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## Acknowledgement

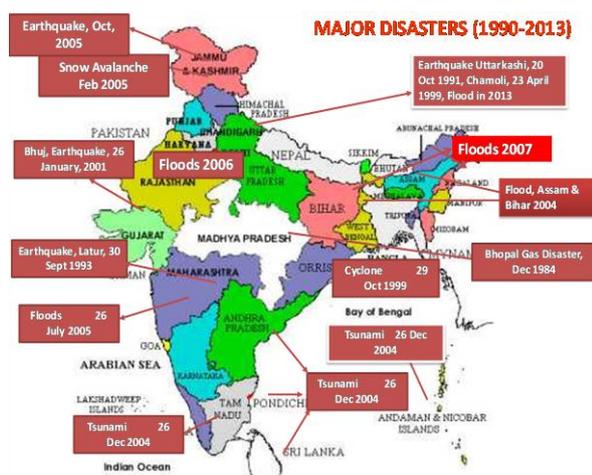
India is one of the most disaster prone countries of the world. It has had some of the world's most severe flood, droughts, famines, cyclones, tsunami, earthquakes, chemical disasters, rail accidents and road accidents. India is also known for terrorist prone country in the world.

India was, until recently, reacted and only responded to disasters and provided relief and response programs. It was initially a relief driven disaster management system. But in recent times, there has been a paradigm shift and India and State Disaster Management Authorities have become or are becoming more proactive with emphasis on disaster prevention, mitigation and preparedness.

India traditionally accepted international help in responding to disasters. However, after the 2004 Indian Ocean tsunami, India refused to accept international response assistance from foreign governments. Not only that, India deployed its defence personnel, medical teams, disaster experts, ships, helicopters, and other type of human, material, and equipment resources to help Sri Lanka, Mauritius, and Indonesia. It may be noted that India itself suffered from the tsunami and was internally responding at the same time.

As the tsunami, flood, cyclone or earthquake experience illustrates, disasters do not recognize or respect national geographic boundaries. We can better manage or channelize rain water but we cannot command the Nature to shower less rain, heavy rain or incessant rain. We do not have control over tsunami neither on cyclone nor on Earthquake. As we look at and feel the phenomena of climate change and global warming, more disasters will be spread over many countries and will be regional in nature. India has set up an example of responding internally and simultaneously in neighbouring countries for the other countries to follow. Having understood the emerging need and concern of disaster risk reduction measure, Central Board of Secondary Education has already introduced disaster management education as part of social science from class VIII to the class XII and very recently ministry of higher education has invited all the Universities to introduce Disaster Management as part of academic curricular so as to make the students learn and practice in their day today life and better response to the natural and manmade hazards. Along with disaster management education in schools and colleges, India and state governments are also implementing community based disaster management program with the help of United Nations Development Program, NDMA, and SDMA.

School of Disaster Management, Centurion University of Technology and Management has been taking initiative of inculcating knowledge and understanding on preparedness and response mechanism of the natural calamities in and through teaching and hands on practice to the B. Tech and M. Tech students since last four years. The reading material prepared, compiled and collected in and through visiting many e. Books and Google documents on the title "Concept and Fundamentals



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*of Disaster Management” This chapter explains on the history of disasters, its causes, consequences and concept and definitions of various terms of Disasters.*

*I am thankful to the director SDM – CUTM and the management for encouraging me to publish this small piece of document and I hope this note will enlighten the students’ minds and hearts on disasters and consequently lead them to live and allow other to live a better and safer life where ever they are.*

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## UNIT I – Concept and Fundamentals of Disaster Management

### The History of Disasters in India

With the Bengal famine, Odisha Super Cyclone, Latur earthquake, Bhopal chemical disaster, Andhra cyclone, Gujarat earthquake, recurring floods, Mumbai 2008 bomb blasts and many other disasters there is no foyer in the world with space large enough to exhibit the collective pain on the face of India. India has ranked at the top or near top in almost all type of disasters with number of deaths and people affected. India does not appear in the world tally of damages in financial terms due to disasters because of poverty and lack of infrastructure. Indian history is dappled with so many disasters that it is difficult to cover in a section of the chapter in a book. Therefore, only a sample of disasters is given in this chapter. Some type of disasters and some of the disasters need to be excluded due to space limitations.

### Drought

Drought is a temporary reduction in water or moisture availability significantly below the normal or expected amount for a specific period. This condition occurs either due to inadequacy of rainfall, or lack or irrigation facilities,

The main droughts occurred in India were:



Drought of 1900, killing 1.25 million people.

Drought of 1942, killing 1.5 million people.

Drought of 1943, in Easter part of Bengal (now part of Bangladesh) killing 1.9 million people.

Drought of 1965, killing 1.5 million and affecting 100 million people.

Drought of 1972, affecting 200 million people.

Drought of June 1982, affecting 100 million people.

Drought of May 1987, affecting 300 million people.

Drought of April 2000, affecting 50 million people.

Drought of July 2002, affecting 310 million people.

### Flood

An overflowing of a large amount of water beyond its normal confines. The flood is compounded by the problems of sediment deposition, drainage congestion and synchronization of river floods with sea tides in the coastal plains.

### The main floods occurred in India were:

Floods recur every year during the monsoon season in India. On an average every year, 1,588 lives are lost, 7.5 million hectares of land is affected, and the damage caused to crops, houses and public utilities is 18 billion Indian Rupees (Rs.) due to the floods. Between 1953 to 2005, a total of 84,207 lives were lost due to the floods in India, with maximum of 11,316 in 1977, and a minimum of 37 in 1953. The only other year that had less than 100 deaths was 1965.

The data regarding each year's flood damage, with totals, averages, and maximum losses from 1953 to 2005 in terms of human lives lost, cattle lost, population affected, monetary value of damage to public utilities, and total monetary damage loss, area affected, crops damaged, and houses damaged could be seen in National Disaster Management Guidelines: Management of Floods (National Disaster Management Authority 2008, 89-90).

On average, 32 million people are affected due to flooding. The maximum people affected were in 70 million in 1978. The total damage due to the floods during the 1953 to 2005 period of half a century was Rs 977 billion, a staggering figure for a poor country. The maximum damage was Rs 88 billion in 2000, and the average damage during 1953 to 2005 was Rs 18 billion. Heavy flood damages have occurred during the monsoon years of 1955, 1971, 1973, 1978, 1980, 1984, 1988, 1989, 1998,

2004, 2005, 2008, 2011 and (2013 in Utarakhand, Asam, UP ad Madyapradesh, Odisha, Maharashtra, Bihar, West Bengal, Andrapadesh, Tamilnadu and Rajesthan )

There were wide spread floods in Gujarat in the beginning of July 2005, taking away lives and disrupting many lives. This was followed by the eighth heaviest ever recorded 24-hour rainfall figure of 994 mm (39.1 inches) which lashed the Mumbai metropolis on July 26, 2005, and intermittently continued for the next day. That day 644 mm (25.4 inches) rain was received within the 12 hour period between 8 AM and 8 PM. Apart from Mumbai, many parts of Maharashtra state were also flooded. Many people in the cars on the roads of Mumbai could not open their car doors to escape and died. Due to disruption of the transport system people could not reach their homes in the night. At least 1,000 people are feared to have passed away.

In 2008 there were floods in many parts of India. There was diversion of water by Nepal near the India-Nepal border which lead to the flooding of the Koshi (is a Hindi word that literally meaning angry) river in Bihar. The severe floods made it difficult to reach the marooned people due to logistic difficulties. Many people remain trapped in flood waters for days. Approximately 1,500 people died due to Koshi river flooding.

## Cyclone

Cyclones are huge revolving storms caused by the cyclonic winds and water surge from the sea in an anti – clockwise circle and these tropical storms are known as cyclones.

India also has history of suffering from cyclones. The 1935, tropical cyclone killed 30,000 people. In 1942, tropical storm in Odisha and West Bengal killed 40,000 people. In 1943, Rajputana tropical storm, 5,000 people were killed. In eastern coast of Odisha, 1971 tropical storm killed 9,658. In 1977 cyclone, in Tamil Nadu, Andhra Pradesh and Kerala 14,204 people were killed. The biggest cyclone disaster is the Odisha super cyclone. It hit the Odisha coast of India on October 29, 1999 accompanied with 155 mph (250 km/h) cyclone winds and water surge from the sea. It caused the deaths of over 10,000 people, and heavy to extreme damage in its path of destruction. Following the cyclone, with the help of the World Bank, Odisha State Disaster Management Authority was formed.

## Earthquake

An earthquake is a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface. For hundreds of millions of years, the forces of plate tectonic/construction have shaped the Earth as the huge plates that form the Earth's surface move slowly over and under each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free causing the ground to shake.

### Some of the major earthquakes in India were:

There was a earthquake in 1618 in Mumbai in which 2,000 people lost lives.

The loss of lives is estimated to be 300,000 in the Bengal earthquake of 1737 (that time Bangladesh was part of Bengal). The January 16, 1819 Kutch earthquake was of 8.0 on the Richer scale (XI intensity on Modified Mercalli scale) razed to the ground chief towns of Tera, Kathara and Mothala. An area of 250,000 square miles was affected by January 10, 1869 earthquake of 7.5 Richer scale in Assam.

In the neighbouring Shillong there was wide spread destruction when 8.7 Richer scale and XII Modified Mercalli scale earthquake struck on June 12, 1897. Kanga, in Himachal Pradesh had an 8.0 on Richer scale earthquake on April 4, 1905, killing 20,000 people. In Bihar, India (near the Nepal border) there was 8.3 Richer scale and XI Modified Mercalli intensity earthquake in 1934 in which 6,000 people were killed. In the following year, at Quetta (now part of Pakistan), there was an earthquake of 7.5 and IX Modified Mercalli intensity, killing 25,000 people.

In the year 1941, in the Andaman Islands there was 8.1 on the Richer scale (X on Modified Mercalli scale) earthquake causing very heavy damage. It is contemplated that survivors passed on the

earthquake survival knowledge by oral tradition, which saved many local inhabitants in the 2004 Indian Ocean Tsunami.

Assam faced yet another huge earthquake of 8.6 Richer / XII Modified Mercalli Scale in 1950 (earlier earthquake in Assam were in 1869, neighbouring Shillong in 1897, and 1918) killing 1,500 people. On August 21, 1988, Assam, once again, had an earthquake. This time it was 7.2 on Richer scale (IX Modified Mercalli scale intensity) killing people. Twenty million people were affected from this earthquake, which was the 2nd largest number of people affected by any earthquake.

Anjur in Gujarat had a 7.0 Richer or XII Modified Mercalli intensity earthquake in 1956 killing hundreds of people. Anjur is very near to the epicentre of 2001 Gujarat earthquake (see below).

The Latur, Marthawada region of the Maharashtra state, had a 6.4 on the Richter Scale (or VIII Modified Mercalli intensity) earthquake struck <http://en.wikipedia.org/wiki/India> at 03:55 AM on September 30, 1993 affecting primarily Latur and Osmanabad districts of Maharashtra. Approximately 7,928 people died and another 30,000 were injured. A reconstruction project was launched with the help of the World Bank and the victims were given structurally safe constructed houses.

The 2001 Gujarat earthquake struck India at about 08:14 AM when India was celebrating its republic day on January 26, 2001. It was 7.6 to 8.1 Richer scale earthquake, which was felt widely in India and Pakistan. In the aftermath of the earthquake, about 25,000 people died in different parts of Gujarat, including Bhuj, Bachao, Anjur, Ahmedabad, and Surat. There were 6.3 million people affected, which was the third largest number of people affected by any earthquake in the world. Immediately after the earthquake there was a total failure of command and control system, but afterwards many innovative changes and institutional mechanisms were initiated. One of the important innovations was the training of people and their involvement with labor along with professional mason in rebuilding their own houses.

The December 26, 2004 earthquake of magnitude 9.3 on the Richter scale off the coast of Sumatra in the Indonesian archipelago generated tsunami that affected nearly 2,260 kilometers of the mainland coastline of Tamil Nadu, Kerala, Andhra Pradesh and Pondicherry, as well as the Andaman and Nicobar Islands, with tidal waves up to 10 meters high penetrating up to 3 kilometres inland.

This tsunami took at least 10,749 lives, and resulted in 5,640 persons missing. It affected more than 2.79 million people across 1,089 villages. It is estimated that 11,827 hectares of crops are damaged, and that about 300,000 fisher folk have lost their livelihoods (Gupta Forthcoming).

On October 8, 2005 there was an earthquake of 7.6 richer scale intensity near the Muzaffarabad city of Pakistan killing 79,000 people in Pakistan; 1,309 in Kashmir of India; and 4 in Afghanistan. The severe cold weather conditions increased the sufferings of the evacuees sheltered in tents.

## Tsunami

Tsunami is a Japanese word with the English translation, "harbour wave." Represented by two characters, the top character, "tsu," means harbour, while the bottom character, "nami," means "wave." is a wave train, or series of waves, generated in a body of water by an impulsive disturbance that vertically displaces the water column. Earthquakes, landslides, volcanic eruptions, explosions, and even the impact of cosmic bodies, such as meteorites, can generate tsunamis. Tsunamis can savagely attack coastlines, causing devastating property damage and loss of life.

Tsunami of 2004, caused by a 9.0 magnitude earthquake, is the most devastating tsunami in modern times, affecting 18 countries in Southeast Asia and Southern Africa, killing more than 250,000 people in a single day, and leaving more than 1.7 million homeless. However, less reported, albeit real, is its impact in the islands of the Indian Ocean more than 1,000 miles away from its epicentre? This is the first peer-reviewed paper on the 2004 tsunami events specifically in the eleven nations bordering

the Indian Ocean, as they constitute a region at risk, due to the presence of tectonic interactive plate, absence of a tsunami warning system in the Indian Ocean, and lack established communication network providing timely information to that region. Our paper has a dual objective: the first objective is to report the 2004 tsunami event in relation to the 11 nations bordering the Indian Ocean. The second one is to elaborate on lessons learned from it from national, regional, and international disaster management programs to prevent such devastating consequences of tsunami from occurring again in the future.

### Landslides/Mudslides

A landslide is a type of "mass wasting." Mass wasting is down slope movement of soil and/or rock under the influence of gravity. A landslide is a movement of mass rock, debris, or earth down a slope. The failure of the slope happens when gravity exceeds the strength of the earth materials. Click here to learn about the different types of landslides right away, or stick around to learn about the different parts of a landslide

### Epidemics

Disease that spreads rapidly and affects an inordinately large number of people within a very short period. Unexpected and sudden increase in the number of people affected by a particular disease within a geographical region. The World's 2nd and 4th to 8th deadliest epidemics also occurred in India. These included: Bubonic bacterial plague infectious diseases in 1907, killing 1.3 million people. Viral infectious diseases in parts of India (which is now Bangladesh) in 1918 killing 393,000 people. Bubonic bacterial plague infectious diseases in 1920, killing 2 million people. Cholera bacterial infectious diseases in 1920 killing, 500,000 people. Bubonic bacterial plague infectious diseases in 1924, killing 300,000 people. Viral infectious diseases in 1926, killing 423,000 people.

### Terrorist Attack as manmade disaster

Terrorism is the systematic use of terror, often violent, especially as a means of coercion. In the international community, however, terrorism has no legally binding, criminal law definition. Common definitions of terrorism refer only to those violent acts which are intended to create fear (terror); are perpetrated for a religious, political, or ideological goal; and deliberately target or disregard the safety of non-combatants (civilians). Some definitions now include acts of unlawful violence and war. There have been many terrorist attacks in India. The major terrorist attacks are:

- March 12, 1993 - A series of bomb blasts, alleged to be planted by Muslim underworld figures, rock Mumbai killing some 260 people and injuring 713.
- February 14, 1998 - 46 persons were killed and more than 200 injured when 13 blasts ripped through Coimbatore.
- December 24-31, 1999 – Pakistani militants hijack an Indian Airlines flight from Kathmandu to New Delhi with 189 people aboard, kill one passenger and force the release of three jailed Muslim militants in exchange.
- October 1, 2001 - At least 21 people were killed in a suicide bomb explosion and gunfire at the assembly in Kashmir in an attack.
- December 13, 2001 - Heavily armed Islamic militant group opened fire in Parliament complex, killing several people in an unprecedented attack on the seat of power in the world's biggest democracy.
- January 22, 2002 - Four people were killed in an attack on the American Center, Kolkata allegedly by Lashkar-e-Taiba militants.
- May 14, 2002 - More than 30 army men were killed in a terrorist attack on an Army camp near Jammu.
- September 24, 2002 - 35 people were killed when 2 terrorists attacked the Akshardham temple in Gandhinagar, Gujarat.

- December 6, 2002 - Twenty-five people were injured in a bomb blast by members of the Students Islamic Movement of India at McDonald's fast food restaurant at Mumbai Central railway station. The bomb was planted in the air conditioner duct. It was suspected to be a crude bomb.
- January 27, 2003 - At least 30 people were injured when a bomb planted on a bicycle went off throwing splinters of sharp nails outside Vile Parle railway station in Mumbai.
- March 13, 2003 - A powerful bomb blast shattered a bogie of a local train at Mulund railway station in Mumbai during peak hours killing 11 people and injuring more than 65.
- August 23, 2003 - Two bombings at the Gateway of India and the Mumba Devi temple in Mumbai killed 52, injured 167.
- October 29, 2005 - 67 people were killed and 224 injured in serial bombings in major Delhi markets on Diwali (biggest festival, like Christmas) eve. A Pakistani group, Islamic Inquilab Mahaz, claimed responsibility for the attack. The group is linked to Lashkar-e-Taiba.
- March 7, 2006 - At least 20 persons were killed and over 101 injured when two blasts rocked Varanasi. The first blast took place at the Sankat Mochan Hanuman temple, the second at the Varanasi railway station.
- July 11, 2006 - Seven explosions ripped through crowded commuter trains and stations in Mumbai, killing at least 200 people and leaving 700 more bloodied and injured.
- The popular tourist destination and the pink city of Jaipur, capital of Rajasthan state faced seven bomb (left in bags hanging on the bicycles) blasts on the evening of May 13, 2008. These explosions took place within a span of 12 minutes during the peak evening 7 PM time at various locations in the down town busy religious and shopping places. An eighth bomb was found and was defused. There were about 65 dead with 150 people injured.
- The Ahmedabad city, the commercial hub of Gujarat state was bombed by a series of 21 bomb blasts that hit on July 26, 2008, within a span of 70 minutes, killing 56 people and injuring over 200 people. The blasts occurred just a day after the blasts in Bangalore.
- The Mumbai city was attacked by more than ten coordinated shooting and bombing attacks in different parts of the financial capital and largest city. The attacks began on November 26, 2008 and lasted till November 29, 2008, killing at least 173 people and wounding at least 308. Eight of the attacks occurred in the prominent places of South Mumbai, including the Oberoi Trident Hotel, the Taj Mahal Palace & Tower Hotels, and Chhatrapati Shivaji Railway Terminus. Ajmal Amir Kasab, the only attacker who was captured alive, disclosed that the attackers were members of Lashkar-e-Taiba, the Pakistan-based militant organization, considered a terrorist organization by India, the United States, and the United Kingdom, among others. In the wake of the failure of the security system the Home Minister resigned.
- Recently there have been many bomb explosions in Assam and other parts of North-Eastern Indian cities.

### Technological disaster

There have been many technological disasters in India. In 1979 the Koyna dam at Morvi in Gujarat collapsed killing 1,335 people. Many gas leakages from the chemical plants have killed workers as well. Some of the more well-known blasts are discussed below.

On December 4 and 6, 1985 a major leakage of oleum gas took place from Shriram Food and Fertilizers Industry, in the heart of the capital city of Delhi which resulted in the death of several persons. Following this, The Supreme Court of India established the principle of 'strict and absolute liability', making owners of hazardous plants strictly and absolutely liable for damages originating from their activities regardless of their fault.

The Bhopal chemical catastrophe is the world's biggest industrial disaster to date. On the night of December 3, 1984 in the Union Carbide plant at Bhopal, 40 tones of methyl isocyanide (MIC) gas leaked without any warning. The poisonous gas leakage killed 3,828 people immediately, injuring hundreds of thousands, incapacitating most of them for life. In addition, thousands of cattle, nearly poisoning water, polluting surrounding air for miles affected the breathing capacity of the people,

and other long lasting disastrous effects (Gupta Forthcoming). According to Amnesty International (2004, 1) 22,000 people have died of their injuries.

## Global Warming

'Global warming is defined as an increase in the average temperature of the Earth's atmosphere, especially a sustained increase great enough to cause changes in the global climate'. The term global warming is synonymous with Enhanced green house effect, implying an increase in the amount of green house gases in the earth's atmosphere, leading to entrapment of more and more solar radiations, and thus increasing the overall temperature of the earth.

## Climate Of India

Being such a huge country, India exhibits a wide diversity of temperatures; from the freezing cold winters in the Himalayas to the scorching heat of the Thar Desert. The above two regions play a very significant role in controlling the weather of India, making it warmer than to be expected with its latitude. The Himalayas participate in this warming by preventing the cold winds from blowing in, and the Thar desert attracts the summer monsoon winds, which are responsible for making the majority of the monsoon season of India. However, the majority of the regions can be considered climatically tropical.

## Concept of Disaster Management

Disaster management is the discipline of dealing with and avoiding risks. It is a discipline that involves preparing, supporting, and rebuilding society when natural or human-made disasters occur. In general, any Emergency management is the continuous process by which all individuals, groups, and communities manage hazards in an effort to avoid or ameliorate the impact of disasters resulting from the hazards. Actions taken depend in part on perceptions of risk of those exposed. Effective emergency management relies on thorough integration of emergency plans at all levels of government and non-government involvement. Activities at each level (individual, group, community) affect the other levels. It is a common to place the responsibility for governmental emergency management with the institutions for civil defence or within the conventional structure of the emergency services. In the private sector, emergency management is sometimes referred to as business continuity planning.

## Hazard

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

## Disaster

A situation in which a hazard is causing significant harm to lives and livelihoods.

## Risk

The probability that negative consequences may arise when hazards interact with vulnerable areas, people, property and environment Emergency

## Disaster & equations of Disaster Management.

**Disaster Risk (DR) =  $\frac{\text{Hazard (H)} \times \text{Vulnerability (V)}}{\text{Capacity (C)}}$**

## Vulnerability

A condition or sets of Conditions that reduces people's ability to prepare for, withstand or respond to a hazard.

## Capacity

Conditions or abilities which increase a community's ability to deal with hazards.

## Emergency

Any situation where there is an exceptional and widespread threat to life, health or basic subsistence, which is beyond the coping capacity of individuals and community.

## Disaster Prevention

Activities designed to provide permanent protection from disasters.

## Disaster Mitigation

Measures taken in advance of a disaster aimed at reducing its impact on society and the environment.

## Disaster Preparedness

Ability to predict, respond to and cope with the effect of a disaster. The knowledge and capacities developed by governments, professional, organizations, communities and individuals to effectively anticipate, respond to, and recover from the impacts of likely, imminent or current hazard events or conditions.

## Response

Actions taken immediately following the impact of a disaster when exceptional measures are required to meet the basic needs of the survivors.

## Relief

Measures that are required in search and rescue of survivors, as well to meet the basic needs for shelter, water, food and health care.

## Rehabilitation

Actions taken in the aftermath of a disaster to assist victims to repair their dwellings, re-establish essential services, revive key economic and social activities.

## Reconstruction

Permanent measures to repair or replace damaged dwellings and infrastructure and to set the economy back on course.

## Development

Sustained efforts intended to improve or maintain the social and economic well-being of a community.

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