

DISASTERS STATISTICS IN INDIAN SCENARIO IN THE LAST TWO DECADE

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Abstract- Disasters during 1990-2009 periods have been discussed in terms of natural and man-made disasters in the Indian subcontinent as well as in India. As per EM-DAT data, India has experienced 772 disasters during the period of 1990-2009. This paper combines the scattered disasters data during last two decades into one record. The purpose of this paper is to provide graduate students, researchers, and responsible personnel with an overview on the statistics of various disasters in India and the subcontinent. The disasters data for the covered region have been collected from several sources such as the technical reports, general and research articles, internet web sites, India government reports and EM- data 2012.

Index Terms- Disasters, Natural disasters, Man-made disasters, India

I. INTRODUCTION

Disasters, one of man's oldest concerns, reach back to periods of pre- history and myth, yet strangely enough, are hardly an area of critical scrutiny[1]. A disaster is defined by the Asian Disaster Risk Reduction Center[2] as "Disasters are known as sudden events, which bring serious disruption to society with massive human, material and environmental losses and these losses always go beyond the capacity of the affected society to cope with its own resources." Natural disasters are catastrophic events resulting from natural causes such as volcanic eruptions, tornadoes, earthquakes, etc., over which man has no control. Natural disasters are often termed "Acts of God"[3]. Man-made disasters, on the other hand, are those catastrophic events that result from human decisions. The International Federation of Red Cross and Red Crescent Societies (2003) [4] highlighted that a man-made disaster refers to non-natural disastrous occurrences that can be sudden or more long-term. Sudden man-made disasters include structural, building and mine collapses when this occurs independently without any outside force. In addition air, land, and sea disasters are all man-made disasters.

Long-term man-made disasters tend to refer to national and international conflicts. There are disasters that result from both human error and natural forces. These are hybrid disasters. An example of a hybrid disaster is the extensive clearing of jungles causing soil erosion, and subsequently heavy rain causing landslides.

Disaster definitions: There are many definitions of a disaster: definitions have been given by Turner and Pedgeon (1997) [5], Prehospital and Disaster Medicine (2002) [6], Denis (1995) [7] and Keller and Al-Madhari (1996) [8]. The definition used seems

dependent upon the discipline using the term. Turner and Pedgeon (1997) [5] pointed out that no definition of "disaster" is universally accepted. Parker (1992) [9] reviewed the concept of disaster, and suggested that the preferred definition of disaster is: . . . An unusual natural or man-made event, including an event caused by failure of technological systems, which temporarily overwhelms the response capacity of human communities, groups of individuals or natural environments and which causes massive damage, economic loss, disruption, injury, and/or loss of life. This definition encompasses medical accidents and disasters such as those which affect of whooping cough vaccine, Open and HIV/AIDS haemophiliac cases.

Disaster Types: Types of disasters have been the subject of research and concern to academicians and to government and independent agencies. The complete EM-DAT[10] divides disasters into 2 categories (natural and technological), and further divides the natural disaster category into 5 subcategories, which in turn cover 12 disaster types and more than 30 subtypes (see Table 1). The principal categories and subcategories are shown below.

Disaster subcategory definitions

- Geophysical: Events originating from solid earth
- Meteorological: Events caused by short-lived/small to meso- scale atmospheric processes (in the spectrum from minutes to days)
- Hydrological: Events caused by deviations in the normal water cycle and/ or overflow of bodies of water caused by wind set-up
- Climatological: Events caused by long-lived/ meso- to macro- scale process (in the spectrum from intra-seasonal to multi – decadal climate variability)
- Biological: Disaster caused by the exposure of living organisms to germs and toxic substances.

II. TYPES OF DISASTERS IN INDIA

Many regions in India are highly vulnerable to natural and other disasters on account of geological conditions. About 60% of the total area of the country is vulnerable to seismic damage of buildings in varying degrees. The most vulnerable areas, according to the present seismic zone map of India, are located in the Himalayan and sub-Himalayan regions. Kutch and the Andaman and Nicobar Islands, which are particularly earthquake hazard prone. Over 8% Indian area of 40 million hectares is prone to floods, and the average area affected by floods annually

is about 8 million hectares. Of the nearly 7,500 kilometers long coastline, approximately 5,700 kilometers is prone to cyclones, and 68% area is susceptible to drought (India, Ministry of Home Affairs, 2004, p. 3) [11].

Table 1: Natural Disaster Categories, Types, and Subtypes

		Hydrometeorological	
Biological	Geophysical	Hydrological	Meteorological
Epidemic Viral infectious disease Bacterial infectious disease Parasitic infectious disease Fungal infectious disease Prion infectious disease Insect infestation Animal stampede	Earthquake Volcano Mass movement (dry) Rock-fall Landslide Avalanche Subsidence	Flood General flood Storm surge/coastal flood Mass movement (wet) Rock-fall Landslide Avalanche Subsidence	Storm Tropical cyclone Extra-tropical cyclone Local storm Climatological Extreme temperature Heat Waves Cold Waves Extreme winter condition Drought/ wildfire Forest Fire Land Fire

Source: UCL, "EM-DAT: The OFDA/CRED International Disaster Database," UCL, <http://www.emdat.be> [10].

India which supports just on 2 per cent landmass, one-sixth of the world's population suffers heavily from natural disasters of different kinds that hit the poorest of the poor and which is why the considerations of disaster safety deserves prime attention. The Parliament of India passed the Disaster Management Bill 2005. According to the Bill No: LV5:
(d) "disaster" means a catastrophe, mishap, calamity or grave occurrence affecting 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; . . . (India, Parliament, Rajya Sabha, 2005) [12].

India has a highly diversified range of natural features. Its unique geo- climatic conditions make the country among the most vulnerable to natural disasters in the world. Disasters occur with amazing frequency in India and while the society at large has adapted itself to these regular occurrences, the economic and social costs continue to mount year after year. It is highly vulnerable to flood, drought, cyclones, earthquakes, landslides, volcanoes, etc. Almost all parts of India experience one or more of these events (Gupta 2000) [13]. The country also from time to time experiences some man- made disasters, which cause considerable damages to property and loss of lives.

Natural Disasters

During 1980-2010, India has experienced 431 natural disasters. The natural disasters resulted in 1,521,726,127 fatalities, and 143,039 casualties [10]. Natural disasters which occurred in India have been summarized in Table -2 (1980-2010) and shown in Figure 2(1990-2009).

Though several studies by De & Joshi (1995, 1999) [14-15], Srivastava, Sinha Roy & De (2000) [16] and Bhaskar Rao, Naidu & Srinivasa Rao (2001) [17] show a decreasing trend in frequency of Tropical Cyclones (TC) and Monsoon Depressions

(MD) over the north Indian Ocean (The Bay of Bengal and the Arabian Sea) in recent years, their potential for damage and destruction still continues to be significant. A severe Super Cyclonic Storm with winds of upto 250 km/h crossed the coast in Orissa on October 29, 1999. This may prove to have been the worst cyclone of the century in the Orissa region and is responsible for as many as 10,000 deaths, for rendering millions homeless and for extensive damage (WMO, 1999) [18] High magnitude floods during the monsoon season are considered to be India's recurring and leading natural disaster (Kale et al., 1994) [19]. The country has to face loss of life and damage to property due to severe floods time and time again. Heavy flood damages were experienced in the country during the monsoons of 1955, 1971, 1973, 1977, 1978, 1980, 1984, 1988, 1989, 1998, 2001 and 2004. Central Water Commission has compiled the damage figures due to flood from 1953 to 2004 on the basis of which yearly average loss to life is reported to be about to 1590 and the damage to public utilities Rs. 8068 billion (*USD 184 Billion) [20].

Table 2: Natural Disasters from 1980 – 2010

Overview	
No of events:	431
No of people killed:	143,039
Average killed per year:	4,614
No of people affected:	1,521,726,127
Average affected per year:	49,087,940
Economic Damage (US\$ X 1,000):	48,063,830
Economic Damage per year (US\$ X 1,000):	1,550,446

Source: Disaster Prevention Web [32]

Severe losses were also caused by floods in recent past, e.g. heavy monsoon rains triggered landslides and flooding in India in July, 2006, specifically in the regions around Mumbai. Over 1,100 people lost their lives, and the insured property damage amounted to USD 0.8 billion. Swiss Re reports in the year 2007[21] related to 20 worst catastrophes in terms of victims has also indicated that India is one of the most victim-prone countries compared with others (Swiss Re reports, 2006 [22], 2007 [21]). The numbers of people affected in the rest of the world were 111,159, in Asia the number was 554,439 and within Asia, 24 per cent of deaths due to disasters occurred in India (Shashi Shankar, 2007) [23].

A study by Chowdhury, Dandekar & Raut (1989) [24] have ranked the year 1918 as the worst drought year of the last century - a year when about 68.7% of the total area of the country was affected by drought. Likewise the severe drought years of 1877 and 1987 were followed by flood years of 1878 and 1988. In the 19th century the droughts of 1877 and 1899 followed by the early droughts of the twentieth century. In the last century the drought of 1987 and 1972 are the next in order of severity. Occurrence in drought of consecutive years has been reported in 1904-05, 1951-52, 1965-66. These pair of years was associated with moderate droughts, where at least 25% of the country was affected. During 1999, 2000 and 2001 drought conditions prevailed over some parts of India, not affecting the country as a whole significantly. During 2002 twelve out of 36 subdivisions of the country came under the grip of moderate to severe drought when about 29% of the total area of the country was affected by drought.

Fifty-seven percent of the country is prone to seismic activity. During the international decade of natural disaster reduction, India suffered the adverse impact of several earthquakes, the most significant being in Uttarkashi, Latur and Jabalpur. Some of the most devastating earthquakes which India has faced in the past include the Kutch earthquakes of 2001 and 1819, the Shillong earthquake of 1897, the Kangra earthquake of 1905, the Bihar-Nepal earthquake of 1934, the North-East and Assam earthquake of 1950 the Anjar earthquake in Gujarat of 1956, etc. The seismic zonation map of India shows the north-eastern states, Kutch region of Gujarat and Uttaranchal as most vulnerable [25].

In 1996, flashfloods intruded into the desert state of Rajasthan. The floods killed about 100 people. But in subsequent months more than 1,000 lives were lost due to a malaria epidemic, as the flood-accumulated waters became an ideal breeding ground for mosquitoes. Amplified by a systemic failure, the epidemic took a heavy toll, far more than the flood itself, in a region not known for water-borne diseases [25].

Man- made disasters

Man- made disasters can be sudden or long term disasters (IFRCRCS, 2003) [4]. Sudden man- made disasters are known as Industrial accidents and Transportation accidents. India has experienced several man-made disasters. India has experienced 480 man-made disasters in the period of 1990-2009 [10]. On December 3, 1984, a highly toxic cloud of methyl isocyanate leaked from Tank – E610 engulfing the city of Bhopal. The leak was the consequence of a large volume of water entering one of

the MIC storage tanks around 9:30 pm the day before. This triggered off a chemical reaction resulting in a tremendous increase of temperature and pressure in the tank. Around 12:30 am 40 tonnes of MIC along with hydrogen cyanide and other reaction products exploded into the night air of Bhopal. Of the 800,000 people living in Bhopal at that time, no one knows exactly how many people were affected that night. While the UCC, in its official statement on the tragedy, maintained that 3,800 died, the Indian Government argued that 1,754 people were killed and 200,000 injured. Sources like the Delhi Science Forum and Amnesty International however, place the toll at 5,000 and 7,000 respectively [26]. According to Shrivastava (1987, p. 65) [27] circumstantial evidence of death, based on the number of shrouds sold and quantity of cremation wood used, seems to suggest that around 10,000 people died that night. Lapierre and Moro (2002, p. 371) [28] place the death toll in between 16,000-30,000. Union Carbide contended that the gas leak could only have been caused by deliberate sabotage.

There have been many transportation accidents in India. The deadliest head-on mid-air collision of aircrafts in the world, the worst air disaster in India, and the fourth deadliest air disaster in the world, occurred over Charkhi Dadri, near Delhi on November 12, 1996, killing 349 people. The aircrafts involved were a Saudi Arabian Airlines Boeing 747 passenger aircraft carrying 312 passengers and crew and an Ilyushin II-76TD belonging to Kazakhstan Airlines, carrying 37 passengers and crew. One of them, or both, did not stick to the prescribed height, and did not maintain the required vertical separation. Both the planes collided at a speed of 500 km per hour and instantly caught fire. There were no survivors [29].

June 22, 2003, in the first major accident on the Konkan Railway, 53 people, including three children, were killed and 25 injured when the engine and three coaches of the Karwar-Mumbai Central Holiday Special train derailed after crossing Vaibhavwadi station in Sindhudurg district in Maharashtra [30].

III. FINDINGS

Disasters have been classified into natural, man-made disasters. Natural disasters are catastrophic events resulting from natural causes. Natural disasters are often termed "Act of God". Although the natural disasters are beyond the control of human being, however, the impacts of the natural disasters can be reduced by setting up of advanced warning systems which forecast the impending natural disasters, also the consequences of the natural disasters can be reduced through an effective disaster management. The occurrence of disasters from all kinds of hazards is among the highest in Asia and Pacific. In Asia alone in last decade more than 83% of the total reported disasters were due to floods [31].

In figure 1, the number of disasters, occurred during 1990-2009, has been plotted against types of Disaster viz. Natural and Man-made disasters in South Asia subcontinent. During this period, the subcontinent has faced 1,860 disasters out of which there were 894 natural disasters and 966 man-made disasters (EM-DAT data, 2012) [10]. The subcontinent is one of the most populated, underdeveloped region and highly vulnerable to such types of disasters. As per figure 1, the subcontinent has received highest number of natural disasters from flood and storm which

are 402 and 173 in numbers respectively. Apart from these disasters, the subcontinent has also faced numerous natural disasters in the form of earthquake, epidemics and mass movement like avalanche and landslide. As far as man-made disasters are concerned, the subcontinent has received 738 disasters related to transport accidents and 95 related to industrial accidents (see lower frame of figure 1).

faced 340 disasters in the form of transport accidents (see lower frame of figure 2). It has also faced 81 miscellaneous and 59 industrial related disasters. From these observations, naturally India and, hence, the south Asia subcontinent is highly vulnerable to-

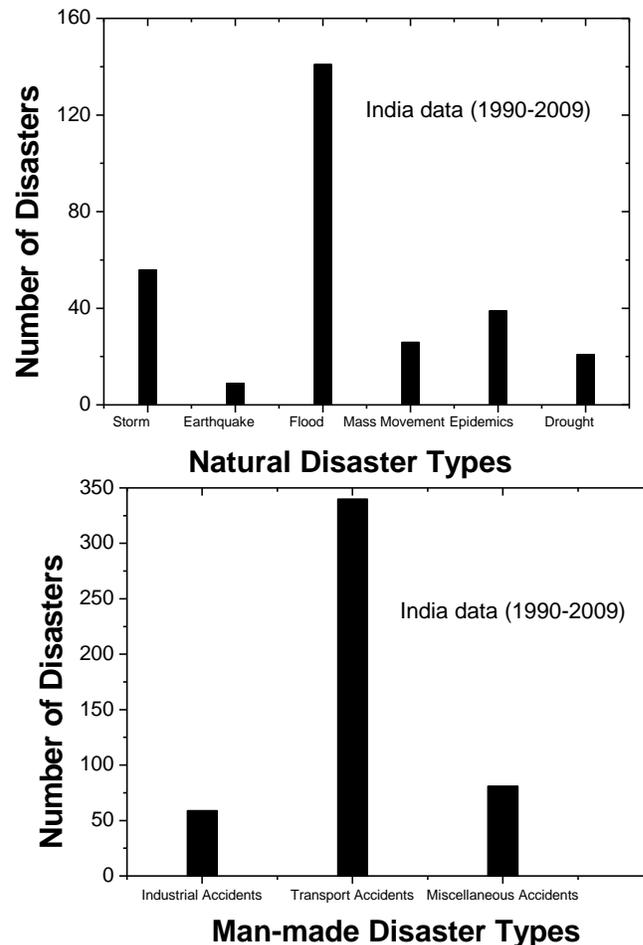
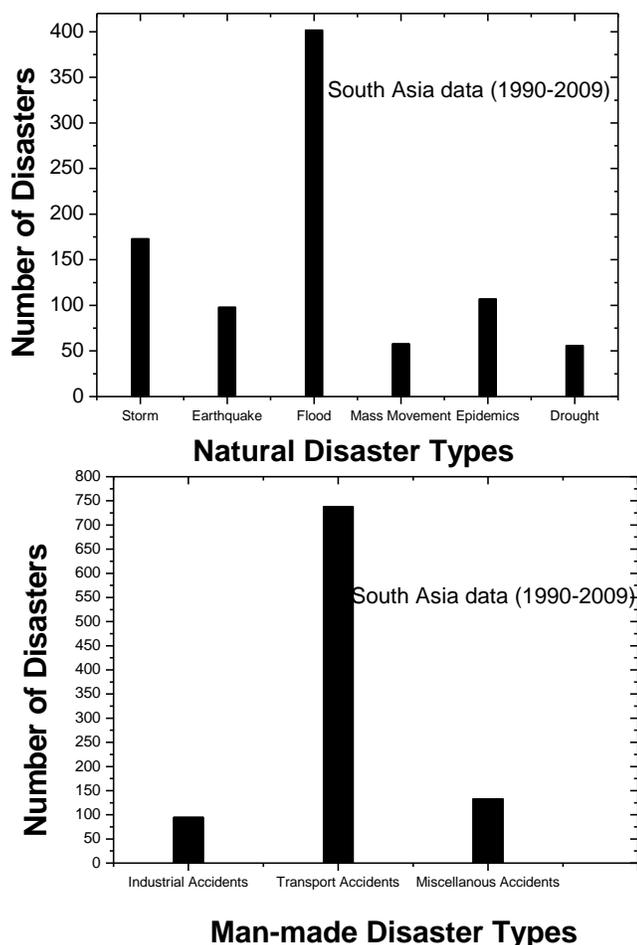


Figure 1: Number of Disasters in terms of natural (upper frame) and man-made (lower frame) have been plotted for south Asia subcontinent during 1990-2009.

Figure 2: Number of Disasters in terms of natural (upper frame) and man-made (lower frame) have been plotted for India during 1990-2009.

There were 133 disasters in the subcontinent related to miscellaneous accidents, like fire, structural collapse, explosion etc., during the period.

For the analysis of the data in the Indian context, similar types of graphs have been plotted in figure 2. India has received total 772 disasters during 1990-2009 (EM-DAT data, 2012 [10]), out of which there were 292 natural and 480 were man-made disasters. As per figure 2, India has faced highest natural disasters in the form of flood (141 in number) and storm (56 in numbers). India has also received several disasters in the form of epidemics (39), mass movement (26), drought (21) and earthquake (9) (see upper frame of figure 2). As far as man-made disasters are concerned, like in subcontinent, India has

-monsoon related natural disasters, like flood, storm, landslides etc., as well as man-made transport disaster.

In terms of their percentage sharing, we can summarize the data as follows:

- India has experienced 292 natural disasters which are 37.8% of total disasters. Most of the natural disasters were resulted from the heavy rains. The numbers of flood were 48 % of the natural disasters whereas other disasters viz. earthquake, drought, storm, epidemics and mass movement share 52 %.
- India has experienced 480 man- made disasters. The man- made disasters were 62.2 % of the total disasters. Out of these, India has experienced 59 industrial disasters. The industrial disasters were 12.3 % of the

man-made disasters. Whereas, India has experienced 340 transport disasters. The transport disasters were 70.8 % of the man-made disasters while miscellaneous disasters were 81 in number and shares 16.9% of the total man-made disasters.

IV. CONCLUSION

The disaster definition and types of disasters worldwide have been reviewed in brief and the disaster types in terms of natural and man-made in South Asia subcontinent and in India have been reviewed. The natural disasters and man-made disasters have also been reviewed in terms of their sub categories like flood, drought, transport and industrial disasters etc. In the final conclusive words, the natural disasters can be reduced by setting up advanced warning systems, which forecast the impending natural disasters timely. The consequences of the natural disasters also can be reduced through an effective disaster management. In addition to this, natural and man-made disasters can also be prevented or reduced through public involvement in disaster management policies, books, video, conducting workshop and training programme, community participation, capacity building, mock drills etc.

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