



Rain and Rivers

All life on earth is very crucially dependent on water. As you know, over 71% of the earth's surface is covered with water. We depend on water for growing crops. But we do not get water uniformly over the year. It is also not available uniformly all over the earth. Nor is the quality of water the same everywhere.

Discuss the following in the class: in which months you get rain, in which part of the village or town do you have more water or less water, where do you get good drinking water and where do you



get salty or hard water. In the following chapters, we will study about the diversity in water availability and its consequences.

PART - I

Sun, Clouds and Rainfall

After the unbearable heat of April, May and June comes the rainy season, which lasts for a few months. Do you know what causes rains? Where do the rain bearing clouds come from? Discuss whatever you know or think about these things in the class.

Evaporation

Pranavi woke up early in the morning. She needed to take bath in hot water, so she heated water in a dish over fire. As

the water heated up, water vapours touched the lid and with the help of outside cool air, vapour became water drops and stuck to the lid of the dish. When she removed the lid, some of the water drops fell down into the dish. By observing this, she realised that the water evaporates and latter it becomes condensed into water by cooling.

The story of rain begins with water vapour. What is water vapour? When you dry your wet clothes in the open, you see

that the water disappears after a while and the clothes dry. Similarly, if you keep some water in a plate, it dries up in a couple of days. Actually, water in the clothes or in the plate becomes water vapour and mixes with the air through a process called 'evaporation'. So, even when water is not boiling there is evaporation.

There are several water bodies on the earth's surface – oceans, rivers, lakes etc. There is constant evaporation of water from these water bodies. In fact, wherever there is moisture, evaporation will take place. There is evaporation from our bodies, from trees, plants and soil. The process of evaporation speeds up with the increase in temperature.

- ◆ In which season would there be more evaporation, summer or winter?
- ◆ When will the evaporation be more, during the day or night?
- ◆ Look at the figure 2.1 and make a list of the places from where evaporation takes place.
- ◆ Where do you think the maximum evaporation would take place – from plants, rivers, oceans or soils?

Formation of Clouds and Rain

When there is rise in temperature, water vapour rises and reaches high up in the sky, and it gets cooled. This is because the atmosphere gets cooler as we rise above the surface of the earth. With the cooling, water vapour is transformed into tiny water droplets. These droplets gather around minute dust or smoke particles in the air and gradually increase in size. These small drops of water gather to form the clouds.

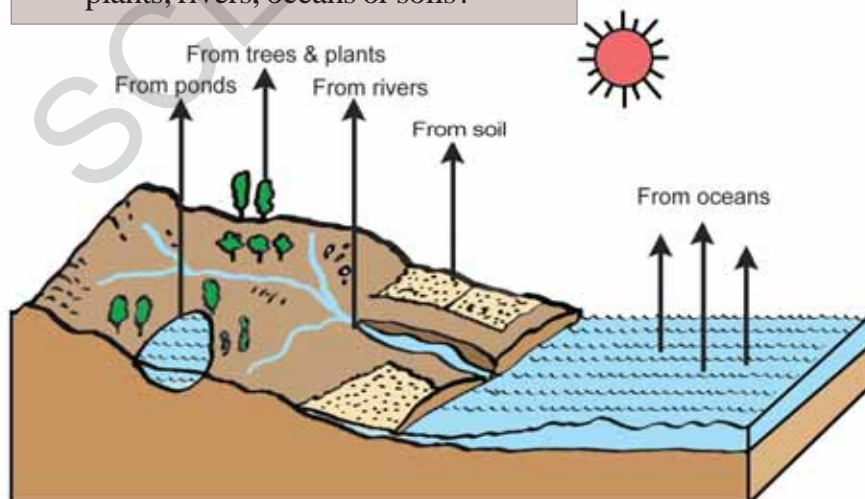
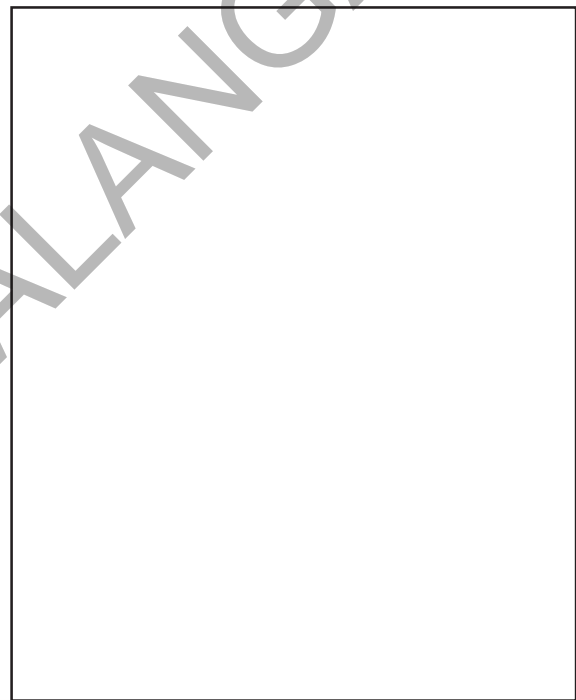


Fig 2.1 Evaporation

- ◆ Make a diagram to explain how vapour is transformed into clouds in the box given above. Label your diagram with these terms – earth, sky, rising vapour, dust particles, water droplets, clouds....

As the clouds continue to rise upwards, it gets cooler and more droplets are formed. The droplets come together to form bigger drops. As they get heavier, it gets more and more difficult for them to remain in the air and so they begin to fall as rain drops.

- ◆ Why do you think is it necessary for the clouds to rise in order to cause rain?
- ◆ Have you ever observed dew? Where is it formed?
- ◆ In which part of the day do you see fog?
- ◆ In which season do you have more foggy days?
- ◆ Have you ever seen snow fall? How is it different from rain fall?
- ◆ Have you ever seen the hail storm?



Fig 2.2 Water cycle

Some Important Terms

Evaporation: Change of water into vapours is known as evaporation. The process in which water vapour changes into water is called condensation. Clouds are tiny droplets of water hanging in the air above.

Water Cycle : The process of water evaporating from the seas, forming clouds in the sky, coming down as rain, flowing down the slopes on land in the form of rivers and finally joining the sea, is called the water cycle.

Precipitation: Different forms of condensation of water vapours is known as precipitation. This may take place in the form of dew, fog, rain, snow or hail.

Humidity: The amount of invisible water vapours present in the atmosphere is known as humidity. When temperature and humidity rise, we feel uncomfortable. We perspire and the sweat does not evaporate quickly. We feel sticky and such weather is called sultry.

Winds and Clouds

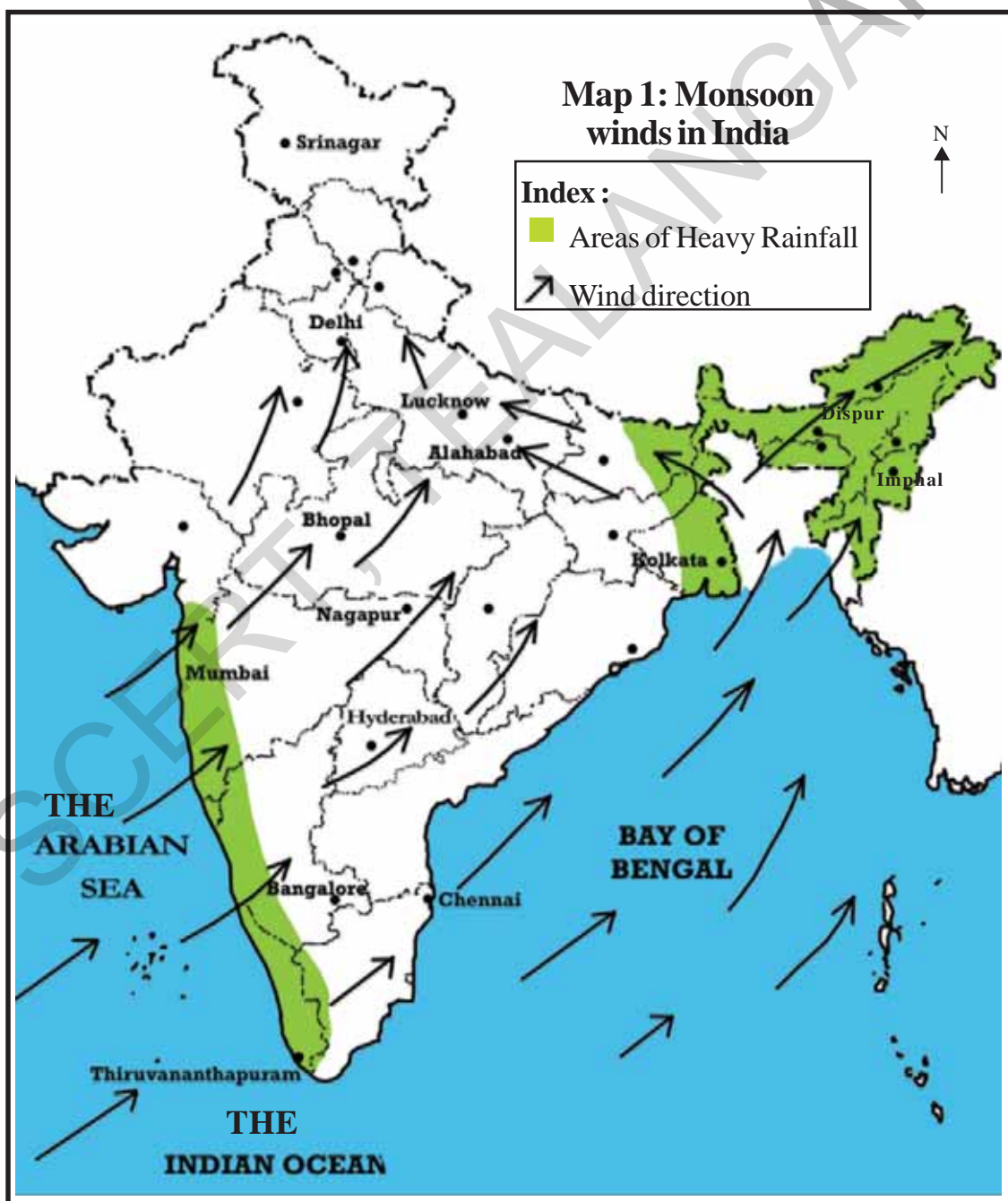
Since evaporation takes place all over the earth's surface, clouds are also being formed all over. However, it is on the surface of the oceans that maximum evaporation and cloud formation takes place. After all, oceans are vast water bodies extending upto thousands of kilometres. As a result, it also rains very

heavily on the oceans. Clouds also travel inland for thousands of kilometres to bring rain to us. Do you know what brings them deep inland?

From which direction does the wind blow during the rainy season?

These winds come all the way from the Arabian Sea and the Bay of Bengal and they transport the rain clouds. They are called '*Monsoon winds*'. They are also called '*south-west monsoon winds*' as they blow from that direction. These winds blow only in the summer.

There are two arms of the monsoon winds: one blows from the Arabian Sea and the other from the Bay of Bengal. The arrows in Map 1 show us the direction of winds.



- ◆ Towards which parts of the country would the winds take the clouds from the Bay of Bengal?
- ◆ Towards which parts of the country would the winds take the clouds from the Arabian Sea?
- ◆ From which direction would the winds blow to bring monsoon rains to West Bengal, Lucknow and Delhi?
- ◆ From which direction would the winds blow to bring monsoon rains to Mumbai, Hyderabad, and Bangalore?

Rainfall in Telangana

- ◆ In which months does it rain the most in your place? List the three rainiest months.
- ◆ Name the three driest months.
- ◆ Do you have 'normal' rainfall every year or does it vary every year?
- ◆ Have you ever experienced drought?
- ◆ Have you ever experienced floods?

In Telangana state, the temperature rises higher every day between March and June. When the South West Monsoons sets around the beginning of June, The winds carrying the clouds reach Telangana. The immediate effect of the rains is that there is suddenly a big difference of temperature after a week's rain. See map 1.

The South West Monsoons bring normal rains to Telangana. The North and Eastern parts of Telangana receive heavy rainfall. Large areas in the Telangana Plateau receive low rainfall. Mahabubnagar and Jogulamba districts receive very little rainfall in Telangana State. See map 2.

The mountain ranges like the Western Ghats come in the path of rain-bearing winds and cause them to rise. Rising air cools down and the water vapour condenses faster, which leads to rainfall. This type of rainfall is common in the mountainous regions.

From May to October, cyclones form in the Bay of Bengal. These cyclones may or may not bring rain to our region. It depends upon the intensity of the cyclone in the Bay of Bengal and the direction of the cyclone after crossing the Coast. Sometimes, monsoons and cyclones bring together wide spread rainfall in this region and cause damage to the crops also.

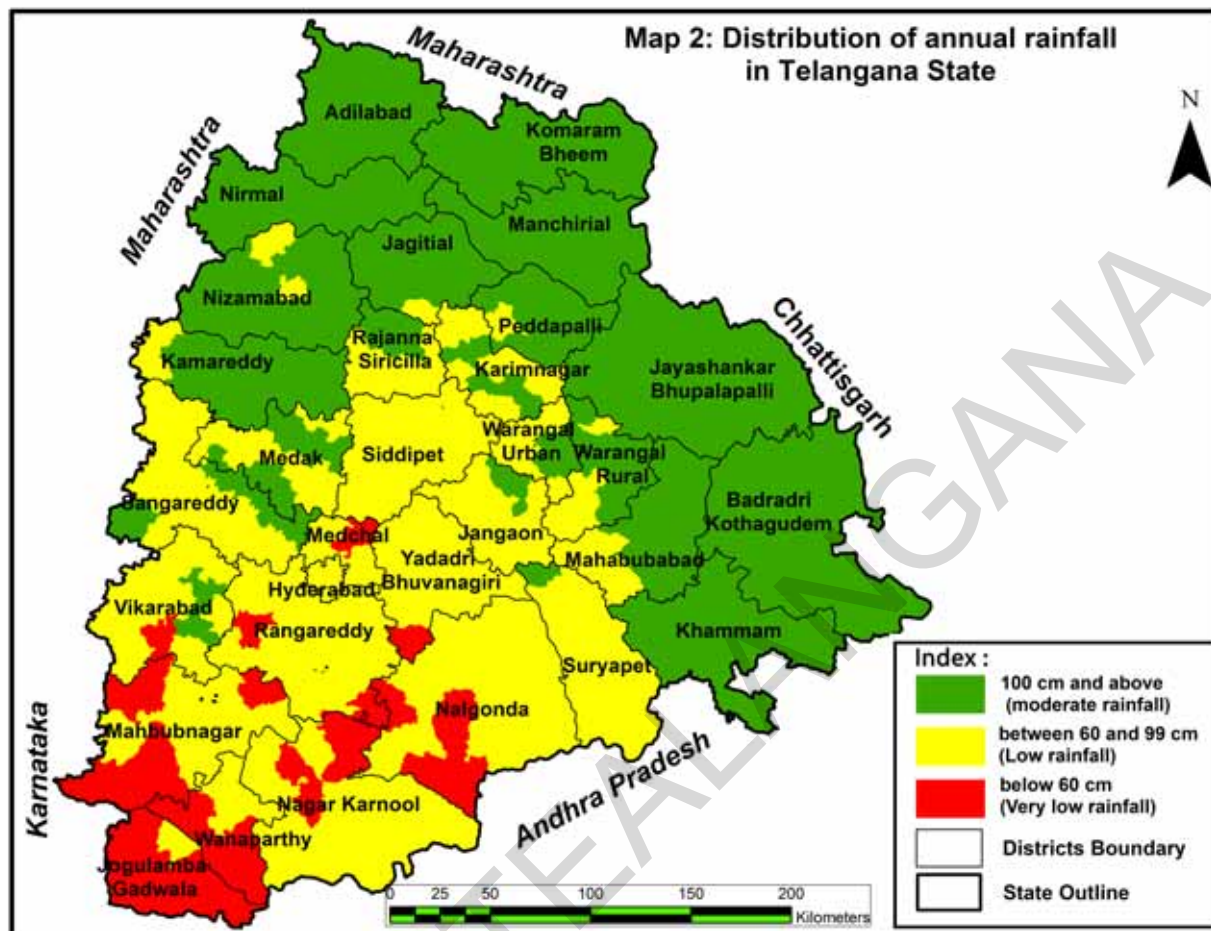
The direction of the winds reverses after October as the winds begin to blow from the Bay of Bengal towards south west . This causes very little rains in October and November in Telangana region. This is called North East Monsoons or the Retreating Monsoons.

10 Years Rainfall in Sircilla town:

Year	Rainfall in M.M	Year	Rainfall in M.M
1996	933	2001	763
1997	695	2002	605
1998	926	2003	819
1999	823	2004	619
2000	895	2005	891

Source: Tahasildar office, Sircilla

- ◆ What is the average rainfall of Sircilla town?
- ◆ Observe the above data. In which year did Sircilla receive the highest and the lowest rainfall?
- ◆ During which two years did it get high rainfall?



- ◆ Look at the map given above showing rainfall received in different parts of Telangana:
 - i. Does your district receive heavy, moderate or low rainfall?
 - ii. Which town has the least/highest rainfall – Nalgonda, Jogulamba, Komrambheem, Yadadri, Hyderabad?
 - iii. Make some more questions and ask each other.
- ◆ Look at the physical map of India in your Atlas and identify Western Ghats and Eastern Ghats. Fill in the blanks in the following sentences.
 - ◆ Western Ghats are spread across the following states _____, _____, _____.
 - ◆ Eastern Ghats are spread across the following states _____, _____, _____.
 - ◆ In which region do Western and Eastern Ghats intersect ?
 - ◆ First, create rough outlines of India in a note book; then draw Western Ghats and Eastern Ghats; after that, roughly mark the areas of Telangana; Finally, label them with months in which it rains.

Rain gauge

An instrument by which the rainfall is measured is known as 'Rain gauge'. The amount of rainfall for a unit area is measured in centimeters. How do we measure the amount of rainfall? How do we find out if Nizamabad has more rain or Rangareddy?

Make your own Rain gauge



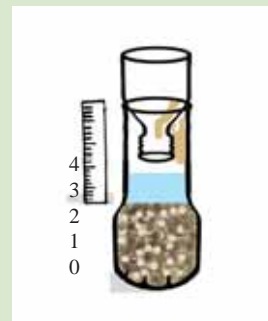
Collect the above items to make a rain gauge (pic 1).



Cut the top of the bottle like this. This ensures the top of the bottle and bottom of the bottle has the same circumference (pic 2).



Turn top of the bottle upside down like this, and fix it to the bottle. (pic 3).



Fill the bottle with sand and water till the spot where you can mark zero. (pic 4)

Now ensure that you keep this bottle in an open place. Make sure that there are no walls or trees that can block the rain water from falling into the bottle. You can use a scale to measure the water. If you leave the bottle in the open for a few days, you can know how much it rained in a week or a month.

When it rains, the water level in the bottle rises. Measure the height of water with the help of a scale and you will get the rainfall in Centimetres for your area during the period you had kept the bottle in the open.

PART -II

Flow of Rivers

What happens to the water that falls on the earth? Some of it percolates into the soil, some flows on the surface of the land and the rest becomes water vapour and mixes with air. You will read about the water that percolates down into the soil in the next chapter. In this part, we will discuss the water which flows on the surface of land.

Rivers

Have you seen rain water flowing in small streamlets on sloping land? Water flows in small streams from the mountain slopes during the rainy season. However, these streams dry up after some time. Nevertheless, water also cuts channels on the mountains.

When it rains again, water flows down the same channels. In this way, river courses and river valleys are formed. This process is shown in figure 2.3.

Study the figure below:

- ♦ Mark the flow of the river with arrows.
- ♦ Mark the slope of the land with arrows.
- ♦ Does the river flow in the same direction as that of the slope of the land?

Transformation of a stream into a broad river

At its source, a river usually starts in the form of a thin stream. As it flows further, it gets bigger and broader. This happens because many small streams join it as the stream flows. Smaller rivers or streams which join a large river are called '*tributaries*'.

As the river becomes bigger and broader, its flow gets slower. It starts depositing the silt and sand it has carried, on its bed and banks. This causes the formation of plains.

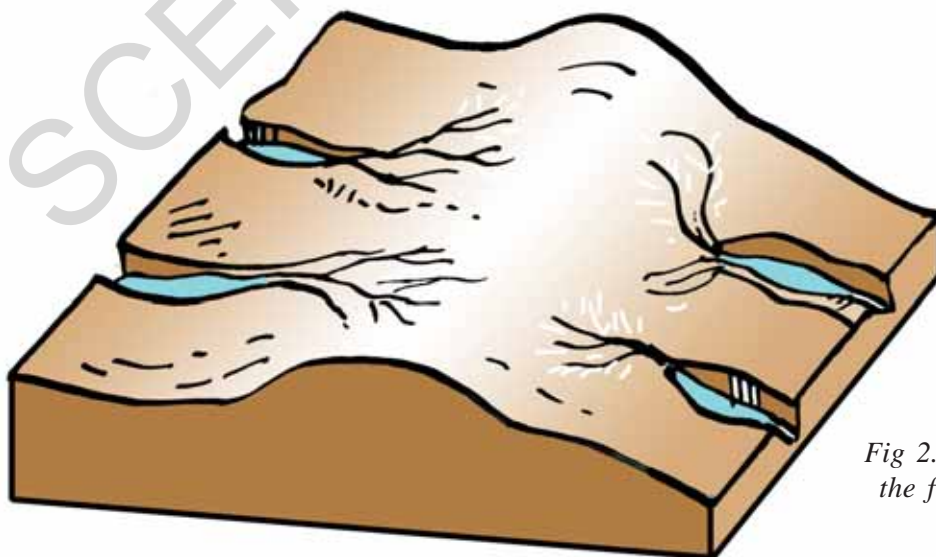
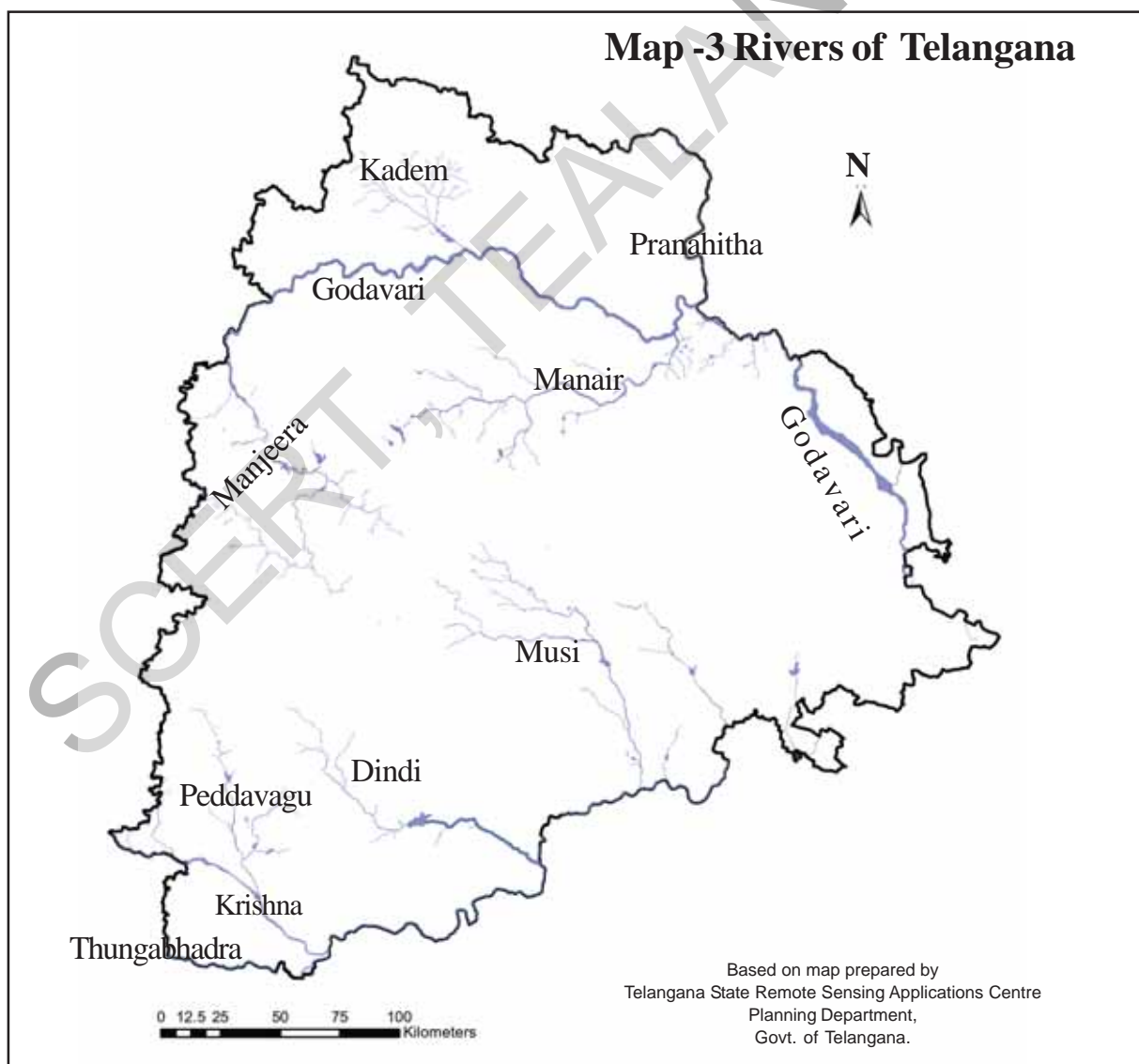


Fig 2.3 Slope and the formation of Rivers

As it nears the sea, the speed of water in the river decreases and is no longer able to carry the silt and sand. It deposits them on its own course, which then gets filled up. When flood waters come again, they have to cut through new channels to reach the sea. Thus, towards the end of its journey to the sea, the river forms a delta. River Krishna and Godavari form deltas in the Eastern Coast. They have water through out the year. However, we also have a number of small rivers that have water only during the rainy season. Why is this so?

Rivers like Krishna and Godavari starts from the Western Ghats, which receive heavy rainfall. The rain water slowly percolates into the ground and flows into the river all through the year. On the other hand, many rivers which start from the dry regions like Dindi, Manjeera, Musi are fed by scanty rainfall. Others, which start in the Eastern Ghats, receive only moderate rainfall and the water flows rapidly into the sea. That is why they go dry during the non-rainy season.



- ◆ Map 3 marks only major rivers of the Telangana state. Take note that some parts of river Krishna form boarder to the Southern side and Godavari forms border to the North Eastern side.
- ◆ Make a list of important streams in your district and identify the major river it joins.
- ◆ Mark whether the stream in your district flows round the year or only during rainy season.

District	Name of the Stream	Joins the River

- ◆ What do you think is the direction of the slope in Telangana map. From north to south, east to west or west to east?

You must have heard that during the rainy seasons some parts of the country get flooded due to excess rainfall. You may have read about floods occurring in rivers like Krishna, Godavari, Brahmaputra or the Ganga.

Flood-Plains and Floods

A river does not contain the same amount of water all year round. While the river is full during the rainy season, it usually shrinks during the dry season. Look at figures 2.4 and 2.5. You can see that the river trough is very wide and it has high banks. This valley is filled with sand and gravel. The river flows in a small stream amidst them. You will notice that there are no trees here. This is because every year when it rains heavily, this valley is filled with water allowing no permanent trees or plants to grow here. This treeless bed is called the *flood-plain* of the river. All major rivers have their flood plains.

Figure 2.5 depicts a flood situation. Look at it carefully and answer the following questions:

- ◆ Has the river water covered the entire flood-plain or confined to the tiny stream that was flowing in the dry season?
- ◆ Is the water confined to the flood-plain or overflowed to the banks of the river?
- ◆ In what way have the floods affected the villages, agricultural fields and trees?
- ◆ How are floods beneficial to agricultural fields?

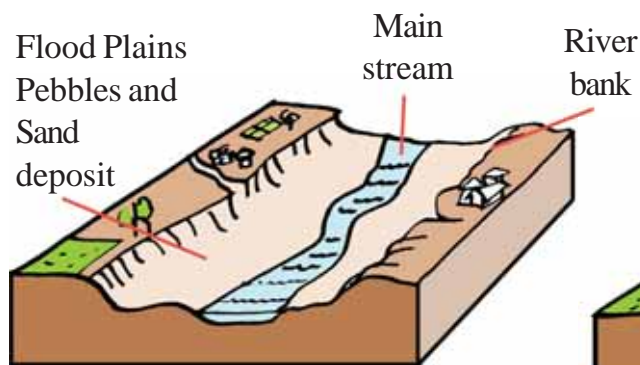


Fig 2.4 Flood Plains

Floods have become a major problem in India in recent years. Some part or the other is flooded every year during the rainy season. This causes severe damage to people, crops and livestock. Let us find out if we have contributed to this in any way.

Vegetation cover on the land (trees, plants, grass etc.) obstructs the run off of rainwater and slows down the speed of its flow. This slowing down helps the rainwater to percolate into the soil. Floods are often caused by sudden increase in the volume of water reaching a river. Vegetation allows the water to flow slowly into the river, thus preventing sudden flooding. It also helps to increase the amount of water which goes into the soil.

Vegetation also helps to prevent floods in another way. It reduces the erosion of soil by rainwater. If there is little or no vegetation, rainwater cuts and carries with it a lot of top soil. This soil is deposited on the riverbed, which reduces the depth of the river. This results in the reduction of capacity of the river to carry water. Thus, with even a little rain, the rivers are flooded and they overflow their banks, causing damage. If the surface of the land is covered with vegetation, then soil erosion is greatly reduced.

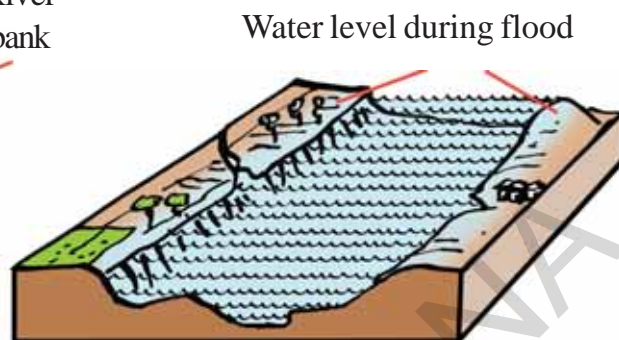


Fig 2.5 Flood

Massive tree plantation

With this aspect as the main focus, majority of the governments are initiating the afforestation programmes in the name of Greenery. Teleangana state is in forefront with massive tree plantation programme.

The government is implementing plantation of 230 crore saplings all over the state. It is aimed to plant 40,000 seedlings in each village and 40 lakh seedlings in each assembly constituency every year. Representatives of the people, officials, villagers and all community people are trying to make it a successful programme by planting trees on all road sides, on barren hills, tank bunds, housing colonies and community lands etc.

Preventing soil erosion

Forest cover controls floods and soil erosion. Tree roots with their holding capacity of the soil, not only lessen erosion but also reduce the flow of surface water which otherwise resulting floods. To construct roads, big trees of more than fifty years old, are being cut down. Hence plantation of trees has become mandatory.

For the effective implementation of the programme, the protection and safeguarding the plants and to monitor the programme, the village level Haritha Rakshaka Committees are formed under the chairmanship of sarpanch. In the same way, district and state level committees are also formed.

- ◆ What are the activities taken up under tree plantation programme in your school?
- ◆ Why is it necessary to take up the initiation of massive plantation of saplings?

Let us take the case of the Ganga. Earlier, there were dense forests on the Himalayas from where Ganga and its tributaries originate. In the recent years, there has been a large scale felling of trees and hence, the forest cover in the Himalayas has reduced considerably. As a result, whenever there is heavy rainfall, the rainwater rapidly flows down the slopes of the mountains and fills up the floodplain of the river. The waters also bring a very large quantity of silt and deposit it on the riverbed. This results in frequent floods which cause heavy damage to life and property along the river.

All this tells us about the importance of protecting our forests and increasing the vegetative cover over other lands.

- ◆ Can you explain how forests and vegetation help in preventing floods?
- ◆ Can forests and vegetation help in reducing droughts? How?

Facing the challenge in Cyclones and Floods

India has a long coast line and it is frequently faced with destructive cyclones from the Bay of Bengal. When heavy winds blow from the sea, heavy rains lash the lands, and high waves make the sea very unsafe. These usually occur between June and December. The worst cyclone hit the East Coast in November 1977. When six - metre high tidal waves swept across villages in coastal area, killing 9941 people. At least, 100 villages were washed away by the cyclonic storms and the ensuing floods. Seen from air, it seemed like a sheet of water drawn over the affected areas floating in the swirling waters.

Formation of cyclones may seem natural over which human beings have no control. However, the impact of these disasters are heightened or lessened due to how our society is organised and prepared. For example, if you see who lives in the most vulnerable part of the land which is most affected by cyclones, you will find that it is the people who live there with least resources to defend themselves. The sea coasts are lined with the huts of poor fisher folk and the low lands of the towns and villages, which get flooded, are usually inhabited by the slums of the poor. The people who live in high cement concrete buildings are able to store food, water etc. for many days. Thus, we can see that disasters affect the poorest the most.

Usually, immediately after the flood waters recede, all sources of water are polluted and become unsafe for drinking. But, the poor are forced to use the polluted water and face the risk of several diseases

like cholera, dysentery, jaundice etc. Only those with resources are able to arrange for safe bottled water to drink. Since roads are damaged and it rains heavily, bringing in relief to the worst affected areas is not easy. Here, people are forced to rely on their own resources to save themselves.

While the immediate damage of the cyclones is also heavy – like loss of lives, crops, houses property etc., more importantly they also cause long term damages.

For example, the life savings of most of the poor stored in the houses in the form of food, tools, cattle, small shops, vehicles, boats, nets, etc. are destroyed. To go back to their work, they need to buy all these again. Many families may lose their working members. Daily wage workers face loss of work for several weeks till normalcy returns and therefore, loss of livelihood. Farmers too not only face loss of crops but also permanent damage to their lands.

How can people meet the challenge of disasters like cyclones and floods?

This can be done through long term planning by governments and close cooperation between the people and the government agencies. Today, with the installation of early warning systems by the government, it is possible to predict the possibilities of natural disasters like cyclones and floods. Governments thus put these systems in place and inform people about the possibility of disasters.

Governments are also responsible for providing long term security to all the people by building strong roads which are not easily destroyed, safe pucca houses for those living in vulnerable areas like sea coast or along the rivers or in low lands. Food, water and medical emergency teams



Fig 2.6 Cyclone in the Bay of Bengal

should be kept ready whenever there is a forecast of cyclone.

How can the people prepare for disasters?

1. Cyclones and floods are a seasonal phenomenon. During the cyclone, listen to the radio or TV weather reports. In case of a cyclone/flood warning, ensure that everyone is alerted. This is usually done through loudspeakers or by going from door to door.
2. Keep an emergency kit ready at home. These kits should contain important papers, some food, some money and emergency telephone numbers.
3. The nearest available place where refuge could be sought in case of a cyclone should be identified in advance.
4. Wherever necessary, the walls of the house, roofing, doors and windows

should be strengthened.

5. When you get a cyclone warning, store adequate drinking water and food grains in waterproof bags.
6. Do not venture outside, especially into the sea during and after the warning has been sounded.
7. Close doors and windows and stay indoors.
8. Move to a pucca building if you feel your house is not strong enough..
9. If the cyclone strikes while you are in a vehicle, stop but keep away from the sea-shore, trees, electric poles and other objects that may be uprooted during the gale.
10. If the cyclone wind suddenly drops, do not go out, as it could be the eye of the cyclone. Wait till the all clear declaration is made officially.
11. Listen to Radio/TV for updates on the situation.
12. Even after 'all clear' has been sounded, take necessary precautions while moving to or out of your house. There may be partially uprooted trees or poles.
13. Look out for snakes that may have come out of their holes.
14. Do not enter flood waters. They may be too deep.
15. As a student group, you can play a very significant role in spreading awareness about the above precautions.

If you need to Evacuate:

1. Pack clothing, essential medication, valuables, personal papers etc. in water-proof bags, to be taken to the safe shelter.
2. Put furniture, clothing, appliances on beds or tables.
3. Turn off power.
4. Whether you leave or stay, put sandbags in the toilet bowl and cover all drain holes to prevent sewage back-flow.
5. Lock your house and take the recommended or known evacuation routes from your area to the safe-shelter.
6. Do not get into water of unknown depth and current (stream).

During Floods:

1. Drink boiled water.
2. Keep your food covered and don't eat too much.
3. Use raw tea, rice water, tender coconut water etc. during diarrhoea.
4. Do not let children remain on empty stomach.
5. Use bleaching powder and lime to disinfect the surroundings.
6. Avoid entering floodwaters. If you have to enter, wear proper protection for your feet and check the depth and current with a stick. Stay away from water with over knee-deep depth.
7. Do not eat food that got wet in the flood waters.
8. Boil tap water before drinking in rural areas. Use halogen tablets to purify water before drinking (ask Village Health Worker for details).
9. Be careful of snakes. Snakebites are common during floods.

Keywords:

1. Rivers and Tributaries 2. Condensation 3. Annual rainfall 4. Flood plain

Improve your learning

1. Explain how water changes into water vapours and how clouds are formed from it?
2. Where do evaporation and cloud formation take place on a large scale?
3. How do the clouds reach deep inlands ?
4. Where does it rain the most? Choose the correct option :
 - a) sea coasts that are in the direction of the winds
 - b) mountains that are in the direction of the winds
 - c) lands far away from the seas.
5. The Godavari flows from the west to the east. Why?
6. Describe the main stages of the water cycle.
7. There may be streams and rivers flowing near your village or town. Find out about them and fill in the table below:



No.	Name	Source	Which river does it join?	Which sea does it meet?

8. Do the rivers/streams in your area contain water throughout the year? Find out from your elders if they had more water in earlier times.
9. How can the people be prepared to face the disasters?
10. Collect the pictures showing cyclones and floods and prepare an album.
11. Make a poster on the floods devastation.

Project:

Observe in your village/locality where the water is being wasted, furnish the details in a table, discuss the reasons, suggest the ways how water can be saved.

Sl. No.	The place where the water is being wasted	Reason	Ways to prevent/ save the water