

08

Natural disasters and management of the damages caused by them



By the end of this chapter, you will be competent to...

- Contribute to minimise damages due to cyclones.
- Contribute to minimise damages due to lightning.

8.1 Let us minimise disasters due to cyclones

The day was 26th of December 2000. It was a bright sunny morning in Trincomalee town. People were involved in their usual daily activities. Although the weather forecast predicted the possibility of a cyclone, it was not very obvious that many people took much heed of it.

Around 8.00 a.m. dark clouds began to appear from the sea side. Before even half an hour later a strong wind began to flow inwards across the town. It was accompanied by a massive rainfall. Roofs of buildings floated by and trees were uprooted. Electricity was cut off. People ran here, there for shelter.

In a short time the rain stopped and the wind became slower. Thinking that the worst was over, people came out of their shelters. Very soon, another strong wind started to blow, this time in the opposite direction to the first. Rain too started again. Whatever buildings were left from the first wind were also destroyed by the second.

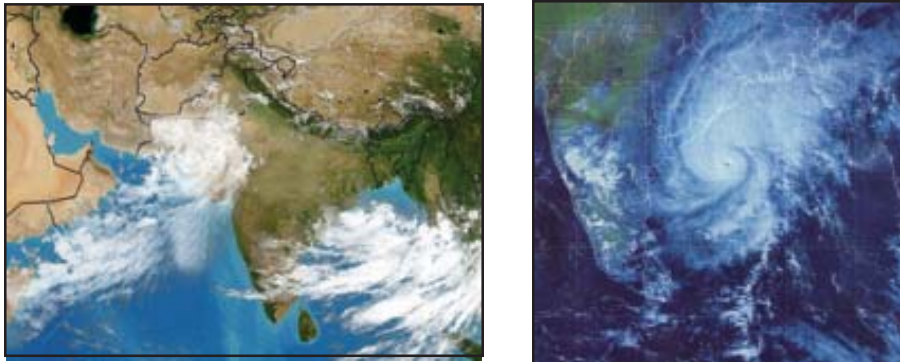


Fig 8.1

Satellite pictures of the cyclone which affected Trincomale on 26th of December 2000

The amount of damage this cyclone caused was estimated as follows;

- Number of families affected - 170,149
- Number of houses fully destroyed - 57,273
- Number of houses partially destroyed - 20,860
- Agricultural land destroyed - 20,810 acres.
- Number of deaths - 11
- Loss to the national economy - Rs. 1500 million

What is a cyclone?

Cyclone is a low pressure system in the atmosphere. It takes the shape of a spiral and strong winds may prevail up to a distance of 100 km. It is an extremely disastrous weather system.

Do you know?

- A cyclone which took place in Bangladesh on 13th November 1970 killed 300,000 people.
- Hurricane Andrew which flew over United States of America in 1972 caused a damage estimated at 26 million dollars.



Fig 8.2 - An enlarged satellite picture of a cyclone

The cyclones which affect Sri Lanka belong to the group of tropical cyclones. These originate in the Bay of Bengal.

The cyclone which originates around the North Pacific region are called Typhoons.

The cyclone which originates around the North Atlantic region are called Hurricanes.

In addition there is a type of cyclone which affects only a small area of land called Tornados.

Factors which cause cyclones

The following factors have to be present for the origination of a cyclone according to Meteorologists

- The temperature of the sea water on the surface and up to 60 km deep in the ocean, should be above 26 °C.
- The region where the system arises being inclined to a position 3° north or south of the equator. (Cyclones do not arise on the equator)
- The humidity of the atmosphere up to 7 - 8 km height should be more than 60%.

Do you know?

The cyclones that arise in the northern hemisphere of the earth rotate in the anticlockwise directions while cyclones that arise in the southern hemisphere rotate in the clockwise direction.

Activity - 8.1

Detecting the direction of currents in water.

Fill the wash basin in your kitchen or bathroom with water from the tap. Put some small pieces of paper which will float on the water. Now remove the stopper at the bottom of the wash basin. The water will flow out in the shape of a cyclone. Note the direction in which the water turns. Repeat many times and note the direction.

You can notice similar observations at places where water flows out of a tube.

Origin of a cyclone

A tropical cyclone starts in the sea. It arises as a low pressure area above the sea where the wind speed is about 30 km per hour. The air around this area which is at normal pressure get dragged towards the low pressure area. But due to the rotation of the earth, this current of air rotates in a spiral and forms into a cyclone. In the northern hemisphere, where Sri Lanka too is situated this rotates in the anticlockwise direction.

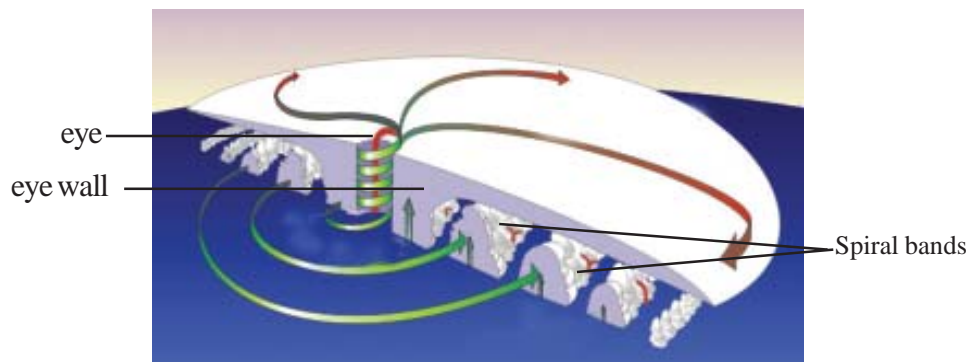


Fig 8.3 - Cross section of a cyclone

In a cyclone in addition to the rotation of the air at the centre, there is also a rising of the air column. This causes a spiral air column. The centre of the spiral is called the 'eye'. It can spread up to an area of 30 km - 60 km from the centre. This is a calm rainless, cloudless area with slow winds. In a satellite picture this appears as a black circle.

The cylindrical clusters of clouds around the eye is called the 'eye wall'. This area has heavy rain and strong winds.

Outside the eye wall, spiral bands of rain clouds can be seen. Here strong winds and rain persist.

Table 8.1 - Stages of development and effects of a cyclone

Stage	Maximum wind speed km/h	Effect
Low pressure area	Less than 35	Not much damage to houses. May damage crops and trees.
Lowest pressure	35 - 65	Little damage to houses, fair damage to trees and large damage to crops
Hurricane	65 - 125	Considerable damage to homes and electricity cables
Cyclone	More than 125	Devastation to houses, electricity lines etc.

Prior notice about cyclones

The Meteorological Department provides information about cyclones. This department works 24 hours of the day. More attention regarding cyclones are paid in the months of November and December as indicated in the graphs. Meteorological Department possesses highly sophisticated modern technology and other technological equipment. Hence it is possible to give a warning about the possibility of a cyclone 48 hours before it occurs.



Fig 8.4 - The path along which cyclones travelled in Sri Lanka

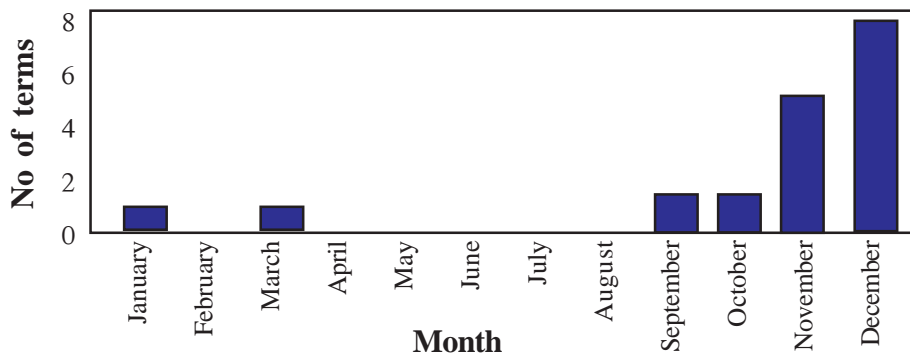


Fig 8.5 - Data of cyclones flowing past Sri Lanka from 1881 - 2000

Assignment - 1

Study the above map (Fig. 8.4) well, and prepare a list of districts in Sri Lanka where cyclones can occur. Find out whether the district you are living in is included in the list.

If there is a threat of a cyclone to Sri Lanka latest relevant information is provided to the District secretarial office and the Police stations. This information is then passed down from these offices to the general public.

- The centre for disseminating prior information regarding cyclones is the Meteorological Department. Tel. No. 0112686686
- Web site www.meteo.slt.lk.

Cyclone threats are announced by radio and television stations as well.

Managing cyclone disasters

If you are residing in a cyclone threatened area, before a cyclone, follow the instructions given below;

- Constantly check whether the tiles or roofing sheets of your house are firmly fixed.
- Maintain the doors and windows in good condition.
- Remove branches of trees that may be dangerous to the house or even removing such trees altogether.
- Any objects that can be broken by knocking against things in a very strong wind should be packed well.
- Be aware of the closest highest location where you can go at a time of floods or the ocean coming in which often happens with cyclones.
- Prepare your 'Crisis kit'. It should contain the following items.
 - Bottles of drinking water
 - First aid
 - Dry food stuff (Biscuits etc.)
 - Sheets etc. for covering yourself
 - Small battery radio
 - Torch (with batteries)
 - Box of matches or lantern
- Keep the telephone numbers of useful people/places at convenient places.

If no notice has been given to evacuate but the cyclone is close to the land

- Disconnect all electrical appliances.

If a cyclone threat is announced

- Keep little children indoors (do not allow them to go out)
- Park your vehicles in a place with a strong roof.
- Cover your valuables, clothes or important documents well with a polythene cover and keep them on a high place.
- Anchor fishery boats. Take any fishing equipment to a high place.

If an evacuation notice is given

- Dress in protective clothing and shoes.
- Disconnect your electricity.
- Untie any pet dogs, cattle or goats from their reigns.
- Move away before strong wind or floods come.
- Get away from windows and stay near the stronger part of the house.
- If buildings are breaking, get under a strong table.
- When the wind gets reduced do not think that the wind has stopped. It may start again from the opposite side.
- Have patience till the media announces that the cyclone is over.
- If you are driving a vehicle get to a place with no trees around and stay parked.

After a cyclone.....

- Do not vacate till the media announces that the cyclone is over.
- Do not use wet electrical appliances
- Listen to the radio for further notices.
- If you vacated your locality do not return till informed.
- Be careful of broken electric cables, bridges, buildings etc.
- Do not drink polluted water.
- Use suitable chemicals and disinfect your wells.

Tornado threats

- These are whirling masses of wind which starts from a thunder cloud spiralling down to the earth.
- The media as well as people often refer to strong winds as cyclones.
- Therefore it is useful to compare a tornado and a cyclone (Table 8.2).



Fig 8.6 - Picture of a Tornado

Table 8.2

	Tropical cyclones	Tornado
Size, diameter	About 500 km	About 100 m
No of clouds	Large number in the cluster	Very often only one in the cluster
Place of origin	Above warm oceans	Above land
Rainfall	Rains over a large area of land	Hardly any rain or very little rain
Damage	Floods, landslides	Damage due to wind in a limited area

Activity - 8.2

Identifying the shape of a tornado.

Take two transparent plastic bottles and fill half of one bottle with coloured water. Fix the mouths of the two bottles with gum tape. Now turn this set up upside down.

Here the flow of coloured water is similar to that of a tornado.

Do you know?

When a tornado blows over a water body, the water gets lifted up. This is called a water spout. Aquatic animals too may get lifted up with this.

8.2 Let us minimise disasters from lightning



From the distant past, man had been aware of the disasters caused by lightning. This is seen by the attitude of our ancestors towards lightning - they elevated lightning to the status of a God. In Sri Lanka too there are many folk lore connected with lightning.



Fig 8.7 - A picture of lightning

It has been disclosed by scientific experiments that lightning is an electrical current coming from the sky to the earth.

This electrical current flows from charged clouds to the earth. If such a current is to flow from the clouds to the earth, electricity must originate in the clouds. Let us find out how this happens.

You have already learnt in Grade Seven about static electricity that is generated by one conductor rubbing against another conductor. Clouds are formed of very fine drops of water. Air currents move up through clouds at high speed. When these air currents move up through cumulonimbus clouds, these clouds gradually grow in height. These get caught to air currents rising vertically up and as a result the top section gets flattened to form a mushroom or umbrella shape.

The air particles as they travel through the cloud rub against the water drops, which then get a charge. According to latest research the clouds which cause lightning have the charges distributed as follows;



Fig 8.8 - A cumulonimbus Cloud

The upper part of the cloud has a distribution of positive charges. The lower part of the cloud has an equal amount of negative charges spread out. A few positive charges are again found at the bottom of the cloud.

When a large amount of charges collect in a cloud they can get discharged within the cloud itself. Accordingly lightning is an electric discharge. According to the manner in which the discharge occurs lightning can be of three types.

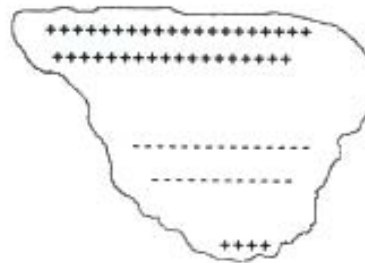


Fig 8.9 - Distribution of charges in a cloud which cause lightning

1. Intra Cloud flash

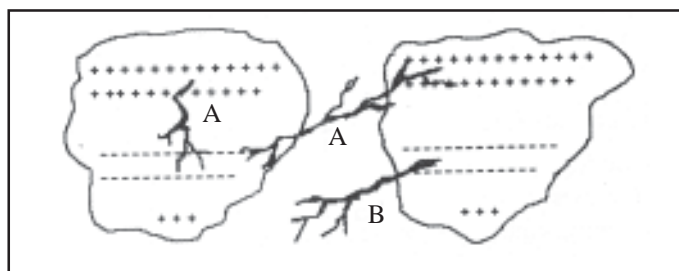
A discharge of positive and negative charges that take place within a cloud or between two clouds.

2. Earth lightning

A discharge which starts from the cloud and ends up on earth.

3. Inter Cloud flash

A discharge which is set off from a cloud into the air.



A - Intra Cloud flash

B - Inter Cloud flash

Fig 8.10

Among these, the type that is harmful to us are the earth lightning. According to the above, lightning is a flash of light. You can understand it from the activity below.

Activity - 8.3

Find two new torch batteries (dry cell). Connect its positive and negative ends by a piece of wire. On an off remove the piece of wire.



In the above you will see a flash of light as well as hear a small noise. What happens here is a small electrical discharge.

A dry cell has a voltage of 1.5 V. However a lightning may have a voltage of about 100 million volts. The current that flows through a lightning discharge is 25000 amperes. A 100 w bulb in our houses have only a current of 0.5 amperes flowing through it.

How lightning is earthed

There are four methods by which lightning can get discharged in such a way as to harm a person.



Fig 8.12 - Side flash

1. Direct lightning

A streak of lightning which hits a building or a single person standing on a flat land.(Fig 8.11)



Fig 8.11 - Direct strike

2. Lateral lightning

Part of lightning flash striking a tall tree gets earthed through a body of a person or a building.(Fig 8.12)



Fig 8.13 - Contact lightning

3. Contact lightning

A lightning flash which strikes a building through a telephone wire or antenna wire etc, or a lightning that strikes a tree and along the tree strikes a person who is close to it.(Fig 8.13)

4. Step lightning

A streak of lightning which strikes a tree, goes along the ground enters a person through one foot and leaves through the other foot.(Fig 8.14)



Fig 8.14 - Step lightning

Periods when lightning disasters are common

According to data collected over a long period it has been shown that lightning disasters are most in the inter-monsoon period of March - April and October - November.

Assignment - 2

Draw a bar graph of the number of days in each month when you heard lightning and thunder in your locality

Protection from lightning

Houses with no other buildings or tall trees around are prone to be affected by direct lightning. This danger can be reduced to a great extent by fixing a lightning conductor.

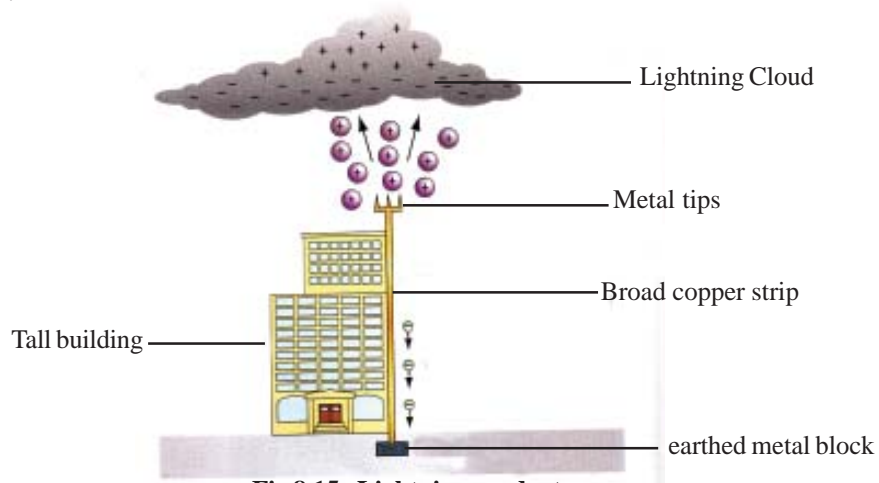


Fig 8.15 - Lightning conductor

Do you know?

The lightning conductor was first invented by Benjamin Franklin in 1749.



Benjamin Franklin

Preventive measures

During lightning

- If you are outdoors, go into the house immediately.
- Avoid travelling in open vehicles such as bicycles, motor bicycles, tractors, boats etc.
- Avoid touching metal objects
- Avoid sleeping on the floor.
- Avoid going out to take clothes from clothes lines.
- Do not bathe or wash in water.
- Do not use telephones with wires/cables

- Switch off the television, remove the antenna and put it outside the house with its metallic end towards the earth.
- Do not try to switch on the trip switch if it goes off.
- Do not stay in open places such as play grounds paddy fields etc.

Danger signals

During weather conditions when lightning may occur, your hair and the body may rise up, indicating that in a few minutes lightning may strike. Follow any of the above preventive measures immediately.

Do you know?

One lightning streak may harm many people. In 1998, the football team of 11 members were all struck by one flash of lightning. A few years back in Monaragala 5 people who went under a tree for shelter during lightning were all struck by lightning.

If any person has been struck by lightning, quickly go to his assistance and

- If the heart beat has stopped, give artificial respiration and heart massage.
- If he is recovering immediately take him to the nearest hospital.
- While taking see that his mouth is turned side ways and not upwards.
- If he is bleeding from burns, try to prevent the bleeding as much as you can.
- A person struck by lightning has no electric charges left on his body. Therefore do not be hesitant to touch him.

Do you know?

During lightning, the nitrogen and oxygen of the air combine to form compounds which dissolve in water and come down with the rain. They help to increase the fertility of the soil.

The best place to protect yourself from lightning is inside a motor vehicle - Faraday Chamber

Exercise

- (1) Which of the following should you not do during lightning
 1. Standing under a tall tree.
 2. If you are in an open place, sitting down.
 3. Stay inside a vehicle
 4. Stay inside the room of a building

- (2) State two things you should not do if you are inside a house during lightning

- (3) If the following statements are true, place '√' sign, and if they are false place a 'X' sign against them.
 1. A tropical cyclone is a low pressure system arising at the equator.

 2. A tornado is a windy area which revolve around a low pressure area.

 3. A 'water spout' is a situaton arising when a tornado travels over a body of water.