

Present study is based on following objectives,

- ✓ To analyse the pattern of climate change and prevalence of natural disasters in India
- ✓ To assess the disaster management policies and practices in India.

5. Methodology:

The data frame work describes the details of indicators of climate change along with policy frame work of disaster management in India. Data related to temperature and rainfalls etc are collected from Indian

meteorological department, Ministry of earth science and national remote sensing agency. Glacier retraction data is elicited from geological survey of India, Bio-diversity aspects from botanical and zoological survey of India. With respect to disaster management, the website of National Institute of Disaster Management (NIDM), Ministry of Home Affairs, New Delhi is used.

6. Results and Discussion:

India has a distinct geographical entity since it is marked off from the rest of Asia by mountain and sea. The geologic and tectonic history of the region is highly complex. India is very rich in biological diversity due to its unique bio geographical location, diversified climatic condition and enormous eco- diversity and geo diversity. India, a mega diverse country with only 2.4 percent of the world’s land area, accounts for 7-8 percent of all recorded species, including over 45, 000 species of plants and 91,000 species of animals. India holds four of four globally identified bio-diversity hot spots, The Himalayas, the Western Ghats, the North-East, and the Nicobar Islands. India also has 23.39 percent of its geographical area under forest and tree cover. India share of crops is 44percent as compared to the world’s average of 11 percent.

6.1 Extreme Heat: India is already experiencing a warm climate. Under 4 °C warming, the west coast and southern India are projected to shift to new, high-temperature climatic regimes with significant impacts on agriculture.

Year	Min	max	Mean
1901	19.51	28.96	24.23
1920	19.07	28.76	23.91
1940	19.24	28.88	24.06
1960	19.27	29.31	24.29
1980	19.53	29.58	24.55
2000	19.48	29.75	24.6
2014	19.77	29.72	24.73

Source: Ministry of Earth Science (data.gov.in)

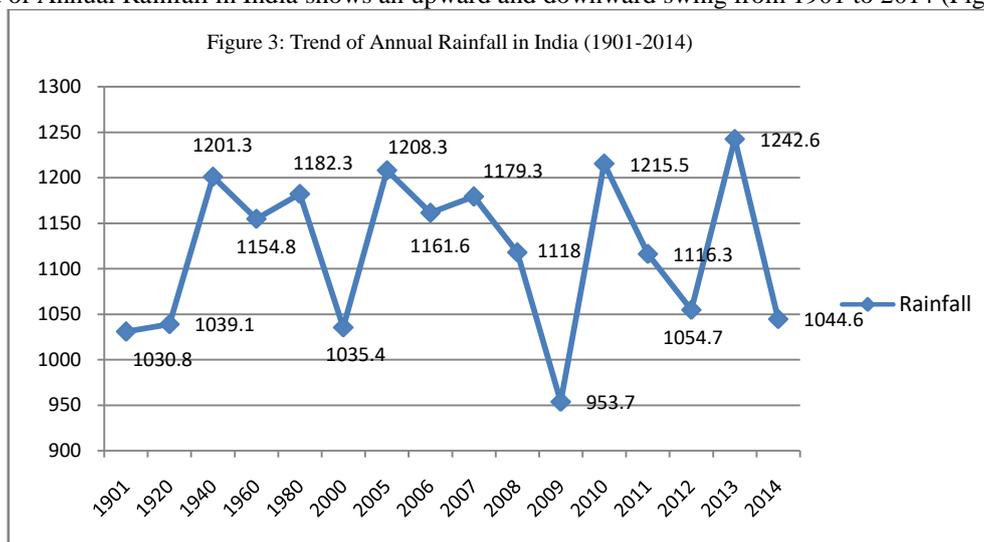
Over the decades, the mean temperature of India is showing an increasing trend (table.1).

6.2 Changing Rainfall Patterns: A decline in monsoon rainfall since 1950s has been already been observed. The frequency of heavy rainfall events has also increased. A 2°C rise in the world’s average temperature makes India’s summer monsoon highly unpredictable. In 1987 and 2002-2003 droughts affected more than half of India’s crop area and led a huge fall in crop production.

Year	Rainfall
1901	1030.8
1920	1039.1
1940	1201.3
1960	1154.8
1980	1182.3
2000	1035.4
2005	1208.3
2006	1161.6
2007	1179.3
2008	1118
2009	953.7
2010	1215.5
2011	1116.3
2012	1054.7
2013	1242.6
2014	1044.6

Source: Ministry of Earth Science (data.gov.in)

The trend of Annual Rainfall in India shows an upward and downward swing from 1901 to 2014 (Figure 3).



Source: Ministry of Earth Science (data.gov.in)

Rising temperature with lower rainfall at the end of the season have caused significant loss in India's rice production. Without climate change, average rice yield could have been almost 6percent higher (75 billion tonnes in absolute terms).

6.3 Glacier Melt: Most Himalayan glaciers has been retreating over the past century. At 2.5 °C warming, melting glaciers and the loss of snow cover over the Himalayas are expected to threaten the stability and reliability of northern indias primarily glacier-fed rivers, particularly the Indus and the Brahmaputra. Retreat of some glaciers in the North-Western Himalaya (NWH) in the last century

Glacier Name	Basin	Time-Span	Year	Retreat of Snout in m	Average Retreat (m/yr)
Triloknath	Chenab	1969-95	27	400	14.81
Bara shigri	-do-	1906-56	51	1750	34.31
		1957-77	21	250	11.90
		1978-95	18	650	36.11
		1996-2000*	4	950	237.50
Chhota Shigri	-do-	1962-95	34	225	6.62
		1988-2000*	13	1100	84.62
Pindari	Ganga	1845-66	122	2840	23.28
Milam	-do-	1849-1997	149	2472	16.59
Gangotri	-do-	1849-1900	51	682	13.37
		1901-35	35	527	15.06
		1936-56	20	173	8.65
		1957-64	7	227	32.43
		1965-71	6	555	92.50
		1972-2002	29	1424	49.10
Siachen	Nubra	1962-1984*	22	504	22.91
		1985-2001*	17	432	25.41
South Terong	-do-	1962-1984	22	3100	140.91
		1985-2001*	17	870	51.18

*Obtained from remotely sensed data. (Abnormally high rates of retreat are shown in bold figures)

Source: Himalayan Glaciers, A State-of-Art Review of Glacial Studies, Glacial Retreat and Climate Change-2009, MOEF

Himalayan hot spot represents one of the high altitude eco-region of the world, rich in floral and faunal diversity. Among the 9000 species of plants around 3500 (35percent) are endemic to the region. Table.3 shows extremely abnormal rates of retreat in the NWH.

6.4 Water Crisis: Many Parts of India are already experiencing water stress. More than 60percent of India's agriculture is rain-fed, making the country highly depend on ground water. , Even without climatic change 15 percent of India's ground water resources are overexploited. Climate- related impacts on water resources undermines power generation in India. Mumbai has the world's largest population exposed to coastal flooding, with large parts of the city built on reclaimed land, below the high tide mark. Sea level rise and storms surges would lead to salt water intrusion in the coastal area, impacting agriculture, degrading ground water quality, contaminating drinking water, and possibly causing a rise in diarrhoea and cholera outbreaks. Kolkata and Mumbai, both densely populated cities, are particularly vulnerable to the impacts of sea-level rise, tropical cyclones and riverine flooding.

6.5 Disasters and Extreme Events: Extreme climate events include heat waves, cold snaps, tropical cyclones, storm surges, floods, droughts and bushfires. Extreme climate events can have a serious impact on the environment and society, including loss of life, property and livelihoods. In recent years, the occurrence of extreme climate events and the associated damage has become highly visible. In India, About 54 per cent of the sub-continent's landmass is vulnerable to earthquakes while about 4 core hectares is vulnerable to periodic floods. The country has suffered four major earthquakes in the span of last fifty years along with a series of moderate intensity earthquakes that have occurred at regular intervals.

Year	Live Lost Human (in No)	Cattle Lost (in No)	Houses Damaged (in No)	Cropped Areas Affected (in Lakh hectares)
2001-02	834	21269	346878	18.72
2002-03	898	3729	462700	21.00
2003-04	1992	25393	682209	31.98
2004-05	1995	12389	1603300	32.53

2005-06	2698	110997	2120012	35.52
2006-07	2402	455619	1934680	70.87
2007-08	3764	119218	3527041	85.13
2008-09	3405	53833	1646905	35.56
2009-10	1677	128452	1359726	47.13
2010-11	2310	48778	1338619	46.25
2011-12	1600	9126	876168	18.87
2012-13	948	24360	671761	15.34
2013-14(p)#	5677**	102998	1210227	63.746
2014-15(p)##	1674	92180	725390	26.85

Source: Annual Report of various years, Ministry of Home Affairs (MHA)

** Includes persons missing in natural disasters

As on 28.02.2015 ##As on 31.12.2014

It is reported that during the year 2004 more than 261 earthquakes events occurred in this region before the devastating earthquake of 26th December 2004 and the tsunami that followed. In 2014, natural disasters accounted 1674 human deaths and 26.85 lakh hectares of cropped area affected.

Year	No. of cold waves	No. of heat waves	No. of deaths due to heat waves	Year	No. of Cyclones
				1950-59	36
1901-10	63	-	-	1960-69	61
1911-67	688	391	-	1970-79	66
1968-77	61	46	-	1980-89	39
1978-99	298	222	4999	1990-99	38
2000-09	83	78	4081	2010-12	44

Source: Annual report of Ministry of Home Affairs (MHA)

Heat waves are likely to result in very substantial rise in mortality and death. In India, from 2000 to 2009 heat waves alone accounts 4081 human deaths and the intensity of the occurrence of cyclonic events also showing an increasing trend (Table.5).

6.6 Endemism: In terms of endemism of vertebrate groups, India's position is tenth in birds with 69 species, fifth in reptiles with 156 species and seventh in amphibians with 110 species. As per 2014 data, India accounts, world's 11.2 percentage of the estimated faunal diversity.

Group	Threatened	No change/stable	Upward/improving	Downward/decreasing	Indeterminate	Trends not available
Mammals	213	4	1	47	87	74
Birds	149	2	-	80	10	57
Reptiles	33	-	-	2	2	29
Amphibia	148	5	-	68	73	2
Pisces	75	-	-	21	42	12
Crustacea	12	-	-	-	-	12
Mollusca	5	-	-	-	1	4
Hymenoptera	5	-	-	-	-	5
Lepidoptera	4	-	-	-	1	4
Odonata	3	-	-	-	1	3
Anoplura	1	-	-	-	-	1
TOTAL	648	11	1	218	217	203

Source: India's 4th National Report to the convention on Biological Diversity, MOEF-2009

State wise distribution of endemic wetland plants,

State	Endemic Plants	Threatened Birds	Threatened Fishes	Threatened Turtles
Kerala	65	0	37	3
Tamil Nadu	46	3	35	4
Karnataka	64	5	15	2
Goa	17	0	15	0
Andhra Pradesh	13	6	19	2
Odisha	6	0	22	6
Madhya Pradesh & Chhattisgarh	20	5	16	7

Maharashtra	69	2	19	3
Gujarat	11	6	12	1
Rajasthan	9	6	17	3
Haryana	0	6	15	1
Punjab	0	4	15	5
Jammu & Kashmir	2	2	20	2
Himachal Pradesh	0	2	19	0
Uttar Pradesh	3	13	34	10
Bihar & Jharkhand	5	6	19	9
West Bengal	5	6	32	11
Assam	2	10	35	10
North East States*	5	12	34	9
TOTAL	342	94	430	88

* Arunachal Pradesh, Meghalaya, Nagaland, Manipur, Mizoram, Sikkim, Tripura

Source: Vijayan et al. 2004; SACON, Coimbatore (table reproduced from India's 4th National Report to the convention on Biological Diversity, MOEF-2009)

Land-use change due to urbanization and industrialization, fragmentation of forests and habitats etc. are the major reason for loss of biodiversity. Data presented in table 6, and 7 gives clear indication of loss species and percentage of endemism due to climatic change.

6.7 Health Issues: Climate change is a major problem caused by the increase of human activities leading to several direct and indirect impacts on human health. The weather has a direct impact on our health. If the overall climate becomes warmer, there will be an increase in health problems. It is anticipated that there will be an increase in the number of deaths due to greater frequency and severity of heat waves and other extreme weather events. The elderly, the very young and those suffering from respiratory and cardiovascular disorders will probably be affected by such weather extremes as they have lesser coping capacity. An extreme rise in the temperature will affect people living in the urban areas more than those in the rural areas. Fluctuation in the climate especially in the temperature, precipitation, and humidity can influence biological organisms and the processes linked to the spread of infectious diseases.. Due to global warming there will be an increase in the areas of habitat of disease-spreading insects such as the mosquito, causing an increase in the transmission of infection through these carriers.

		2010	2011	2012	2013	2014	2015*
Malaria	Cases	1599986	1310656	1067824	881730	1102205	482378
	Pf	834364	665004	533695	463846	722546	
	Death	1018	754	519	440	561	
Dengue	Cases	28292	18860	50222	75808	53128	9874
	Death	110	169	242	47587	137	25
Chikunguniya	Cases	48176	20402	15977	18840	16049	10317
Diarrhoea	Cases	10742327	10231049	11701755	11413610	11673018	-
	Death	1526	1269	1647	1629	1323	-
Cholera	Cases	5004	2341	1583	1130	969	-
	Death	9	10	1	5	5	-
Typhoid	Cases	1084885	1062446	1477699	1650145	1707312	-
	Death	440	346	428	387	429	-
Japanese Encephalitis	Cases	555	1214	745	1086	1661	92
	Death	112	181	140	202	293	11
Acute Encephalitis Syndrome	Cases	5167	8249	8344	7872	10867	1310
	Death	679	1169	1256	1273	1717	143
Kala Azar	Cases	29000	33187	20600	13869	17321	5168
	Death	105	80	29	20	11	3

Source: National Health Profile of India, Central Bureau of Health Intelligence, MOHFW & National Vector Borne Disease Control Programme (NVBDCP), Directorate General of Health Services, Ministry of Health & Family Welfare. * Upto July 2015, Pf: Plasmodium falsiparum: Malaria caused by Pf is the most dangerous form of malaria.

Climate change is expected to have major health impacts in India, increasing malnutrition and related health disorders such as stunting. Child stunting is projected to increase by 35 percent by 2050 compared to a scenario without climate change. Malaria and vector-borne diseases along with and diarrheal infections which are a major cause of child mortality are likely to be spread in to the areas of extreme vulnerable climatic condition. There is a high incidence of occurrence of vector borne diseases like Malaria, Kala -azar, Japanese Encephalitis, filaria, Chikungunia etc., in the immediate past (Table.8). It is observed that changes in climatic patterns may alter the distribution of vector species and increase its spread in new areas. An increase in temperature and relative humidity may enlarge the transmission windows. More than one billion people all over the world rely on sea food as their primary food item. Occurrences of cancers and preneoplastic conditions

initiated and promoted by pollutant exposure have been observed in marine taxa ranging from invertebrates to marine mammals. A significant proportion of chemicals detected in seafood samples were carcinogenic and likely to cause public health risk.

7. Disaster Management; Policy Frame Work and Practices in India:

In India, The Ministry of Environment, Forest and Climate Change (MoEFCC) is the nodal agency for the planning, promotion, co-ordination and overseeing the implementation of India's environmental and forestry policies and programmes. Along with this, It serves a link to the International agencies including United nations Environment Programme (UNEP), South Asia Cooperative Environment Programme (SACEP), International Centre for Integrated Mountain Development (ICIMOD) and for the follow-up of the United Nations Conference on Environment and Development (UNCED). The Ministry is also entrusted with issues related to multilateral bodies such as Commission on Sustainable Development (CSD), Global Environmental Facility (GEF) and of regional bodies like Economic and Social Council for Asia and Pacific (ESCAP) and South Asian Association for Regional Co-operation (SAARC) on matters pertaining to climate change.

7.1 Indian Constitution and Disaster Management: The chapter of fundamental duties of the Indian constitution imposes duty on every citizen to protect environment. Article 51-A(g) says that it shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wild life and to have compassion for living creatures." Article 48-A of the Indian Constitution says that "The state shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country". Public Interest Litigation under Article 32 and 226 of Indian Constitution resulted in a wave of environmental litigation. Environment Impact Assessment (EIA) in India is a standard process used to foresee the environmental consequence of a policy, plan, project or program before implementing them. EIA is an equally an early warning process and an ongoing review process that protects susceptible environmental resources from unjustifiable damage. EIA is made compulsory on various projects to get environmental clearance.

7.2 Regulatory Framework: Over the years, a number of laws have been enacted to protect the environment and mitigate the climatic disasters. The regulatory framework consists of the following acts.

- ✓ The Indian Forest Act, 1927 - The Act of 1927 embodied land-using policy, Section 26(i) of the Act makes it punishable if any person, who, in contravention of the rules made by the State Government, poisons water of a forest area.
- ✓ The Wild-Life (Protection) Act, 1972 - Prohibits the hunting of wildlife, with rare exceptions. It declared protected areas as Sanctuaries and National Parks. This act constituted wildlife authorities. Prohibits or regulates trade in wild animals, trophies and animal article.
- ✓ The Water Prevention and Control of Pollution Act, 1974
- ✓ The Forest (Conservation) Act, 1980 - Prohibits the "de-reservation" of reserved forests, the use of forest land for a "non-forest" purpose, and the clearing of trees from forest land, except with the prior approval of the Central Government.
- ✓ The Water (Prevention & Control of Pollution) Cess Act, 1981, An Act "to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water". Constituted Pollution Control Boards (PCBs) in every state, and a Central Pollution Control Board at the Centre. PCBs issue consents for establishment of industries and discharge of effluents
- ✓ The Air (Prevention & Control of Pollution) Act, 1981 - Provides a regulatory framework for the "prevention, control and abatement of air pollution".
- ✓ The Environment (Protection) Act, 1986 - Framed in implementation of the Stockholm Declaration in the aftermath of the Bhopal Gas Leak tragedy. Enables framing of Rules and Regulations for: Discharge of Pollutants Coastal Protection Environmental Impact Assessment, Hazardous Substances and Waste, Ozone Depleting Substances. The Environment Protection Act, 1986, imposed a similar responsibility on every citizen "to protect and improve the natural environment including forests, trees, rivers and wildlife, and to have compassion for all living creatures".
- ✓ The Public Liability Insurance Act, 1991.
- ✓ The National Environment Tribunal Act, 1995 - The Tribunal hears claims for compensation arising out of accidents arising out of handling hazardous substances. Imposes strict or no-fault liability in such cases.
- ✓ The National Environment Authority Act, 1997 - The Authority hears appeals from orders granting environmental clearances for projects and industrial activity.
- ✓ The Biological Diversity Act, 2002 - Gives effect to India's obligations under the U. N Convention on Biological Diversity. Established national and state biodiversity authorities. Restricts access of non-resident Indians, foreign nationals and companies to a biological resource for research, commercial use, survey or collection etc. Provides funds for the constitution of national, state, and local biodiversity fund.
- ✓ The National Green Tribunal Act, 2010.

7.3 National Disaster Management Act 2005: The Parliament of India has enacted the National Disaster Management Act in November 2005, which brings about a paradigm shift in India's approach to disaster management. The centre of gravity stands visibly shifted to preparedness, prevention and planning from earlier response and relief centric approach. The Act provides for establishment of

- ✓ National Disaster Management Authority (NDMA)
- ✓ State Disaster Management Authority (SDMA)
- ✓ District Disaster Management Authority (DDMA)

The Act also provides for -

- ✓ Constitution of Disaster Response Fund and Disaster Mitigation Fund at National, State and District levels.
- ✓ Establishment of NIDM and NDRF.
- ✓ Provides penalties for obstruction, false claims, misappropriation etc.
- ✓ It states that there shall be no discrimination on the ground of sex, caste, community, descent or religion in providing compensation and relief.

"Disaster" is defined as follows under Section 2(a) of the DM Act: "Disaster" means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area;"

Section 2(e) of the DM Act defines Disaster Management as follows:

'Disaster management' means a continuous and integrated process of planning, organising, coordinating and implementing measures which are necessary or expedient for:-

- ✓ Prevention of danger or threat of any disaster; W.P.(C).Nos.26246/2015, 26377/2015 & 28130/2015
- ✓ mitigation or reduction of risk of any disaster or its severe consequences;
- ✓ capacity-building;
- ✓ preparedness to deal with any disaster;
- ✓ prompt response to any threatening disaster situation or disaster;
- ✓ assessing the severity or magnitude of effects of any disaster;
- ✓ evacuation, rescue and relief;
- ✓ Rehabilitation and reconstruction."

7.4 National Disaster Management System in India: In the federal set-up of India, the responsibility to formulate the Governments response to a natural calamity is essentially that of the concerned State government. However, the Central Government, with its resources, physical and financial does provide the needed help and assistance to buttress relief efforts in the wake of major natural disasters. The dimensions of the response at the level of Central Government are determined in accordance with the existing policy of financing the relief expenditure and keeping in view the factors like: (i) the gravity of a natural calamity, (ii) the scale of the relief operation necessary, and (iii) the requirements of Central assistance for augmenting the financial resources at the disposal of the State Government.

The Division of Disaster Management of Ministry of Home Affairs, Government of India is the nodal ministry for all matters concerning disasters at the Centre except the drought. The Drought Management is looked after by the Ministry of Agriculture, Government of India. The National Contingency Action Plan (NCAP) facilitates launching of relief and rescue operations without delay. The CAP identifies initiatives required to be taken by various Central Ministries, and Public Departments like in the wake of natural calamities, sets down the procedures and determines the focal points in the administrative machinery. As pointed out earlier, the central government only supplements the efforts of the State Government. State Governments are autonomous in organizing relief operations in the event of natural disaster and in the long-term preparedness/ rehabilitation measures. The States have Relief Commissioners who are in charge of the relief measures in the wake of natural disasters in their respective states. In the absence of the Relief Commissioner, the Chief Secretary or an Officer nominated by him is overall in-charge of the Relief operations in the concerned State. The Chief Secretary is the head of the State Administration. The State Headquarters has, in addition, a number of Secretaries who head the various Departments handling specific subjects under the overall supervision and co-ordination of the Chief Secretary. At the level of the State Government natural disasters are usually the responsibility of the Revenue Department or the Relief Department. States are further divided into districts, each headed by a District Collector (also known as District Magistrate or Deputy Commissioner). It is the District Collector who is the focal point at the district level for directing, supervising and monitoring relief measures for disaster and for preparation of district level plans.

7.5 Institutional Policy Framework for a Safe Future, Mitigation and Prevention:

- ✓ The institutional and policy mechanisms for carrying out response, relief and rehabilitation have been well-established since Independence. These mechanisms have proved to be robust and effective insofar as response, relief and rehabilitation are concerned.

- ✓ At the national level, the Ministry of Home Affairs is the nodal Ministry for all matters concerning disaster management. The Central Relief Commissioner (CRC) in the Ministry of Home Affairs is the nodal officer to coordinate relief operations for natural disasters. The CRC receives information relating to forecasting/ warning of a natural calamity from India Meteorological Department (IMD) or from Central Water Commission of Ministry of Water Resources on a continuing basis. Each Ministry/Department/Organization nominates their nodal officer to the Crisis Management Group chaired by Central Relief Commissioner. The nodal officer is responsible for preparing sectoral Action Plan/ Emergency Support Function Plan for managing disasters.
- ✓ National Crisis Management Committee (NCMC): Cabinet Secretary, who is the highest executive officer, heads the NCMC. Secretaries of all the concerned Ministries /Departments as well as organizations are the members of the Committee. The NCMC gives direction to the Crisis Management Group as deemed necessary.
- ✓ Crisis Management Group: The Central Relief Commissioner in the Ministry of Home Affairs is the Chairman of the CMG, consisting of senior officers (called nodal officers) from various concerned Ministries. The CMG's functions are to review every year contingency plans formulated by various Ministries/Departments/Organizations in their respective sectors, measures required for dealing with natural disasters coordinate the activities of the Central Ministries and the State Governments in relation to disaster preparedness and relief and to obtain information from the nodal officers on measures relating to above.
- ✓ Control Room (Emergency Operation Room): An Emergency Operations Center (Control Room) exists in the nodal Ministry of Home Affairs, which functions round the clock, to assist the Central Relief Commissioner in the discharge of his duties. The activities of the Control Room include collection and transmission of information concerning natural calamity and relief, keeping close contact with governments of the affected States, interaction with other Central Ministries/Departments/Organizations in connection with relief, maintaining records containing all relevant information relating to action points and contact points in Central Ministries etc., keeping up-to-date details of all concerned officers at the Central and State levels.
- ✓ Contingency Action Plan: A National Contingency Action Plan (CAP) for dealing with contingencies arising in the wake of natural disasters has been formulated by the Government of India and it had been periodically updated. It facilitates the launching of relief operations without delay.
- ✓ State Relief Manuals: Each State Government has relief manuals/codes which identify that role of each officer in the State for managing the natural disasters.
- ✓ Funding mechanisms: The policy and the funding mechanism for provision of relief assistance to those affected by natural calamities are clearly laid down. These are reviewed by the Finance Commission appointed by the Government of India every five years. The Finance Commission makes recommendation regarding the division of tax and non-tax revenues between the Central and the State Governments and also regarding policy for provision of relief assistance and their share of expenditure thereon. A Calamity Relief Fund (CRF) has been set up in the State as per the recommendations of the Eleventh Finance Commission (Centre contribute 75 percent where as State 25 percent). State can get assistance through National Calamity Contingency Fund (NCCF).Also through Prime Minister Fund.
- ✓ At the State level, response, relief and rehabilitation are handled by Departments of Relief & Rehabilitation. The State Crisis Management Committee is set up under the Chairmanship of Chief Secretary in the State. All the concerned Departments and organizations of the State and Central Government Departments located in the State are represented in this Committee. This Committee reviews the action taken for response and relief and gives guidelines/directions as necessary. A control room is established under the Relief Commissioner. The control room is in constant touch with the climate monitoring/forecasting agencies and monitors the action being taken by various agencies in performing their responsibilities. The district level is the key level for disaster management and relief activities. The Collector/ Dy. Commissioner is the chief administrator in the district.

7.6 Disaster Management at the Grassroots Level: "Disaster Management", going by the definition, can be broadly classified into three categories, namely, response in disaster situations, prevention of any disaster and capacity-building. The above measures are achieved by three different approaches, which can be classified as emergency measures, long-term measures and hybrid measures. Emergency measures: The District Authority is empowered to take any measures for mitigation of disaster. By emergency measures, it can direct any officer or department to carry out its order. It has power to control and restrict vehicle traffic in vulnerable area. It has power to control movement of persons. It can conduct search and rescue operations. It can establish emergency, communication system. These measures are, in fact, relief and rescue measures in the event of disaster. "Capacity-building" includes-

- ✓ Identification of existing resources and resources to be acquired or created;
- ✓ Acquiring or creating resources identified under sub-clause

- ✓ Organization and training of personnel and coordination of such training for effective management of disasters;"

Long term measures: The long term measures are the actions of the Authority in relation to prevention of disaster as well as capacity building. This measure equips the Authority to meet any contingencies that arise out of a disaster. Hybrid measures: The statutory provisions in the DM Act do not indicate about this measure specifically. This measure is a combination of emergency measure and long term measure. In this process, urgent action to respond to disaster can be converted as long term measures. There may be a situation where a building owned by a private person need to be demolished immediately for rescue operation.

7.7 Role of Local Bodies: Local governance institutions, with their grass-root level contacts with the common people, can make a substantial contribution to the process of spreading awareness and ensuring an active people's participation in disaster mitigation activities. They are the ideal channels for NGOs and other agencies that conduct any disaster management programme, right from relief, recovery and rehabilitation to planning for mitigation and prevention.

7.8 Role of Non Governmental Organizations: Emerging trends in managing natural disasters have highlighted the role of Non Governmental Organizations (NGOs) as one of the most effective alternative means of achieving an efficient communication link between the Disaster Management agencies and the affected community. Many different types of NGOs are already working at advocacy level as well as grassroots level; in typical disaster situations they can be of help in preparedness, relief and rescue, rehabilitation and reconstruction and also in monitoring and feedback.

7.9 Role of the Community: It has now been revealed that the community as an institution in itself is emerging as an effective player in the entire mechanism of disaster administration. In the event of actual disasters, the community, if well aware of the preventive actions it is required to take can substantially reduce the damage caused by the disaster. Awareness and training of the community is particularly useful in areas that are prone to frequent disasters.

8. Conclusion:

The country has an integrated administrative machinery for disaster management at National, Provincial (State), District and Sub-District levels. India, besides evolving effective post-disaster management operations, has also formulated and implemented pre-disaster mitigation programmes and sectoral development programmes to reduce the impact of disasters as well as reduce the socio-economic vulnerabilities. It is absolutely necessary to create awareness amongst the public as well as decision makers for allocating resources for appropriate investments in disaster management. India is committed to the goals and objectives of the International Decade for Natural Disaster Reduction. A special plan programme is now implemented for development of human resources, encouraging research and documentation and enhancing community awareness in the field of natural disasters. In spite of initiating various disaster mitigation measures, the trend of losses is not indicating any sign of improvement. Population pressure, environmental degradation, migration and unplanned urbanisation are some of the major factors contributing to increase the vulnerability. As such need has been felt to accelerate the pace of disaster mitigation efforts in the country, Now India is planned to give more stress on linkage of disaster mitigation with development plans, effective communication system, use of latest information technology, insurance, extensive public awareness and education campaigns particularly in the rural areas legal and legislative support, involvement of private sector, strengthening of institutional mechanism including Natural Disaster Management Division in the nodal Ministry of Agriculture, strengthening international co-operation at regional and bi-lateral level etc.

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