ROLE OF URBAN LOCAL GOVERNMENT IN DISASTER MANAGEMENT

Background Paper

(23 & 24 March 2007)

Prof. Nishith Rai
Dr. Awadhesh Kr. Singh

Regional Center For Urban And Environmental Studies
Lucknow University Campus,
Lucknow.

India is one of the world's major theaters of disasters and both natural and human made. Floods, droughts cyclones, and earthquakes pound it end to end every year. Communal riots, conflicts, fires, epidemics, and other disasters compound the country's chronic troubles. The social and economic progress achieved over decade by the people, and advances in physical development, can be significantly devastated and degraded by disasters. Urbanization, industrialization, globalization and liberalization of economy all have influenced human life. People are tend to live in disaster prone areas due to severe stress on land, high prices of land and construction of buildings, poverty, migration and non-regulation of urban housing constructions. Even, the natural protection measures are neglected to pave the way for economic development. The government of India through various stake-holding agencies has been making efforts to meet the exigencies as arisen by natural disasters. It is, however, experienced that all these efforts and contingency plans concentrate on the post disaster situation. A half backed approach is adopted for preventing the occurrence of disasters. There is need for fundamental change in national disaster policy itself. The community has to be associated at all levels of planning and implementation of the disaster management programmes.

Urbanization Pattern

Urbanization is a global phenomenon experienced by developed as well as developing countries. There is migration from villages to towns and cities with results in growth of metropolitan cities since they provide

multiple avenues, services and amenities viz. education, health care, employment, business and entertainment options etc. People also migrate for economic opportunities and urban life styles. Though urbanization brings about development in social, economic and cultural spheres of life but sometimes it disturbs the ecological systems. Rapid and unplanned growth of urban agglomerations generates a series of negative environmental and social effects. Today urban India presents a very pathetic scene. Cities have become a site of rotting garbage, degrading drainage system and shocking night soil removal system. India's life line is in danger. Many Indian rivers are heading towards an environmental disaster due to discharging of untreated sewage into water bodies. Besides, poor have practically no access to covered toilets and in many towns and cities, the majority defecate in the open. The untreated sewage being dumped into the river and water bodies leads to health hazards.

India is one of the least urbanized countries in the world because between 1951 and 2001, the level of urbanization increased by 13 percentage points only. However, it has second largest urban population in the world and more than two thirds of it live in urban agglomerations. Four mega cities viz., Mumbai, Kolkata, Delhi, and Chennai with a population of more than 6 millions each in 2001, account for almost one fourth population living in cities. As per 2001 Census, 285 million population i.e. 27.8 per cent of 1027 million total population of India is residing in 4368 cities and towns in the country, whereas in 1971, 20 per cent population lived in urban areas. In 2021, about two fifth population is expected to live in urban areas with absolute size of 550 million population. In 1901, there was only one million plus city but in 2001, there were 35 such cities. The number of such

cities is likely to increase by 75 in 2021. The decadal growth in urban population during 1991-2001 has been 31.2 per cent whereas at the beginning of the 20th century only 10.8 per cent of total 218 million population of the country resided in cities and towns (Table - 1).

Table - 1
Urbanization in India

Year	Percentage of Urban Population	Number of Municipal Towns	Total Population (Millions)	Urban Population (Millions)
1901	10.8	1827	238.39	25.85
1911	10.3	1815	252.09	25.95
1921	11.2	1949	251.32	28.09
1931	12.0	2072	278.98	33.46
1941	13.9	2250	318.66	44.16
1951	17.3	2843	361.23	62.44
1961	18.0	2365	439.23	78.13
1971	19.9	2590	548.15	109.11
1981	23.3	3378	159.46	159.56
1991	25.7	3768	846.30	217.61
2001	27.8	4368	1027.0	285.0

Source: Census, 2001

There has been phenomenon growth in the number of towns and urban agglomerations over the period of 1901 to 2001; however, annual exponential growth rate of urban population is low. Even, in the recent, the growth has been reported to be declining. There have been just 2.06 percentage points increase in proportion of urban population to total population during 1991 to 2001. An analysis of the distribution of urban population by size categories reveals that the process of urbanization in India has been large city oriented. This is proved that a high proportion of urban

population being concentrated in class I cities, which has gone up systematically over the decades in the last century, the massive increase in proportion of class I cities from 26 per cent in 1901 to 85.20 per cent in 1991while it declined to 68.67 per cent in 2001, has been attributed to faster growth of large cities. The number of class one cities has grown to 393 in 2001 from 24 in 1901. There has been more than five fold increase in the number of class one cities since 1951 (Table 2).

Table - 2

Number of Towns and Percentage of Urban Population in Different Size Categories

Year	Class I	Class II	Class III	Class IV	Class V	Class VI	Total
1901	24 (26.00)	43 (11.29)	130 (15.64)	391 (20.83)	744 (20.14)	479 (6.10)	1827
1911	23 (27.48)	40 (10.51)	135 (16.4)	364 (19.73)	707 (19.31)	485 (6.57)	1815
1921	29 (29.70)	45 (10.39)	145 (15.92)	370 (18.29)	734 (18.67)	571 (7.03)	1949
1931	35 (31.20)	56 (11.65)	183 (16.8)	434 (18.00)	800 (17.14)	509 (5.21)	2072
1941	49 (38.23)	74 (11.42)	242 (16.35)	498 (15.78)	920 (15.08)	407 (3.14)	2250
1951	76 (44.63)	91 (9.96)	327 (15.72)	608 (13.63)	1124 (12.97)	569 (3.09)	2365
1961	102 (51.42)	129 (11.23)	437 (16.94)	719 (12.77)	711 (6.87)	172 (0.77)	2365
1971	148 (57.24)	173 (10.92)	558 (16.01)	827 (10.94)	623 (4.45)	147 (0.44)	2590
1981	218 (60.37)	270 (11.63)	743 (14.33)	1059)19.54)	758 (3.50)	253 (0.50)	3378
1991	300 (65.20)	345 (10.95)	947 (13.19)	1167 (7.77)	740 (2.60)	197 (0.29)	3768
2001	393 (68.67)	401 (9.67)	1151 (12.23)	1344 (6.84)	888 (2.36)	191 (0.23)	4368

Source: India Infrastructure Report, 2006.

The startling fact is that the proportion of population living in smaller towns has shown declining trend over the period while there is massive growth in population of larger towns. Importantly, growth of population in smaller towns has been reported negative while growth of population in larger cities and towns has been found massive. During 2001, the high proportion of urban population to total population has been reported to be in Delhi, Pondicherry, Goa, Chandigarh, Maharastra, Mizoram, Lakshadeep, Tamil Nadu, Karnataka, Gujarat etc. The high rate of growth of urban population during 1991-2001 has been reported high in Dadra and Nagar Haveli (14.59 per cent) followed by Arunachal Pradesh (7.00 per cent), Andman Nicobar (4.14 per cent), Sikkim (4.83 per cent), and Delhi, (4.14 per cent). During 2002, there were 384 urban local bodies in India. Out of total urban local bodies in India, 107 ULB's were Municipal Corporations, 1443 Municipal Councils and 2091 Nagar Panchayats. The highest number of local bodies were reported in Tamil Nadu (719) followed by Uttar Pradesh (628), Madhya Pradesh and Maharastra.

Increasing urbanization, expansion of habitat into unsuitable vulnerable areas; higher population density, higher housing density, vulnerable housing and buildings construction; non engineered unsafe construction; and aging buildings and other infrastructure are some of the factors that have increased vulnerability of hazards and disasters in urban areas.

Hazards and Disasters

The term disaster owns its origin to the French World '*Desastre*" which refers to bad or evil star. A disaster can be defined as 'a serious disruption in the functioning of the community or a society causing wide spread material, economic, social or environmental losses which exceed the ability of the affected society to cope using its own resources.' A disaster is a result from the combination of hazard, vulnerability and insufficient capacity or measures to reduce the potential changes of risk. A disaster is the product of a hazard such as earthquake, flood or wind storm coinciding with a vulnerable situation which might include communities, cities or villages. A disaster happens when hazard impose on the vulnerable population and causes damage, casualties and disruption. Without vulnerability or hazard there is no disaster. A disaster occurs when hazards and vulnerability meet. Hazard may be defined as dangerous condition or event that threat or have the potential for causing injury to life or damage to property or the environment. Hazards can be grouped into two broad categories namely natural and manmade. Natural hazards are those hazards which are caused because of natural phenomenon. Cyclones, tsunamis, earthquake, and volcanic eruption are exclusively of natural origin. Landslides, floods drought, fires, are socio-natural hazards since their causes are both natural and manmade. Manmade hazards are hazards which are due to human negligence. Manmade hazards are associated with industries or energy generation facilities and include explosions, leakage of toxic waste, pollution, dam failure, wars or civil strife etc. (Table 3)

Table - 3
Hazard Classification and Related Disaster Types

A. Water &	B. Geological	C. Chemical,	D. Accident	E. Biological

Climate Related	Disasters	Industrial and Nuclear Disasters	Related Disasters	Disasters
Floods & Drainage Management**	**Earthquakes****	**Chemical and Industrial Disasters****	**Urban Fires **#**	**Biological Disasters and Epidemics$**
Cyclones**	**Land Slides and Mudflows****	**Nuclear Disasters****	**Mine Flooding**#**	**Pest Attacks$**
Tornadoes & Hurricanes**	**Dam Failure and Dam Bursts****		**Oil Spill**#**	**Cattle Epidemics$**
Hail Storms**	**Mine Fires****		**Major Building Collapse**#**	**Food Poisoning$#**
Cloud Bursts**			**Electrical Disasters and Fires**#**	
Snow Avalanches**			**Air Road and Rail Accidents**#**	
Heat & Cold Waves**			**Festival Related**#**	
Sea Erosion**			**Boat Capsizing#**	
Thunder & Lightening**			**Village Fires#**	
Droughts**			**Forest Fires#**	
			Serial Bomb Blasts#	

** Engineering related
# Accident/Terrorism related
$ Biological related

Vulnerability may be conceptualized as the extent to which a community structure, service, or geographic area is likely to be damaged or disrupted by the impact of particular hazard on account of their nature, construction and proximity to hazardous terrain or a disaster prone area. The vulnerable buildings and infrastructure are more prone to earthquake hazards. Hence structures should be built strong enough to resist maximum

force exerted by any event or for combination of event. Social and economic conditions also determine the vulnerability of a society to an extent. Interestingly, 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. The level of risk depends upon (i) nature of the hazard; (ii) vulnerability of the elements which are affected; and (iii) economic value of those elements. Thus, disaster risk management includes measures which reduce disaster related losses of life, property or assets by either reducing the hazard or vulnerability of the elements at risk. Disaster management is conceptualized as the body of policy and administrative decisions and operational activities which pertain to the various stages of a disaster at all levels. Broadly disaster management can be divided into pre-disaster and post-disaster contexts. There are three key stages of activity that are taken up within disaster management. They are (i) pre-disaster - mitigation, prevention, preparedness, risk assessment; (ii) during a disaster - emergency response, relief distribution, search and rescue, shelter, medical and trauma care etc., (iii) post disaster - rehabilitation and reconstruction of disaster affected persons and areas.

Natural Disasters

There has been increase in the number of natural disasters over the past years, on account of urbanization and population growth; as a result impact of natural disasters is now felt to a larger extent. According to the United Nations, in 2001 alone, natural disasters of medium to high range caused at least 250,000 deaths around the world, more than double the previous year, and economic losses of around 836 billion. The natural disasters are not bound by political boundaries and have no social or economic considerations. They are borderless as they affect both developing and developed countries. Since 1991, two third of the victims of natural disasters were from developing countries, while just 2 per cent were from highly developed nations. Those living in developing countries and especially those with limited resources tend to be more adversely affected (Government of India, 2002). The continent of Asia is particularly vulnerable to disaster strikes.

Situation Analysis

The Indian subcontinent is vulnerable to droughts, floods, cyclones and earthquakes. Land slides, avalanche and forest fires also occur frequently (Table 4).

Table -4
Major Disasters in India Since 1970

S.No.	Disaster	Impact
	Cyclone	
1.	**29 October 1971, Orissa**	**Cyclone and tidal waves killed 10,000 people**
2.	**19 November 1977 Andhra Pradesh**	**Cyclone and tidal waves killed 20,000 people**
3.	**29 and 30 October 1999 Orissa**	**Cyclone and tidal waves killed 9,000 and 18 million people were affected**
	Earthquake	
4.	**20 October 1991 Uttarkashi**	**An earthquake of magnitude 6.6 killed 723 people**
5.	**30 September 1993 Latur**	**Approximately 8000 people died and there was a heavy loss to infrastructure**
6.	**22 May 1997 Jabalpur**	**39 people dead**
7.	**29 March 1997, Chamoli**	**100 people dead**
8.	**20 January 2001, Bhuj, Gujarat**	**More than 10,000 dead and heavy loss to infrastructure**
	Landslide	
9.	**July 1991, Assam**	**300 people killed, heavy loss to roads and infrastructure**
10.	**August 1993, Nagaland**	**500 killed and more than 200 houses destroyed and about 5 kms. Road damaged**
11.	**18 August 1998, Malpa, Uttarakhand**	**210 people killed. Villages were washed away**
	Floods	
12.	**1978 Floods in North East India**	**3,800 people killed and heavy loss to property**
13.	**1994 Floods in Assam, Arunachal Pradesh, Jammu and Kashmir, Himachal Pradesh, Punjab, Uttar Pradesh, Goa, Kerala and Gujarat**	**More than 2000 people killed and thousands affected**
14.	**2004 Tsunami, Coastal areas of Tamil Nadu, Andhra Pradesh, Andaman Nicobar Islands and Pondicherry.**	**More than 10,000 people were killed and damage of $1068 million to properties.**

Source: Natural Hazards and Disaster Management, Text Book in Geography for Class XI CBSC, Delhi.

Among the 32 states and Union Territories in the country, 22 are multi-disaster prone. About 40 million hectares of land in the country has been identified as flood prone and on an average 18.6 million hectare of land

is flooded annually. About 57 per cent of area of the country is vulnerable to seismic activity. About 18 per cent of country's total area is drought prone, approximately 50 million people are annually affected by droughts and about 68 per cent of total sown area of the country is drought prone. India has a long coastline of 8040 km. which is exposed to tropical cyclones arising in the Bay of Bengal, the Arabian Sea and Indian Sea. The Indian Ocean is one of the six major cyclonic prone regions of the globe (Jain, 2004:61). The Coromandal coastline is more cyclones prone, with 80 per cent of the total cyclones generated in this region. Risk to the existing housing stock in various states and union-territories had been estimated by Expert Group Set up by the Ministry of Urban Affairs and Employment, Government of India. About 3.9 million houses are susceptible to earthquakes of very high intensity, about 20 million houses are susceptible to damage due to winds and about 9.3 million houses are susceptible to damage due to floods. Besides the risk of earth quakes, cyclones and floods are liable to very high damage and destruction of vulnerable houses under heavy rains. (Jain, 2004:61). Some 49 per cent of the total housing stock is liable to very high damage from natural hazards, while about 1 per cent of the total housing stock gets destroyed every year. It is to be noted that in earth quake, 80 per cent of the casualties are due to collapsing buildings. Brick and stone buildings without proper support are liable to collapse. Non-engineered buildings continue to be built in the areas prone to natural disasters. Unemployment, poverty backwardness, migration from rural areas and increasing price of land and construction, million of people are occupying disaster prone areas. Thus about 6 per cent increase in disaster affected population has been reported.

According to the World Bank assessment, the natural disasters alone accounted India whopping amount of $13 million during 1986-2001, depleting 2 per cent of the GDP and 12 per cent of national revenue. Compared to the loss of $13.4 billion during 1981-95 and $2.9 million during 1965-80, the present swelling in the volume of losses is certainly frightening and demands urgent attention of development planners (Kishore K. Singh, 2004:349). The dilapidated and poorly built houses in urban areas increase the risks of disasters. Lack of tenurial rights over the urban space and shortage of housing facilities have forced to urban poor to live in the most unsafe environment. The Indian sub-continent is highly prone to natural disasters. Floods, droughts, cyclones and earthquakes are a recurrent phenomenon in India. Between 1988 and 1997 disaster Killed 5116 people and affected 24-79 million every year (Table - 5).

Table - 5
Damage Due to Natural Disasters in India

Year	People Affected (lakh)	Houses & Buildings Damaged	Amount of Property Damage/Loss (Rs. crore)
1985	595.6	2449878	40.6
1986	550.0	204927	30.74
1987	483.4	2919380	20.57
1988	101.5	242533	40.63
1989	30.1	782340	20.41
1990	31.7	1019930	10.71
1991	342.7	1190109	10.90
1992	190.9	570969	20.05
1993	262.4	1529916	50.80
1994	235.3	1051223	10.85
1995	543.5	2088355	40.73
1996	549.9	2376693	50.43
1997	443.9	1103549	N.A.
1998	521.7	1563405	0.72

1999	501.7	3104064	1020.97
2000	594.34	2736355	800.00
2001	788.19	846878	12000.00

Source: Annual Reports, NDM Division, Ministry of Agriculture, Government of India, Delhi.

The changing topography due to environmental degradation has also increased the vulnerability in the country. In 1988, 11.2 per cent of total land area was flood prone, but in 1998 floods inundated 37 per cent geographical area. Three major disasters that India have experienced in the recent past are the super cyclone in Orissa (1999), earthquake in Gujarat (2001) and Tsunami (2004) in Tamil Nadu, Pondicherry, Andaman Nicobar Islands and parts of other southern states. Frequent disasters lead to erosion of development gains and restricted options threatened by hazards.

The continent of Asia is particularly vulnerable to disasters strikes. Between the years 1991 to 2000 Asia has accounted for 83 per cent of the population affected by disasters globally. Within Asia, 24 per cent of deaths due to disasters occurred in India, on account of its size population and vulnerability. Floods and high winds account for 60 per cent of all disasters in India. Many parts of the Indian sub-continent are susceptible to different types of disasters owing to the unique topography and climatic characteristics. About 54 per cent of the sub continent's landmass is vulnerable to earthquakes while about 4 crore hectares is vulnerable to periodic floods. The country has suffered four major earthquakes in the span of last 50 years along-with a series of moderate intensity earthquakes that have occurred at regular intervals. Since 1988, six earth quakes have struck

different parts of the country. Tsunami in India killed 10749 persons while $1068 million loss or damage to properties was reported.

The Indian sub-continent lies upon the Indian plate which is moving northward and collides with the Eurasian Plate. Due to this collision, the Himalayas are generated in the process. This is the main cause of earthquakes from Himalayas to the Arakan Yoma. The same process, results in earthquakes in Andaman and Nicobar Islands. Sometimes earthquakes of different magnitudes occur within the Indian Plate. As per the latest seismic zoning map of India, the country is divided into four Seismic Zones. Zone V marked in red shows the area of very high risk zone, Zone IV marked in orange shows the area of high risk zone, Zone III marked in yellow shows the region of moderate risk zone and Zone II marked in blue shows the region of low risk zone. Zone V is the most vulnerable to earth quakes, where historically some of the country's most powerful shock has occurred (Table - 6).

Table - 6
Significant Earthquakes in India

Date	Location	Magnitude M>6
1819 June 16	Kutch, Gujarat	8.0
1869 January 10	Near Cachar, Assam	7.5
1885 May 30	Sopor, J & K	7.0
1897 June 12	Shillong Plateau	8.7
1905 April 4	Kangra, Himachal Pradesh	8.0
1918 July 8	Srimangal, Assam	7.6
1930 July 2	Dhubri, Assam	7.1
1934 January 15	Bihar-Nepal Border	8.3
1941 June 26	Andaman Islands	8.1
1943 October 23	Assam	7.2
1950 August 15	Arunachal Pradesh-China Border	8.5

1956 July 21	Anjar, Gujarat	7.0
1967 December 10	Koyna, Maharashtra	6.5
1975 January 19	Kinnaur, Himachal Pradeh	6.2
1988 August 6	Manipur-Myanmar Border	6.6
1991 October 20	Uttarkashi, U.P. Hills	6.6
1993 September 30	Latur-Osmanabad, Maharashtra	6.3
1997 May 22	Jabalpur, Madhya Pradesh	6.0
1999 March 29	Chamoli District, Uttar Pradesh	6.8
2001 January 26	Bhuj, Gujarat	6.9
2005	Muzaffarabad Jammu & Kashmir	7.4

Source: http://www.ind.ernet.in/section/seismo/static/signif.htm

As per India's Seismic Vulnerability Atlas, 58 cities of India fall within seismic vulnerability Zones. Out of which 13 cities are located in Zone V, 16 Cities in Zone IV AND 29 cities are situated in Zone III (Table - 7).

Table - 7
Classification of Cities in Seismic Zones

Zone	No.	Cities
V	13	Aizwal, Bhuj, Chamoli, Dharamshala, Guwahati, Itanagar, Kohima, Kullu, Pithoragarh, Port Blair, Shillong, Srinagar
IV	16	Amritsar, Chandigarh, Darjeeling, Dehradun, Delhi, Gangtok, Gorakhpur, Gurgaon, Haridwar, Jammu, Jamnagar, Ratnagiri, Shimla, Meerut, Patna, Uttarkashi
III	29	Ahmedabad, Bhubaneshwar, Bikaner, Bokaro, Mumbai, Kolkata, Calicut, Coimbatore, Cochin, Cuttack, Gandhinagar, Gaya, Jabalpur, Kanpur, Lucknow, Pune, Puri, Mangalore, Nellore, Panaji, Patiala, Porbandar, Pune, Puri, Rajkot, Surat, Trivandrum, Vadodara, Vijayawada, Warangal

Source: Anup Karanth, GOI-UNDP-DRM Programme, December 2006

Geographically, Zone V includes the Andamand and Nicobar Islands, all of North Eastern India, parts of north western Bihar, eastern parts of

Uttaranchal, Kangra Valley in Himachal Pradesh, Srinagar area in Jammu and Kashmir and Rann of Kutchh in Gujarat. Earthquakes with magnitudes in excess of 7.0 have occurred in these areas, and have had intensities higher than IX. Most of the earthquakes which occurred were rated at 5-6 scale (60 per cent) while more than one third earthquakes were in between 6-7 Richter scale. Again, about half of the earth quakes have occurred in North East India alone (Table - 8).

Table -8
Earthquake Occurrence in India

S. No.	Seismic Region	No. of Earthquakes having M=				Max. MM Inten-sity	Average Return Period observed	Total
1.	Kashmir and Western Himalayas (J&K, Himachal Pradesh, Sub-mountain parts of Punjab)	25	7	2	1	X	2.5-3 years	35 (4.91)
2.	Central-Himalayas (Uttarakhand, Nepal, Himalayas, North Bihar)	68	28	4	1	XI	1 yr.	101 (14.18)
3.	North East India	200	130	15	4	>X	<4 months	349 (49.01)
4.	Indo-Gangetic Basin & Rajasthan (Rajasthan, Punjab, Haryana, Delhi, Plains of U.P., Bihar and Bengal)	14	6	-	-	VIII	5 years	20 (2.81)
5.	Cambay and Rann of Kutchh	6	5	3	1	X-X	7 years	15 (2.11)
6.	Peninsular India	32	10	-	-	VIII	2.5-3 years	42 (5.89)
7.	Andaman & Nicobar	80	68	1	1	>IX	<8 months	150(21.06)
	Whole in India	425	254	25	8	-	<2 months	712(100.00)

Source: Dr. A.S. Arya Progress Towards Earthquake Risk Reduction in India, INCEDE Report

During the earthquakes, majority of losses is due to collapse of buildings and damage to infrastructure. More than half of the houses are

built with stone walls and 35 per cent have burnt brick units which are highly vulnerable to sustain damage of seismic intensities namely VII, VIII and IX.

Tsunami Disaster in the Indian Ocean was one of the worst natural disasters in modern times. Over 200,000 people died and more than 1.5 million people lost their homes and their livelihoods. If the earthquake is under water and land movement is near the coast then tsunami may strike suddenly and if the earth movement is far in the sea then it may take few minutes to hours before striking the coast. The onset is extensive and often very destructive. The general causes of tsunamis are geological movements. Major tsunamis occurred in India are shown in Table - 9.

Table - 9

Tsunamis in India

Date	**Location**	**Impact**
1524	Near Dabhol, Maharashtra	Sufficient data not available
02 April 1762	Arakan Coast, Myanmar	Sufficient data not available
16 June 1819	Rann of Kutchh, Gujarat	Sufficient data not available
31 October 1847	Great Nicobar Island	Sufficient data not available
31 December 1881	An earthquake of 7.9 in the Richter scale in Car Nicobar Island	Entire east cost of India and Andaman & Nicobar Islands; 1 m tsunamis were recorded at Chennai
26 August 1883	Explosion of the Krakatoa volcano in Indonesian	East coast of India was affected; 2 m tsunamis were recorded at Chennai

26 June 1941	An 8.1 Richter scale earthquake in the Andaman archipelago	East coast of India was affected but no estimates of height of the tsunami is available
27 November 1945	An 8.5 Richter scale earthquake at a distance of about 100 km south of Karachi	West coast of India from north to Karwar was affected; 12 m tsunami was felt at Kandla
26 December 2004	Banda Aceh, Indonesia; Tamil Nadu, Kerala, Andhra Pradesh, Andaman and Nicobar Islands, India; Sri Lanka, Thailand, Malaysia, Kenya, Tanzania	The East cost of India was affected. The waves measured around 10 m high killing more than 10,000 precious lives

Source: NDMD, MOH, Government of India, Delhi

The recent tsunami strike in December 2004 severely hit the coastal states of Tamil Nadu, Kerala, Andhra Pradesh and union territory of Andaman Nicobar Islands. According to Government reports, 10739 people in India lost their lives and 6913 were injured. It was reported that 5640 persons are still missing. The highest human losses were in the Andaman Nicobar Islands and the state of Tamil Nadu. Overall damages were estimated at about $660 million and losses to $410 million (UN, 2005).

Landslides are slippery masses of road, earth or debris which make by force of their own weight down mountain slopes or riverbanks. Though, they occur gradually, however, sudden failure can often bring toll and heavy losses to humankind and property. Erosion, intense rainfall, geological weak materials, human excavation, earthquake shaking and volcanic explosion are some of the factors for land sliding (Table - 10).

Table - 10

Major Landslides in India

October 1990	Nilgiris	36 people killed and several injured. Several buildings and communication network damaged
July 1991	Assam	300 people killed, road and buildings damaged.
November 1992	Nilgiris	Road network and buildings damaged, Rs. 5 million damage estimated
July 1993	Itanagar	25 people buried alive 2 km road damaged
August 1993	Kalimpong, West Bengal	200 houses destroyed, 500 people died, about 5 km road stretch was damaged
November 1993	Nilgris	40 people killed, property worth several lakhs damaged
January 1994	Kashmir	National Highway 1A severely damaged
June 1994	Varundh ghat, Konkan Coast	20 people killed, breaching of ghat road damaged to the extent of 1km at several places
May 1995	Aizwal, Mozoram	25 people killed. Road severely damaged
September 1995	Kullu, HP	22 persons killed and several injured. About 1 km road destroyed
14 August 1998	Okhimath	69 people killed
18 August 1998	Malpa, Kali river	205 people killed. Road network to Mansarovar disrupted
August 2003	Uttarkashi	Heavy loss of infrastructure

Source: Natural Hazards and Disaster Management, Text Book in Geography for Class XI CBSE, Delhi

Cyclonic disturbances of varying intensities originate in the Bay of Bengal and the Arabian Sea mainly during the April-December period. A scrutiny of cyclones in nearly 100 years (1891-1989) reveals that a few districts were hit by cyclones more often than other districts. These districts

are Junagarh, 24 Parganas, Midnapur, Balasore, Cuttack, Puri, Srikakulam, Vizag. East Godavari, Krishna, Nellore and Tanjore while the coastal areas of Orissa and West Bengal were affected, by a large number of cyclonic storms during post 1949 period (Subhiah, 2004). The cyclone of 1977 caused death toll of over 14000 while recent cyclone in December 2000 severely hit three districts of Tamil Nadu (Table 11).

Table - 11

Noteworthy Tropical Cyclones

Sl.No.	Year	Area	Death toll
1.	1971	Eastern Coast	9658
2.	1972	Andhra Pradesh and Orissa	100
3.	1977	Chennai, Kerala & Andhra Pradesh	14,204
4.	1979	Andhra Pradesh	594
5.	1981	Gujarat	470
6.	1982	Gujarat & Maharashtra	500
7.	1984	Tamil Nadu & Andhra Pradesh	512
8.	1985	Andhra Pradesh	5,000
9.	1990	Andhra Pradesh	957
10	1990	Orissa	250
11.	1999	Orissa	8,913

Source: Office of the US Foreign Disaster Assistance

Major cyclones occurred in Indian ocean are shown in Table 12. The Bangladesh cyclone of 1991 hit India too and caused death of 1.32 lakh persons.

Table - 12

Recent Cyclones in Indian Region

Cyclone	Peak wind	OCS *	MSDW** m/s	Size dia. of	Peak Surge	Loss of Human	Loss of Property

	Intensity m/s	M/S		area of 17 m/s or more wind	m Lives	million	Rupees
Chirala cyclone (1977)	**70**	**28.5**	**31.0**	**750**	**5.2**	**10000**	**3500**
Machilipatnam Cyclone (1979)	**58**	**22.2**	**20.0**	**600**	**3.5**	**700**	**1700**
Sriharikota Cyclone (1984)	**58**	**11.5**	**12.2**	**300**	**3.2**	**604**	**4000**
Bangladesh Cyclone (1985)	**58**	**28.4**	**28.0**	**800**	**4.5**	**2500**	**1377**
Kavali Cyclone (1989)	**65**	**10.3**	**13.2**	**250**	**3.5**	**51**	**140**
Machilipatnam Cyclone (1990)	**65**	**23.2**	**23.9**	**550**	**3.5**	**967**	**22480**
Bangladesh Cyclone (1991)	**65**	**23.0**	**24.2**	**500**	**6.0**	**132000**	**-**
Orissa Cyclone (1999)	**72**	**42.0**	**20.0**	**10000**	**5.5**	**-**	**-**

*Outer Core Strength
**Main Strength of Destructive Wing

Source: Bhandari, N.M. et. al., Structural Damage due to Cyclones and their Retrofitting, World Congress on Disaster Management, WFEO'S Vol. II, 2004

The coastal bet plantation (green belt plantation along the coastal line in a scientific interweaving pattern) can reduce the adverse impact of hazards of cyclone, tsunami, and flood. However, the frequent cutting of plants, trees and clearance of forest and mangroves, the cyclone and tsunami waves trend freely in land. The lakh of productive forest cover allows water to immediate large areas and cause destruction. Thus, community based mitigation strategies are to be introduced.

Floods are a recurring phenomenon in chronically flood prone regions in India. Floods affect around 7.56 million hectares of area (2.30 per cent of country's area) and 3.3 million hectares of crop lands every year (4 per cent

of the cropped area). Eastern India, comprising Uttar Pradesh, Bihar, West Bengal, Assam, and Orissa account for about 70 per cent of the flood impacts in the country. The death toll due to major floods in India is shown in Table 13.

Table - 13
Major Floods of India

Year	Number of people killed	Location
1961	2,000	North
1968	4,892	(1) Rajasthan, Gujarat - (2) Noth-East, West Bengal, Assam
1971	4,023	North India
1978	8,800	North, Northeast
1980	1,600	Uttar Pradesh, Bihar, Gujarat, Kerala, Haryana
1989	1,591	Maharashtra, Andhra Pradesh, Gujarat
1994	2,001	Assam, Arunachal Pradesh, Jammu and Kashmir, Himachal, Punjab, Uttar Pradesh, Goa, Kerala, Gujarat states
1995	1,479	Bihar, Haryana, Jammu & Kashmir, Punjab, Uttar Pradesh, West Bengal, Mahrashtra
1997	1,442	Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Gujarat, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kera, Maharashtra, Madhya Pradesh, Orissa, Punjab, Rajasthan, Sikkim, Uttar Pradesh, West Bengal states
1998	1,811	Assam, Arunachal, Bihar, Kerala, Meghalaya, Punjab, Sikkim, Uttar Pradesh, West Bengal states
2000	1,290	Gujarat, Andhra Pradesh, Assam, Arunachal Pradesh, Bihar, Himachal Pradesh, Kerala, Madhya Pradesh, Punjab, Uttar Pradesh, West Bengal

Source: NDMD, MOH, Government of India, Delhi

The flood of 2000 alone killed about 1300 persons in Gujarat, Andhra Pradesh, Assam, Arunachal Pradesh, Bihar, Himachal Pradesh, Kerala, Madhya Pradesh, Punjab, Uttar Pradesh and West Bengal. Even, floods have adversely affected economy and society of major metropolitan cities

like Mumbai, Surat, Ahmadabad, Raipur, and Pune etc. in the recent past. The annual damage due to heavy rains landslides and floods is shown in Table - 14.

Table - 14
Damage Due to Floods in India

S.No.	Year	Districts affected	Villages affected (No)	Population affected (Lakh)	Crop Area affected (Lakh Ha.)	Houses Damaged (no.)	Human life loss (no.)	Cattle loss (No.)	Estimated value of loss to houses (Rs. in crore)	Estimated of value of Public Properties (Rs. in crore)
1	1999	202	33,158	328.12	8.45	884,823	1,375	3,861	0.72	
2.	2000	200	29,964	416.24	34.79	2,736,355	3,048	102,121	631.25	389.72
3.	2001	122	32,363	210.71	18.72	346,878	834	21,269	195.57	676.05

Source: Annual Reports, Natural Disaster Management Division, Ministry of Agriculture.

In 2001, 122 districts were hit by floods and affected 21.110 million population. Mapping of flood prone areas; land use regulation and control; construction of engineered structures; flood management; and community based mitigation such as sedimentation clearance, reforestation, etc. may reduce the adverse impact of floods in vulnerable areas.

Drought is an insidious natural hazard that results from a departure of precipitation from expected or normal that is insufficient to meet the demands of human, plant and animal activities. Almost 35 per cent of the country's area, receiving annual average rainfall of less than 750 mm is prone to drought once in three years. In these areas, almost 200 million people are affected in varying degrees by drought (Table - 15). In the arid and the semi arid regions, seasonal periodicities can affect the pattern of livelihood system of farmers.

Table - 15
Losses Due to Drought in India

S.No.	Year	Districts affected	Villages affected (No)	Population affected (Lakh)	**Damage to crops area (Lakh Ha.)**	**Estimated value of damaged crops (Rs. crore)**	Cattle population affected (in lakh)
1	1999	125	-	369.88	134.22	6.44	345.60
2.	2000	110	54,883	378.14	367.00	371.87	541.67
3.	2001	103	22,255	88.19	67.44	NA	34.28
	Total	338	77,138	836.21	568.66	378.31	921.55

Source: Annual Reports, Natural Disaster Management Division, Ministry of Agriculture

Human Instigated

In a society where gender, caste, religion, region, and class differentials are extremely predominated human made disasters tend to occur more frequently and often with great intensity. Communal riots, terrorism, militancy, ethnic conflicts, plight of refugees, internally, displaced persons, road and train accidents, forest and buildings fire, epedemics and industrial accidents etc. cause heavy toll of human lives and property. The natural disasters cannot be properly predicted and controlled while manmade disasters may be controlled through proper planning and preparedness.

Forest fires are a major cause of degradation of India's forests. About 90 per cent of the forest fires in India are created by humans. India witnessed the most severe forest fire in the recent time during the summer of

1945 in the hills of Uttarakhand and Himachal Pradesh. The fires were very severe and attracted the attention of whole nation. These affected 6.78 million hectares of forest land. About 3.75 million hectares of forests are affected by fire annually, as per Forest Protection Division, Ministry of Forests and Environment, Government of India.

Fires in Urban Structure - houses, buildings, and other structure also cause destruction to property and human lives. Heating sources, cooking accidents, electric short, combustible and hazardous materials etc. cause the fire in urban structures. In the event of fires, chemical leakages, or explosions occurring in industrial facilities, people are exposed to risks and hazards. Bhopal chemical gas leak disaster (1984) was the worst industrial disasters of India. The tragedy was a technological accident in which 45 towns of highly poisonous methyl iso-cyanide gas along with hydrogen cyanide and other reaction products leaked out of the pesticide factory of Union Carbide into the night air of Bhopal. The official death toll reached to 3,598 in 1989 and thousands still face a fate worse than death.

The nature and impact of disasters are changing. They need to be placed in the larger context of present day realities. Most experts refuse to include epidemics in their short list of disasters, costing the world dearly in terms of morbidity, mortality, and hence, the human capital. Today, aid and relief go largely to non-biological disasters while increasingly treatment immune and mutagenic bio-systems wreck havoc in the developing countries. The Surat plague outbreak in 1994 killed 56 people nationwide. This outbreak served as a chilling reminder of how rapid urbanization and deterioration of the urban environment can bring people into contact with

forgotten disease factors. The scientific studies show that an increase in the temperature viz. 1-2 degrees would enable mosquitoes to extent their range to low geographical areas, leading to an increase in cases of malaria and several other infectious diseases especially in populations living at the periphery of the areas currently prone to these diseases. Tuberculosis, Malaria, Kalajar Dengue, plague, Japanese encephalitis, diarrhea diseases, including cholera, poliomyelitis, HIV/AIDS, etc. are some of the chronic diseases which have caused concern today.

India has one of the largest populations of people living with HIV/AIDS, second only to South Africa CVN-AIDS, 2003). An estimated 5.1 million individuals currently live with the HIV infection, across all states. The HIV prevalence rate among the adult population is 0.8 per cent, but the absolute number of people living with HIV/AIDS is very high and growing gradually. The endemic is challenging the development achievements of recent years and raising fundamental issues of human rights. In India, HIV/AIDS epidemic is characterized by heterogeneity; it seems to be following the type 4 pattern, where the epidemic shifts from the most vulnerable populations (including sex workers, injecting drug users, men who have sex with man) to bridge populations (client of sex workers, STD patients, partners of drug users) and then to the general population. The epidemic continues to shift towards woman and young people. Migrates both within and between states is a major source of transmission of infection. Srivastava and Sasikumar (2003) estimated that migrants account for 26.6 per cent of the country's population. This shows a declining trend, however, the absolute number of migrants grew from 67.7 million in 1971 to 231.9 million in 1991. Migration of semi skilled and unskilled labours to

West Asia and OECD countries started in mid 1970; the growth in demand for foreign labour was triggered by the oil price boom. South Arabia and UAE were the principal destinations for Indian migrants during the past two decades (Table 16) State-wise distribution of emigration clearances granted during the period 1993-2001 shows that 16 states contributed to the process of emigration to the OECD countries. Three states - Kerala, Tamil Nadu, and Andhra Pradesh-together accounted for 60 per cent of those who obtained emigration clearance (Table 17). The returning migrant is often unaware of whichever has been infected with HIV and the potential risk of infection that his spouse and urban children face.

Table - 16
Distribution of Indian Migrant Workers in West Asia

(%)

Country	1979	1983	1987	1991	2000
Bahrain	5.19	3.28	7.03	6.64	4.23
Iraq	3.99	5.46	3.19	-	-
Kuwait	12.97	12.55	9.12	5.85	9.12
Libya	2.00	4.37	2.28	0.80	-
Oman	11.98	10.92	16.79	14.62	11.07
Katar	5.99	4.37	4.56	4.98	3.91
Saudi Arabia	19.96	29.48	34.67	39.87	39.09
UAE	30.34	27.29	20.53	26.58	32.57
Others	7.58	2.29	1.82	0.66	-
Total	100.00	100.00	100.00	100.00	100.00

Source: Based on Data of Ministry of External Affairs, Government of India, UNDP, No Safety Signs Here, Delhi, 2004

Table - 17
State-wise Distribution of Emigration Clearances Granted

(%)

State	1993	1994	1995	1996	1997	1998	1999	2000	2001
Andhra Pradesh	8.12	8.11	7.29	7.24	9.19	8.62	9.58	12.47	13.64
Bihar	1.72	1.60	1.41	1.40	1.53	4.10	2.96	2.80	3.55
Gujarat	3.14	3.01	2.93	2.89	3.07	2.40	2.00	2.38	3.99
Goa	0.39	0.04	0.23	0.23	0.25	0.27	0.27	0.55	0.82

Haryana	**0.19**	**0.18**	**0.19**	**0.22**	**0.22**	**0.48**	**0.15**	**0.02**	**0.06**
Karnataka	**7.84**	**7.58**	**0.06**	**8.15**	**9.70**	**3.25**	**2.67**	**4.54**	**3.60**
Kerala	**35.41**	**36.30**	**15.80**	**40.40**	**37.49**	**25.82**	**30.52**	**28.95**	**22.40**
Madhya Pradesh	**1.49**	**1.37**	**1.02**	**1.00**	**0.94**	**1.81**	**0.46**	**0.71**	**1.84**
Maharastra	**8.04**	**7.56**	**6.34**	**6.09**	**6.04**	**6.94**	**4.98**	**5.55**	**8.30**
Orissa	**0.80**	**0.85**	**0.89**	**0.83**	**0.84**	**0.58**	**0.28**	**0.24**	**1.10**
Punjab	**3.24**	**2.93**	**2.85**	**2.84**	**2.98**	**7.57**	**7.66**	**4.17**	**4.54**
Rajasthan	**5.76**	**6.45**	**6.83**	**4.40**	**6.78**	**5.58**	**4.95**	**4.23**	**5.48**
Tamil Nadu	**16.04**	**16.58**	**15.83**	**15.69**	**15.79**	**19.65**	**23.93**	**26.56**	**22.52**
Uttar Pradesh	**5.73**	**5.36**	**4.56**	**4.58**	**4.26**	**9.50**	**5.95**	**3.81**	**5.08**
West Bengal	**0.64**	**0.47**	**0.55**	**0.57**	**0.54**	**1.06**	**0.79**	**0.81**	**1.76**
Delhi	**0.99**	**0.90**	**0.79**	**0.70**	**0.60**	**1.56**	**1.80**	**1.32**	**1.16**
Others	**0.46**	**0.72**	**24.42**	**2.77**	**0.27**	**0.81**	**1.05**	**0.90**	**0.00**
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Source: Based on data of Ministry of Labour, Government of India, UNDP, No Safety Signs Here, Delhi, 2004

Trans-border migrants in India - especially Nepali, and Bangladesh migrants also face the high risk of HIV infection. Nepalese women migrants are highly vulnerable to commercial and sexual exploitation (UNDP, 2004). Those who are engaged in commercial sex line in unhygienic and inhuman conditions, even those who work as domestic help are at risk of being physically and sexually abused by their employers. Bangladesh migrants are less vulnerable them Nepalese migrants however, their number in India is rapidly increasing which causes severe stress on civic services.

The illegal immigration from Bangladesh has become a serious problem; it has changed the demographic landscape and affected Delhi, Rajasthan, Gujarat, Maharastra. In India, the quantum of immigration is small in relation to the total population of the country. There are about 8 to 10 million Bangladeshis nationals in India who are spread all over north India from West Bengal to Rajasthan (Week, December 5, 1993). The

illegal immigration from Bangladesh has caused concern in Mizoram, Tripura, Assam, and West Bengal. Even, it caused to some extent the emergence of militancy and ethnic unrest-ness in North East region of India (Tewari and Singh, 1998). The militancy in North East region has caused concuss to the policy makers and development activists. The increasing trend of violence and destruction of property in the region has caused setback to development efforts (Table - 18).

Table - 18
Militancy in North East Region (2003)

Head	Assam	Tripura	Nagaland	Manipur	Meghalaya	Arunachal Pradesh	Mozoram
Incidents	**358**	**394**	**199**	**243**	**85**	**50**	**03**
Extremists Killed	**207**	**50**	**70**	**128**	**37**	**31**	**-**
Extremists Arrested	**215**	**336**	**90**	**232**	**103**	**32**	**-**
Security Forces killed	**12**	**39**	**03**	**27**	**07**	**01**	**01**
Arms Looted	**02**	**36**	**15**	**03**	**02**	**02**	**-**
Arms Recovered	**186**	**76**	**64**	**29**	**53**	**34**	**-**
Arms Surrendered	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Extremists Surrendered	**328**	**268**	**29**	**05**	**20**	**18**	**01**
Civilians killed	**182**	**207**	**13**	**50**	**35**	**07**	**-**
No. of Persons Kidnapped	**89**	**221**	**163**	**81**	**51**	**42**	

Source: Annual Report, 2003-04, Ministry of Home, Government of India, Delhi

Though, scheme of rehabilitation of surrendered extremists in North East has checked insurgency, however, a large number of districts in Tripura, Mizoram, Assam, Manipur and Nagaland are affected with militancy. Similarly, the terrorism in Jammu & Kashmir and Punjab has derailed the development efforts for a long time. However, terrorism activities in Jammu & Kashmir, supported by neighbouring countries are causing tremendous loss to human lives and public property (Table - 19).

Table - 19
Terrorists Activities in Jammu & Kashmir

Year	No. of Incidents	Civilians killed	SFs killed	Terrorists killed	Foreign Terrorist killed
1990	4158	461	155	550	14
1991	3765	382	173	844	12
1992	4817	634	189	819	14
1993	5247	747	198	1310	90
1994	5829	820	200	1596	122
1995	5938	1031	237	1332	85
1997	3420	971	193	1075	197
1998	2932	889	236	999	319
1999	3071	873	355	1002	305
2000	3074	847	397	1520	436
2001	4522	996	536	2020	625
2002	4038	1008	453	1707	508
2003	3401	795	314	1494	470
2004 (upto March)	638	150	62	263	60
Total	59864	11945	3882	17820	3396

Source: Annual Report, 2003-04, Ministry of Home, Government of India, Delhi

The increasing influence and incidence of violence by Naxalism in India is also causing concern. Naxalite extremism is spread over 9 states (Table - 20).

Table - 20

Incidents of Violence by Naxalite - Extremists

State	2001	2002	2003	2004 (upto March)	2006 (upto June)
Andhra Pradesh	461(180)	346 (96)	575 (139)	155 (50)	104 (18)
Bihar	169 (111)	239 (117)	249 (127)	79 (32)	63 (30)
Chhatisgarh	105 (37)	304 (55)	254 (74)	61 (14)	360 (244)
Jharkhand	355 (200)	353 (157)	341 (117)	80 (18)	169 (58)
Madhya Pradesh	21 92)	17 (3)	13 (1)	2 (1)	6 (-)
Maharastra	34 (7)	83 (29)	74 (31)	10 (10)	56 (25)
Orissa	30 (11)	68 (11)	49 (15)	19 (4)	21 (4)
Uttar Pradesh	22 (12)	20 (6)	13 (8)	3 (3)	6 (2)
West Bengal	9 (4)	17 (7)	6 (1)	4 (8)	14 (11)
Other States	2 (-)	18 (1)	16 (-)	2 (1)	5 (-)
Total	1208 (564)	1465 (482)	1590 (513)	415 (132)	806 (392)

Source: Annual Report, 2003-04, Ministry of Home, Government of India, Rastriya Sahara, 6 March 2007, Lucknow

The extremism has its root cause in socio-economic backwardness of the region and development deprivation of weaker sections of society. The terrorist activities are being supported by neighbouring countries. These are being operated from Territory of Bangladesh, Pakistan, Myanmar, Bhutan and Nepal. There is marked increase in attacks on government and private properties by naxilites displacing a growing penchant for attacking railway property.

India like many other developing countries, is witnessing a spiraling increase in the number of vehicles clogging its roads. Between 1970 and

2003, number of registered vehicles increased by about 48 times. During 2003, registered vehicles were reported to be 67.03 million. By 2050, there will be over 267 million vehicles on Indian roads (World Disaster Report, 1998). Of the world wide annual average of 0.7 million road accidents, 10 per cent occur in India. In 2003, number of road accidents was reported to be 406.73 million in which 85.99 million persons were killed. Number of accidents per ten thousand vehicles was reported to be 60.68 while number of persons killed per ten thousand vehicles was 12.88 (Table - 21). Most of the road fatalities were reported in Andhra Pradesh, Mahrashtra, Rajasthan, Uttar Pradesh, Tamil Nadu, and Karnataka. The economic cost of road accidents is equivalent to about one per cent of Gross National Product.

Table - 21
Road Accidents in India

S.No.	Year	Total No. of Road Accidents	Total No. of Persons killed	Total number of Registered Motor Vehicles (in '000)	No. of Accidents per '0000 Vehicles	No. of Persons killed per '0000 Vehicles
1.	1970	114100	14500	1401	814.42	103.50
2.	1980	153200	24000	4521	338.86	53.09
3.	1990	282600	54100	19152	147.56	28.25
4.	1991	295131	56278	21374	138.08	26.33
5.	1992	275541	60113	23507	117.22	25.57
6.	1993	284646	60380	25505	111.60	23.67
7.	1994	325864	64463	27660	117.81	23.31
8.	1995	351999	70781	30295	116.19	23.36
9.	1996	371204	74665	33786	109.87	22.10
10.	1997	373671	76977	37332	100.09	20.62
11.	1998	385018	79919	41368	93.07	19.32
12.	1999	386456	81966	44875	86.12	18.27
13.	2000	391449	78911	48857	80.12	16.15
14.	2001	405637	80888	54991	73.76	14.71
15.	2002	407497	84674	58924	69.16	14.37
16.	2003	406726	85998	67033	60.68	12.83

Source: Ministry of Transport, Government of India

India's Ariel skies and airports seem relatively safe an average of two accidents and 10 deaths a year, however, India's skies are a battleground of bad policies, civil military and technological obsolescence. The increased aircraft movement and number of private air lines have increased density with more vulnerability of air accidents.

India has the largest rail system which played by ad-hoc modernization, a bureaucratic outlook on some of the worst global accidents and an inadequately trained work force (Mathur, 2000). The increasing incidence of bomb blasts and explosions in trains has caused concern. There has been fluctuating trend in rail accidents and fatalities. During 1997-98, 420 rail accidents caused 316 fatalities (Table - 22). During 2001-02, 413 rail accidents occurred in India. Number of train accidents per million km. has been reported to be 0.55 while number of casualties per million passengers carried was reported just 0.02 (Table - 23).

Table - 22

Railway Accidents in India

Year	Total Railway Accidents	Total Fatalities in Railway Accidents	Accidents at Level Crossing	Fatalities in Level Crossing	Total in injuries in Railway Accidents	Injuries in level crossing accidents
1988-89	545	231	55	52	736	134

1989-90	541	239	42	51	992	192
1990-91	532	322	37	75	88	175
1991-92	742	235	48	104	896	302
1992-93	746	282	71	116	908	222
1993-94	675	369	71	168	906	312
1994-95	604	296	74	187	676	159
1995-96	440	589	69	138	934	191
1996-97	426	353	66	221	610	264
1997-98	420	316	65	134	977	179

Source: Annual Report Indian Railways, New Delhi, 1998

Table 23

Details of Railway Accidents in India

Particulars	1997-98	1998-99	1999-2000	2000-2001	2001-2002
Collisions	35	24	20	20	30
Derailments	285	292	325	344	279
Level crossing accidents	66	67	93	83	88

Fire in trains	6	5	21	15	8
Misc. accidents	-	-	-	2	8
Total	392	388	459	464	413
Train accidents per million kilometre	0.58	0.56	0.64	0.64	0.55
No. of persons killed	171	280	338	55	85
No. of passengers injured	747	615	716	281	565
Casualties per million passengers carried	0.20	0.06	0.22	0.01	0.02
Compensation paid (Rs. lakhs)	240.89	489.65	110.95	88.07	482.46

Source: Year Book 2001, Indian Railways.

Institutional Arrangements

India has integrated administrative machinery for management of disasters at national, state, district and sub-district levels. However, the basic responsibility of undertaking rescue, relief and rehabilitation measures is that of state government concerned. The Central Government supplements the efforts of the states by providing financial and logistic support.

The Contingency Action Plan identifies initiatives required to be taken by various Central Ministries and Public Departments in the wake of natural disasters. Ministry of Home Affairs is the nodal Ministry for coordination of relief and response and overall natural disaster management, and the Department of Agriculture and Cooperation is the nodal Ministry for drought management. Other Ministries are assigned the responsibility of providing emergency support in case of disasters that fall in their purview as indicated in the Table 24.

Table - 24

Ministries Responsive For Various Categories of Disasters

Disaster Type	Nodal Ministry
Natural Disaster & Management (Other than Drought)	Ministry of Home Affairs
Drought Relief	Ministry of Agriculture
Air Accidents	Ministry of Civil Aviation
Railway Accidents	Ministry of Railways
Chemical Disasters	Ministry of Environment & Forests
Biological Disasters	Ministry of Health
Nuclear Disasters	Department of Atomic Energy

The responsibility to cope with natural disasters is essentially that of the state Government. The Chief Secretary of the state heads a state level Committee which is in overall charge of the relief operations in the state and the Relief Commissioners who are in charge of the relief and rehabilitation measures in the wake of natural disasters in their states function under the overall direction and control of the state level Committee. In many states, Secretary, Department of Revenue is also in charge of relief (Government of India, 2003:195).

The district administration is the focal point for implementation of all governmental plans and activities. The administration of relief is the responsibility of the Collector/District Magistrate who exercises coordinating and supervising powers over all departments at the district level.

The 73rd and 74th constitutional amendments gave the status of 'Institutions of self government' to Panchayati Raj Institutions. The

constitutional amendments also laid down necessary guidelines for the structure of their composition, powers, functions, devolution of finances, regular holding of elections and reservation of seats for weaker sections and women. These local bodies may be effective instruments in tackling disasters through early warming system, relief distribution, providing shelter to the victims, medical assistant etc. The Eleventh Finance Commission too paid detailed attention to the issue of disaster management and came out with a number of recommendations, including expenditure on restoration of infrastructure and other capital assets as well as capacity building. Training and education are crucial for mitigating disasters and also for disaster response. Training is an integral part of the capacity building as trained personnel respond much better to different disasters. The multi sectoral and multi hazard prevention based approach to disaster management requires specific professional inputs. Similarly, preventive disaster management and development of a national ethos of prevention calls for awareness generation at all levels. Again, capacity building should not be limited to professionals and personnel involved in disaster management but should also focus on building the knowledge, attitude and skills of a community to cope with the effects of disasters.

The Yokohama Convention in May 1994 underlined the need for an emphatic shift in the strategy for disaster management. It was inter alia stressed that disaster prevention mitigation, preparedness and relief are four elements which contribute to and gain from the implementation of sustainable development policies. The Government of India has adopted mitigation and prevention as essential components of development strategy. In order to respond affectively to flood, Ministry of Home Affairs has

initiated National Disaster Risk Management Programme in all the flood prone states. Elected representatives and officials of local bodies are being trained in flood disaster management under the programme. Bihar, Orissa, West Bengal, Assam and Uttar Pradesh are among 17 multi hazards prone states where this programme is being implemented with assistance from UNDP, USAID and European Commission.

A comprehensive programme has been taken up for earth quake risk mitigation. The building construction in urban and sub-urban areas is regulated by Town Country Planning Acts and Building Regulations. A National Core Group for Earthquake Risk Mitigation has been constituted consisting of experts in earthquake engineering and administration. Review of Building Bye-Laws and Adoption is being insured by the various state Governments. A National Programme for Capacity Building of Engineers and Architects in Earthquake Risk Mitigation has been implemented by the Central Government. Training for rural masons for construction of earthquake resistance buildings and houses is being provided under UNDP - Government of India, Disaster Management Programme in various States. Retrofitting of lifeline buildings is also been insured by the State Governments. An Earthquake Mitigation Project has been drawn with an estimated cost of Rs. 1132 crores. The programme includes training of masons in earthquake resistance constructions and adopting techno-legal regimes by state governments. Accelerated Urban Earthquake Vulnerability Reduction Programme has been taken in 38 cities in Seismic Zone III, IV and V in a population of half a million and above. Training Programmes have been organized for engineers and architects to impart knowledge about seismically safe construction and implementation of Bureau of Indian

Standards Norms. A National Cyclone Mitigation Project with cost of Rs. 1050 crores has been drawn up in cyclone prone states. The project envisages construction of cyclone shelters, coastal shelter belt plantation, strengthening of warning systems, training and education etc. A Disaster Risk Management Programme has been taken in 169 districts in 17 multi hazards state prone with assistance from UNDP, USAID and European Union. Importantly, Disaster Management Faculties have already been created in Administrative Training Institutes located in 28 districts. Disaster Management as a subject in social sciences has been introduced in school curriculum for classes VIII and IX. Besides, 8 battalions of Disaster Risk Response have been created for providing prompt response during disasters. In order to provide training and knowledge for prevention, mitigation, response of disaster as well as rehabilitation and reconstruction of affected persons and areas, academic institutions have been established with financial assistance from government. However, disaster management required multi disciplinary and pro active approach.

Disaster Management

Disaster risk management can be addressed in three ways: structural measures, non-structural measures and establishing communication networks. Structural measures would reduce the impact of disasters and non-structural measures would enhance the management skills and improve capacities of the community, local self governments, urban local bodies and the state authorities to prepare, prevent and respond effectively to disasters.

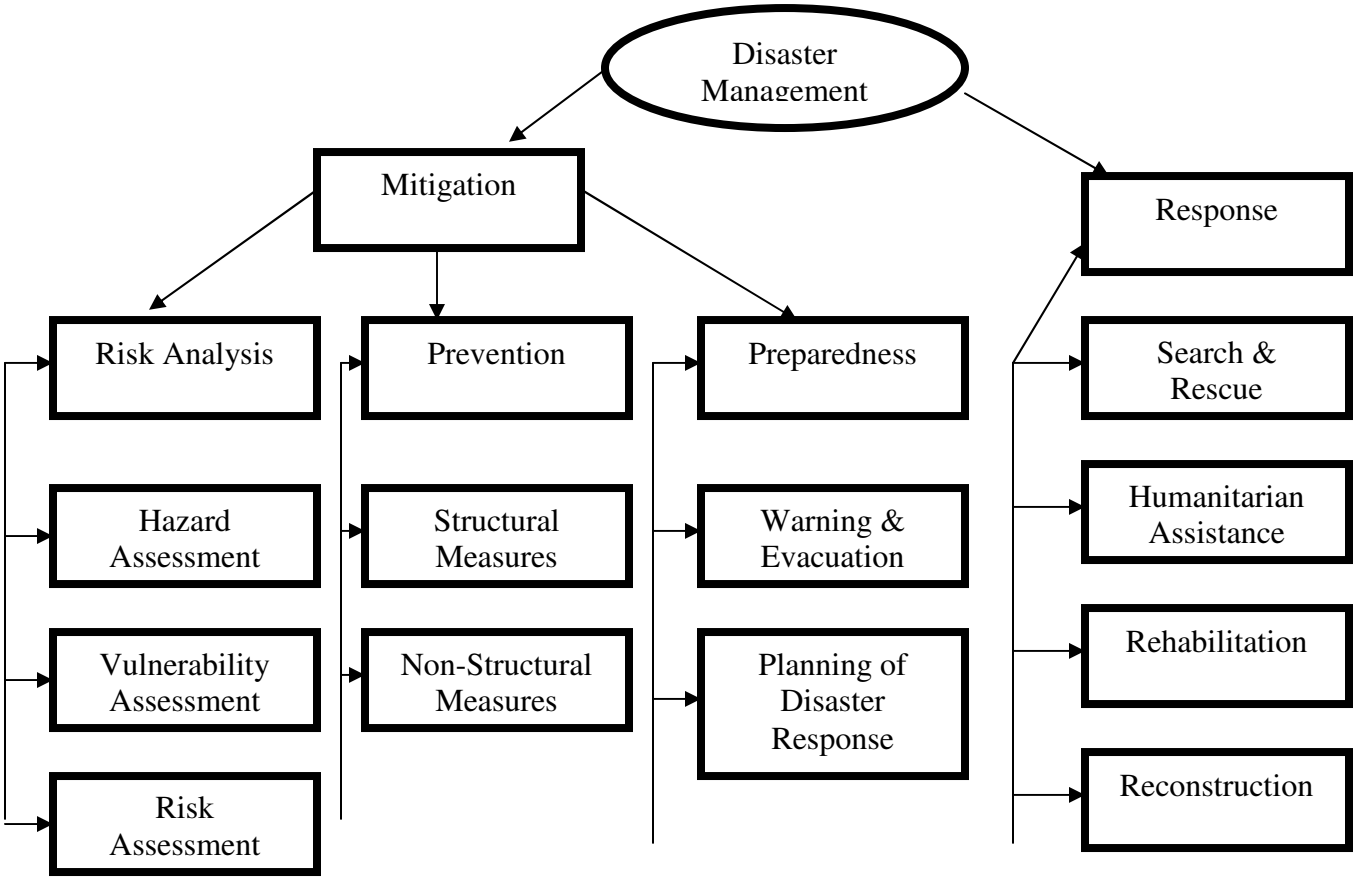
Non-structural measures are more important and include vulnerability mapping, risk assessment analysis, hazard zoning, inventory of resources to meet the emergency etc.

The dynamics and machinery of urban development is complex. Therefore, careful attention is needed to find the best opportunities and effective routes to introduce safety measures. Many authorities fail to recognize the rich range of measures that need to be adopted and integrated into a viable and affordable programme. The expanding scale of urban pressures, problems, and risks in India is a daunting challenge. However, India has certain assets that many countries envy when it comes to reducing urban risks. There is strong and increasing government commitment to disaster protection, a vibrant civil society's network which provides base of community participation and high share of private sector in humanitarian aid to disaster's victims and reconstructions of disaster affected areas. However, there is lack of coordination and integrated approach for disaster response.

Chart - 1 denotes elements of disaster management. There are mainly three elements of disaster mitigation viz. risk management, prevention and preparedness. Chart - 2 shows functional structure of natural disaster mitigation. The main three elements are rehabilitation, prevention and response. In responsive measures, relief, medical aid, shelter, food rescue, warning, evacuation, assessment of vulnerability and risks, public awareness, capacity building for livelihoods restoration etc. are included.

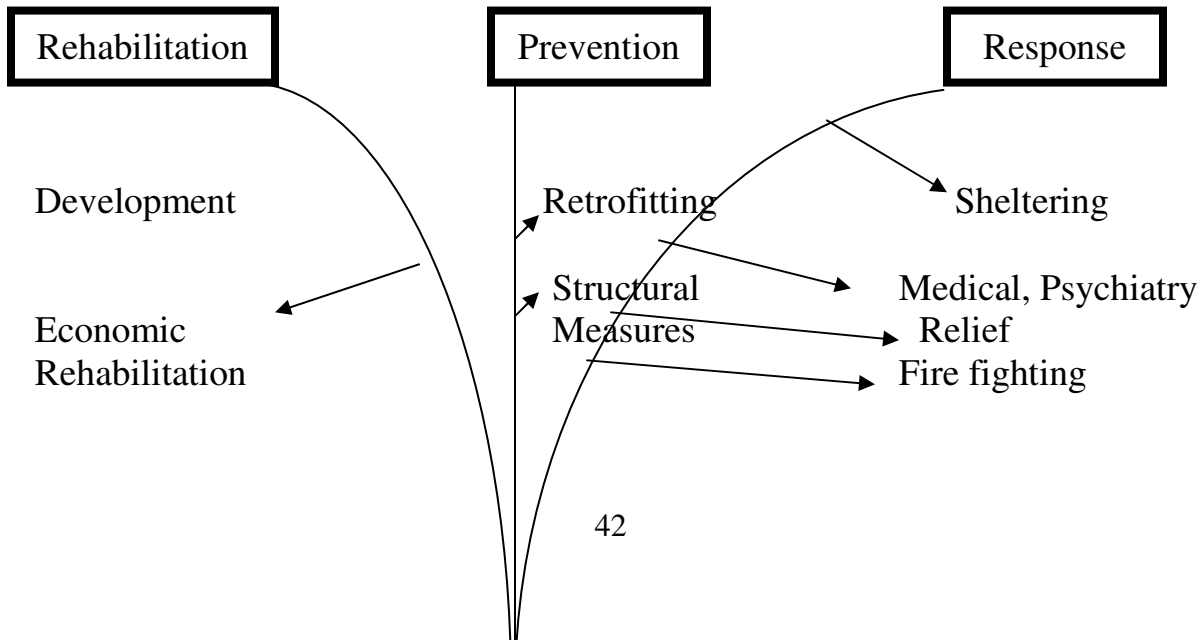
Chart - I

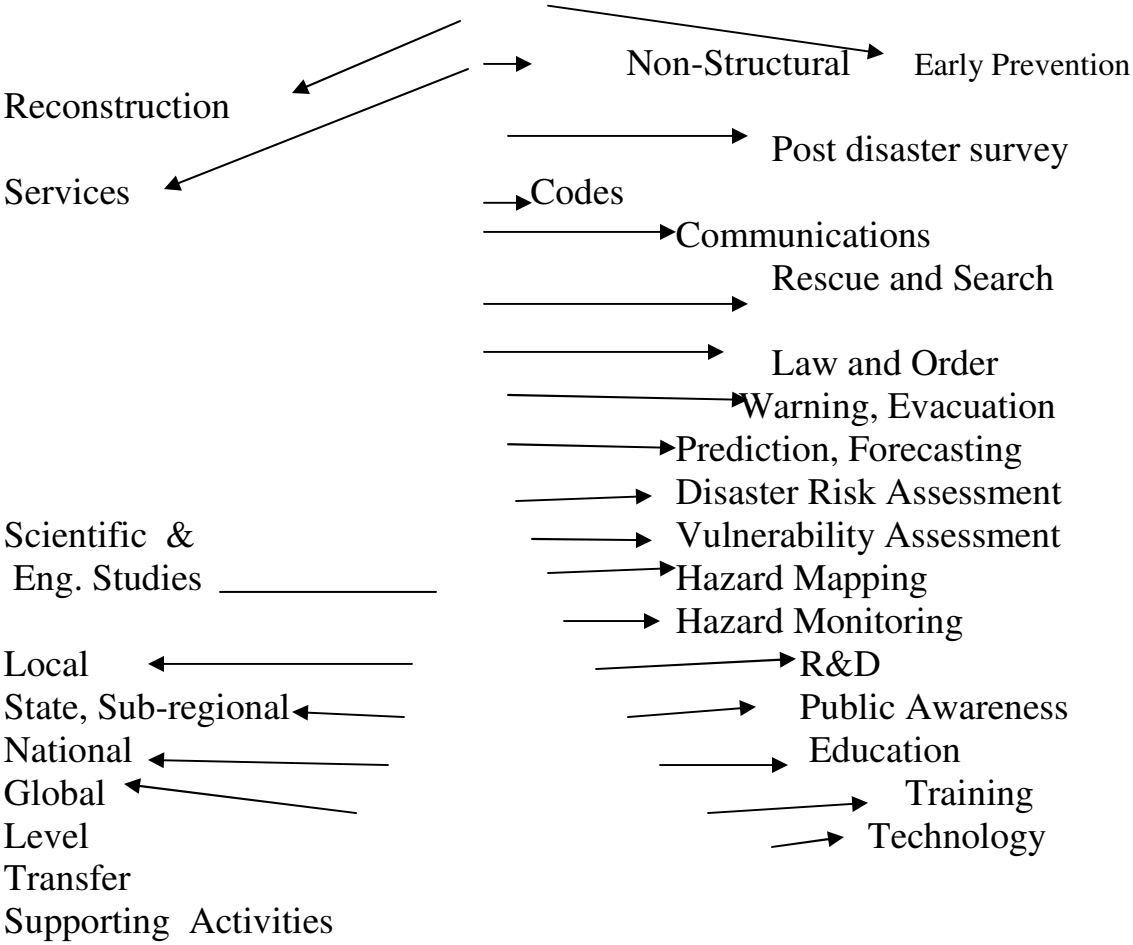
Main Elements of Disaster Management



Source: Arya, A.S. (2004)

Chart - 2: Functional Structure of Natural Disaster Mitigation





Source: Arya, A.S. (2004)

Disasters are the ultimate test of emergency response capability. The ability to effectively deal with disasters is becoming relevant because of the increasing risk factors. Increase in population density (Quarantell, 1981), population shifts and increasing technology are some of the important factors for increasing risks, leading to disasters. As areas become more densely populated, there are more potential victims when a disaster strikes. National disasters such as earthquakes, hurricanes, cyclones, Tsunami, and floods tend to result in greater losses due to densely populated areas in India. Another reason for increasing disaster losses are that population density in disaster prone areas is increasing. The increasing settlements development in high risk areas is the cause of concern. The pattern of settlement in high risk areas is reflected in the increasing mortality ratio in India. In the process of setting high risk areas, natural protection against environmental threats is removed. In India, the vegetative coverage and forests were destroyed in coastal areas for promoting shrimp farming, business, and tourism and housing colonies. This lead to damage of natural protection against hurricanes, and Tsunami and ultimately Tsunami affected to the large population in coastal areas in southern states recently. The vulnerability of people living in high risk areas is increasing because the habitations are often unaware of potential risks and how to deal with them. Even, the prices of land for house construction in high risk areas are lower which attract people for housing construction, even without proper approval of housing structures. People are living in structures that are not designed to resist the forces of local hazards. In India, earthquakes have affected severely due to lack of good design technology and inadequate earthquake

resistance housing and building structures. The new technology is also adding to the list of disaster agents at an ever increasing rate. A large quantity of hazardous chemicals, wastes, bio-medical wastes, and dumping adds proliferation of high risk office buildings and hotels that subject their inhabitants to fire threats not experienced before. The society is also becoming more dependent on technology and specialization, making more vulnerable to disaster (Quarantell, 1985). Our dependence on computers is introducing a new form of disaster vulnerability (Drabek 1986: 375).

In the context of ever increasing risks of disaster losses, it is imperative to deal with these catastrophes with full preparedness and planning. In disasters there are often conditions that may make the traditional division of labour and resources, characteristics of routine emergency management, unsuitable for disaster response (Heide, E.A.). These are as follows:

- Disaster may put demands on organizations, requiring them to make internal changes in structure and delegation of responsibilities;
- Disasters may create demands that exceed the capacities of single organizations, requiring them to share tasks and resources with other organizations that use unfamiliar procedures;
- Disaster may attract the participation of organization and individual volunteers who usually do not respond to emergencies;
- Disasters may cross jurisdictional boundaries, resulting in multiple organizations being faced with overlapping responsibilities;

- Disasters may create new tasks for which no organization has traditional responsibility;
- Disasters may render unusable the normal tools and facilities used in emergency response;
- Disasters may result in the spontaneous formation of new organizations that did not exist before.

The typical response to a disaster includes multiple independent organizations from the private sector as well as from agencies of city, country, state, region and district governments. Disasters do not need to cover large geographical areas in order to cross multiple levels of government responsibility. However, disaster management is the only responsibility of government. Community based organizations and NGOs have to play a critical role in disaster management. Disasters are characterized by great uncertainty. Often the character and extent of damage and the secondary threats are not immediately apparent and therefore the necessary counter measures not undertaken. Disasters often create the need for different organizations to share resources. Therefore, coordination of multi organizational task accomplishment is required. The needs such as fuel and maintenance for vehicles, sanitary facilities, food, shelter and rest facilities, relief and replacement, personnel and emergency message, contact arrangement also are to be included in the logistic support of an organization responding to a disaster (Kallsan 1983:28). In contrast to daily emergencies, disasters often call for large scale search and rescue operations. An important security task in disasters is keeping unauthorized persons out of the disaster area in order to prevent looting and decrease congestion hampering rescue efforts, and to prevent persons from being injured in the

wreckage. Moreover, mass handling of the dead creates problems that may not have been faced in routine emergencies. Handling the dead poses different problems in disasters. The other tasks that are important in disaster response are:

- Warning and communicating with the public
- Shelter and feeding of displaced persons
- Evacuating neighbourhoods
- Evacuating hospitals, prisons, nursing homes and psychiatric facilities
- Coordinating volunteers
- Acquiring and allocating unusual resources
- Dealing with mass arrival carcasses
- Dealing with livestock or family pets that had to be left behind or sheltered (Drabek, 1986:116)
- Procedures for condemning damaged buildings
- Disposing of unclaimed valuable and merchandise found in the rubble at the scene (Moore, 1958:85)
- Control of air traffic (Drabek, 1981: 179)
- Disposing of large amounts of donations
- Controlling emergency vehicle traffic in order to avoid blockage of routes by emergency vehicles
- Checking the hospitals, nursing homes and day care centres that may need assistance
- Prioritizing of utility sources delivery

Adequate communication is a recurring challenge in disaster response. The importance of communication is its ability to get people to work

together on a common task or toward a common goal to coordinate. It is the process by which each person understands that how his individual efforts intermesh with those of others. The information is required for need assessment and rescue operations. The most crucial types of information that need to be shared are related to (Brunacini, 1985:54):

a) An ongoing assessment of what the disaster situation is and what disaster counter measures need to be undertaken;
b) An ongoing determination of what resources are needed to undertake the counters measure. What resources are presently available and how they can be obtained;
c) A determination of the priority of needed disaster counter measures;
d) A determination of what persons and organizations will be responsible for the various tasks necessary to accomplish the counter measures (Sorensen, 1985:32)

Computers are not only useful for sharing and analyzing disaster information, but also for sharing it. The internet facility may provide strong base for efficient communications in the following measures (Wohlworth, 1987; Carroll 1983; Carroll, 1985, Wallace 1985).

- Sharing and collecting information about what agencies have responded and what resources they have dispatched.
- Locating and specifying procedures for obtaining special disaster resources;
- Sharing information about the location, scope, and character of the disaster and damage that has resulted;

- Sharing information about the status of transportation routes facilities, docking and landing sites;
- Generating and sharing predictions about weather and other expected conditions;
- Obtaining information on how to deal with a specific hazardous chemical;
- General electronic mail.

Thus, it is clear that the communication and equipments and procedures used by most emergency agencies are established primarily to deal with information flow within the organization. Disasters care for inter agency communication also. To some extent, it can be facilitated by the availability of inter-agency radio networks. However, the critical information requirements of the various organizations involved in disaster response need to be mutually understood and the responsibility for gathering and disseminating it needs to be made clear.

Significantly, disasters pose problems for resource management. A prerequisite to effective and efficient resource management is an accurate system for overall analysis of the disaster situation and the available resources (Dynes 1974; 77; Quarantelli, 1983:68). Overall, need, assessment, involves two major processes: (1) situation analysis; and (2) resource analysis. Situation analysis is the collection of information about the extent and character of the disaster itself and problems that have to be tackled. While resource analysis involves the collection of information about the resources needed to be handled. The source allocation of disaster

resources depends on the task priorities already decided for the response of disaster.

In contrast to most routine emergencies, efficient response in disaster requires procedures for triage and casualty distribution. Triage has been called the key stone to mass casuality management (Bowers, 1960:59). The technique for assigning priorities for treatment of the injured when resources are limited is called triage. Generally, attention is given first to those with the most urgent conditions and to those who are the most salvageable (Silverstein, 1984:8). The triage is beneficial in disaster response due to the facts: (i) triage separates out those who need rapid medical care to some life or lives, (ii) by separating out the minor injuries; triage reduces the urgent burden on medical facilities and organizations, (iii) by providing for the equitable and rationale distribution of causalities among the available hospitals. Triage reduces the burden on each to a manageable level, often even to non-disaster level. In order to distribute casualties rationally among the hospitals, capacity assessment of the existing hospitals, dispensaries and clinics need to be examined.

It is to be noted that convincing the public to evacuate areas threatened by impending disaster is often challenging one (Mcluckie, 1970:2). In disasters, communication with the public assumes new dimensions not present in routine emergencies. Warning can be one of the most important types of disaster communication allowing the recipients to avoid the threat altogether or to significantly lesson its effects. However, people are often reluctant to evacuate the premises stricken by disaster (Quarantell, 1972:67). There are a number of reasons why persons hesitate

to evacuate in the face of threatening disaster. They may not be convinced that they are actually at risk, they may wish to stay and protect their property, or they may want to assure the safety of other family members and property before leaving (Perry 1985; 60; Drabek, 1986:84). Those living in disaster threatened areas are more likely to evacuate if they are encouraged by invitations from relatives and friends outside.

In the impact area people prefer to seek shelter with friends or relatives rather than at public shelters. Importantly, the process of warning is complicated since it requires the accomplishment of a number of tasks. Jammed telephone lines and circuits as well as traffic congestion, make the process more difficult.

Disaster response and preparedness is most effective when it is built in to development programmes. In long run, disaster mitigation could be implemented at nominal cost by incorporating them into development programmes. The expenditure on disaster mitigation would reduce the potential losses that disaster cause. Significantly, urban planning urgently begs fundamental conceptual change, with a need for locating urban disaster management strategies in a holistic framework embracing issues like poverty, provision of institutional support for informal sector activities, over urbanization, environmental degradation and unchecked consumerism etc. A sound, effective and people centric urban disaster management strategy can emerge only in the context of a truly sustainable, and people centric development paradigm. Disaster management and mitigation be organized around local recovery efforts. In an integrated disaster risk management approach, activities from structural interventions to community based

disaster management, which reduces hazard and vulnerability, should be coordinated. It is imperative to orient and train development agencies to integrate disaster risk management into the national and local planning process, thus mainstreaming disaster reduction into development collaboration among the stakeholders is a critical strategy in disaster reduction. It enhances complements the respective capabilities of concerned sectors and organizations in the pursuit of development objectives.

Objectives of the Seminar

The seminar has the following main objectives:

1. to review the status, situation, dimensions and trends of disasters and their impact on development;
2. to examine role of government agencies in disaster mitigation and response;
3. to examine the role of local self governments in disaster mitigation and response;
4. to examine the role of NGO, community based organization, and other stakeholders in disaster management;
5. to review the status of disaster management strategies;
6. to discuss the scope and prospects of disaster mitigation planning;
7. to discuss institutional arrangements for urban risk mitigation;
8. to share experiences in managing disasters;
9. to suggest policy measures for disaster mitigation and response.

Issues for Deliberations

- What should be development paradigms in order to reduce the vulnerability of disasters?
- What should be emergency planning for managing natural disasters?
- What should be the role of urban local bodies in disaster mitigation and response?
- What should be the role of NGO's and community based organizations in disaster management?
- What should be the role of government agencies in disaster management?
- What should be the role of urban local self government in disaster mitigation and response?
- How capacity building of stakeholders and community based organizations may be ensured?
- How hazard mapping and risk assessment may be ensured?
- What are the alternate sources for financing of disaster management programmes?
- What is engineering role in earthquake disaster mitigation?
- What are the improved models for housing and building construction?
- What should be human settlement strategies?
- What lessons may be learnt from sharing the experiences in managing disasters?
- How inter agency communication may be improved?
- How computers may be useful in disaster management?

- How resources may be effectively and efficiently be utilized during disasters?
- How warming system may be improved?
- What should the role of media during the disasters?
- What should be the approach and strategy for preparation and coordination among different stakeholders during disasters?
- How to address issues of human rights of victims of natural and human instigated disasters?
- How to address the issues of gender in humantarian assistance during disasters?
- How to address health (physical and psycho social) issues in disaster management?
- How environmental and ecological crises can be checked and avoided?
- How issues of development induced displacement and rehabilitation may be addressed?
- How urban planning can ensure sustainable urban development paradigms?
- How vulnerability mapping and forecasting mechanism may be strengthened?
- How role of various stakeholders in disaster management may be strengthened?
- How resources for financing disaster mitigation and response may be mobilized?
- How public private partnership in disaster management may be build-up?

- How to create a data base for agencies involved in disaster management?
- How to develop data base for local resources for managing disasters?
- How role of community in disaster management may be strengthened?
- How peace process in North East region and other troubled areas may be accelerated?
- How epidemics and chronic diseases may be checked and prevented?
- How we can reduce the occupational health hazards and industrial hazards?
- How road safety measures may be strengthened?
- How resources for financing road safety measures may be mobilized?
- How seismic risk reduction efforts can be strengthened?
- How training needs for skills and planning may be assessed?
- What should be the national quick response mechanism and role of mobile hospitals in disaster management?
- How the role of defence services in disaster management may be strengthened?
- How institutional coordination during disasters may be strengthened?
- What should be the role of NGOs in rescue, relief, rehabilitation and reconstruction of victims and disaster affected areas?
- What should be the techno-financial approaches to risk mitigation in urban India?
- What should be the role of insurance companies in managing financial risks due to natural disasters?
- How GIS and Remote Censing Appliances may be useful in managing natural disasters?

- How we can strengthen the knowledge network for managing disasters?
- What should be legislative framework for regulating building and housing constructions in urban areas?
- What should be techno-legal strategies for disaster risk mitigation?
- How we can check the desertification and prevent ecological crisis?
- What should be the mechanism for documentation of best practices in disaster management?
- How resource literature in vernacular languages may be developed for sharing knowledge to mitigate and manage disasters?

References

Arya, A.S., Engineering Role in Earthquake Disaster Reduction in India, paper presented in World Congress on Natural Disaster Mitigation, by World Federation of Engineering Organization, at Delhi, 19-22, February, 2004.

Bowers, W.E. et.al., Surgical Philosophy in Mass Casualty Management, Springfield, IL, CC, Tharnao, 1960.

Brunacini, A.V., Fire Command, National Fire Protection Association, Quinty, MA, 1985.

Brunacini, A.V., Phoenix Fire Department Operation and Manual Vol. 2, Standard Operating Procedures, Unpublished, Phoenix, A2, 1998.

Carroll, J.M., Emergency Planning: Proceedings of the Conference or Emergency Planning, January 27-29, 1983, San Diego, CA, Simulation Series, Vol.11(2), Society for Computer Formulation, Lactolla, CA, 1983.

Dheri S.K and Mishra, G.C., Fire: Blazing Questions, in India Disaster Report, OUP, Delhi, 2000

Drabek, T.E. et.al., Managing Multi Organizational Emergency Responses: Emergent Search and Rescue Networks in Natural Disaster and Remote and Settings, Natural Hazards Information Centre, University of Colorado, Boulder, 1981.

Drabek, T.E., Emergency Management: The Human Factor, Federal Emergency Management Agency, National Emergency Training Centre, Emmetsburg, MD, 1985.

Drabek, T.E., Human System Responses to Disaster: An Inventory of Sociological Findings, Springer-Velar, New York, 1986.

Dynes, R.R. et. al., Organized Behaviour in Disaster, Disaster Research Centre, University of Delaware New York, 1974.

Dynes, R.R. et.al., Organizational Communications and Decision Making in Crises, Disaster Research Centre, University of Delware, New York, 1977.

Elegant, S., Resurrection, Time, April 4, 2005.

Francis, C.M. et. al., Epidemics: Diseases as Disaster, in India Disaster Report, OUP, Delhi, 2000

Government of India - Disaster Management: Development Perspectives, National Disaster Management Division, Ministry of Home Affairs, Government of India, Delhi, 2002

Government of India - Hazards, Disasters and Your Community: Primer for Parliamentarians, NDM Division, Ministry of Home Affairs, Government of India, Delhi

Government of India - Status of Disaster Management in India, Ministry of Home Affairs, Government of India, New Delhi

Government of India Tenth Five Year Plan (2002-07), Government of India, Delhi.

Hamilton, R.V., et. al., Social Psychological Interpretation on the Udaukansas, Tornado, Unpublished Report, University of Wichita, October 1985.

Hazarika S., Ethnic Conflicts in North East, in India Disaster Report, OUP, Delhi, 2000

Heide, Erik Aderfder, Disaster Response: Principles of Preparation and Coordination, Disaster Research Centre, University Delaware, New York.

Jain, A.K., Emergency Planning for Natural Disasters, paper presented in World Congress on Nature Disaster Mitigation, organized by World Federation of Engineering Organization, at Delhi, dated 19-22 Feb. 244.

Kallsen, G., Collapse of Coalinga, Journal of Emergency Medical Services 8(7), 1983

Marshall, Andrao, Healing Hands, Time April 4, 2005.

Mathur, Ranjeet, Railway Accidents, in India Disaster Report, OUP, Delhi, 2000

Mcluckie, B., The Warning System in Disaster Situations: A Selective Analysis, Report Series No. 9, Disaster Research Centre, University of Delaware, New York, 1970.

Medury and Dhameja, Rehabilitation of Cyclone in Orissa in Administrative Reforms (ed) Amita Singh in India, Sage Publications Delhi, 2006.

Moore, H.E., Tornadoes Over Texas: A Study of Waco and San Angelo in Disaster University of Texas Press, Austin, 1958.

Nath Meenakshi, Sarangi S., Industrial Disasters: Working Towards Oblivion Bhopal Gas Tragedy, in India Disaster Report, OUP, Delhi, 2000.

Parausraman, S. and Unnikrishnan, P.V. (ed), India Disaster Report, Oxford University Press, Delhi 2000.

Perry, R.W., Comprehensive Emergency Management: Evacuating Threatened Populations, Greenwich, CT, JAI Press, Inc., 1985.

Quarantelli, E.L., Disaster Planning: Small and Large - Past, Present and Future, presented at American Red Cross, EFO Division Disaster Conference, Blacksburg, V.A., February 19-22, 1981, Disaster Research Centre, University of Delaware, New York, 1981.

Quarantelli, E.L., Organizational **B**ehaviour in Disasters and Implications for Disaster Planning Report Series 18, Disaster Research Centre University of Delaware, New York, 1985.

Quarantelli, E.L., Socio-Behavioural Response to Chemical Hazards: Preparations for and Responses to Acute Chemical Emergencies at the Local Community Level, Disaster Research Centre, University of Delaware, New York, 1981.

Rai, N. and Singh, A.K., Disaster Response in India: With Special Reference to Tsunami Disaster, Urban Panorama, Vol. V (1), January-June, 2006

Shashi Kumar S.K., Trends in International Migration from India- 1950-2000, Paper presented at Labour Mobility and Globalizing World, September 18-19, VVGNLI, ISLE, IHD, Noida 2002

Silver Mcein M.E., Triage Decision Trees and Triage Protocols: Changing Strategies for Medical Rescue in Civilian Mass Casualty Situations, U.S. Department of Commerce, Springfield, U.A. 1984.

Singh, K.K., Indian Policy, Legislation and Institutional Arrangements for Urban Risk Mitigation: An Argument for Right Based Approach, paper presented in World Congress on Natural Disaster Mitigation, by World Federation of Engineering Organization, at Delhi, dated 19-22, February, 2004.

Singh, U.B., and Singh A.K., Socio-Economic Dimensions of National Disasters in India: Suggested Strategies for Mitigation, paper presented in World Congress on Natural Disaster Mitigation by World Federation of Engineering Organizations at Delhi, February 19-22, 2004.

Sorensen, J.H., et.al., Inter and Intra Organizational Cohesion in Emergencies, Mass Emergencies and Disasters 3(3), November 1989.

Srivastava R.S. and Sashikumar S.K., An Overview of Migration in India: Its Implications and Key Issues, JNU, VVGNLI, New Delhi, 2003.

Subbiah, A.R., Natural Disaster Management, Vol. 21, State of Indian Farmers, Academic Foundation, Delhi, 2004

Thomas, V.J., Road Accidents in India, in India Disaster Report, OUP, Delhi, 2000

Tiwari, B.K. and Singh, A.K., Bangladeshi Issue in Perspective: The Problem of Immigrants in India, Dynamics of Public Administration, Vol. III-IV (1-2), January, December 1998.

UN Recovery Frame Work in Support of government of India for a Post Tsunami Rehabilitation and Reconstruction Programme, United States, March, 2005.

UNAIDS - Innovative Approaches to HIV Prevention, UNAIDS, Geneva, 2001

UNAIDS - Migrants: Right to Health, UNAIDS, Geneva, 2001

UNDP - HIV Vulnerability and Migration: South Asia Perspectives, UNDP, Delhi, 2002

UNDP - Recovery Framework in Support of Government of India for a Post Tsunami Rehabilitation and Reconstruction Programme, UNDP, Delhi, 2005

UNDP Disaster Risk Management Programme, (2002-07) MoHRD, Government of India, Delhi, 2003.

UNDP No Safety Signs Here, UNDP, Delhi 2004

Wallace, W.A., et.al., Decision Support Systems for Disaster Management, IW Petak W.J. Emergency Management: A Challenge for Public Administration, special issue, Public Administration Review, Jan. 1985.

Wohlworth, N., Putting Computer Technology to Work in Emergency Planning, Emergency Preparedness Digest, 14(2) April-June 1987.

World Bank, World Bank in India, Newsletter, Vol. 4(3), November 2005.