

# APPOLO



# STUDY CENTRE

## DISASTER

<b>Social Geography (population Density &amp; Distribution, Racial, Linguistic Groups &amp; Major Tribes)</b>	<b>6 th term 3</b>	<b>Unit 3. Understanding Disaster</b>
	<b>8 th term 2</b>	<b>Unit 2 - Hazards</b>
	<b>9 th book</b>	<b>Unit 8 - Disaster Management</b>
	<b>10<sup>th</sup> Volume 2</b>	<b>Unit 7 - Human Geography of Tamil Nadu</b>
	<b>11<sup>th</sup> Geography</b>	<b>Unit 8 - Culture and Political Geography</b>
	<b>12<sup>th</sup> geography</b>	<b>Man Made Disasters</b>

## 6<sup>th</sup> term 3

### 6. Understanding Disaster

Disaster is a very common phenomenon in the human society. It has been experienced by people since time immemorial. Though its form may be varied, it has been a challenge for society. The latest development which has been discovered in the World Disaster Reports recently is that, the disasters have increased in frequency and intensity. India is one of the most disaster prone countries in the world. It has some of the world's most severe droughts, famines, cyclones, earthquakes, chemical disasters, rail accidents and road accidents. The high density of population in the developing countries, especially in the high risk coastal areas, results in millions of people getting affected by natural disasters, especially in recurring disasters like floods, cyclones, storm surges, etc.

Disaster	
Natural Disasters	Man- Made Disasters
✓ Earthquakes	✓ Fire
✓ Volcanoes	✓ Destruction of buildings
✓ Tsunamis	✓ Accidents in industries
✓ Cyclones	✓ Accidents in transport
✓ Floods	✓ Terrorism
✓ Landsides	✓ Stampede
✓ Avalanches	
✓ Thunder & Lightning	

#### Disaster:

'A disaster is a serious disruption of the functioning of a society involving human and material loss. Disaster is broadly classified into natural and man-made disasters.

#### Natural Disaster:

1. **Earthquake:** The sudden shaking of the earth at a place for a short spell of time is called an earthquake. The duration of the earthquake may be a few seconds to some minutes. The point where an earthquake originates is called its 'focus'. The vertical point at the surface from the focus is called 'epicentre'.

2. **Volcanoes:** Volcanoes are openings or vents where lava, small rocks and steam erupt onto the earth's surface.
3. **Tsunami:** Tsunami are waves generated by earthquake, volcanic eruptions and underwater landslides.
4. **Cyclones:** A low pressure area which is encircled by high-pressure wind is called a cyclone.
5. **Floods :** An overflow of a large amount of water, beyond its normal limits, especially on the rainfed areas is called a flood.
6. **Landslide:** The movement of a mass of rocks, debris, soil etc., downslope is called a landslide.
7. **Avalanche:** A large amount of ice, snow and rock falling quickly down the side of a mountain is called an Avalanche.
8. **Thunder and lightning:** Thunder is a series of sudden electrical discharge resulting from atmospheric conditions. This discharge results in sudden flashes of light and trembling sound waves which are commonly known as thunder and lightning.

### Man Made Disasters:

1. **Fire:** Massive forest fires may start in hot and dry weather as a result of lightning, and human carelessness or from other causal factors.
2. **Destruction of buildings:** Demolition of buildings by human activities.
3. **Accidents in industries:** Chemical, biological accidents that occur due to human error. (e.g.) Bhopal gas tragedy
4. **Accidents in Transport:** Violation of road rules, carelessness cause accidents.
5. **Terrorism:** The social unrest or differences in principles leads to terrorism.
6. **Stampede:** The term stampede is a sudden rush of a crowd of people, usually resulting in injuries and death from suffocation and trampling.

### Tsunami and floods

A killer Tsunami hit the south east Asian countries on the 26th of December, 2004. A massive earthquake with a magnitude of 9.1 -9.3 in the Richter scale epicentre in the Indonesian island of Sumatra. It triggered one of the biggest Tsunamis the world had ever witnessed. The massive waves measuring up to 30 metres that killed more than 2,00,000 people of Asia. In India, over 10,000 people were killed by this disaster. Tamil Nadu alone accounted for 1,705 deaths. All the coastal districts were affected, Nagapattinam was the worst hit in the state of Tamil Nadu. Fishermen,

tourists, morning walkers, children playing in beach and people living on the coast were unprepared for the waves. So they lost their life and the most of the loss of lives and damage to property was within 500 metres of the shore. After that the Indian government set up a Tsunami Early Warning System at Indian National Centre for Ocean Information Services (INCOIS), Hyderabad in 2007.

### Tsunami - Do's and Don'ts

- ✓ You should find out if your home, school etc., are in vulnerable areas along sea shore.
- ✓ Know the height of your street above sea level.
- ✓ Plan evacuation routes and practise your evacuation routes.
- ✓ Discuss tsunamis with your family. Review safety and preparedness measures with your family.
- ✓ If you see the sea water receding, you must immediately leave the beach and go to higher ground far away from the beach.
- ✓ Don't go to the coast to watch the Tsunami.
- ✓ Don't try to surf the tsunami waves.
- ✓ Be aware facts about tsunami.

**Floods:** Floods are high stream flows, which overlap natural or artificial banks of a river or a stream and are markedly higher than the usual flow as well as inundation of low land.

### Types of floods

- **Flash floods:** Such floods that occur within six hours during heavy rainfall.
- **River floods:** Such floods are caused by Precipitation over large catchment areas or by melting of snow or sometimes both.
- **Coastal floods:** Sometimes floods are associated with cyclone high tides and tsunami.
  - ✓ Causes of floods
  - ✓ Torrential Rainfall.
  - ✓ Encroachment of rivers bank.
  - ✓ Excessive rainfall in catchment.
  - ✓ Inefficient engineering design in the construction of embankments, dams and canals.

- **Effects of floods**

- ✓ Destruction of drainage system
- ✓ Water pollution
- ✓ Soil erosion
- ✓ Stagnation of water
- ✓ Loss of agricultural land and cattle
- ✓ Loss of life and spread of contagious diseases.

### Do's

To find out if the settlement area is to be affected by flood or not. Keeping radio, torch and additional batteries, storing drinking water, dry foods items, salt and sugar. Safeguarding materials like kerosene, candle, match box, clothes and valuable things.

- ✓ Keeping umbrella and bamboo poles.
- ✓ Keeping first aid box and strong ropes to bind things.
- ✓ To dig canals from the farm land, to drain the excessive water keeping sand bags etc.,

### Don'ts

- ✓ Try to connect electricity once it is cut.
- ✓ Operate vehicles
- ✓ Swim against floods
- ✓ Avoid going on excursions.
- ✓ Neglect flood warning messages

### During floods

- ✓ Cut off gas connection and electricity.
- ✓ Keep sand bags on drainage holes and bathroom holes.
- ✓ Leave immediately through the known passage or prescribed passage
- ✓ Drink hot water.
- ✓ Use bleaching powder to keep your environment hygienic.
- ✓ Before using match sticks and candles, ensure that there is no gas leakage.
- ✓ Don't eat more food when you are affected by diarrhoea.
- ✓ Don't try to take anything that floats in flood.

## **Disaster Risk Reduction (DRR)**

Disaster Risk Reduction: The practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters. There are four key approaches to public awareness for disaster risk reduction. Campaigns, participatory learning, informal education, and formal school based interventions.

### **Forecasting and Early Warning**

- ✓ Weather forecasting, Tsunami early warning system, cyclonic forecasting and warning provide necessary information which help in reducing risks during disasters.
- ✓ School Disaster Management Committee, Village Disaster Management Committee, State and Central government institutions take mitigation measures together during disaster.
- ✓ Newspaper, Radio, Television and social media bring updated information and give alerts on the vulnerable area, risk, preparatory measures and relief measures including medicine..

## Unit 2 Hazards

### Introduction

**Teacher** : Good morning students.

**Students** : Good morning teacher.

**Teacher** : Are all present today?

**Krithika** : No teacher, Shruthi is absent today.

**Teacher** : Why is she absent today?

**Pavithra** : Teacher, don't you know what happened to her?

**Teacher** : No my dear child, what happened to her?

**Theshmitha** : Teacher, Yesterday, while returning home, she was struck by a big branch of a tree due to heavy rain and got injured.

**Teacher** : Oh my God....what a pity? Students, you all must be very careful while moving around to avoid the problems from hazards.

**Kamalesh** : Teacher, what do you mean by hazards? You mean the Belgian football player 'Hazard'?

**Teacher** : No...no, it is an event which can affect the living and non-living things of earth. I think today is the right day to get into the interesting chapter 'hazards'.

### Hazards

In the beginning of twenty-first century, the earth supported a human population that was more numerous and found healthier and wealthier than ever before. At the same time, there were a lack of awareness on the risks that faced by the people. By keeping this in mind, the present lesson of hazards is intended to familiarise the different types of hazards to promote awareness among students regarding hazards.

Hazards are defined as a thing, person, event or factor that poses a threat to people, structures or economic assets and which may cause a disaster. They could be either humanmade or naturally occurring in the environment. The word 'hazard' owes its origin to the word 'hasart' in old French meaning a game of dice (in Arabic - az-zahr; in Spanish - azar). Though the society experiences several types of hazards, it is important for a region to be aware of those threats that are most likely to affect the community most severely.

A natural hazard is a natural process and event that is a potential threat to human life and property. The process and events themselves are not a hazard but become so because of human use of the land.

A disaster is a hazardous event that occurs over a limited time span in a defined area and causes great damage to property/ loss of life, also needs assistance from others.

A catastrophe is a massive disaster that requires significant expenditure of money and a long time (often years) for recovery

## Types of Hazards

Some hazards occur frequently and threaten the people. Hazards are classified in different ways.

- I. Based on their causes of occurrence.
- II. Based on their origin.

### I. Based on their causes of occurrence

Hazards can be broadly classified into three types: natural, human-made and socio-natural hazards.

**1. Natural hazards:** These are the results of natural processes and man has no role to play in such hazards. The main examples of natural hazards are earthquakes, floods, cyclonic storms, droughts, landslides, tsunamis and volcanic eruptions.

**2. Human-made hazards:** these are caused by undesirable activities of human. It can result of an accident, such as an industrial chemical leak or oil spill, or an intentional act. Such hazards can disturb the safety, health, welfare of people and cause damage or destruction to property. The following are the examples of human-made hazards. They are explosions, hazardous wastes, pollution of air, water and land, dam failures, wars or civil conflicts and terrorism.

**3. Socio-natural hazards (Quasi-natural hazards):** these are caused by the combined effect of natural forces and misdeeds of human. Some of the examples are:



- The frequency and intensity of floods and droughts may increase due to indiscriminate felling of trees, particularly in the catchment areas of the rivers.
- Landslides are caused by natural forces and their frequency, and impact may be aggravated as a result of construction of roads, houses etc., in mountainous areas, excavating tunnels and by mining and quarrying.
- Storm surge hazards may be worsened by the destruction of mangroves.
- Smog is a serious problem in most big urban areas. The emissions from vehicles and industries, combustion of wood and coal together combined with fog leads to smog.

## II. Based on their origin

Hazards can be grouped into eight categories

- 1. Atmospheric hazard** – Tropical storms, Thunderstorms, Lightning, Tornadoes, Avalanches, Heat waves, Fog and Forest fire.
- 2. Geologic/Seismic hazard** – Earthquakes, Tsunamis, Landslides and Land subsidence.
- 3. Hydrologic hazard** – Floods, Droughts, Coastal erosion and Storm surges
- 4. Volcanic hazard** – Eruptions and Lava flows.
- 5. Environmental hazard** – Pollution of soil/ air/ water, Desertification, Global warming and Deforestation.
- 6. Biological hazard** – Chickenpox, Smallpox, AIDS [HIV] and Killer bees.
- 7. Technological hazard** – Hazardous material incidents, Fires, Infrastructure failures [Bridges, Tunnels, Dams] and Nuclear/ Radiological accidents.
- 8. Human-induced hazard** – Terrorism, Mass shootings, War, Transportation accidents and Civil disorder

### 1) Earthquakes

Earthquake is a violent tremor in the earth's crust, sending out a series of shock waves in all directions from its place of origin. Earthquake prone regions of the country have been identified on the basis of scientific inputs relating to seismicity, earthquakes occurred in the past and tectonic setup of the region. Based on these inputs, Bureau of Indian Standards has grouped the country

into four seismic zones: Zone II, Zone III, Zone IV and Zone V (No area of India is classified as Zone I).

### Seismic Zones of India

Seismic Zones	Level of Risk	Regions
Zone V	Very High	Comprises entire northeastern India, parts of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Rann of Kutch in Gujarat, part of North Bihar and Andaman & Nicobar Islands
Zone IV	High	Covers remaining parts of Jammu and Kashmir and Himachal Pradesh, National Capital Territory (NCT) of Delhi, Sikkim, northern parts of Uttar Pradesh, Bihar and West Bengal, parts of Gujarat and small portions of Maharashtra near the west coast and Rajasthan
Zone III	Moderate	Comprises Kerala, Goa, Lakshadweep Islands, remaining parts of Uttar Pradesh, Gujarat and West Bengal, parts of Punjab, Rajasthan, Madhya Pradesh, Bihar, Jharkhand, Chhattisgarh, Maharashtra, Odisha, Andhra Pradesh, Tamil Nadu and Karnataka.
Zone II	Low	Covers remaining parts of country.

## 2) Floods

Flood is an event in which a part of the earth's surface gets inundated. Heavy rainfall and large waves in seas are the common causes of flood

**The major causes of floods are:**

### A. Meteorological factors

- i) Heavy rainfall
- ii) Tropical cyclones
- iii) Cloud burst

### B. Physical factors

- i) Large catchment area

- ii) Inadequate drainage arrangement

### **C. Human factors**

- i) Deforestation
- ii) Siltation
- iii) Faulty agricultural practices
- iv) Faulty irrigation practices
- v) Collapse of dams
- vi) Accelerated urbanisation

The following map shows the major flood prone areas in India. Gangetic plains covering the states of Punjab, Haryana, Uttar Pradesh, North Bihar, West Bengal and Brahmaputra valley are the major flood prone areas in north and northeast India. Coastal Andhra Pradesh, Odisha and southern Gujarat are the other regions which are also prone to flood often.

### **3) Cyclonic Storms**

A cyclonic storm is a strong wind circulating around a low pressure area in the atmosphere. It rotates in anti-clockwise direction in Northern Hemisphere and clockwise in the Southern Hemisphere.

Tropical cyclones are characterised by destructive winds, storm surges and exceptional levels of rainfall, which may cause flooding. Wind speed may reach upto 200 km/h and rainfall may record upto 50 cm/day for several consecutive days.

A sudden rise of seawater due to tropical cyclone is called storm surge. It is more common in the regions of shallow coastal water.

#### **East coastal areas vulnerable to storm surges**

- i) North Odisha and West Bengal coasts.
- ii) Andhra Pradesh coast between Ongole and Machilipatnam.
- iii) Tamil Nadu coast (among 13 coastal districts, Nagapattinam and Cuddalore districts are frequently affected).

## West coastal areas vulnerable to storm surges

The west coast of India is less vulnerable to storm surges than the east coast.

- i) Maharashtra coast, north of Harnai and adjoining south Gujarat coast and the coastal belt around the Gulf of Cambay.
- ii) The coastal belt around the Gulf of Kutch.

## 4) Droughts

Any lack of water to satisfy the normal needs of agriculture, livestock, industry or human population may be termed as a drought. Further, the drought could be classified into three major types as,

- i) **Meteorological drought:** it is a situation where there is a reduction in rainfall for a specific period below a specific level.
- ii) **Hydrological drought:** it is associated with reduction of water in streams, rivers and reservoirs. It is of two types, a) Surface water drought, and b) Groundwater drought.
- iii) **Agricultural drought:** it refers to the condition in which the agricultural crops get affected due to lack of rainfall

## Drought

Droughts in India occur in the event of a failure of monsoon. Generally monsoon rainfall is uneven in India. Some areas receive heavy rainfall while other regions get moderate to low rainfall. The areas which experience low to very low rainfall are affected by drought.

## The major areas highly prone to drought are:

- 1) The arid and semi-arid region from Ahmedabad to Kanpur on one side and from Kanpur to Jalandhar on the other.
- 2) The dry region lying in the leeward side of the Western Ghats.

## 5) Landslides

Landslide is a rapid downward movement of rock, soil and vegetation down the slope under the influence of gravity. Landslides are generally sudden and infrequent. Presence of steep slope and heavy rainfall are the major causes of landslides. Weak ground structure, deforestation, earthquakes, volcanic eruptions, mining, construction of roads and railways over the mountains are the other causes of landslides. belt around the Gulf of Cambay.

About 15% of India's landmass is prone to landslide hazard. Landslides are very common along the steep slopes of the Himalayas, the Western Ghats and along the river valleys. In Tamil Nadu, Kodaikanal (Dindigul district) and Ooty (The Nilgiris district) are frequently affected by landslides.

## 6) Tsunamis

Tsunami refers to huge ocean waves caused by an earthquake, landslide or volcanic eruption. It is generally noticed in the coastal regions and travel between 640 and 960 km/h. Tsunamis pose serious danger to the inhabitants of the coastal areas.

The word 'Tsunami' is derived from Japanese word 'tsu' meaning harbour and 'nami' meaning wave (Harbour wave).

### Indian Ocean Tsunami of 2004

- On December 26, 2004, at 7:59 a.m. local time, an undersea earthquake with a magnitude of 9.1 struck off the coast of the Indonesian island of Sumatra.
- The tsunami killed at least 2,25,000 people across a dozen countries, with Indonesia, Sri Lanka, India, Thailand, Somalia and Maldives, sustaining massive damage.

## 7) Hazardous Wastes

The wastes that may or tend to cause adverse health effects on the ecosystem and human beings are called hazardous wastes. The following are the major hazardous wastes.

**i) Radioactive substance:** tools and unused fuel rods of nuclear power plants.

- ii) **Chemicals:** synthetic organics, inorganic metals, salts, acids and bases, and flammables and explosives.
- iii) **Biomedical wastes:** hypodermic needles, bandages and outdated drugs.
- iv) **Flammable wastes:** organic solvents, oils, plasticisers and organic sludges.
- v) **Explosives:** the wastes resulting from ordnance manufacturing and some industrial gases.
- vi) **Household hazardous wastes:** pesticides, waste oil, automobile battery and household battery.

### **Chernobyl nuclear disaster site (near Pripyat) to become an official tourist spot**

#### **Before:**

- Chernobyl (then Soviet Union) nuclear accident was happened on 26th April, 1986.
- The radiation emitted was more than 400 times than that released by the atomic bomb dropped on Hiroshima (Japan) in 1945. This accident remains the largest nuclear accident in history.
- More than 3,50,000 people were evacuated from the area and severe restrictions on permanent human settlement are still in that place.

#### **Now:**

- 33 years after the accident, the Exclusion Zone, which covers an area now in Ukraine and Belarus is inhabited by numerous animals and more than 200 bird species.
- In 2016, the Ukraine part of this zone was declared as a radiological and environmental biosphere reserve by the government.

## **8) Pollution of Air**

Air is a mixture of several gases. The main gases are nitrogen (78.09%) for forming products such as, fertilisers for plants and for making the air inert, oxygen (20.95%) for breathing and carbon dioxide (0.03%) for photosynthesis. Some other gases like argon, neon, helium, krypton, hydrogen, ozone, xenon and methane are also present. Besides, water vapour and dust particles make their presence felt in one way or the other.

Air pollution is the contamination of the indoor or outdoor air by a range of gases and solids that modify its natural characteristics and percentage. Air pollutants can be categorised into primary and secondary pollutants.

A **primary pollutant** is an air pollutant emitted directly from a source. A **secondary pollutant** is not directly emitted as such, but forms when other pollutants (primary pollutants) react in the atmosphere.

### **Primary Pollutants**

- i) Oxides of Sulphur
- ii) Oxides of Nitrogen
- iii) Oxides of Carbon
- iv) Particulate Matter
- v) Other Primary Pollutants

### **Secondary Pollutants**

- i) Ground Level Ozone
- ii) Smog

### **9) Pollution of Water**

Water pollution may be defined as alteration in the physical, chemical and biological characteristics of water, which may cause harmful effects in human and aquatic life.

In India, water pollution has been taking place on a large scale and since a long period. Both surface and groundwater bodies are polluted to a great extent. The major causes of water pollution in India are:

- i) Urbanisation
- ii) Industrial effluents
- iii) Sewages
- iv) Agricultural runoff and improper agricultural practices
- v) Seawater intrusion
- vi) Solid wastes.

### **Need for Prevention Measures**

Prevention is defined as the activities taken to prevent a natural calamity or potential hazard from having harmful effects on either people or economic assets.

- Prevention planning consists of i) hazard identification, and ii) vulnerability assessment.
- Delayed actions may increase the economic losses.
- For developing countries like India, prevention is perhaps the most critical components in managing disasters.

**Nature is emerging as a new weapon of mass destruction, do you agree?**

Around 22,000 people have died in India in 10 years until 2017 due to major environmental disasters - Indian Meteorology Department. In the past two decades (1998-2017) over 5,00,000 people have died due to extreme weather events around the world - stated by Global Climate Risk Index Report Published by Germanwatch (German-based non-profit organisation).

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9th

## 8. Disaster Management: Responding to Disasters

### Case Study - Tsunami

Shortly before 8 am on 26 December 2004, the cicadas fell silent and the ground shook in dismay. The Moken, an isolated tribe on the Andaman Islands in the Indian Ocean, knew that the Laboon, the 'wave that eats people', had stirred from his ocean lair. The Moken also knew what was next: a towering wall of water washing over their island, cleansing it of all that was evil and impure. To heed the Laboon's warning signs, elders told their children, run to high ground. 'If the water recedes after an earthquake, run immediately to high ground' The tiny Andaman and Nicobar Islands were directly in the path of the tsunami generated by the magnitude 9.1 of earthquake off the coast of Sumatra. Final total put the islands' death toll at 1,879 alone with another 5,600 people missing. The islanders who had heard the stories about the Laboon or similar mythological figures survived the tsunami essentially unscathed.

Most of the casualties that occurred in the southern Nicobar Islands were outsiders, leaving them with no indigenous tsunami warning system to guide them to higher ground. So, humans have passed down stories through the ages that helped cultures to cope when disaster inevitably struck. These stories were fodder for anthropologists and social scientists, but in the past decade, geologists have begun to pay more attention to how indigenous people understood and prepared for disaster. These stories, which couched myth in metaphor, could ultimately help scientists prepare for cataclysms to come. In this lesson, you will learn about how to respond to certain disasters to become resilient. A disaster is "a catastrophe that causes great damage or loss of life and property".

### Disaster Response

Disaster response entails restoring physical facilities, rehabilitation of affected population, restoration of lost livelihoods and reconstruction efforts to restore the infrastructure lost or damaged. The Response Phase focuses primarily on emergency relief: saving lives, providing first aid, restoring damaged systems (communications and transportation), meeting the basic life

requirements of those impacted by disaster (food, water and shelter) and providing mental health and spiritual support and care.

### **Who are the first responders?**

No matter how large or small, local communities are expected to provide immediate disaster response. On a daily basis, police officers, firefighters, and emergency medical technicians are a community's first responders, whether during fire, flood or acts of terrorism. Mental health professionals and the community's hospitals may also be activated in those early minutes and hours after disaster. Disaster management includes Prevention, Mitigation, Preparedness, Response and Recovery.

Disaster management involves all levels of government. Non-governmental and community based organizations play a vital role in the process. Modern disaster management goes beyond post-disaster assistance. It now includes pre-disaster planning and preparedness activities, organizational planning, training, information management, public relations and many other fields. Crisis management is important, but is only a part of the responsibility of a disaster manager. The traditional approach to disaster management has a number of phased sequences of action or a continuum. These can be represented as a disaster management cycle. We mainly focus on the way how the community should respond to disasters.

### **Earthquake**

An earthquake is a sudden vibration of the part of the earth caused by plate movements. It occurs along the plate boundaries. The place inside the earth where an earthquake originates is focus. The point on the earth's surface above the called a focus is called an epicentre. The damage caused by the earthquake is the highest near the epicentre. The earthquake is measured by an instrument called a Seismograph. It is recorded in Richter scale. Let us now see how the communities can better respond to earthquakes.

### **What to do during an earthquake?**

Be aware that some earthquakes are actually foreshocks and a larger earthquake might occur later. Minimize your movements to a few steps that reach a safe place nearby and stay indoors until the shaking has stopped and you are sure exiting is safe.

## **If indoors**

DROP to the ground; take COVER by getting under a sturdy table or other piece of furniture and HOLD ON until the shaking stops. If there is no table or desk near you, cover your face and head with your arms and crouch in an inside corner of the building.

Protect yourself by staying under the lintel of an inner door, in the corner of a room, under a table or even under a bed. Stay away from glass windows, outside doors and walls and anything that could fall (such as lighting fixtures or furniture). Stay inside until the shaking stops and go outside.

## **If outdoors**

1. Move away from buildings, trees, streetlights and utility wires.
2. If you are in open space, stay there until the shaking stops. The greatest danger exists directly outside buildings at exits and alongside exterior walls. Most earthquake-related casualties result due to collapsing walls, flying glass and falling objects.

## **If in a moving vehicle**

1. Stop as quickly as safety permits. Avoid stopping near or under buildings, trees, overpasses and utility wires.
2. Proceed cautiously once the earthquake has stopped. Avoid roads, bridges or ramps that might have been damaged by the earthquake.

## **Tsunami**

A tsunami can kill or injure people and damage or destroy buildings and infrastructure as waves come forth and recede. A tsunami is a series of enormous ocean waves caused by earthquakes, underwater landslides, volcanic eruptions or asteroids. Tsunamis can travel 700-800 km per hour, with waves 10-30 meter high. It causes flooding and disrupts transportation, power, communications, and water supply.

## **How to respond to Tsunami?**

1. You should find out if your home, school, workplace or other frequently visited locations are in tsunami hazard areas along the sea-shore.
2. Plan evacuation routes from your home, school, workplace, or any other place you could be, where tsunamis poses a risk.

3. Use a weather radio or stay tuned to a local radio or television station to keep informed of local watches and warnings.
4. Discuss tsunamis with your family. Everyone should be aware of what to do when tsunami strikes. Discussing tsunamis ahead of time will help reduce fear and save precious time in an emergency. Review flood safety and precautionary measures with your family.

### **What to do after a Tsunami?**

1. You should continue using a weather radio or staying tuned to a Coast Guard emergency frequency station or a local radio or television station for updated emergency information.
2. Check yourself for injuries and get first aid if necessary, before helping injured or trapped persons.
3. If someone needs to be rescued, call professionals with the right equipment to help.
4. Help people who require special assistance, like Infants, elderly people, those without transportation, large families who may need additional help in an emergency situation, people with disabilities, and the people who care for them.
5. Stay out of a building if water remains around it. Tsunami water, like floodwater, can undermine foundations, causing buildings to sink, floors to crack, or walls to collapse.
6. Check for gas leaks. If you smell gas or hear a blowing or hissing noise, open a window and get everyone outside quickly.

### **Riot**

Though riot may seem dramatic, an angry mob can be just as dangerous and unpredictable as just about any natural disaster. Thousands of people are killed in riots all over the world each year, and these riots erupt from a number of racial, religious, economic, political, or social causes that cannot be predetermined. As per Pew Research Center analysis of 198 countries on April 11, 2015. Syria tops in riot in the world followed by Nigeria, Iraq and India. If you've found yourself in the middle of a riot, you may not be able to run away immediately, but you can take some measures to protect yourself from harm. If you want to know how to survive a riot, just follow these steps.

## Surviving a Riot

### At Travel Destination: What to Do

1. Keep abreast of the current news if you are in a volatile area.
2. If you come across a demonstration, don't become inquisitive, just leave the area and find another route to your intended destination.
3. Avoid any place where police or security forces action is in progress.

### If caught in a riot:

1. If you find yourself caught up in a demonstration, keep to the edge of the crowd where it is safer. At the first opportunity, break away and seek refuge in a nearby building or find a suitable doorway or alley and stay there until the crowd passes.
2. When leaving the fringe of the demonstration, just walk away - don't run as this will draw attention to you.
3. In the event that you are arrested by the police/military, do not resist. Go along peacefully and contact your law advisor to help you resolve your predicament.
4. If you are caught up in the crowd, stay clear of glass shop fronts, moreover, move with the flow.
5. If shooting breaks out, drop to the ground and cover your head and neck, and lie as flat as you can.

### Fire

1. Wildfires occur when vegetated areas are set alight and are particularly common during hot and dry periods. They can occur in forests, grasslands, bush and deserts, and with blowing wind, can spread rapidly.
2. Fires can lead to the destruction of buildings, wooden bridges and poles, power, transmission and telecommunication lines, warehouses containing oil products and other fuel. It causes injury to people and animals.
3. The most common causes of fires are lightning strikes, sparks during arid conditions, eruption of volcanoes and man-made fires arising from deliberate arson or accidents.
4. A side-effect of wildfires which also threatens inhabited areas is smoke. Fires create large quantities of smoke, which can be spread far by wind and poses a respiratory hazard.

5. On an average, in India, every year, about 25,000 persons die due to fires and related causes. Female accounts for about 66% of those killed in fire accidents. It is estimated that about 42 females and 21 males die every day in India due to fire.

### **Fire Safety Do's and Don'ts**

1. Know your building's evacuation plan.
2. Evacuate calmly and quickly, whenever a fire alarm or carbon monoxide alarm sounds.
3. Before opening a door, feel it with the back of your hand. If the door is hot, do not open it.
4. If you encounter smoke during your evacuation, stay low to the floor.
5. Know the outside rally point for your building.
6. Know the locations of fire extinguishers, fire alarm pull stations and exits.

### **What you should do during a fire:**

1. Stay calm.
2. Pull the nearest fire alarm or call 112.
3. Give your name and location of the fire. Do not hang up until the police dispatcher tells you to do so.
4. Leave the building immediately.
5. Inform others as you pass them to leave the building immediately.
6. Walk – don't run – to the nearest exit.
7. Never use elevators – an elevator may become a trap.

### **NOTE**

- ❖ Japan is in a very active seismic area and it has the densest seismic network in the world.
- ❖ Which country actually has the most number of earthquakes? Indonesia is in a very active seismic zone also, but because it is larger than Japan, it has more earthquakes.
- ❖ Which country has the most earthquakes per unit area? This would probably be Tonga, Fiji or Indonesia, since they are all in extremely active seismic areas along subduction zones.

# 10<sup>th</sup>

## Unit - 7

### Human Geography of Tamil Nadu

#### Learning Objectives

- To understand the agricultural factors, major crops and their distribution in Tamil Nadu
- To learn about the water resources of Tamil Nadu
- To study the mineral and industrial resources of Tamil Nadu
- To analyze the population and its composition in Tamil Nadu
- To learn about the man made disasters in Tamil Nadu

#### Introduction

Human geography refers to the study of ways of development of human societies and their operation in relation to their physical environment. This chapter focuses on the distribution, characteristics and utilisation of different resources in Tamil Nadu. We have studied earlier that the earth is endowed with a variety of natural resources such as landforms, rivers, soil, natural vegetation, water and wildlife. These resources are useful only when they are utilised. Human beings use these resources using their intelligence and skill. Thus, the human beings are the most significant resource on the earth surface. They turn all these natural resources into useful products with their skills and abilities.

#### Agriculture

The word "agriculture" is derived from the Latin words "ager and cultura", which means field and growing. Agriculture is a practice of farming that includes the cultivation of crops, rearing of animals, birds, forestry, fisheries and other related activities. Agriculture is the major occupation in Tamil Nadu. Agriculture has been the mainstay of the state's economy since independence with more than 65% of the population depends upon this sector for their living. Agriculture provides employment for rural people on a large scale. There is a strong link between agriculture and economic growth. Agriculture constitutes about 21% of the state's economy. However, it fluctuates from one year to another. Paddy, millets and pulses are the principal

food crops of the state. Sugarcane, cotton, sunflower, coconut, cashew, chillies, gingelly, groundnut, tea, coffee, cardamom and rubber are the major commercial crops.

## Geographical determinants of Agriculture

Landform, climate, soil and irrigation are the factors that determine the growth of agriculture.

### Landform

Tamil Nadu is a land of diverse landscape comprising of hills, plateaus and plains. Among them the plains are most suitable for agriculture. The plains with alluvial soil enhances agricultural productivity. Example: Plains of cauvery. Agriculture in the plateau is moderate and is poor on the hills.

### Climate

Tamil Nadu is situated in the tropical zone, which is nearer to the equator. The state experiences a tropical climate. Hence, the temperature in Tamil Nadu is relatively high almost throughout the year. So, only the tropical crops are cultivated. Water is another limiting factor of agriculture. Northeast monsoon is the major source of rainfall for Tamil Nadu. Therefore, the major cropping season begins with this season. The rainfall in this season and the irrigation facilities affect agriculture to a large extent.

### Soil

Soil is one of the most essential elements of agriculture. It provides essential minerals or nutrients for the growth of crops and vegetation. The regions of river valleys and the coastal plains are the most agriculturally productive regions of the state as they are covered with fertile alluvial soil.

## Types and regions of Agriculture Practices in Tamil Nadu

Farming type	Area practiced
Subsistence intensive agriculture	Practiced all over Tamil Nadu with few exceptions.
Plantation Agriculture	Hill slopes of Eastern and Western Ghats.



Mixed farming	Banks of River Cauvery and Thenpennai.
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## Irrigation

Monsoon rainfall in the state is highly irregular. Further it is seasonal. Hence, irrigation becomes necessary for successful cultivation of crops in the state. In the dry regions, rain-fed crops are cultivated.

The Tamil Nadu Rice Research Institute (TRRI) is an Indian research institute working in the field of rice under Tamil Nadu Agricultural University (TNAU). It is situated at Aduthurai, in Thanjavur district, it was established in April, 1985 in TNAU to meet the research requirements of the region with the help of existing Agricultural Colleges and Research centres and perform lead function for rice and rice based cropping system research.

## Cropping Seasons in Tamil Nadu

Farmers select different crops for different seasons of cultivation. It is based on the temperature and availability of moisture in the soil. Accordingly, the state has the following cropping seasons.

Name	Sowing	Harvesting	Major crops
Sornavari (chittirai pattam )	April-May	August- September	Millets and cotton
Samba (Adipattam)	July- August	January- February	Paddy and sugarcane
Navarai	November - December	February- March	Fruits, vegetables, cucumber and watermelon

## Distribution of major crops in Tamil Nadu

### Paddy

Paddy is the most important staple food crop of Tamil Nadu. Ponni and kichadi samba are the major varieties of paddy grown in Tamil Nadu. About 3

million hectares of the state is under rice cultivation. Though it is cultivated all over Tamil Nadu, its cultivation is highly concentrated in Thanjavur, Tiruvarur, Tiruvallur, Kancheepuram, Villupuram, Cuddalore and Tirunelveli districts. It ranks third in the production of rice among the states of India. The deltaic region of river cauvery (the undivided Thanjavur district) is the major rice-producing region of Tamil Nadu. So, this region is rightly called as the "Granary of Tamil Nadu."

## Millets

Millets form staple food of nearly onethird of human population of Tamil Nadu. Sorghum/jowar (cholan), ragi (kezhvaragu) and bajra (kambu) are the major millets. These are grown not only in drier areas but also in the coastal plains. Sorghum is grown in the Coimbatore plateau and Kambam valley. Ragi is grown in Coimbatore, Dharmapuri, Vellore and Cuddalore districts. Bajra is mostly cultivated in Ramanathapuram, Tirunelveli, Karur, Perambalur and Salem districts.

India observed 2018 as national year of millets. FAO has decided to observe 2023 as the International year of millets.

## Pulses

Pulses are the major source of protein. Bengal gram, black gram, green gram, cowpea and horse gram are the important pulses grown in Tamil Nadu. Pulses are grown in a wide range of climatic conditions mostly in drier regions with or without irrigation. Mild cool climate and a low to moderate rainfall are best suited for these crops. Pulses serve as excellent fodder. Pulses are grown in almost all districts in the state except Chennai, Nilgiris and Kanyakumari. Coimbatore leads in the production of Bengal gram. Vellore and Kanyakumari districts produce red gram.

To promote organic farming a central scheme named 'National Project on Organic Farming' was launched Apart from general things (creating awareness, promoting organic fertilizers, training, capacity building etc.), the scheme provides financial assistance through Capital Investment Subsidy Scheme for agro-waste compost production units, bio-fertilizers/ bio-pesticides production units, development and implementation of quality control regime, human resource development etc.

Tiruvarur, Nagapattinam and Thoothukudi districts are the principal producers of green gram and black gram. Horse gram is widely cultivated in Dharmapuri and Krishnagiri districts.

### **Oil Seeds**

Groundnut, gingelly castor, coconut, sunflower and mustard are some of the oilseeds that are grown in Tamil Nadu. Apart from its use in food preparation, it is used in industries as a lubricant, in the manufacture of varnish, soaps, candles, cosmetics and pharmaceuticals. Groundnut is the major oilseed of the state. The cultivation of groundnut is mostly concentrated in Vellore, Tiruvannamalai, Villupuram, Salem and Pudukottai districts. It is also grown to some extent in Dharmapuri, Cuddalore, Perambalur and Madurai. Erode, Ramanathapuram, Sivagangai and Virudhunagar districts are its minor producers. Coconut is grown in Coimbatore, Thanjavur and Kanyakumari districts.

### **Sugarcane**

It is one of the major cash crops of the state. It is an annual crop. It requires high temperature and heavy rainfall. It grows well in the tropical region. Major sugarcane-producing districts are Tiruvallur, Kancheepuram, Vellore, Cuddalore, Tiruchirapalli, Coimbatore, Erode and Tirunelveli.

### **Cotton**

Cotton is a fibre and cash crop. It requires black soil, long frost-free condition and warm and humid weather for its cultivation. Humid weather in the early stages and hot, dry weather during harvest period is suitable for this crop. It is predominantly cultivated in Coimbatore plateau and Vaigai-Vaippar river basins. It is also cultivated in Madurai, Ramanathapuram, Virudhunagar, Tirunelveli, Thoothukudi, Salem and Dharmapuri districts.

### **Plantation crops**

Tea, coffee, cashew, rubber and cinchona are the major plantation crops of the state. Tamil Nadu ranks second in area and production of tea in India next to Assam. Tea plantations are found in the hills of the Nilgiris and Coimbatore. The Nilgiris is the notable regions for tea plantations. Coffee

plants are grown in the hills of Western Ghats as well as Eastern Ghats. It is also found in the hilly slopes of Dindigul, Madurai, Theni and Salem districts. Yercaud, Kolli Hills and Kodaikanal are notable for coffee plantations. Tamil Nadu stands second in area and production of coffee next to Karnataka. Rubber plantations are significant in Kanyakumari. Pepper is confined to the warm and wet slopes of Eastern and Western Ghats of Tamil Nadu. Cashew is extensively cultivated in Cuddalore district.

Cinchona is planted at heights varying from 1060 to 1280 metres in Anaimalai hills. Cardamom estates are located at few places in the hills of Madurai region at an elevation of 915 to 1525 metres.

TANTEA (TANTEA Tamil Nadu Tea Plantation Corporation Limited) is one of the Biggest Black Tea Producers in India with high quality clonal tea. Its plantation spreads over nearly 4500 hec. Tamil Nadu Dairy Development Corporation Ltd. was transformed into the newly registered Tamil Nadu Co-operative Milk Producers Federation Limited Popularly known as "Aavin".

### **Livestock/Animal Husbandry**

Livestock has remained an integral part of socio-economic fabric of rural people. The number of cattle found in Tamil Nadu is 88,92,473. There are 47,86,680 sheep, 81,43,341 goats and 11,73,48,894 poultry animals.

#### **Goat**

Goat is also known as 'poor man's cow' in India. It forms a very important component in dry land farming system. In the marginal or undulating lands unsuitable for rearing of other types of cattle like cow or buffalo, goat is the best alternative. With very low investments, goat rearing can be made into a profitable venture for small and marginal farmers.

#### **Sheep**

Sheep is used for multiple purposes like wool, meat, milk, skins and manure, and forms an important component of the rural economy, particularly in the arid, semi-arid and mountainous areas of Tamil Nadu. It provides a dependable source of income to the shepherds through the sale of wool and animals.

A variety of cattle breeds are reared in the state for the milk and forms a major component of the rural economy. The poultry hub of Tamil Nadu are Namakkal, Salem, Erode and Coimbatore districts.

## **Fishing**

Since Tamil Nadu is a coastal state, fishing is one of the major occupations in the state. With widespread reservoirs and rivers, inland fishing also is also seen to a considerable extent. There are about 2500 species of fishes found in different aquatic environments.

### **Marine Fishing**

The length of the coastline of Tamil Nadu is 1076 km (13% of the country's coastline). The coastal region of the state covers an area of 0.19 million sq.km. An area of 41,412 sq.km of continental shelves of the state favours coastal fishing and Tamil Nadu is one of the leading states in marine fish production. Marine fishing is also called inshore fish or neritic fishing, carried out in oceans and seas. Large mechanised boats are used for fishing. In ocean or seawaters, fishing within few kilometres from the shoreline is called inshore fishing and the fishing far from the shore typically 20–30 miles out in water hundreds and thousands of feet deep is called off-shore fishing. The fish varieties caught are sharks, flying fish, crouch, catfish, silver bellies, and crabs. Chennai, Kanyakumari, Tirunelveli, Nagapattinam, Thanjavur and Ramanathapuram districts contribute about 40% to marine fish production in the state. Their coastal location favours fishing in these regions. The state has three major fishing harbours, three medium fishing harbours and 363 fish landing centres. The export of marine products from the state during 2007– 08 accounted for 72,644 metric tons.

### **Inland Fishing**

Inland fishing is carried out in lakes, rivers, ponds, estuaries, backwaters and swamps. Oysters and prawns are cultured in original nurseries. Catamaran, diesel boats and floating nets are used in fishing. Tamil Nadu Fisheries Department has introduced several programmes for the betterment of fishing. The major programmes are aquaculture in farm ponds and irrigation tanks, fish seed bank, fish seed rearing, ornamental fish culture and the establishment of Fish Farmer Development Agency. Vellore district leads

in the production of inland fish production with 10% of state's production. Cuddalore, Sivagangai and Virudhunagar districts stand second with 9% of inland fish catch each. Fishing sector contributes 1.25% of state's economy.

### Second Green Revolution (Eco-Farming or Organic Farming)

In organic farming synthetic fertilizers, pesticides, growth regulator and livestock feed additives are not used. This type of farming rely on crop rotation, crop residues, animal manure, off-farm organic wastes and biological pest control to maintain soil productivity. This farming method is being adopted by very few farmers in the state. It has to be increased in number.

### Water Resource

Water is the precious gift of nature to humankind and millions of other species living on the earth.

Tamil Nadu constitutes 4% of India's land area and is inhabited by 6% of India's population, but has only 2.5% percent of India's water resources. More than 95% of the surface water and 80% of the ground water have already been put into use. Major uses of water include human/animal consumption, irrigation and industrial use. The state is heavily dependent on monsoon rains. The annual average rainfall is around 930 mm (47% during the northeast monsoon, 35% during the southwest monsoon, 14% in summer and 4% in winter).

Surface Water Resources	Numbers
River Basin	17
Reservoirs	81
Tanks	41,127
Tube wells and other wells	4,98,644
Open wells	15,06,919
Total (Million Cubic metres)	2046788 MCM
<b>Source: Statistical handbook of Tamil Nadu - 2017</b>	

## **Multipurpose River Valley Projects**

Multipurpose river valley projects are basically designed for the development of irrigation for agriculture and hydropower generation. However, they are used for many other purposes as well.

### **Mettur Dam**

The Mettur Dam was constructed in a gorge, where river Cauvery enters the plains. It is one of the oldest dam in India. It provides irrigation to Salem, Erode, Karur, Tiruchirappalli, Thanjavur, Tiruvarur and Nagapattinam districts for about 2,71,000 acres of farmland. The dam, park, major hydroelectric power stations and hills on all sides make this dam an important tourist spot.

### **Bhavani Sagar Dam**

The Bhavani Sagar Dam is located 80 km away from Coimbatore city in the district of Erode. It has been constructed across the river Bhavani. This dam is one of the biggest earthen dams in the country.

### **Amaravathi Dam**

The Amaravathi dam is situated 25 km away from Udumalpet in Tirupur district. The dam has been constructed across the river Amaravathi, a tributary of Cauvery. The dam was built primarily for irrigation and flood control. A small hydropower station has also been installed recently. This reservoir is notable for the significant population of mugger crocodiles. It is also a familiar tourist spot.

### **Krishnagiri Dam**

Krishnagiri dam is situated at a distance of 7 km from Krishnagiri towards Dharmapuri. This dam drains an area of 5428 sq.km. This is a famous tourist spot too. This dam is flooded with tourists during the weekends.

### **Sathanur Dam**

Sathanur Dam was constructed across the river Thenpennai in Chengam taluk. It is in the midst of Chennakesava hills. The waterholding capacity of the

dam is 7321 million cubic feet (full level: 119 feet). About 7183 hectares of land is drained by the left bank canal and 905 hectares by the right bank canal of this dam. It irrigates the land in Thandrampet and Tiruvannamalai blocks. There is also a large crocodile farm and a fish grotto. Parks are maintained inside the dam for tourists and the gardens are used by the film industry.

### **Mullaiperiyar Dam**

Mullaiperiyar dam was built by the British administration in 1895. It has been constructed on the Periyar river, which originates from Thekkady hills of Kerala. The dam was built mainly for watering the farming land of Tamil Nadu, which is perennially drought-prone. Though the dam is located in the state of Kerala, most of its water is used to irrigate Tamil Nadu. The dam is 175 feet in height and 1200 feet in length.

### **Vaigai Dam**

This dam built across the river Vaigai near Andipatti. The dam with a height of 111 feet can store water up to 71 feet. It is located 7 km from Andipatti and 70 km from Madurai. This dam was opened on 21 January, 1959. The dam has a unique garden that deserves the surname 'Little Brindavan'. It is a popular picnic spot in Theni district.

### **Manimuthar Dam**

Manimuthar dam is located about 47 km from Tirunelveli. The gorgeous garden of the dam is located about 5 km from the dam and is accessible through a zig-zag ghat road. Pleasure boating and waterfalls are additional tourist attractions near the dam.

### **The Papanasam Dam**

It is also known as Karaiyar dam and is located about 49 km away from Tirunelveli. The dam is used to irrigate 34,861 hectares of land in Tirunelveli and Thoothukudi districts. It generates 28 MW of hydro power.



## **Parampikulam Aliyar Project**

It is a joint venture of Tamil Nadu and Kerala states. It envisages the construction of seven interconnected reservoirs by harnessing the water of seven rivers, which include major rivers of Parambikulam and Aliyar.

Parappalar project is located near Ottanchatram. Its storage capacity is 167 million cubic feet of water. It is about 75 km from Madurai and is in Palani taluk.

## **Surface water Resources**

The total surface water potential of the state is about 24,864 mcm (million cubic metre). There are 17 major river basins in the state with 81 reservoirs and about 41,262 tanks. Most of the surface water has already been tapped, primarily for irrigation, where water use is largest. An area of 24 lakh hectares of the land are irrigated by surface water through major, medium and minor schemes.

## **Ground Water Resources**

The utilizable groundwater resource of the state is 22,423 mcm. The current level of utilization of water is about 13,558 mcm which is about 60 percent of the available recharge, while about 8875 mcm (40 percent) is the balance available for use.

## **Water Resource Management**

Water resource management is the activity of planning, developing, distributing and managing the optimum use of water resources. The demand for water in Tamil Nadu is increasing at a fast rate both due to increasing population and also due to larger per capita needs triggered by economic growth. The per capita availability of water resources is just 900 cubic metres when compared to the national average of 2,200 cubic metres. Agriculture is the largest consumer of water in the state using 75% of the state's water resources. Demands from other sectors such as domestic and industries have been growing significantly. The state is heavily dependent on monsoon rains. Since the state is entirely dependent on rains for recharging its water resources, monsoon failures lead to acute water scarcity and severe droughts. So, it is important to save water for us and the future generation.

## Mineral Resources

Tamil Nadu is the leading holder of country's resources of vermiculite, magnetite, dunite, rutile, garnet, molybdenum and ilmenite. The state accounts for the country's 55.3% of lignite, 75% of vermiculite, 69% of dunite, 59% of garnet, 52% of molybdenum and 30% of titanium mineral resources.

Important minerals are found in the state are as follows: Neyveli has large lignite resources. Coal is also available in Ramanathapuram. Oil and gas are found in the Cauvery basin.

Iron deposits are found in Kanjamalai region in Salem district and Kalrayan Malai region of Tiruvannamalai district. Magnesite ores are available near Salem. Bauxite is found in Servarayan Hills, Kotagiri, Udagamandalam, Palani and Kollimalai areas. Gypsum is obtained in Tiruchirappalli, Tirunelveli, Thoothukudi and Virudhunagar districts. Ilmenite and rutile are found in the sands of Kanyakumari beach. Limestone is available in Coimbatore, Cuddalore, Dindigul, Kancheepuram, Karur, Madurai, Nagapattinam, Namakkal, Perambalur, Ramanathapuram, Salem and Tiruvallur districts. Magnesite is obtained in Coimbatore, Dharmapuri, Karur, Namakkal, the Nilgiris, Salem, Tiruchirappalli, Tirunelveli and Vellore districts. Feldspar, quartz, copper and lead are also found in some parts of the state.

## Industries

Industries use raw materials and convert them into usable product or goods. Textiles, sugar, paper, leather, cement, electrical equipment, automobiles, information technology and tourism are the major industries of Tamil Nadu.

### Textile Industry

Textile industry is one of the traditionally well-developed industries in Tamil Nadu. The textile mills are concentrated in Coimbatore, Tirupur, Salem, Palladam, Karur, Dindigul, Virudhunagar, Tirunelveli, Thoothukudi, Madurai and Erode. Tamil Nadu has about 3,50,000 power looms manufacturing cotton fabrics and accounts for 30% of India's exports of textiles products. Erode in Tamil Nadu is well known for marketing of handloom, power loom and readymade garments. Coimbatore is also known as the 'Manchester of Tamil

Nadu'. Coimbatore, Tirupur and Erode contribute a major share to the state's economy through textiles. So, this region is referred as 'Textile Valley of Tamil Nadu'. Karur is known as 'The Textile capital of Tamil Nadu'.

### Silk Textiles

Tamil Nadu occupies fourth position in the country in silk production. Kancheepuram silk is unique in its quality and is known for its traditional value all over the world. The annual silk production in Tamil Nadu is around 1200 metric tons. Kancheepuram, Arani, Kumbakonam, Salem, Coimbatore, Madurai and Tirunelveli are the important silk-weaving centres in Tamil Nadu. Ramanathapuram has some specialised areas for the manufacturing of synthetic silk clothes.

### Leather Industry

Tamil Nadu accounts for 60% of leather tanning processes of India and 38% of all leather footwear, garments and components. Hundreds of leather tanneries are located around Vellore and nearby towns, such as Ranipet, Ambur and Vaniyambadi. The Vellore district is the top exporter of finished leather goods in the country. Vellore leather accounts for more than 37% of the country's export of leather and leather-related products (such as finished leathers, shoes, garments and gloves). Central Leather Research Institute (CLRI), a CSIR research laboratory, is located in Chennai.

#### GI Tag

GI(Geographical Indication)is a name or sign used on products which corresponds to a specific geographical location. It provides rights and protection of holders.

Some important GI Tags of Tamil Nadu are:

Place	Products
Aranl	Silk
Kancheepuram	Silk
Coimbatore	Wet Grinder and Coracotton
Thanjavur	Paintings, Art plate, Doll and veenai
Nagercoil	Temple Jewellery
Erode	Turmeric
Salem	Venpattu(salem silk)
Bhavani	Jamakkalam

Madurai	Sungudi
Swamimalai	Bronze Icons
Nachiarkovil	Kuthuvilakku
Pattamadai	Mat
Nilgiri	Orthodox Embroidery
Mahabalipuram	Stone sculpture
Sirumalai	Hill banana
Eathomozhi	Coconut

## Paper Industry

Many paper industries are located in the state. Tamil Nadu Newsprint and Papers Limited (TNPL) is a government of Tamil Nadu enterprise producing newsprint and printing and writing paper at its mill located at Kagithapuram in Karur district. It was started in 1979 with an installed capacity of 2.45 lakh MT of production per annum. TNPL is one of the most accomplished mills in the world, producing different varieties paper of acceptable quality primarily from bagasse and pulpwood. Other paper mills of the state are found in Pukkathurai of Kancheepuram district, Bhavanisagar, Pallipalayam, Paramathi Vellore, Coimbatore, Udumalaipet, Thoppampatti, Nilakkotai and Cheranmahadevi.

## Cement Industry

Cement production and consumption continue to grow despite the general recession in the economy. India is one of the largest cement producers and ranked second in the world with an annual production capacity of 181 million tons. Tamil Nadu Cements Corporation Limited (TANCEM) is one among the major cement producers in Tamil Nadu operating two cement units: one at Ariyalur and another at Alangulam. Asbestos cement sheet plant at Alangulam and stoneware pipe unit at Virudhachalam are the other units of TANCEM. Sankar Cement, Zuari Cement, Ultratech Cement, Madras Cement and Dalmia Cement are the major private cement brands produced in Tamil Nadu.

## Information Technology

According to National Association of Software and Services Companies (NASSCOM), the southern states continue to account for more than half of the

country's total export of software. Tamil Nadu and Andhra Pradesh together account for 59.6% of India's total software exports. Tamil Nadu is the second largest software exporter in the country next to Karnataka.

A special economic zone (SEZ) is an area in which the business and trade laws are different from the rest of the country. SEZs are located within a country's national borders, and their aims include increased trade balance, employment, increased investment, job creation and effective administration.

### **Special Economic Zones**

Special economic zones (SEZs) provide an internationally competitive and hasslefree environment for exports. Units in SEZ manufacture goods and provide a range of services. SEZs are located in Nanguneri, Ennore, Hosur and Perambalur. IT & ITES SEZ named TIDEL-II and TIDEL-III and Bio-Pharmaceuticals SEZ are located in Chennai and Coimbatore SEZ called the TIDEL Park-IV is located in the city.

#### **The list of IT parks in Tamil Nadu**

Tidel Park, Ascendas, Mahindra world city 4 IT & ITES SEZ  
TIDEL-II, IT & ITES SEZ TIDEL-III, Coimbatore SEZ - Tidel Park

### **Manufacturing & Engineering Industry**

The manufacturing industry is one of the vibrant sectors of the state economy and contributes significantly to the industrial output. The manufacturing industry broadly covers manufacture of machinery and equipment, motor vehicles, basic metal and alloy industries, metal products and repair of capital goods. Tamil Nadu's share of the industrial output is around 11-12% of the country's output and 15% of the country's exports excluding software. Tamil Nadu accounts for about 17% of India's software exports.

### **Automobile Industries**

The share of Tamil Nadu in all-India production of automobiles and heavy vehicles is rather significant. Automobile industry plays a crucial role in the state's economy and has been one of the key driving factors. Contributing 8 percent to state GDP and giving direct employment to 2,20,000 people.

Tamil Nadu accounts for about 21% of passenger cars, 33% of commercial vehicles and 35% of automobile components produced in India. Major automobile manufacturers like Ford, Hyundai, HM-Mitsubishi, Ashok Leyland, and TAFE have their manufacturing base in Tamil Nadu.

### **Chemical & Plastic Industry**

The chemical industry is one of the fastest growing sectors of industry and the economy. The sector contributes 13% to the state's GDP and constitutes 8% of the total exports of the country.

### **Handlooms and Powerlooms**

The handloom sector in the state is the single largest cottage industry providing livelihood to a large number of rural people and promoting export earnings. The handloom sector and its related economic activities generate gainful employment for more than 4.29 lakh weaver households and 11.64 lakh weavers in the state. These societies mainly produce the cloth required for the scheme of 'Free Supply of Uniforms to School Children and Free Distribution of Sarees and Dhotis Scheme'.

### **Sugar Industry**

Sugar industry in Tamil Nadu is an important agro-based industry. It plays a vital role in the economic development of the state, particularly in rural areas. The sugar industry provides large-scale direct employment to several thousands and indirect employment to several lakhs of farmers and agricultural labourers in the rural areas who are involved in cultivation of sugarcane, harvesting, transporting and other services. There are 34 sugar mills in Tamil Nadu, in which 16 are in the cooperative sector and 18 in the private sector.

### **Tourism Industry**

Tourism is considered as an industry because of its enormous potential in creating employment for a large number of people. In recent years, the state has emerged as one of the leading tourist destinations for both domestic and foreign tourists. Tourism in Tamil Nadu is promoted by Tamil Nadu Tourism Development Corporation (TTDC). The state currently ranks the highest

among Indian states with about 25 crore arrivals (in 2013). The annual growth rate of this industry stood at 16%. Approximately 28 lakh foreign and 11 crore domestic tourists visit our state annually. The presence of ancient monuments, pilgrim centres, hill stations, a variety of natural landscapes, long coastline, along with rich culture and heritage make Tamil Nadu the best destination for tourists.

### Activity

Plan a visit to a manufacturing unit in your city. Find out how raw materials are converted into finished products. Talk to the workers and manager to know more about the industry.

Plan a field visit with your social science teacher to visit a variety of geographical features, pilgrim centres, monuments, hill stations and prepare a field visit report.

### Population

The term 'population' refers to the number of people living in a defined area. The statistical study of the characteristics of human population is called demography. Demographers make a deep and detailed study of the population. The rapid increase of population may be responsible for retarding economic growth. Hence, overpopulation is one of the major problems confronting our nation with all its evil effects.

### Growth of Population in Tamil Nadu

The total population of Tamil Nadu is 72,140,703 or 7.21 crores as per 2011 Census. Its population was 6.24 crore in 2001 and registered a growth of nearly 1 crore population in a decade. The male and female population of the state in 2011 is 36,137,975 and 36,009,055 respectively and it was 31,400,909 and 31,004,770 in 2001. It shows that the population of the state is shared almost 50% each by male and female. The growth rate of population in the decade 2001-2011 was 15.61% while in the previous decade it was 11.19%. The population of Tamil Nadu forms 5.96% of country's total population as per 2011 Census. In 2001, it was 6.07%.

## **Distribution of Population**

Based on the actual size of population, Tamil Nadu is divided into the following regions.

### **Regions of High Population**

Chennai has the highest urban population with 4.219 million people, but the city ranks second in the district-wise count, next to Coimbatore district, which had 4.224 million people as per 2011 Census. Coimbatore, Chennai, Tiruvallur, Kancheepuram, Villupuram, Dharmapuri, Salem, Madurai and Tirunelveli are the most populous districts in the state. Agriculture and industrial development are the main causes of high concentration of population of these districts.

### **Regions of Moderate Population**

Tiruvannamalai, Cuddalore, Tiruchirapalli and Thanjavur districts have a population 30- 35 lakh. Vellore, Dindugal, Virudhunagar and Thoothukudi districts each have a population of 15-20 lakh. Other than agriculture, small-scale industries and fishing along the coastal areas are the major occupations of people in these districts.

### **Regions of Sparse Population**

The coastal districts Nagapattinam, Tiruvarur, Pudukottai, Ramanathapuram and Sivagangai have a less than 15 lakh. The Nilgiris district has a population of less than 10 lakh (764,826) population and it is the least populated district as per 2011 Census.

### **Population Density**

The density of population in Tamil Nadu is 555 per sq.km as per the 2011 Census, while it was 480 per sq.km in 2001. The state ranks 12<sup>th</sup> among the Indian states in population density. The national average density of population as per the 2011 Census is 382. Chennai is the densest district with 26,903 persons per sq.km followed by Kanyakumari (1106), Tiruvallur (1049), Kancheepuram (927), Madurai (823), Coimbatore (748), Cuddalore (702), Thanjavur (691), Nagapattinam (668), Salem (663), Vellore (646) and Tiruchirappalli (602). These are the regions with high density of population.



The least density of population is recorded in the Nilgiris (288 per sq.km) and the other districts have moderate density of population.

## Religion

Hinduism, Christianity and Islam are the major religions in the state. The Hindus constitute 87.58% of the population, followed by Christians (6.12%) and Muslims (5.86%). Jainism (0.12%), Sikhism (0.02%) and Buddhism (0.02%) also have a presence in the state.

People of other religions constitute 0.01% and the percentage of people with unstated religion is 0.26%.

## Urban and Rural Population

As per 2011 Census, the urban population of Tamil Nadu is 3,49,17,440, which constitutes 48.40% of the total population of the state. The rural population of the state is 3,72,29,590, which constitutes 51.60% of the state population.

## Sex Ratio

The sex ratio represents the number of females per 1000 males. The sex ratio of the state increased from 987 in 2001 to 995 in 2011.

The sex ratio in India is 940 in 2011 as against 933 in 2001. It shows that the sex ratio is more favourable in the state than the country.

As per 2011 Census, 15 out of 32 districts have recorded the sex ratio of more than 1000 and a similar trend was noticed in the 2001 Census also. Only Sivagangai has recorded the sex ratio of exactly 1000. It is noted that 12 districts have the sex ratio of less than 1000 and it ranges between 980 and 1000. The highest sex ratio is found in the Nilgiris district (1041) followed by Thanjavur district (1031). The lowest sex ratio is reported in Dharmapuri district (946) followed by Salem district (954).

## Literacy Rate

The literacy rate of Tamil Nadu as per the 2011 Census is 80.33%. It was 73.45% in 2001. The male literacy rate is 86.81% and the female literacy rate is 73.86%. The corresponding rates in 2001 were 82.42% for males and 64.43% for

females. It may be observed that more than three-fourths of the population is literate among males in all the districts (except Dharmapuri), while more than two-thirds of the population is literate among females in all but eight districts. The districts are Dharmapuri (60.03%), Krishnagiri (64.86%), Tiruvannamalai (65.71%), Villupuram (63.51%), Salem (65.43%), Erode (65.07%), Perambalur (66.11%) and Ariyalur (62.22%).

The literacy rate for India as per 2011 census is 74.04, of which the male literacy rate is 82.14 and the female literacy rate is 65.46. In 2001, the literacy rate of India stood at 64.8. It was 75.3 and 53.7 for males and females, respectively. The district of Kanyakumari has reported the highest literacy rate (92.14%) while Dharmapuri district has the lowest rate (64.71%). A high level of literacy rate is also seen in Chennai (90.33%), Thoothukudi (86.52%), the Nilgiris (85.65%) and Kancheepuram (85.29%) districts.

## Transport and Communication

### Roadways

The State has a total road length of 167,000 km, in which 60,628 km are maintained by state Highways Department. It ranks second in India with a share of over 20% in total road projects under operation in the Public-Private Partnership (PPP) model.

Types of the Roads	Length (Km)
National Highways	4994
State Highways	57291
Corporation & Municipalities Road	23350
Panchayat Union	147543
Village Panchayat Union	21049
Others (Forest Roads)	3348
Commercial	12.13
Non commercial	20.341 Lakhs
Source: Statistical handbook of Tamil Nadu - 2017	

### Railways

Tamil Nadu has a well-developed rail network as part of Southern Railway, headquartered at Chennai. The present Southern Railway network

extends over a large area of India's southern peninsula, covering Tamil Nadu, Kerala, Puducherry, minor portions of Karnataka and Andhra Pradesh. Tamil Nadu has a total railway track length of 6,693 km with 690 railway stations in the state. The system connects it with most of the major cities in India. Main rail junctions in the state include Chennai, Coimbatore, Erode, Madurai, Salem, Tiruchirappalli and Tirunelveli. Chennai has a well-established suburban railway network, a mass rapid transport system(MRTS) and is currently developing a Metro system, with its first underground stretch in operation since May 2017.

## Airways

Tamil Nadu has four major international airports. Chennai International Airport is currently the third largest airport in India after Mumbai and Delhi. Other international airports in Tamil Nadu include Coimbatore, Madurai and Tiruchirapalli airports. It also has domestic airports at Tuticorin and Salem connecting several parts of the country. Increased industrial activity has given rise to an increase in passenger traffic as well as freight movement, which has been growing at over 18% per year.

NH - 44 is the longest national highway in Tamil Nadu which runs from Hosur to Kanniyakumari (627.2 km) Via Dharmapuri-Salem-Karur- Dindigul-Madurai-Tirunelveli.

NH - 785 is the shortest national highway in Tamil Nadu which runs from Madurai to Natham (38 km).

## Waterways

Tamil Nadu has three major ports. They are in Chennai, Ennore and Tuticorin. It has an intermediate port at Nagapattinam and 15 minor ports. The ports are currently capable of handling over 73 million metric tonnes of cargo annually (24% share of India). All the minor ports are managed by the Tamil Nadu Maritime Board, Chennai Port. This is an artificial harbour and the second principal port in the country for handling containers. It is currently being upgraded to have a dedicated terminal for cars capable of handling 4,00,000 vehicles. Ennore intermediate port was recently converted as a major port and handles the major coal and ore traffic in Tamil Nadu.

## Communication

Communication is derived from the Latin word *communicare*, meaning 'to share'. The act of conveying or exchanging information is called means of communication. They are mass communication and personal communication.

### Postal Districts and Headquarters in Tamil Nadu

Zone /districts	Head quarters
Chennai	Chennai
Western	Coimbatore
Central	Thiruchirapalli
Southern	Madurai

## Trade

Export and import are the two components of trade. Export means goods and services sold for foreign currency. Tamil Nadu contributes 12.2% to the country's exports. Import refers to goods and services are brought from overseas producers. Tamil Nadu imports many goods from outside. The difference between the values of export and import is called the balance of trade.

### Major Exports of Tamil Nadu

(i) Agricultural Products	tobacco, cereals, cotton, sugarcane, paddy, groundnut, spices and vegetables.
(ii) Leather Products	wallets, purses, pouches, handbags, belts, footwear and gloves
(iii) Gems and Jewellery	pearls, precious stones, gold jewellery, decorations and antiques
(iv) Chemicals and related products	paper, chemicals, rubber and glass.

## **Imports of Tamil Nadu**

Machineries like transport equipment, machine tools, non-electrical machinery, electrical machinery, pharmaceutical products, petroleum, fertilizers and newsprint are its major imports. The state contributes 10.94% to the country's trade through major ports.

The above discussion shows that Tamil Nadu is an important state of India in terms of size, population, resources and economic development. People in the state are well secured. The new schemes introduced by the state government periodically have enabled notable progress in various fields.

## **Man made Disasters in Tamil Nadu**

### **Definition**

A disastrous events caused directly or indirectly by human actions are called as manmade disaster. Man-made disaster can include hazardous material spills, fires, groundwater contamination, transportation accidents, structure failures, mining accidents, explosions and acts of terrorism.

### **Industrial Disaster**

Disasters caused by industrial companies either by accident, negligence, or incompetence fall under industrial disasters. Electrical faults seem to be the major reason for industrial disasters in the country. Overheating, aging of the material and use of sub-standard quality of electrical gadgets have been the main factors contributing to the increasing fire accidents in industries. Electricity is not just a life line; It can also take away life when handled improperly', Apart from these, explosions, leaking of poisonous gases, injuries and deaths caused by machines are the other causes of industrial disasters.

Sivakasi, is considered the "fireworks capital" of India. Series of industrial accidents causing deaths are reporting frequently in the regions of Virudhunagar and Sivakasi where a number of fireworks and match units are in operation. An explosion occurred on 5 September, 2012 in a private firework company. In this incident 40 workers were killed and more than 70 workers were injured. Various measures are being taken by the Government to reduce the fire accidents and casualties caused by industries. In another industrial

accident which took place at Coimbatore on 2nd February 2016 in a tyre melting unit, six migrant workers were critically injured.

## Stampede

A situation in which a large number of animals or people running in the same direction in an uncontrolled way causing injuries and deaths is called stamping. On 21st April, 2019 seven people were killed and 10 injured in a stampede during a local festival at a temple near Thuraiyur in Tamil Nadu. The incident took place when hundreds of devotees gathered at the Karuppasamy temple in Muthiampalayam village for the 'padikasu' (temple coin) distribution ceremony.

## Mitigation

Hazard mitigation refers to any sustained action taken to reduce or eliminate the longterm risk to human life and property from hazardous conditions.

- Regular maintenance of machines and wires may reduce the frequency of accidents,
- Creating awareness and training the workers to be cautious during work hours may help them to reduce risk during disasters.
- Wearing specially designed dresses and other safety materials would help the workers to protect themselves from any serious injuries.
- Conducting periodical medical camps would help them to assess their health status. The Provision of having life insurance policies will secure their future.
- Besides these, the administration should be employees friendly and ready to extend their help in case of any untoward incidents.

Disaster emergency contact number

1077 - Control room of District Collector/Magistrate.

## Road Accidents

The road accidents in India is on very high level. Tamil Nadu leads in the number of road accidents in the country. Increase in road traffic, high speed of vehicles and violation of traffic rules are the causes of major of accidents. In

2013, 14504 accidents had taken place in the state which resulted in 15563 deaths. In the ten years from 2002-2012, Tamil Nadu tops the list in number of road accidents among the states of India. It is reported that about 15 percent of accidents of the country takes place in Tamil Nadu. The figure of 2017 also puts Tamil Nadu on top with recording of 16157 deaths out of 147913 deaths recorded in the country. Death toll came down rapidly in 2018 to 12213 deaths, a decline of 24.5 percent.

### **Risk Reduction Measures**

**Before:** Avoid Speeding, Drunk and driving, use helmets and seat belts and follow traffic rules

**After:** Call police or ambulance; seek medical attention; make an accurate record and exchange information.

**KNOW - RISK...!**  
**NO - RISK...!**

### **Basic Road Safety Rules**

- Aware of the road signals
- Stop, look and cross
- Listen and ensure whether a vehicle is approaching;
- Don't rush on roads;
- Cross roads in pedestrian crossings;
- Don't stretch hands while driving vehicles;
- Never cross road at bends and stay safe in a moving vehicle.

Accelerated changes in demographic and economic trends disturb the balance which leads to increased frequency and the negative impact of disaster. At present the society face a challenging mix of demographic, ecological and technological condition which make population more vulnerable to the impact of the calamities. Though the number of natural disasters are in decline than they were in the past, the increasing level of magnitude poses a threat. Besides the various measures taken by the government and the public, education on awareness regarding the disasters may help in the reduction of risks during disasters.

For the management of disasters in the state, the following forces and organizations are in service.

- I. State Disaster Management Authority (Chairman-Chief Minister)
- II. Relief/ Disaster Management Department
- III. Police
- IV. Forest Department
- V. Fire and Civil Defence Services
- VI. Health Services
- VII. Transport Department
- VIII. Public Works Department
- IX. Veterinary Services
- X. Food & Civil Supplied Department.

### **The Organizations at District Level**

- (i) District Magistrate (Chairman- District Collector)
  - (ii) Revenue Department
  - (iii) Civil Administration,
  - (iv) Local Police,
  - (v) Civil Defence,
  - (vi) Fire & Emergency Services,
- Home Guards (also Local Community, Non-Governmental Organisations, Voluntary Agencies



## **Unit VIII Natural Disasters Public Awareness for Disaster Risk Reduction**

### **Introduction**

On an average, 232 million people are affected by different types of disasters every year. In recent years disaster risks have been on the rise due to factors such as population growth, unplanned urbanization, environmental degradation, conflicts and competition for scarce resources, climate change, disease epidemics, poverty and pressure from development within high-risk zones. Hence, disaster risk reduction is the need of hour.

Recognizing the importance of Disaster Risk Reduction in 2005, 168 governments and all leading development and humanitarian actors signed the Hyogo Framework for Action (HFA), committing themselves to a ten-year multi-stakeholder and multi-sector plan to invest in disaster risk reduction as a means to building disaster-resilient societies.

Public awareness campaigns can be started modestly and tailored to meet the needs of specific populations and target groups. These approaches can be integrated into almost all existing initiatives, whenever and wherever they take place. They can build on and support existing volunteer mobilisation and peer-to-peer communications. To support this, it requires strong and unified disaster reduction messages and clear and targeted information, education and communication materials.

### **Public awareness for disaster risk reduction**

There are four key approaches to public awareness for disaster risk reduction: Campaigns, participatory learning, informal education, and formal school-based interventions. Let's take formal school based interventions to learn in detail.

#### **Formal school-based interventions:**

The focus of formal school-based interventions cover two areas: school disaster management and disaster risk reduction in school curricula. These are considered to be formal because accountability and responsibility for school safety and curricula belong exclusively to education authorities, so they require support for long-term planning and capacity building.

## School disaster management:

The primary goals of school disaster management are to ensure the safety of students and staff. Sustained school disaster management requires the familiar participatory and on-going process of identification of hazards and risks, mitigation and reduction of risks, and developing response capacity.

A school disaster management plan, developed at the school level, should be the living document that expresses the awareness of public for disaster risk reduction. Every school has to setup the following school disaster committees:

1. Coordination Committees
2. Awareness generation Team
3. Search Rescue and Evacuation Team
4. Site safety Team
5. First Aid Team
6. Warning and Information Team
7. Bus safety Team
8. Water / Food Arrangement Team.

All the teams should participate in the mock drill.

**Mock drills** form a vital part of the school disaster management process, and provide an intensive learning experience. They should be followed by reflection and assessment by all members of the school community. Lessons learned are incorporated into the school disaster management plan, and goals set for improvement next time. Depending on hazards faced, there are several major types of drills that can be practiced:

## Disasters and Rules of actions during disasters

### Earthquake

An earthquake is sudden, rapid shaking of the ground caused by the shifting of rocks beneath the earth's surface. Earthquakes strike suddenly without warning and can occur at any-time. The impacts of the earthquakes include deaths, injuries and damage of property. You have learned about occurrence of the earthquake and other related information in the earlier part of the book.

### **Nepal - India Earthquake**

The April 2015 Nepal Earthquake (also known as the Gorkha Earthquake) killed nearly 9,000 people and injured nearly 22,000. It occurred on 25 April, with a magnitude of 8.1 Richter scale. Its epicentre was east of Gorkha District at Barpak. It was the worst natural disaster to strike Nepal since 1934 Nepal-Bihar earthquake. The earthquake triggered an avalanche on Mount Everest, killing 21 people making April 25, 2015 the deadliest day on Nepal's history. The earthquake triggered another huge avalanche in the Langtang Valley, where 250 people were reported missing.

### **Mock drill: Earthquake**

In case we are inside the class when earthquake occurs, instruct loudly "earth quake position - drop, cover, and hold on". Drop down on your knee. Cover your head, neck and face. Go under a table to protect your head.

### **Rules of actions during an earthquake:**

1. Stay calm, do not panic.
2. If you are in a building, sit down on the floor under a table or any other furniture and firmly hold on to it until the earthquake has stopped.
3. If there is no table nearby, cover your face and head with your hands and sit on the floor in a corner of the room.
4. Keep away from glass windows, glass doors and things that can fall down.
5. Do not try to leave the building quickly; during earthquakes people mostly die because they try to run out of the building and become trapped under ruins if the building is destroyed.
6. Do not go to the staircase, a balcony or an elevator.
7. If you are in the street, keep away from buildings; try to get into an open space and avoid power transmission lines.
8. If you are at home, turn off electrical equipment and gas quickly.
9. If you are in chemistry class or a laboratory where chemicals are stored, try to leave the room because chemicals may cause injuries;

### **After earthquake:**

1. First check if you have any injuries, and then check the condition of the surrounding people. If you cannot do this, wait for the rescue team;

2. After the earthquake when you leave the shelter, do not return for 2-3 hours because the quakes may repeat (an aftershock).
3. Check if there is fire; in case of a mild one try to extinguish it.
4. Be cautious about the possibility of gas leakage and damage caused to electrical wiring.
5. Be careful while opening wardrobe doors to take necessary items;
6. Use only lanterns; do not use an oil lamp or a candle.
7. Listen to the radio to receive information about the earthquake.

## **Landslide**

A landslide is defined as the movement of a mass of rock debris down a slope. Landslides are caused by the direct influence of gravity. Landslides can be caused by rainfall, snowmelt, stream erosion, and flood, earthquakes, volcanic activity, disturbance by human activities, or any combination of these factors. Landslides cause property damage, injury and death and adversely affect a variety of resources. For example, water supplies, fisheries, sewage disposal systems, forests, dams and roadways can be affected.

### **During a Landslide**

1. Listen for any unusual sounds that might indicate moving debris, such as trees cracking or boulders knocking together.
2. If you are near a river, be alert for any sudden increase or decrease in water flow and for a change from clear to muddy water. Such changes may indicate landslide activity upstream, so be prepared to move quickly.
3. Be alert especially when driving. Embankments along roadsides are particularly susceptible to landslides.
4. Disconnect the power supply in the areas of landslide.

### **After the Landslide**

1. Stay away from the slide area. There may be danger of additional slides
2. Check for injured and trapped persons near the slide, without entering the direct slide area.
3. Direct rescuers to their locations.
4. Listen to local radio or television for the latest emergency information
5. Watch for flooding, which may occur after a landslide or debris flow.

## Cyclone

The major natural disaster that affects the coastal regions of India is cyclone and as India has a coastline of about 7516 km; it is exposed to nearly 10 percent of the world's tropical cyclones. About 71 percent of flood prone areas are in ten states (Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Pondicherry, Andhra Pradesh, Orissa and West Bengal). The islands of Andaman, Nicobar and Lakshadweep are also prone to cyclones.

Districts in Tamil Nadu which are frequently affected by cyclones: All the 13 coastal Districts of Tamil Nadu are affected by cyclonic storms which occur during May-June and in October-November months. These Districts are: Tiruvallur, Chennai, Kancheepuram, Villupuram, Cuddalore, Nagapattinam, Tiruvarur, Tanjavur, Pudukkottai, Ramanathapuram, Tuticorin, Tirunelveli and Kanniyakumari.

On an average, about five or six tropical cyclones form in the Bay of Bengal and Arabian sea and hit the coast every year. Out of these, two or three are severe. When a cyclone approaches to the coast, a risk of serious loss or damage occurs from severe winds, heavy rainfall, storm surges and river floods. The effect of a storm surge is most pronounced in wide and shallow bays exposed to cyclones such as in the northern part of Bay of Bengal. Most cyclones occur in the Bay of Bengal followed by those in the Arabian Sea and the ratio is approximately 4:1. During the cyclonic of cyclonic storms, wind speed is between 65 km/h and 117 km/h.

### Rules of action before a cyclone

1. Go to high-lying places from low-lying areas
2. Those residing in old buildings should temporarily relocate to safer buildings; Jewels and documents should be kept in safe custody.
3. Battery-operated radio, plastic torchlight, lamp, kerosene, match-box should be kept safely for future use.
4. Keep in ready all the first-aid kit and material available with you.
5. Keep in stock foodstuffs, material, fuel, drinking water and life-saving drugs needed for the next week.
6. It is also important to take cattle and other pets to safer places.
7. It is important to know that if we see quickly approaching storm clouds it is possible to predict strong winds several minutes in advance.

## During a cyclone

1. If you are in a building during a strong gust, it is necessary to close and fasten windows and doors. It is better to stay in the rooms.
2. Turn off all electrical devices.
3. Protect yourself with your hands or a scarf. Protect the eyes, nose and mouth from dust.
4. If you are in a wildlife area, try to find a place protected from the wind. If there is no such place nearby, lie down on the ground.
5. If you are in a car it is better to stay there and close the windows. Do not park the car under unstable objects that can break down and fall on the car.

## After cyclone

1. Turn off electricity, gas and water and unplug all electric appliances.
2. Beware of snakes and other animals immediately after the cyclone.
3. Do not go for sightseeing.
4. Stay away from damaged power lines, falling trees and flood water.
5. Boil and purify water before drinking.

## Flood

Flood destructions have always brought miseries to numerous people, especially in rural areas. Flood results in the outbreak of serious epidemics, specially malaria and cholera. Simultaneously, scarcity of water also arises. It has a drastic effect on agricultural produce. Sometimes, water remains standing over large areas for long span of time hampering the Rabi crops.

India is one of the most flood prone countries in the world. The principal reasons for flood lie in the very nature of natural ecological systems in this country, namely, the monsoon, the highly silted river systems and the steep highly erodible mountains, particularly those of the Himalayan ranges. The average rainfall in India is 1,150 mm with significant variation across the country. The annual rainfall along the western coast and the Western Ghats, Khasi hills and over most of the Brahmaputra valley amounts to more than 2,500 mm. Twenty-three of the states (29) and union territories (6) in the country are subject to floods and 40 million hectares of land, roughly one-

eighth of the country's geographical area, is prone to floods. The National Flood Control Program was launched in the country in 1954.

Mock Drill means Practicing of something that can happen in future so that it can be easily dealt with in.

- Tropical Cyclone Vardha hit Chennai on 12 December, 2016. National Disaster Management Authority (NDMA) reports that at least 10 people have died in Tamil Nadu.
- Maximum sustained wind speeds of over 130 km/h were recorded, and the storm has caused severe damage to parts of the city of Chennai. Over 4,000 trees have been uprooted, power lines downed and buildings damaged.

### Do's before flood

1. Keep furniture and electrical appliances on beds and tables
2. Put sandbags in the toilet bowl and cover all drain holes to prevent sewage back flow.
3. Keep your mobile charged
4. Listen to radio or watch television for the latest weather bulletin and flood warnings.
5. Keep strong ropes, a lantern, battery operated torches, extra batteries ready.
6. Keep umbrellas and bamboo sticks with you for protection from snakes.

### Drought

The above map shows most the acute shortage of water in Tamil Nadu in 10 years. (2017) Drought is a period of time (months or years) during which a part of the land has shortage of rain, causing severe damage to the soil, crops, animals, and people. It sometimes causes even death. During drought high temperature is experienced. Such conditions may affect our health.

The primary cause of drought is deficiency of rainfall and in particular, the timing, distribution and intensity. In India around 68 percent of the country is prone to drought. Of the entire area 35 percent receives rain falls between 750 mm and 1,125 mm which is considered drought prone while 33 percent areas receive rainfalls less than 750 mm is considered to be chronically drought prone.

## Rules of action before, during and after Drought

### Before drought:

1. Rainwater harvesting should be followed.
2. Sewage water should be recycled and used for domestic purpose.
3. Building canals or redirecting rivers for irrigation.
4. Utilise water economically.

### During drought:

1. Wear cotton clothing and a hat.
2. In case of overheating, immediately move to a shady area.
3. Consume adequate amounts of water stay.

### After drought:

1. If anyone faints after sunstroke, emergency medical measures should be taken.
2. Contact local government agencies to receive information about disaster and assistance for the population.

## Lightning

Lightning is an atmospheric electrostatic discharge (spark) accompanied by thunder, which typically occurs during thunderstorms, and sometimes during volcanic eruptions or dust storms. Lightning generates 10-20 ampere current and it is therefore fatal. It is especially dangerous for people in an open area.

- You can hear thunder from about 16 km of its starting point.
- Lightning bolts travel at the speed of up to 80,000 km / second.
- The average length of a single lightning bolt is 3-4km.

Lightning strikes often have fatal consequences. On an average, 2000 people die from lightning in the world every year. Lightning mostly strikes tall things, such as trees that break down and catch fire or it may strike power transmission lines and antennas fastened on roofs and buildings which causing fire. The air temperature, when lightning occurs, is as hot as 9982.2 °C.



Thunder is the sound caused by lightning. A charged, superheated lightning bolt creates a “resonating tube” as it travels. The air in the tube rapidly expands and contracts causing vibrations that we hear as the rumble of thunder. Lightning strikes can explode a tree. Imagine 15 million volts of electricity hitting a tree branch. The heat travels through the tree, vaporizing its sap and creating steam that causes the trunk to explode.

### **Before lightning**

1. If you are planning to go to the countryside, check the weather forecast.
2. If a thunderstorm is expected it is better to postpone the trip.
3. It is good if you can estimate the distance to the front line of a thunderstorm. In order to do this you must check the time interval from the moment you see the lightning until you hear thunder. Lightning always precedes thunder. We know that the sound speed travels on average about 1km every 3 seconds. Reduction of the time interval between the sight of lightning and the resulting thunder means that the danger is approaching and protective measures must be taken. If there is no interval between lightning and thunder means, it means that the cloud is already over your head.

### **During Lightning:**

1. If you are in a building it is necessary to close windows, doors, ventilation pipes and chimneys.
2. It is necessary to turn off the telephone, TV set, and other electrical equipment because lightning may strike electrical cables and pass through wiring.
3. Do not take a shower because both water and metal conduct electricity.
4. Do not light the fireplace because the heat coming from the chimney may attract lightning.
5. It is better to stay away from electric wires, lightning rods, water pipes, antennas and windows.
6. If you are in an open area during a thunderstorm, do not stand under a tall tree. Lightning is most damaging for tall trees. It is better to stay 30-40 meters away from them. Avoid trees that are standing separately. Remember that lightning does not strike bushes.
7. If the area is open, it is better to find a lower place or a cavity and squat there. It is dangerous to stand or lie down on the ground, because this increases the exposure area.
8. It is necessary to get rid of metal items such as a bicycle, coins etc.

9. Do not stand under an umbrella.
10. Do not run during the occurrence of lightning; move slowly towards a shelter because the air flow may attract lightning;
11. If you are in a car, do not get out. It is better to close the windows and turn off the antenna. Do not park your car under tall trees or any structures that may fall down and hit you.
12. If there is an injured person next to you, remember that the victim may lose consciousness. It is necessary to provide first aid.
13. Cover your mouth with a wet cloth in order to protect your lungs.

## Glossary

1. **Disaster:** A serious disruption of the functioning of a society involving human, and material, and impacts that exceed the ability of the affected society to cope using its own resources.
2. **Disaster risk reduction:** The practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters.
3. **Mitigation :** The lessening of the adverse impacts of hazards and related disasters
4. **Preparedness:** The capacity developed by organizations, to effectively anticipate, respond to, and recovers from the impacts of disaster events.
5. **Prevention:** The outright avoidance of adverse impacts of hazards and related disasters.
6. **Public awareness:** The extent of common knowledge about disaster risks, the factors that lead to disasters and the actions that can be taken, to reduce vulnerability to hazards.
7. **Resilience:** The ability of a society exposed to hazards to resist, absorb, adapt to and recover from the effects of a disaster.
8. **Hyogo Framework for Action-** A global blueprint for disaster risk reduction efforts between 2005 and 2015 - by providing specific operational guidance for promoting disaster risk reduction.

12<sup>th</sup>

## 8. MAN- MADE DISATERS

### Introduction

#### "Mumbai railway station stampede kills at least 22"

"Rush-hour crush on footbridge connecting two stations was triggered by falling concrete that caused panic!" At least 22 people have been killed and more than 30 injured during a rush-hour stampede on a bridge between two railway stations in Mumbai. The crush occurred on a narrow footbridge connecting Prabhadevi station, formerly Elphinstone, and Parel station during the Friday, September 29, 2017 morning commuter rush and amid heavy rain. "There was a huge crowd on the foot over bridge. Everybody tried to leave at once and it appeared one of them slipped and fell, triggering the stampede," said an Indian Railways spokesman. Another spokesman said the number of people on the bridge was higher than usual because people were using the station to shelter from the rain. The above incident throws some lights on how to be aware of the accidents we encounter in our daily walk of life. Let us try to answer the following questions:

1. Which is more important life or the scheduled journey to be completed?
2. Why rushing in anything may be disastrous?
3. Why timely communication is more important to avoid accident?

The root of the word disaster ("bad star" in Greek and Latin) comes from an astrological theme in which ancients used to refer to the destruction of a star as a disaster.

### Terms to know:

1. Hazard is a potentially damaging physical event or human activity which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.
2. Disaster is a serious disruption of a society functioning, causing widespread human, material losses which exceed the ability of the affected society to cope using its own resources.
3. Disaster risk management is a set of activities, including structural and non-structural measures to avoid (prevention) or to limit

(mitigation and preparedness) adverse effects of disaster.

4. Capacity - the assets, resources and skills available within a community that can be used to reduce the risks or effects of a disaster.
5. Disaster risk reduction includes activities that will minimize disaster-related losses of life and property.

Disaster is a serious disruption, causing damage or injury to people, buildings, roads, livelihoods, or the environment, which exceed the community's ability to cope.

The magnitude and impact of disasters are increasing and disasters have disrupted social, economic and environmental community activities worldwide. International data shows that disasters have taken, over the last 10 years, more than 478,000 lives. It has affected 2.5 billion people and caused direct economic losses in the amount of 690 billion US dollars worldwide.

Recent financial studies underline the urgent need for a shift from sole disaster response to disaster risk reduction. Therefore, efforts should be made to ensure that disaster risk reduction is an important aspect of poverty reduction and general development initiatives in the coming years.

### **Community-Based Disaster Risk Reduction**

Community is a group of people living in the same place having homogenous characteristics. It includes shared experiences, locality, culture, language and social interests. Community-based disaster risk reduction is a process within a community and for the community. Reducing risk in communities should address the root causes of risks and address it through local knowledge and expertise. Performance and the arts provide a variety of creative opportunities to communicate. Important messages through live experiences. Examples include: Street theatre, dramatic readings, skits and plays, puppet shows, poetry reading.

Dance, flash mob activities in large urban settings (a group of people who assemble suddenly in a public place, perform an unusual act and then disperse), tapping into oral traditions such as story-telling, music and sing-along, mural-making and other hands-on art and design activities. All of these can involve volunteers and community members, as performers and audiences. Skilled performers find creative ways to engage their audience.

## Man - made Disasters

Disasters induced by human beings are man-made disasters. It includes fire accident, transport accident, structure failure, mining accidents, explosions, stampede etc. In this lesson, we study about some of the man-made disasters.

### Stampede

The term stampede is a sudden rush of a crowd of people, usually resulting in injuries and death from suffocation and trampling. In stampede, the term mob or crowd is used to refer to a congregated, active, polarized aggregate of people, which is basically heterogeneous and complex. Its most salient features include homogeneity of thought and action among its participants and their impulsive and irrational actions.

### Causes of stampede

Incidents of stampedes can occur in numerous socio-cultural situations. These stampede incidents can be categorized into the following types: Entertainment events, escalator and moving walkways, food distribution, processions, natural disasters, power failure, religious events, fire incidents during religious/ other events, riots, sports events and weather related events.

Large religious gatherings are a particular stampede danger in the developing world. A 2013 paper out of India, for example, found that 79 percent of stampedes in that country have taken place at religious events, as opposed to political or entertainment-related events.

### Stampede Management

Crowd management is defined as the systematic planning and supervision of the orderly movement and assembly of people. Crowd control is the restriction or limitation of group behavior.

### The rules of action for stampede

**1. Notice Alternate Exit:** First thing to know in such situations is the route out. If you are attending an event, one of the things you can do in

preparation is to try and know the topography of the place. This will help you find the exits. So, when struck in a stampede, try to identify these exits.

**2. Keep Your Hands by Your Chest:** Your hands must be up by your chest like they would be in a boxing position. This makes it easy to move. It also stops your ribs from getting crushed by the crowd on both sides. When the crowd pushes you from front and back, your lungs will be affected. You will suffer of suffocation.

**3. How to move when on your feet:** In the middle of a moving crowd, do not resist the flow by standing still or sitting down. The force is too much to fight. Like in a wave, there is force and in crowd situation. Keep moving diagonally between the pockets of people whenever there is a lull. Try to move towards the exits but not towards walls or fences where you might be cornered. Keep moving with the crowd to avoid falling.

**4. How to move if you fall:** If you fall and get back on your feet, cover your head with your hands and hurl up in a fetal position. Basically, avoid exposing your lungs to the crowd. Keep trying to find an opportunity to get up.

**5. Communicate smartly:** When trapped in the crowd, use sign language such as waving your hands up one side after another so that you will not get exhausted.

**6. Conserve energy:** Keep calm and do not try to scream. That only increases panic.

**7. Set a meeting place:** Arrange a meeting place, in case you get separated, one inside and another one outside.  
If someone extends his/her hand for help, grab hold to keep them up.

**Child safety Tips:** Take a second, take a photo.

Before taking children out to any event, pull out your phone and take a photo of each child individually a selfie. That way you have a picture of how they looked that day. The photo can be sent to police to aid in locating the child in case the child is lost in a crowd.

## Drowning

Drowning is the 3rd leading cause of unintentional injury death worldwide, accounting for 7% of all injury-related deaths. There are an estimated 3, 72, 000 annual drowning deaths worldwide. Children, males and individuals with increased access to water are most at risk of drowning. Drowning is the process of experiencing respiratory impairment from submersion/immersion in liquid; outcomes are classified as death, morbidity and no morbidity.

### Fact File

It is one of our most visceral fears; thrashing in the deep, far below the water's surface, lungs burning for oxygen. Drowning claims hundreds of thousands of lives every year, a great many of whom are young children. Of course, exposure to water is a key factor in drowning, but there is a strong economic correlation as well. Those in poorer countries are far more likely to be drowning. In Bangladesh, 17,000 children drown annually that's 46 a day.

Below are 10 facts about drowning; from a lake that never surrenders its victims to a party for lifeguards that ended in deadly irony.

### **Fresh Water and Salt Water Drown You Differently.**

Males are especially at risk of drowning, with twice the overall mortality rate of females. Studies suggest that the higher drowning rates among males are due to increased exposure to water and riskier behavior such as swimming alone, drinking alcohol before swimming alone and boating. Drowning accounts for 75% of deaths in flood disasters.

## Prevention

There are many actions to prevent drowning. Installing barriers (e.g. covering wells, using doorway barriers and playpens, fencing swimming pools etc.) to control access to water hazards, or removing water hazards entirely greatly reduces water hazard exposure and risk. Community-based, supervised child care for pre-school children can reduce drowning risk and has other proven health benefits. Teaching school-age children basic swimming, water safety and safe rescue skills is another approach. Setting and

enforcing safe boating, shipping and ferry regulations is an important part of improving safety on the water and preventing drowning. Building resilience to flooding and managing flood risks through better disaster preparedness planning, land use planning, and early warning systems can prevent drowning during flood disasters.

## Fire Accident

Massive forest fires may start in hot and droughty weather as a result of lightning, and human carelessness or from other causal factors. Fires can lead to the destruction of buildings, wooden bridges and poles, power, transmission and telecommunication lines, warehouses of containing oil products and other fuel. It causes injury to people and animals.

### Students' activity Mock Drill:

To escape a fire, **stop, drop, and roll**. In case your clothes burn, stop running, drop on the floor and roll to stop fire spreading.

During droughts or windy weather, fire may destroy low vegetation and trees. The spreading speed of low fire is 1-3 m/sec and high fire may reach up to 100m/sec.

### Rule of actions for Fire Accident-Do's

1. When Fire accident occurs, warning should be given by shouting or ringing bell.
2. Extinguish the fire using sand and other fire extinguishers.
3. Main switch should be switched off immediately.
4. If clothes started burning, the victim should roll on the ground to extinguish the fire.
5. The combustible materials found near the fire accident place, have to be discarded so that the fire does not spread to them.
6. If fire breaks out with smoke spreading, cover the nose, crawl and move out.
7. Think that life is more valuable than belongings.
8. Move from the fire accident place to a safe place.

### Preventive Measures

1. Create a safe zone between the house and flammable plants.



2. Cut off all the branches of trees with below three meter height standing near your house.
3. Remove moss and dry branches from plants standing near the house.
4. Clean ditches and pits from dry branches, leaves and cones.
5. Keep flammable materials in the checked safe containers.
6. Ask your relative or friend living in a different location to be your contact person.
7. Have a fire extinguisher and know how to use it.

### **Do you know?**

A natural gas vent in Iraq known as The Eternal Fire of Baba Gurgur, meaning 'Father of Fire' has been burning continuously for over 4,000 years, and it has been mentioned by Herodotus, and Plutarch.

### **During fire accident**

1. When water cannot be used (because the equipment is plugged-in) or there is no water and the fire is not strong, you can use cooking soda or calcite soda, washing powder, sand, soil.
2. Keep your head no higher than 30 cm above the floor; above this height accumulation of heavy poisonous gases is possible.
3. If there is no opportunity to leave the room, move towards a window, and try to get the attention of people by giving signals.
4. If your clothing has caught fire do not run because this will intensify burning. Take the clothes off, throw them in a safe place and put out the fire.
5. If you are near a fire in a forest and cannot extinguish the fire by yourself, immediately inform people who are nearby about the necessity to leave the hazard zone.

### **Things that must never be done during a fire**

1. Never pour water on burning electrical equipment if it is switched on. If a TV set, a refrigerator is burning, turn off the electricity from the main switch.
2. Do not jump from windows of upper floors.
3. Do not panic.
4. Do not try to extinguish the fire by yourself.

## Industrial Disasters

Industrial hazards consist of four principle hazards. The hazards encountered are fire, explosion, toxic release and environmental damage. This is because industries employ many different processes involving a wide range of different raw materials, waste products and final products. Danger originates from technological or industrial accidents, dangerous procedures, infrastructure failures or certain human activities. It may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

**Fire:** This is the most frequent hazard. Fire can also produce toxic fumes like Acrolein, Carbon monoxide and Cyanides. Physical structures can be damaged either by the intensity of the heat or combustion. It may also have an effect on essential services like power and instrumentation.

**Explosion:** Explosions is the result of a shock wave. This overpressure can kill people but usually the indirect effects of collapsing buildings, flying glass and debris causes far more loss of life and severe injuries. There are different types of explosions which include gas explosions and dust explosions. Gas explosions occur when a flammable gas mixes with air. Dust explosions occur when flammable solids, especially metals, in the form of fine powders are intensively mixed with air and ignited.

**Chemical release:** Sudden release of toxic vapors has the potential to cause death and severe injuries several kilometers from the release point. They are carried by water and air. Their release into public sewage systems, rivers, canals and other water courses, either directly or through contaminated water used in firefighting can result in serious threat to public. The number of casualties depends on the weather conditions, population density in the path of the cloud and the effectiveness of the emergency arrangements.

**Environmental Damage:** Release of other substances, not directly toxic to humans can cause major pollution problems. It is becoming increasingly recognized that damage to natural resources such as plant and animal life can have serious long term consequences. E.g. destruction of trees is increasing the effect of global warming and extinction of animals are severely disrupting food webs and causing an increase in pests.

## Means of reducing the industrial hazards

**Process Safety Management:** Reliability assessment of process equipment, incorporating safety tips, scrubbing system, etc, should be done before effecting major process changes.

**Safety Audits:** Periodical assessment of safety procedures, performance of safety systems and gadgets along with follow up measures should be carried out.

**Emergency Planning:** A comprehensive risk analysis indicating the impact of consequences and practiced emergency procedures should be done. This can be done by communities as well as national or regional corporation authorities.

**Training:** Proper training of employees and protective services should be done.

## Road accident

It is estimated that 1.34 million people are killed in the road accidents every year. Road accident is the 8th leading cause of death globally. Every year, up to 50 million people suffer serious, life-altering injuries which, in many low- and middle-income countries, directly contribute to the poverty cycle.

Primary road safety risk factors in low and middle-income countries include:

1. Speeding
2. Drink-driving
3. Non-use, or improper use of helmets, and
4. Non-use, or improper use of seatbelts

Strengthening the capability of the road traffic police to enforce traffic laws is fundamental to deterring road users from violating the laws, to reduce harm and to reduce inappropriate and unsafe behaviors on the roads.

## Basic road safety rules for students:

### 1. Aware of the road signals

Assist students to learn the traffic lights and signs. Check out the relevance of each color:

- Green light is an indication for “go”- Whenever the signal turns green, the vehicle can move ahead.
- Red light is an indication “to stop”- All the vehicles have to stop, when the red light is on.
- Yellow light is an indication “to slow down”- When the yellow light turns on, you should slow down your vehicle and prepare to stop.
- “Walking man” signal at intersections are constructed for the pedestrians. Recall the fact that you will be authorized to cross the road only when the signal turns green. Ensure that there are no vehicles, both on the left and right side of the road.
- Never attempt to cross the road, if the signboard signifies “Don’t walk” message or the walking symbol turns red.

### 2. Stop, look, and cross

In fact, students will either walk to school or to the bus stop for waiting their respective school bus. The only task of students is to cross the road prudently, right after the school bus drops them off. Hence, we should undertake the responsibility to provide adequate guidance for crossing the road cautiously.

We teach them to be aware of various road signs and recommend them to utilize the zebra crossing while crossing the road. If there are no markings or signs, the following procedures can be worthwhile:

- Check the right side, after that to the left side of the road for the incoming vehicles.
- If you notice a vehicle is approaching, wait for the vehicle to pass and then safely cross the road.
- Do not cross the road at the turns, it is unsafe.
- Never cross the road between the stopped vehicles.

However, accompaniment is required for the children aged below 6 years and you should compulsorily hold their hands while crossing the road.

### **3. Listen**

Educate the child to be extra vigilant while they cross the road at the turns. As a consequence, listening can only aid them. For this reason, instruct your child to listen and ensure whether a vehicle is approaching or not. Ordinarily, vehicles apply horns at turns and at unmanned intersections to provide a warning to other road users. Meanwhile, you can interpret the following instances to students:

- If a horn is heard, stop and cross only after ensuring that no vehicle approaches you from left or right side of the road.

### **4. Don't rush on roads**

Students will not be tolerant and have a tendency to dash across the road to reach the other side. In addition, they become absent-minded when they are having fun and henceforth bound across or along the road. Therefore, teach them to remain placid while they are near the road.

### **5. Relevance of Sidewalks**

Persuade students to avail the service of sidewalks whenever they walk on the road. Demonstrate them how to cross the road safely. Motivate them to avail the sidewalks even though it is not a busy street.

### **6. Crossroads and pedestrian crossings**

Students will have a tendency to scoot across the street. This will become particularly perilous since vehicles will never slow down unless there is a cross road or relevant signal. Notify your students to cross only at intersections and avail the pedestrian crossings. If there is no crossroad or pedestrian crossing, you can admonish students to comply the rules mentioned above.

### **7. Place the hands inside the vehicle**

A multitude of students have the habit of placing their hands outside the vehicle while it is moving. They will lay their head out and wave with exhilaration. This is a familiar sight among the school bus students. Nevertheless, these behaviors can have significant consequences. Due to carelessness, they will be injured by vehicles, which advance from the opposite direction.

## 8. Never cross road at bends

Bends are evidently the blind spot for motorists. When you attempt to cross at bends, the driver will be unable to recognize you and stop the car at the right time. As a result, students will be hurt while crossing at bends.

## 9. Remain safe on a bicycle

If students ride bicycle to reach the school, ensure that they adhere to the following cycling rules:

- Utilize the bicycle lane. If such a lane does not exist, ride the bike either on the extreme left or right side of the road and glide along with the traffic.
- Never permit your students to ride on congested streets without your supervision.

## 10. Staying safe in a moving vehicle

In a moving vehicle, you can ensure the student's safety with the assistance of a seat belt. Let them practice the following safety rules in your absence:

- Never stand, stroll or sprint inside a moving vehicle.
- Remain seated and hold the rails on the seats until the school bus halts.
- Do not put your hands outside the moving vehicle.

## 11. Get off the vehicle at the curb side

Ask your students to memorize the following safety tips and conform to the rules while they get down from the school bus:

- Ensure that you reach the bus stop prior to the scheduled bus timing in order to avert the circumstance of running behind the school bus.
- Form a queue to board or descend the school bus.
- Disembark the school bus at the curbside in order to evade unnecessary endangerment and hindrance to other vehicles.