

## *Human* ANTHROPOGENIC DISASTERS

### 14.1 ANTHROPOGENIC DISASTERS : MEANING AND CONCEPTS

Anthropogenic disasters, also called man-made disasters, are defined as any acts (activities) of humans, whether deliberate (intentional) or indeliberate (unintentional), leading to great loss of human lives and wealth, both public and private properties.

In other words, the potential hazardous events or accidents caused by human activities directly or indirectly, of deliberate, indeliberate, intentional or unintentional actions, negligence, ignorance or error or failure of man-made systems resulting in human killings and destruction of properties may be termed as man-made or anthropogenic disasters. A few examples may clear the concept of anthropogenic disasters as follows :

(1) deliberate and intentional acts : (a) dropping of atom bombs on Hiroshima and Nagasaki in Japan by American forces during World War II (1945).

(b) terrorist attack on World Trade Center and Pentagon in the United States of America on 11 September, 2001.

(2) acts of negligence : avoidance of safety measures :

(a) Chernobyl nuclear power plant meltdown in Ukraine in 1986.

(b) Bhopal gas tragedy, India, December 3/4, 1984.

(c) Fukushima nuclear power plant meltdown, Japan, 11 March, 2011.

(d) Deep water Horizon oil spill and oil fire, Gulf of Mexico, 2010.

(3) unintentional act : global warming and climate change, environmental pollution, accelerated rate of soil erosion, crowd stampede (both unintentional and negligence).

(4) combined acts of negligence and mishandling : rail, road and air accidents, and also accidents of ships in the oceans.

Some of the human activities also accelerate and motivate natural disasters such as dam-failure floods, reservoir-induced seismic events, landslides (devegetation and road construction), accelerated soil erosion (caused by faulty farming practices and deforestation) etc.

## 14.2 MAN-MADE DISASTERS : TYPOLOGY *Types*

There is no specified procedure to classify anthropogenic disasters into certain categories but the present authors suggest the following detailed classification of different types of man-made disasters with suitable examples :

### (1) Technological disasters

- (a) industrial hazards and disasters
  - accidents related to processing and storage of hazardous substances
  - accidents related to raw materials extraction and mining
  - accidents in manufacturing units mainly dangerous items such as petrochemicals, fireworks etc.
- (b) structural failures and fire
- (c) power outage and explosion of hazardous substances (explosives) such as fire cracker accidents
- (d) radiation contamination
- (e) storage and handling accidents of biological hazardous agents such as pathogens
- (f) accidents related to chemical, biological, radiological and nuclear (CBRN) substances.

### (2) Transportation disasters

- (a) aviation accidents
- (b) rail accidents
- (c) road accidents
- (d) space accidents

- (e) oil leaks and spills
- (f) sea travel accidents

### (3) Sociological disasters

- (a) crime
- (b) arson and looting
- (c) civil disturbances
  - demonstration
  - strikes
  - riots
  - public nuisance and criminal activities
  - resistance or rejection of all types of control and authority

### (4) Terrorism disasters

- (a) nationalist/separatist terrorism
- (b) state-sponsored terrorism
- (c) religious terrorism
- (d) left-wing terrorism
- (e) right-wing terrorism
- (f) anarchist terrorism
- (g) cyber terrorism
- (h) narco terrorism

### (5) Crowd stamped disasters

- (a) religious fair stampedes  
e.g. Mahakumbh religious fair, 2013, Mecca religious crowd stampedes, stampedes in famous religious places etc.
- (b) sports events related stampedes
- (c) large political meetings, cultural events etc. related crowd stampedes

### (6) political and religious disasters

- (a) wars, e.g. World Wars I and II
- (b) civil wars, e.g. Russian civil war, 1917-1921, American civil war, 1861-1865, second Sudanese civil war, 1562-1568, Nigerian civil war, 1967-1970 etc.

## ANTHROPOGENIC DISASTERS

- (c) religious war, e.g. French wars of religion, 1562-1598.
- (d) policy related disasters, e.g. Homolodor policy of Russia in Ukraine caused severe famine that killed about 1,000,000 people; Leap Forward Policy of China caused widespread starvation deaths in northern provinces of China; policy related Bengal Rice Famine in India, 1942 due to suppressive governance of British regime killed a few million people,
- (e) genocides and poisons and concentration camps, etc.

### (7) Man-induced natural disasters

- (a) dam-failure floods
- (b) reservoir-induced seismic events
- (c) accelerated soil erosion and sedimentation
- (d) pollution and environmental degradation
- (e) global warming and climate change, etc.



## 14.3 TECHNOLOGICAL DISASTERS

Technological hazards and disasters include industrial accidents; structural failures (e.g. building collapse) and fires; power failures, explosions of hazardous substances (explosives, such as fire crackers accidents); storage and handling accidents of biological hazardous agents such as pathogens in the microbiology laboratories and hospitals and health care centers; accidents related to chemical, biological, radiological and nuclear (CBRN) substances; meltdown of reactors of nuclear power plants; leakage of poisonous gases from chemical factories (e.g. Bhopal gas tragedy, India) etc.

## (1) Industrial Hazards and Disasters

Industrial sites i.e. factories and mills are always vulnerable to accidental hazards that lead to deaths of humans and animals and damage to human properties and the environment anywhere in the world because it is the human hands and mindset that handle different steps of final industrial productions i.e. stages of extraction of minerals from their original natural locations (e.g. mining of minerals), fabrication, processing, storage, distribution and transportation of final products to different destinations. Thus, there is likelihood of risk and danger at each and every stage of industrial manufacturing and handling of hazardous materials of all sorts (e.g. solid, liquid or gaseous).

The causes of industrial hazards and disasters are manifold as follows :

- hazardous nature of materials in themselves (e.g. pathogens used in microbiological laboratories, hospitals and pharmaceutical factories for manufacturing drugs and vaccines; atomic minerals used in nuclear power plants for the generation of electricity; explosives used in the fireworks manufacturing units etc.)
- lack of prescribed standard safety and protective measures (mainly in chemical factories, nuclear power plants, petro-chemical units, distribution of mineral oil and natural gas through pipe lines),
- carelessness and overlooking safety and protective measures or deliberate avoidance of such measures,
- loose electric fittings and fire caused by resultant short-circuit,
- failure of infrastructure facilities,
- human errors while handling the equipments and machinery or deliberate destructive actions for sabotage and

disruption of industrial function through terrorists,

- natural hazards such as strong tidal surges, high monstrous tsunami waves, which damage industries of coastal locations and nuclear power plants (as happened in the case of nuclear reactors meltdown in Fukushima, Japan, on 11 March 2011 caused by a strong tsunami off the coast of Sendai, Japan, in the western Pacific Ocean); severe atmospheric disturbances (e.g. tropical cyclones, hurricanes, typhoons, taifu etc.); atmospheric lightning; high magnitude earthquakes; devastating floods etc.
- unintentional accidents, etc.

The following are the potential hazards and disasters areas which need utmost care and attention :

- Industrial or establishment sites where highly inflammable materials or explosives are used for the manufacturing of critical and strategic items,
- Storage sites of hazardous materials such as military installations, nuclear storage sites and nuclear waste disposal sites,
- Nuclear power generation, and hydel and thermal power generation sites,
- Blasting in the mineral mines by the use of dynamite to remove the superincumbent loads of rocks,
- Transportation routes (roads and railroads) of movement of hazardous materials,
- Raw material extracting sites such as mines (coal mines, iron ore mines etc.), etc.

A few examples of industrial disasters or accidents which have caused human deaths and loss of huge properties, related to chemical industries handling hazardous materials, indus-

trial accidents, nuclear power plants accidents and leakage of radiation, mine accidents etc. would clearly demonstrate the dimension of dangers of industrial disasters as follows :

### **Bhopal Gas Tragedy (1984)**

The Bhopal Gas Tragedy (Bhopal, India) of 2/3 December 1984 is a burning example of one of the deadliest disasters caused by human negligence in the maintenance of deadly gases such as MIC gas (methyl iso-cynate). The leakage of MIC gas from the Union Carbide Factory at Bhopal on the wintry night of December 2/3, 1984 caused the single biggest air pollution tragedy which, according to official sources, claimed 2500 human lives in the early hours of December 3, 1984, whereas non-governmental sources put the figure beyond 5000. Methyl iso-cynate gas is produced at Bhopal based Union Carbide Factory of the USA to manufacture pesticides. The produced MIC gas is stored in underground containers. The poisonous MIC gas leaked from these containers and the leakage continued for 40 minutes. The poisonous gas was quickly spread in nearby densely populated localities of old Bhopal under the impact of morning breeze. According to the latest report the poisonous gas has claimed 3,410 human lives so far. Besides, hundreds of thousands of inhabitants were exposed to poisonous gas and thousands of animals were killed. The poisonous gas also polluted drinking water, soils, tank and pond water and adversely affected foetus, newly born babies, pregnant women, children, young and old people alike.

### **Chasnala Coal Mine Disaster, India, 1975**

A heartshaking disaster claiming 372 precious human lives occurred on 27 December, 1975 in Chasnala coal mine, in Dhanbad district, Jharkhand state, India. Hundreds of coal miners were working in the ill-fated deep Chasnala coal mine when a blast triggered



ANTHROPOGENIC DISASTERS

sudden collapse of roof of one chamber. This incident caused gushing of water at the speed of 32,000 km<sup>3</sup> of water per minute into the mine resulting into rapid flooding of coal mine. Thus, the unfortunate accident occurred when the miners were surrounded by two death traps i.e. they were trapped under heaps of debris and were drowned in flood water. This unfortunate coal mine disaster killed 372 miners.

The Chasnala coal mine disaster was caused due to sheer negligence of owner company (IISCO) but the Indian Iron and Steel Company, the owner of the coal mine, denied any charge of negligence and carelessness in observing mining safety guidelines and claimed that all international standards of coal mine operation were observed and followed strictly.

Top 13 deadly mining disasters have been arranged in table 14.1.

Table 14.1 : Worst mining disasters in the world

Sl. No.	Year	Event	Location	Casualties
1.	26 April, 1942	Honkeiko Colliery accident	Manchuria, China	1549
2.	10 March, 1906	Courriers mine disaster	France	1100
3.	9 May, 1960	Laobaidong colliery explosion, Datong	China	682
4.	1963	Mitsui Miike coal mine disaster	Japan	458
5.	9 Nov., 1963	Omuta coalmine explosion	Japan	447
6.	14 Oct., 1913	Shengheydd coalmine disaster (Worst in Wales)	Wales, U.K.	438
7.	1 Jan., 1960	Coalbrook mine disaster	South Africa	437
8.	6 June, 1972	Wankie coalmine explosion	Rhodesia	427
9.	1866	Oaks colliery accident	England	388
10.	28 May, 1965	Coal mine fire near Dhanbad, Jharkhand	India	375
11.	27 Dec., 1975	Chasnala coalmine explosion and flooding, Jharkhand (Dhanbad)	India	372
12.	12 Dec., 1866	Bomsley disaster	England, U.K.	361
13.	6 Dec., 1907	Monongah coal mine disaster, West Virginia	USA	361
14.	13 May, 2014	Turkey mine blast	Turkey	232

It is significant to mention that mining activities claim largest number of casualties worldover of all the industrial disasters-related human deaths. The number of human casualties depends on number and extent of mining activities (areal extent), methods of rescue and

relief operations, capability of the concerned mining companies, level of observation of international safety standards, government initiatives etc.

China has the largest mining activities in the world as extensive mining is pursued mainly

in coal and iron ore mining. China accounts for the largest number of mining casualties in the world as about 80 percent of mining deaths at world level occurs in China alone because safety standards are not strictly followed. According to S. Davis and M. Spiegel (2005) more than 6000 workers died in different mines in the year 2004 alone whereas BBC (2004) reported about 20,000 deaths of miners in 2004. The United States has the most advanced techniques to rescue miners trapped in the mines. For example, 9 miners were trapped in huge volume of water in the Quecreek Maine mine in Pennsylvania on 24 July 2002 but all the trapped miners were rescued by boring a relief tunnel.

**Manufacturing units of fireworks** are always vulnerable to blasts and fires by explosives used in the manufacturing of crackers and

related items. Lu Yang of China is the largest manufacturer of fireworks in the world that is why it is called the **fire works capital of the world**. In Indian context Sivakasi in Tamil Nadu is considered the **fire works capital of India** as about 90 percent fireworks of India are manufactured in Sivakasi and adjoining areas in Tamil Nadu. In fact, manufacturing of fireworks involves use of highly inflammable and explosive materials, and hence there is every likelihood for sudden unprecedented accidents caused by fires and explosions, if any of safety and protective measures of handling of explosives, storage of explosives and manufactured fireworks mainly crackers in godowns is overlooked and is not followed, which may cause human fatality. This is why fireworks industrial disaster is worldwide phenomenon. Table 14.2 displays major fireworks accidents and fatalities emanating therefrom in the world.



### Sivakasi Fireworks Disaster, India, 2012

A heartshaking fireworks accident tragically occurred on 5 September, 2012, in a fireworks factory at Mudalipatti, 13 km away from Sivakasi in Tamil Nadu, India. It may be mentioned that Tamil Nadu in general and Sivakasi in particular is the largest manufacturer of fireworks in India but due to mere lawlessness, avoidance of safety and protective measures, apathy of the state government, carelessness of workers etc. cause frequent accidents of fire and explosions resulting into human deaths including women and children employed in fireworks making against the rule of law (children are not allowed to work as labourers as child labour is strictly prohibited) almost every year (table 14.3).

There are numerous manufacturing units of fireworks and match industry in Sivakasi and

adjoining areas of Tamil Nadu, India, of them many are illegal and are working in villages and even private homes. The workers are not well trained in the proper handling of explosives and other dangerous materials being used in the manufacturing of fireworks. Simultaneously there is no proper storage facilities for keeping the fireworks and raw materials mainly explosives. All these combine to cause serious fireworks accidents and resultant casualties in India, Pakistan and Bangladesh, though fireworks accidents also occur in developed countries.

The Sivakasi fireworks disaster was caused by explosion and blasts in the fireworks manufacturing unit by carelessness of the workers and owner of the factory/unit. The blast was so huge and violent that 3 concrete sheds of the factory were flattened and 38 people were killed in Om Sakthi Fireworks, a private fireworks factory.