

RAINFALL AND RIVERS

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

EVAPORATION

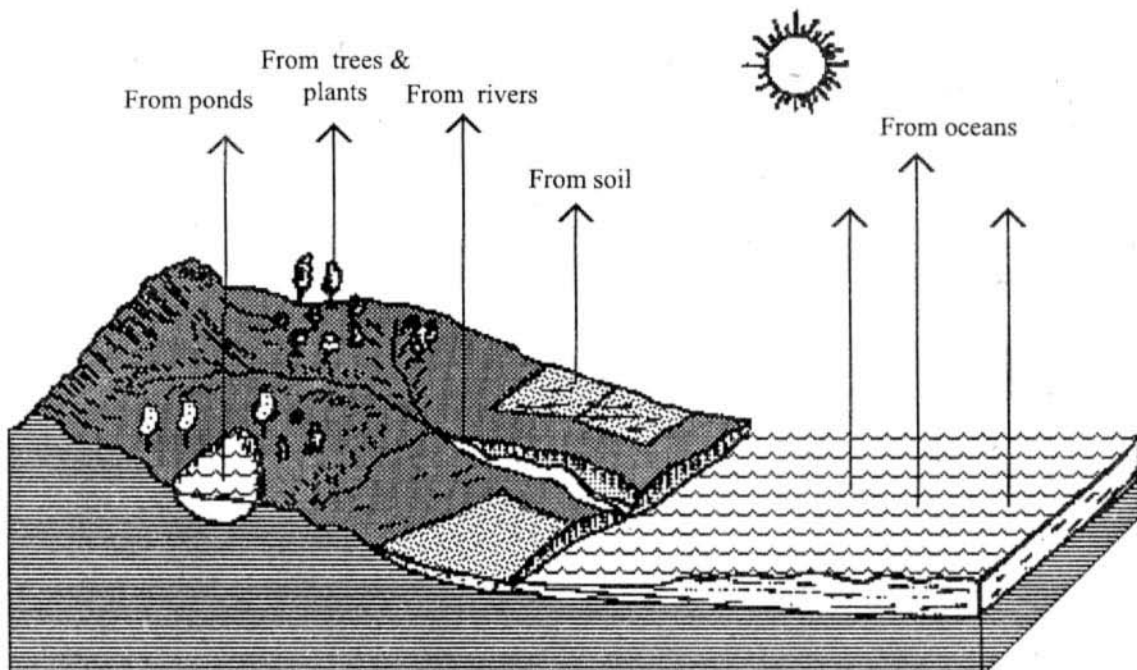
The story of rain begins with water vapour. What is water vapour? When you dry your wet clothes in the open, you see that the water disappears after a while and the clothes dry. Similarly, if you keep some water in a plate it dries up in a couple of days. Actually, water in the cloth or in the plate becomes water vapour and mixes with the air through a process called '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. Infact, wherever there is moisture there is evaporation. There is evaporation from our bodies, from trees, plants and soil! The process of evaporation speeds up with increase in temperature.

- *Look at figure 1 and make a list of all the things from which evaporation takes place.*
- *Do you think there is more evaporation during the day or the night?*
- *In which season do you think there would be more evaporation – in summer or winter?*

Fig.1 Evaporation

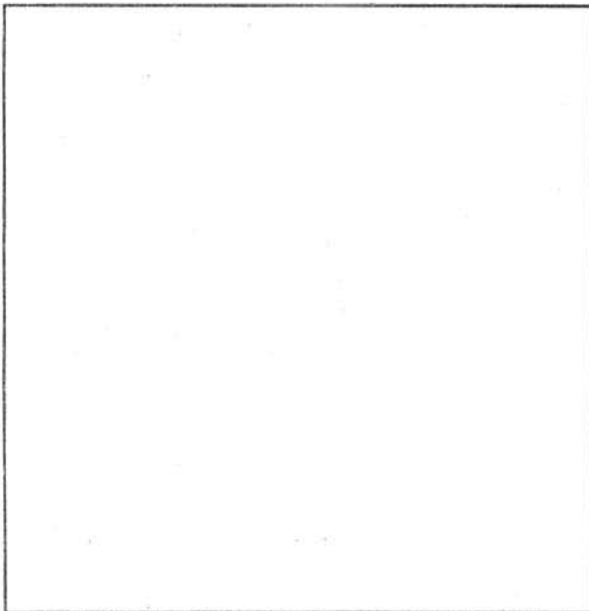


- *Where do you think maximum evaporation would take place— from plants, rivers, oceans or soils?*

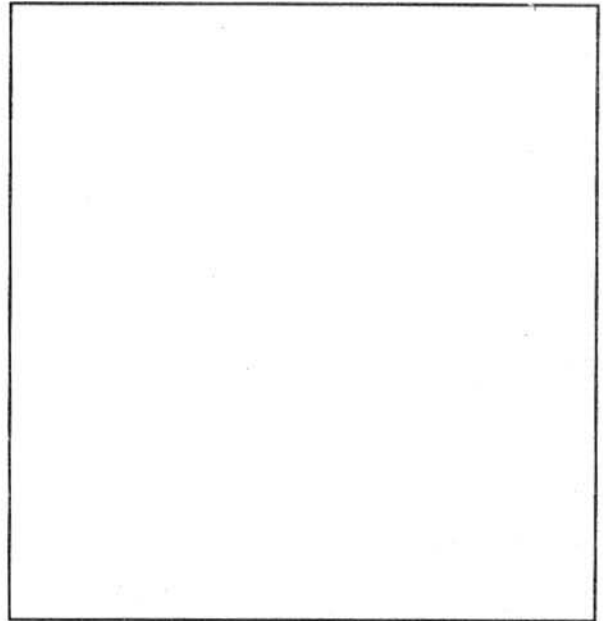
FORMATION OF CLOUDS AND RAIN

When water vapour rises with hot air and reaches high up in the sky, it gets cooled. This is because it 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.

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



As the cloud continues to rise upwards, it gets cooler and more droplets are formed. The droplets get 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.



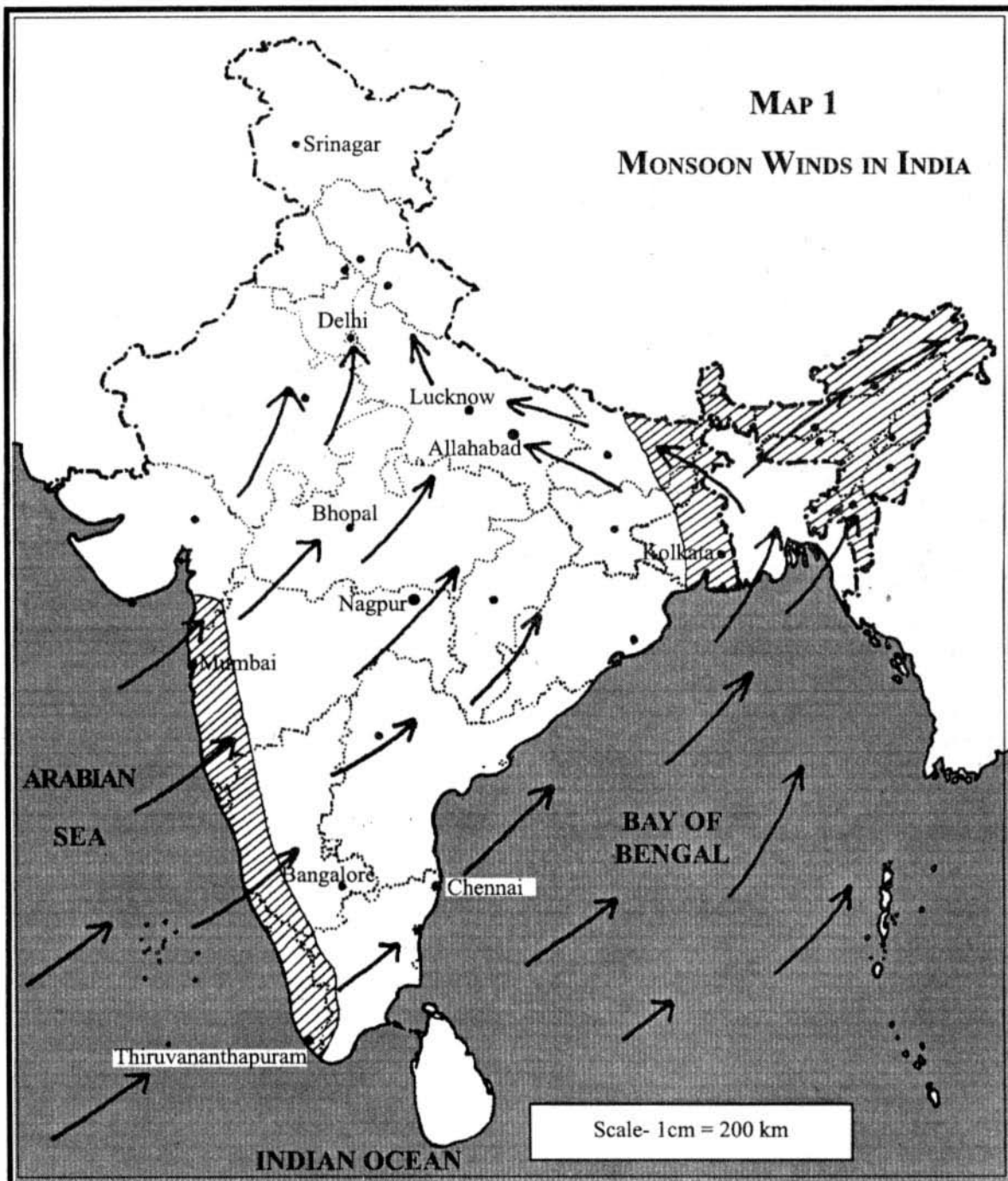
- *Make a diagram to explain this process in the box above.*
- *Why do you think it is necessary for the clouds to rise in order to cause rain?*

WINDS & 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 kilometers. As a result it also rains very heavily on the oceans. Clouds also travel inland for thousands of kilometers 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.



Based upon Survey of India Outline map printed in 1987. The territorial waters of India extend into the sea to a distance of 12 nautical miles measured from the appropriate baseline. © Govt of India copyright.

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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 these winds.

- *Towards which parts of the country will the winds take the clouds being formed in the Bay of Bengal?*
- *Towards which parts of the country will the winds take the clouds being formed in the Arabian Sea?*
- *From which direction will the winds blow to bring monsoon rains to West Bengal, Lucknow and Delhi?*
- *From which direction will the winds blow to bring monsoon rains to Mumbai, Nagpur and Bhopal?*

These are the two branches of the monsoon. The winds blowing from southwestern side bring rainfall to Madhya Pradesh and the winds blowing from the east bring rainfall to the Gangetic valley (states of UP, Bihar and West Bengal).

Why Does It Not Rain Equally Everywhere

You may know that different parts of the country receive different amounts of rainfall. Places like Kolkata and Mumbai receive very high rainfall, while places like Delhi and Jaipur get less rain.

The clouds that rise from the Bay of Bengal and Arabian Sea reach the coastal areas like Mumbai and Kolkata first. These clouds are dense and hence it rains heavily on the coasts. When the winds carrying the clouds move towards the interior parts, rainfall decreases as the clouds begin to lose moisture. By the time they reach Rajasthan, there is very little moisture left in the winds. Therefore, this state receives very little rainfall and remains dry most of the time. Similarly, the winds blowing from the Arabian Sea result in plenty of rainfall on the western coast. By the time their winds reach states like Tamil Nadu and

Andhra Pradesh on the eastern side, their moisture content becomes less and therefore rainfall decreases. That is the reason why the coastal parts of these states receive less rainfall compared to the coastal areas of Kerala, Karnataka and Maharashtra.

The winds that blow from the Bay of Bengal cross the coast near Kolkata and reach the Himalayas. They are forced to rise upwards along the mountains. This cools the moist air further, and there is plenty of rainfall. This is the reason why, besides the eastern part of India, countries like Bangladesh, Bhutan and Nepal receive plenty of rainfall. On the other hand, western Himalayas receive much less rainfall.

- *Look at the map and answer these questions:*

Do you think there will be more rain in the western part of Rajasthan than in the eastern part?

Do you think it will rain more in Thiruvananthapuram or in Chennai?

Do you think it will rain more in Uttaranchal or in Sikkim?

Besides Rajasthan, where else do you think deserts can be found in India?

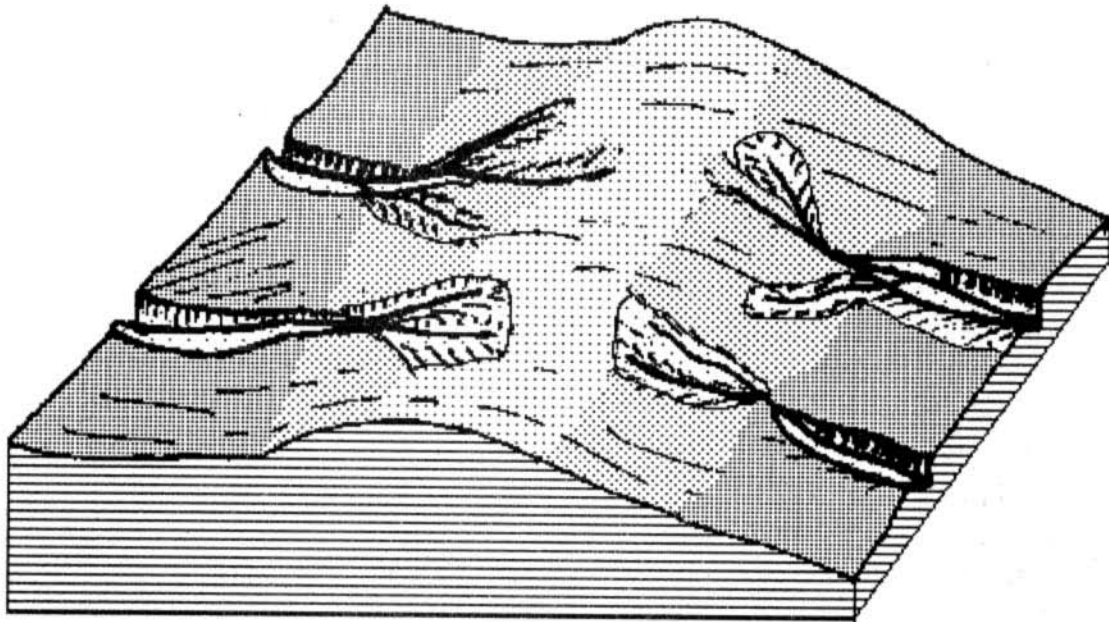
WHERE DOES THE RAIN WATER GO?

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 following chapter. In this chapter we will discuss the water which flows on the surface of the land.

Rivers

Have you seen rain water flow in small streamlets on sloping land? In the same way, water flows in small streams from mountain slopes during the rainy season. However, these streams dry up after some time. Nevertheless,

Fig. 2 Slopes and the Formation of Rivers



the water 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.

- *Study this figure and answer these questions:*
- *Mark the direction of the flow of the river with arrows.*
- *Mark the direction of the slope of the land with arrows.*
- *Do the rivers flow in the same direction as the slope of the land?*

Transformation of a Stream into a Broad River

At its source, a river is usually 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. Rivers or streams, which join a larger river, are called 'tributaries'. As the amount of water in the main river increases, it becomes bigger and broader.

If you travel in the Vindhyan ranges you will see several small streams combine to form

large rivers like the Betwa, the Kali Sindh, the Chambal, etc. If you visit Amarkantak, in Shahdol district, you will see the source of the Narmada. The Narmada is very thin here. When it flows further it is joined by several streams and becomes a big river. Its valley broadens and deepens. The river Narmada in Jabalpur and Hoshangabad is very broad and deep.

- *Can you name the tributaries of the Narmada by looking at Map No. 2?*

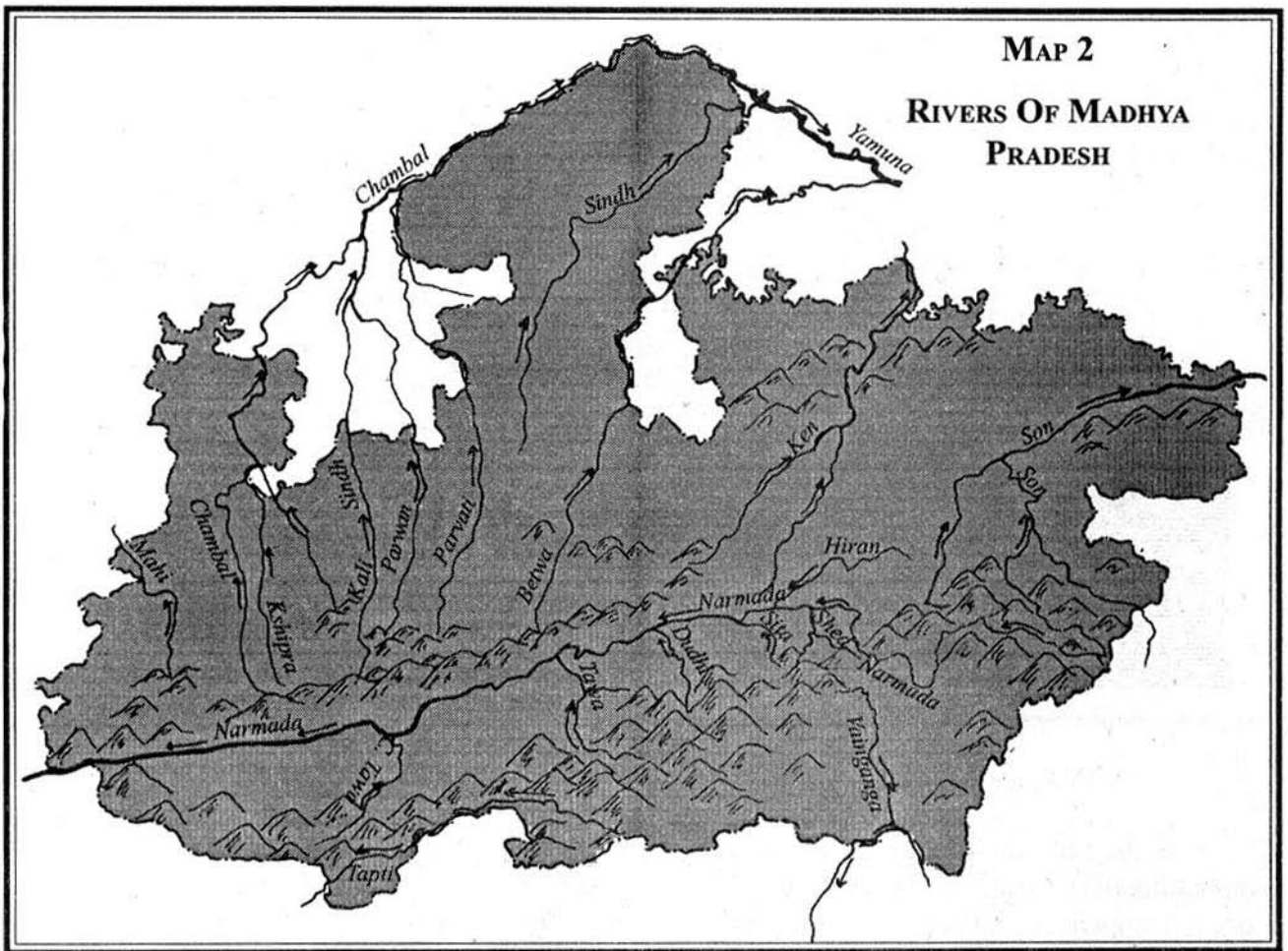
The Rivers of Madhya Pradesh

There are two major hill ranges in our state, the Vindhyas and the Satpuras. Most of the rivers of Madhya Pradesh begin from these hills.

- *Look at the map of rivers of MP and make a list of the rivers beginning from the two ranges:*

Vindhyas	Satpuras

MAP 2
RIVERS OF MADHYA PRADESH



Direction of flow

- *List the rivers flowing northwards.*
- *Can you name two rivers, which have their sources very near to each other but flow in almost opposite directions? Why do you think they flow in opposite directions?*

As you know the direction of flow of a river is determined by the direction of slope of the land. This means that the slope of the Narmada valley is from the east to the west, whereas the slope of the region drained by the Betwa is from the south to the north. The direction in which a river is seen flowing will indicate the slope of the region through which it is flowing. If you stand by a river, you would know in which direction it is flowing and the

slope of the region through which it is flowing.

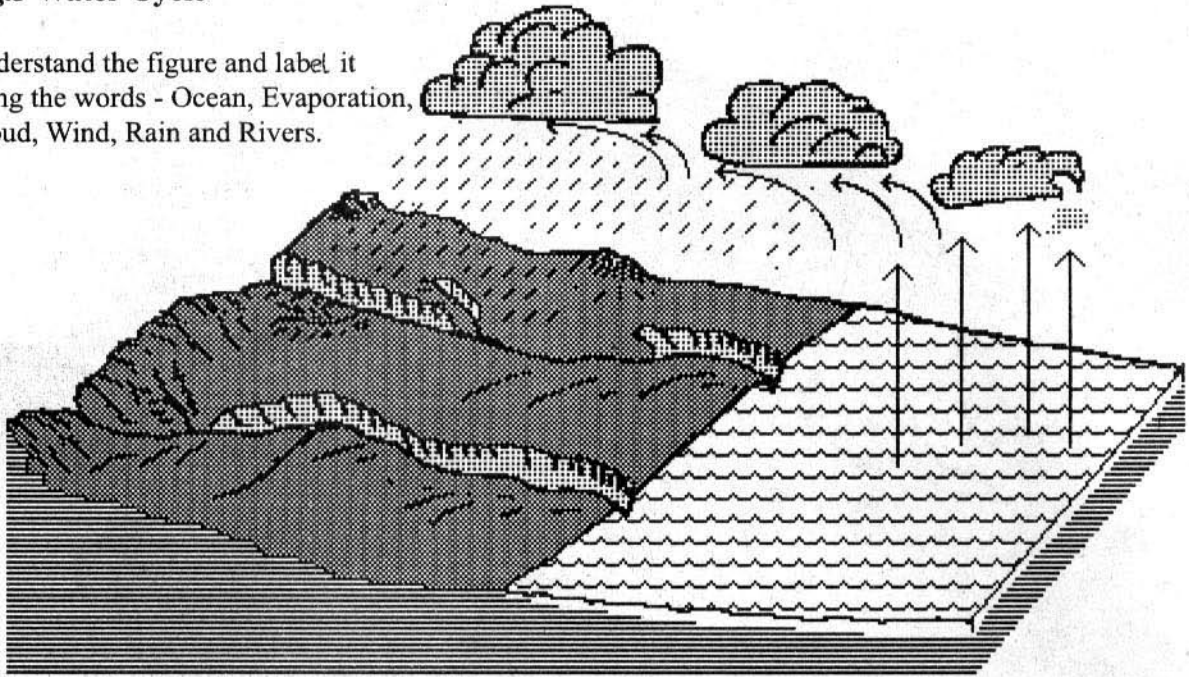
- *By looking at the map can you tell whether the entire Madhya Pradesh slopes in one direction? Can you discern the different directions of slope in the state?*

All rivers flow along the slope to eventually meet the sea. If you look at the map, you will see that the Narmada crosses the state to enter Gujarat and finally flows into the Arabian Sea. The point where the river meets the sea is called the 'mouth of the river'.

- *Look at a map of India and find out which rivers do the Chambal and the Son join. Also find out if they too eventually meet the Arabian Sea.*

Fig.3 Water Cycle

Understand the figure and label it using the words - Ocean, Evaporation, Cloud, Wind, Rain and Rivers.



WATER CYCLE

We began the story with water evaporating from the seas and oceans. Now the story is complete with the rivers meeting the sea. This cycle of water evaporating from the seas, becoming clouds in the sky, pouring down as rain and flowing down the slope on the land in the form of rivers and finally joining the sea again is called the *Water Cycle*. Figure 3 sums up the cycle. Study it carefully.

- *Can you write in your own words, the history of a drop of water, which reaches the mouth of the Narmada after completing the water cycle?*

DROUGHT

You know that the rainfall is not the same every year- it may rain heavily one year and very little the next. If the rainfall is less than one fourth of the normal yearly rainfall it is said that a *drought* has occurred. If it does not rain enough for a few years, the ponds, lakes, wells, etc. dry up. Due to water shortage, crops

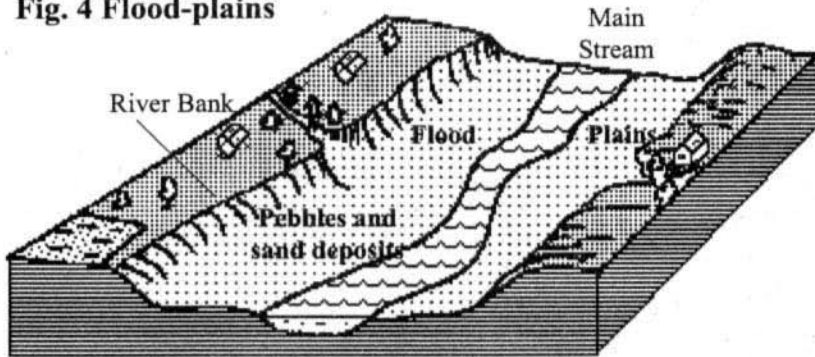
also fail, resulting in a decline in agricultural production.

- *Discuss the impact of drought on the following:*
 - drinking water:*
 - fodder for animals:*
 - crops:*
 - forests:*
 - rivers:*
 - wells:*
- *Have a discussion in the class about how people cope with droughts.*

FLOOD-PLAINS AND FLOODS

A river does not contain the same amount of water all the year round. While the river is full during the rainy season, it usually shrinks during the dry season. Look at figure 4. You can see that the river trough is very wide and it has high banks. This trough is filled with sand and gravel. The river flows as a small stream

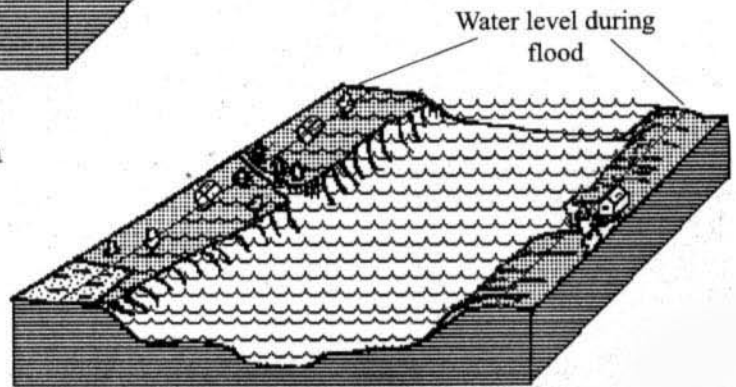
Fig. 4 Flood-plains



amidst them. You will notice that there are no trees here. This is because every year when it rains heavily, this trough is filled with water allowing no permanent tree or plant to grow here. This treeless bed is called the *flood-plain* of the river. All major rivers have their flood-plains.

You must have often heard that during the rainy season some parts of the country get flooded due to excessive rainfall. You may have read about floods occurring in rivers like the Narmada, the Brahmaputra or the Ganga.

Fig. 5 Flood



Vegetation cover on the land (trees, plants, grasses, 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. Vegetation cover also prevents rainwater from flowing fast over the soil. Floods are often caused by sudden increase in the volume of water reaching a river. Vegetation allows the water to flow slowly to the river, thus preventing sudden flooding. It also helps to increase the amount of water, which goes into the soil. This reduces the total amount of water that flows into the river.

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 topsoil. This soil is deposited on the riverbed, which reduces the depth of the river. This results in the reduction of the capacity of the river to carry water. Thus, with even a little rain, the rivers are flooded and they overflow their banks, causing damage. On the other hand, if the surface of the land is covered with vegetation, then soil erosion is greatly reduced.

- *Figure 5 depicts a flood situation. Look at it carefully and answer the following questions.*
- *Has the river water covered the entire flood-plain or is it confined to the tiny stream that was flowing in the dry season?*
- *Is the water confined to the flood-plain or has it overflowed the banks of the river?*
- *In what way have the floods affected the villages, agricultural fields and trees?*
- *Floods are also beneficial to agricultural fields – can you find out how floods help?*

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

For example, let us take the case of the Ganga. Earlier there were dense forests on the

Himalayas from where the Ganga and its tributaries originate. In recent years there has been a large scale felling of trees and hence the forest cover in the Himalayas has been reduced considerably. As a result, every time 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 the importance of protecting our forests and increasing the vegetative cover over other lands.

- *Can you explain how forests and vegetation can help in preventing floods?*
- *Can forests and vegetation help in lessening the effects of droughts (poor rainfall)?*

EXERCISE

1. Explain how water changes into water-vapour and also how clouds are formed from water-vapour
2. Where does evaporation and cloud formation take place on a large scale?
3. How do the clouds reach deep inland?
4. Where does it rain the maximum – (choose the right 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. Fill in the blanks choosing the correct option (bank, tributaries, flood-plain, river valley):
 - a) A river flows through the
 - b) Streams or rivers joining a larger river are called the of the main river.
 - c) The entire trough of a river which is filled with water during the floods is called the of the river.
6. The Narmada flows from east to west while the Betwa flows from the south to the north. Can you explain this difference?
7. Describe the main stages of the water cycle.
8. Can you explain the causes of devastating floods? In what way is it a natural occurrence and in what way is it man-made?
9. There may be several 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?

10. Do the rivers in your area contain water throughout the year? Find out from your elders if they had more water in earlier times.